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Contents

Foreword

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

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1 Scope

The present document specifies the E-UTRAN radio network layer signalling protocol for the S1 interface. The S1 Application Protocol (S1AP) supports the functions of S1 interface by signalling procedures defined in this document. S1AP is developed in accordance to the general principles stated in TS 36.401 [2] and TS 36.410 [3].

2 References

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

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

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

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

[3] 3GPP TS 36.410: "S1 General Aspects and Principles".

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

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

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

[7] Void

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

[27] 3GPP2 C.S0024-B: "cdma2000 High Rate Packet Data Air Interface Specification".

[28] 3GPP TS 22.220: "Service requirements for Home Node Bs and Home eNode Bs".

[29] 3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)".

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

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

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

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

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

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

[36] 3GPP TS 29.274: "Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".

[37] 3GPP TS 23.139: "3GPP system – fixed broadband access network interworking".

[38] 3GPP TS 23.007: "Technical Specification Group Core Network Terminals; Restoration procedures".

[39] 3GPP TS 36.104: "Base Station (BS) radio transmission and reception".

[40] 3GPP TR 25.921 (version.7.0.0): "Guidelines and principles for protocol description and error handling".

[41] 3GPP TS 36.306: "User Equipment (UE) radio access capabilities".

[42] IETF RFC 5905 (2010-06): "Network Time Protocol Version 4: Protocol and Algorithms Specification".

[43] 3GPP TS 26.247: "Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH)".

[44] 3GPP TS 38.413: "NG Radio Access Network (NG-RAN); NG Application Protocol (NGAP)".

[45] 3GPP TS 38.300: "NR; Overall description; Stage-2".

[46] 3GPP TS 23.501: "System Architecture for the 5G System".

[47] 3GPP TS 37.340: "NR; Multi-connectivity; Overall description; Stage-2".

[48] 3GPP TS 33.501: "Security architecture and procedures for 5G System".

[49] 3GPP TS 23.285: "Technical Specification Group Services and System Aspects; Architecture enhancements for V2X services".

[50] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[51] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

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].

DAPS Handover: as defined in TS 36.300 [14].

DCN-ID: DCN identity identifies a specific decicated core network (DCN).

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
ARPI	Additional RRM Policy Index
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
DAPS	Dual Active Protocol Stacks
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
EN-DC	E-UTRA-NR Dual Connectivity
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-UTRAN	Evolved UTRAN
GBR	Guaranteed Bit Rate
GNSS	Global Navigation Satellite System
GUMMEI	Globally Unique MME Identifier
GTP	GPRS Tunnelling Protocol
HFN	Hyper Frame Number
HRPD	High Rate Packet Data
IAB	Integrated Access and Backhaul
IE	Information Element
IMEISV	International Mobile station Equipment Identity and Software Version number
IoT	Internet of Things

LAA	Licensed-Assisted Access
L-GW	Local GateWay
LHN	Local Home Network
LHN ID	Local Home Network ID
LIPA	Local IP Access
LPPa	LTE Positioning Protocol Annex
LWA	LTE-WLAN Aggregation
LWIP	LTE WLAN Radio Level Integration with IPsec Tunnel
MBSFN	Multimedia Broadcast multicast service Single Frequency Network
MDT	Minimization of Drive Tests
MME	Mobility Management Entity
MTSI	Multimedia Telephony Service for IMS
NAS	Non Access Stratum
NB-IoT	Narrowband IoT
NNSF	NAS Node Selection Function
OTDOA	Observed Time Difference of Arrival
PS	Packet Switched
PSCell	Primary SCell
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
QMC	QoE Measurement Collection
QoE	Quality of Experience
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
SSID	Service Set Identifier
S-TMSI	S-Temporary Mobile Subscriber Identity
SUL	Supplementary Uplink
TAC	Tracking Area Code
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
V2X	Vehicle-to-Everything
WUS	Wake Up Signal

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.

- Retrieve UE Information function. The functionality enables the eNB to request UE information from the MME.

- UE Information Transfer function. The functionality enables the MME to transfer UE information to the eNB.

- CP Relocation function. The functionality enables the initiation of the UE-associated logical S1-connection for a NB-IOT UE using Control Plane CIoT EPS Optimisation following a re-establishment request.

- Report of Secondary RAT data volumes function. The functionality enables the eNB to report Secondary RAT data usage information in case of EN-DC as specified in TS 23.401 [11].

- QMC function. The functionality enables the eNB to collect QoE measurements from the UE.

8 S1AP Procedures

8.1 List of S1AP Elementary procedures

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

Table 1: Class 1 procedures

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

Table 2: Class 2 procedures

Elementary Procedure	Message
Handover Notification	HANDOVER NOTIFY
E-RAB Release Indication	E-RAB RELEASE INDICATION
Paging	PAGING
Initial UE Message	INITIAL UE MESSAGE
Downlink NAS Transport	DOWNLINK NAS TRANSPORT
Uplink NAS Transport	UPLINK NAS TRANSPORT
NAS non delivery indication	NAS NON DELIVERY INDICATION
Error Indication	ERROR INDICATION
UE Context Release Request	UE CONTEXT RELEASE REQUEST
DownlinkS1 CDMA2000 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 Indication	LOCATION REPORTING FAILURE INDICATION
Location Report	LOCATION REPORT
Overload Start	OVERLOAD START
Overload Stop	OVERLOAD STOP
eNB Direct Information Transfer	eNB DIRECT INFORMATION TRANSFER
MME Direct Information Transfer	MME DIRECT INFORMATION TRANSFER
eNB Configuration Transfer	eNB CONFIGURATION TRANSFER
MME Configuration Transfer	MME CONFIGURATION TRANSFER
Cell Traffic Trace	CELL TRAFFIC TRACE
Downlink UE Associated LPPa Transport	DOWNLINK UE ASSOCIATED LPPA TRANSPORT
Uplink UE Associated LPPa Transport	UPLINK UE ASSOCIATED LPPA TRANSPORT
Downlink Non UE Associated LPPa Transport	DOWNLINK NON UE ASSOCIATED LPPA TRANSPORT
Uplink Non UE Associated LPPa Transport	UPLINK NON UE ASSOCIATED LPPA TRANSPORT
PWS Restart Indication	PWS RESTART INDICATION
Reroute NAS Request	REROUTE NAS REQUEST
PWS Failure Indication	PWS FAILURE INDICATION
Connection Establishment Indication	CONNECTION ESTABLISHMENT INDICATION
NAS Delivery Indication	NAS DELIVERY INDICATION
Retrieve UE Information	RETRIEVE UE INFORMATION
UE Information Transfer	UE INFORMATION TRANSFER
eNB CP Relocation Indication	eNB CP RELOCATION INDICATION
MME CP Relocation Indication	MME CP RELOCATION INDICATION
Secondary RAT Data Usage Report	SECONDARY RAT DATA USAGE REPORT
Handover Success	HANDOVER SUCCESS
eNB Early Status Transfer	eNB EARLY STATUS TRANSFER
MME Early Status Transfer	MME EARLY STATUS TRANSFER

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

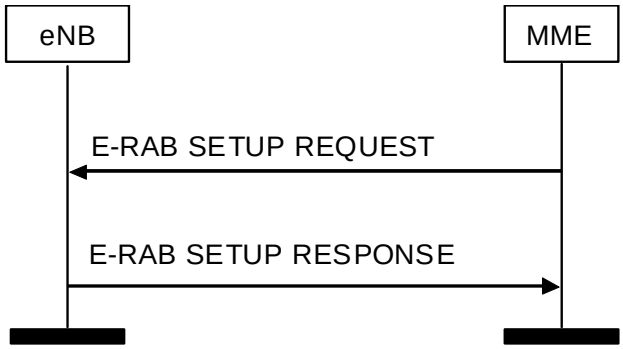

Figure 8.2.1.2-1: E-RAB Setup procedure. Successful operation.

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 IP header compression for the concerned E-RAB.

If the *Ethernet Type* IE is included in the E-RAB SETUP REQUEST message and is set to "True", then the eNB shall, if supported, take this into account to perform header compression appropriately 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

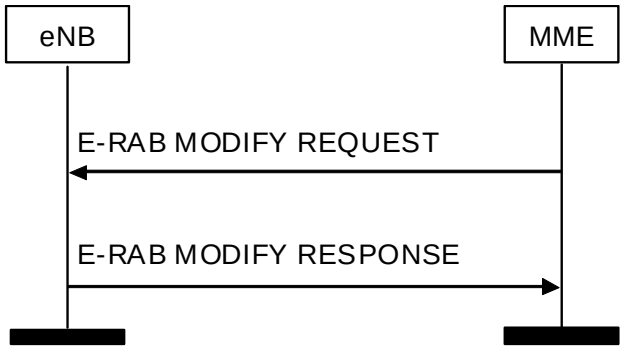

Figure 8.2.2.2-1: E-RAB Modify procedure. Successful operation.

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,
- the *Secondary RAT Data Usage Request* 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.

If the *Secondary RAT Data Usage Request* IE set to "requested" was included in the E-RAB MODIFY REQUEST message, and the eNB supports EN-DC, LAA, LWA or LWIP and has secondary RAT usage data to report, then the *Secondary RAT Usage Report List* IE shall be included in 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

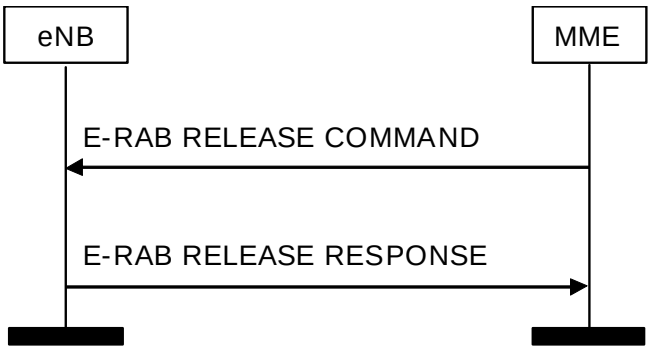

Figure 8.2.3.2.1-1: E-RAB Release procedure. Successful operation.

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].

If the *Secondary RAT Usage Report List* 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

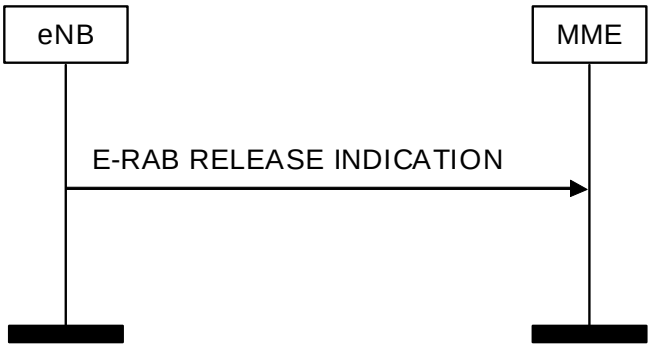

Figure 8.2.3.2.2-1: E-RAB Release INDICATION procedure. Successful operation.

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].

If the *Secondary RAT Usage Report List* 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

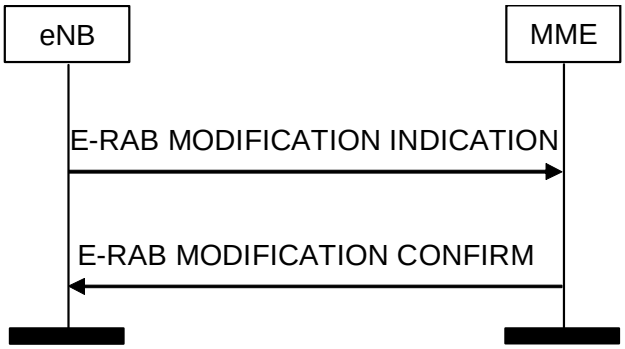

Figure 8.2.4.2-1: E-RAB Modification Indication procedure. Successful operation.

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

If the *Secondary RAT Usage Report List* IE is included in the E-RAB MODIFICATION INDICATION message, the MME shall handle this information as specified in TS 23.401 [11].

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].

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

Interactions with E-RAB Setup procedure or E-RAB Modify procedure:

If the E-RAB MODIFICATION INDICATION message is received by the MME during an ongoing E-RAB Setup procedure or an ongoing E-RAB Modify procedure, the MME shall proceed with the E-RAB Modification Indication procedure.

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

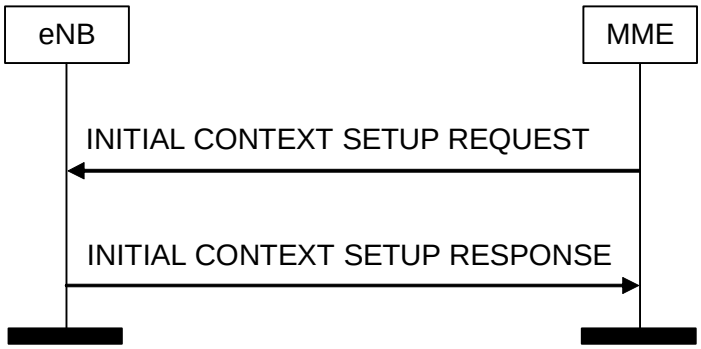

Figure 8.3.1.2-1: Initial Context Setup procedure. Successful operation.

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 *Additional RRM Policy Index* 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 *V2X Services Authorized* IE.
- the *UE Sidelink Aggregate Maximum Bit Rate* IE.
- the *NR UE Security Capabilities* IE.
- the *Aerial UE subscription information* IE.
- the *Pending Data Indication* IE.
- the *IAB Authorized* IE.
- the *NR V2X Services Authorized* IE.
- the *NR UE Sidelink Aggregate Maximum Bit Rate* IE.
- the *PC5 QoS Parameters 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 IP header compression for the concerned E-RAB.

If the *Ethernet Type* IE is included in the INITIAL CONTEXT SETUP REQUEST message and is set to "True", then the eNB shall, if supported, take this into account to perform header compression appropriately 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].

- if supported, store the received *Additional RRM Policy Index* IE 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.
- store the received V2X Services Authorization information, if supported, in the UE context.
- store the received UE Sidelink Aggregate Maximum Bit Rate, if supported, in the UE context, and use it for the concerned UE's sidelink communication in network scheduled mode for V2X services.
- store the received IAB Authorization Information, if supported, in the UE context.
- store the received NR V2X Services Authorization information, if supported, in the UE context.
- store the received NR UE Sidelink Aggregate Maximum Bit Rate, if supported, in the UE context, and use it for the concerned UE's sidelink communication in network scheduled mode for NR V2X services.
- store the received PC5 QoS Parameters, if supported, in the UE context, and use it for the concerned UE's NR sidelink communication as specified in TS 23.285 [49].

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-AreaId* 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 *Trace Activation* IE includes the *UE Application layer measurement configuration* IE, initiate the requested trace session and QoE Measurement Collection function as described in TS 36.300 [14].

- if the *Trace Activation* IE includes the *Bluetooth Measurement Configuration* 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 *WLAN Measurement Configuration* 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 *MDT Configuration NR* IE, store and forward the *MDT Configuration NR* IE to the SgNB, if the eNB has configured EN-DC for the UE.

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 CIoT 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 CIoT EPS Optimisation as specified in TS 23.401 [11] is supported for the UE.

If the *Enhanced Coverage Restricted* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall store this information in the UE context and use it as defined in TS 23.401 [11].

If the *CE-Mode-B Restricted* IE is included in the INITIAL CONTEXT SETUP REQUEST message and the *Enhanced Coverage Restricted* IE is not set to *restricted* and the Enhanced Coverage Restricted information stored in the UE context is not set to *restricted*, the eNB shall store this information in the UE context and use it as defined in TS 23.401 [11].

If the *NR UE Security Capabilities* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall, if supported, store this information in the UE context and use it as defined in TS 33.401 [15].

If the *Aerial UE subscription information* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall, if supported, store this information in the UE context and use it as defined in TS 36.300 [14].

If the *Pending Data Indication* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall use it as defined in TS 23.401 [11].

If the *Subscription Based UE Differentiation Information* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall, if supported, store this information in the UE context for further use according to TS 23.401 [11].

If the *UE Radio Capability ID* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall, if supported, use it as defined in TS 23.401 [11].

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

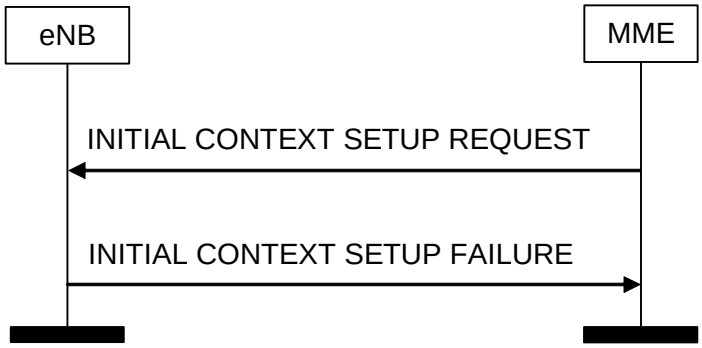

Figure 8.3.1.3-1: Initial Context Setup procedure. Unsuccessful operation.

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., "$TX2_{RELOCOverall}$ 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", "Release due to pre-emption", for the requested UE-associated logical S1-connection release.

If the *Secondary RAT Usage Report List* IE is included in the UE CONTEXT RELEASE REQUEST message, the MME shall handle this information as specified in TS 23.401 [11].

Interactions with UE Context Release procedure:

The UE Context Release procedure should be initiated upon reception of a UE CONTEXT RELEASE REQUEST message. If the UE was configured with EN-DC radio resources at the time UE Context Release Request procedure was triggered, and the PSCell information was available, the eNB shall store the PSCell information in the UE context.

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

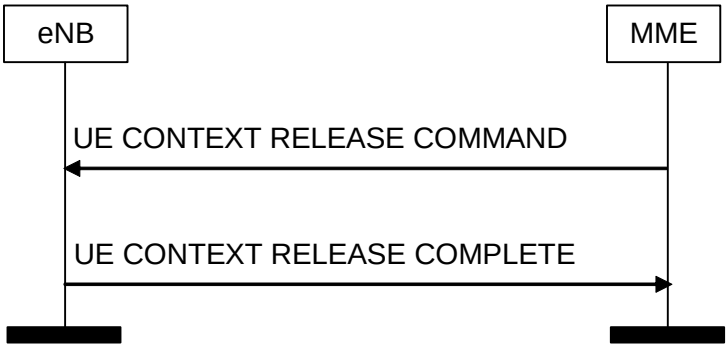

Figure 8.3.3.2-1: UE Context Release procedure. Successful operation.

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 *PSCell Information* IE is included in the *User Location Information* IE, it indicates the UE was configured with EN-DC radio resources at the eNB . Also, if the *Time Since Secondary Node Release* IE is included in the UE CONTEXT RELEASE COMPLETE message, it indicates the time elapsed since EN-DC operation in the eNB was stopped for the UE.

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.

If the *Secondary RAT Usage Report List* IE is included in the UE CONTEXT RELEASE COMPLETE message, the MME shall handle this information as specified in TS 23.401 [11].

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

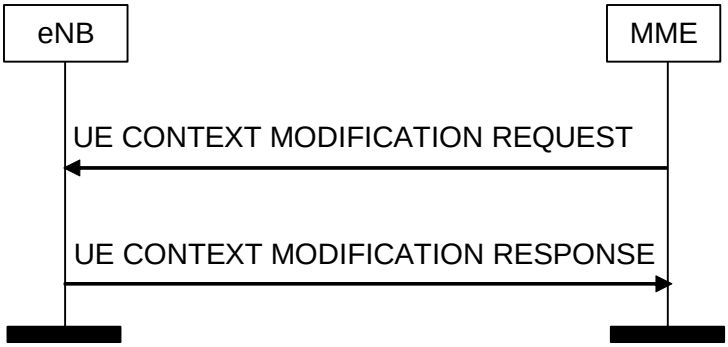

Figure 8.3.4.2-1: UE Context Modification procedure. Successful operation.

The UE CONTEXT MODIFICATION REQUEST message may contain.

- the *Security Key* IE.
- the *Subscriber Profile ID for RAT/Frequency priority* IE.
- the *Additional RRM Policy Index* 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.
- the *V2X Services Authorized* IE.
- the *UE Sidelink Aggregate Maximum Bit Rate* IE.
- the *NR UE Security Capabilities* IE.
- the *Aerial UE subscription information* IE.

- the *IAB Authorized* IE.
- the *NR V2X Services Authorized* IE.
- the *NR UE Sidelink Aggregate Maximum Bit Rate* IE.
- the *PC5 QoS Parameters IE.*
- the *UE Radio Capability ID* 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].
- if supported, store the *NR UE Security Capabilities* IE and use it as defined in 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 supported, store the *Additional RRM Policy Index* IE and use it as defined in TS 36.300 [14].
- store the received *IAB Authorized* IE, if supported, in the UE context.

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.

If the *V2X Services Authorized* IE is contained in the UE CONTEXT MODIFICATION REQUEST message, the eNB shall, if supported, update its V2X services authorization information for the UE accordingly. If the *V2X Services 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 service(s).

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

- replace the previously provided UE Sidelink Aggregate Maximum Bit Rate, if available in the UE context, with the received value;

- use the received value for the concerned UE’s sidelink communication in network scheduled mode for V2X services.

If the *Aerial UE subscription information* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the eNB shall, if supported, store this information in the UE context and use it as defined in TS 36.300 [14].

If the *UE Radio Capability ID* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the eNB shall, if supported, use it as defined in TS 23.401 [11].

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.

If the *NR V2X Services Authorized* IE is contained in the UE CONTEXT MODIFICATION REQUEST message, the eNB shall, if supported, update its V2X services authorization information for the UE accordingly. If the *NR V2X Services 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 service(s).

If the *NR UE Sidelink Aggregate Maximum Bit Rate* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the eNB shall, if supported:

- replace the previously provided NR UE Sidelink Aggregate Maximum Bit Rate, if available in the UE context, with the received value;

- use the received value for the concerned UE’s sidelink communication in network scheduled mode for NR V2X services.

If the *PC5 QoS Parameters* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the eNB shall, if supported, use it for the concerned UE’s NR sidelink communication as specified in TS 23.285 [49].

8.3.4.3 Unsuccessful Operation

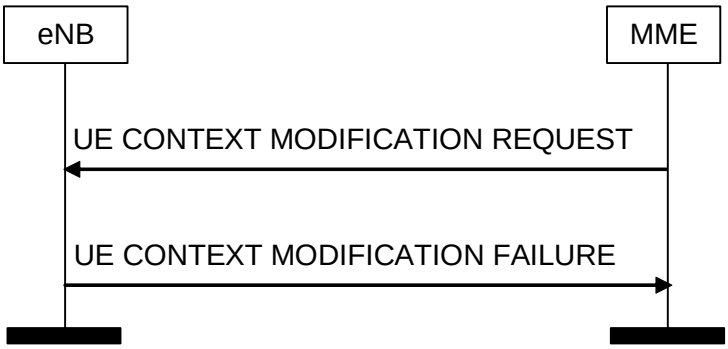

Figure 8.3.4.3-1: UE Context Modification procedure. Unsuccessful operation.

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

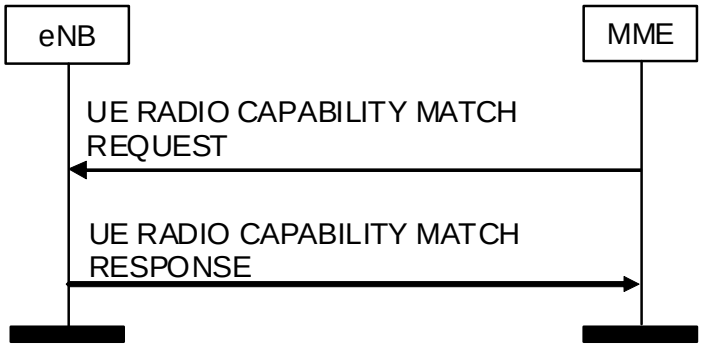

Figure 8.3.5.2-1: UE Radio Capability Match. Successful operation

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.

If the *UE Radio Capability ID* IE is included in the UE RADIO CAPABILITY MATCH REQUEST message, the eNB shall, if supported, use it as defined in TS 23.401 [11].

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

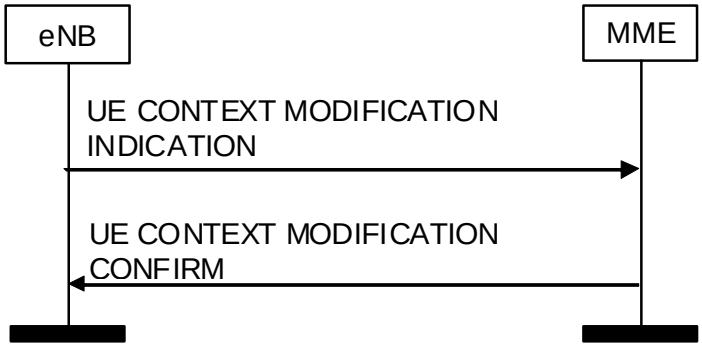

Figure 8.3.6.2-1: UE Context Modification Indication. Successful operation

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

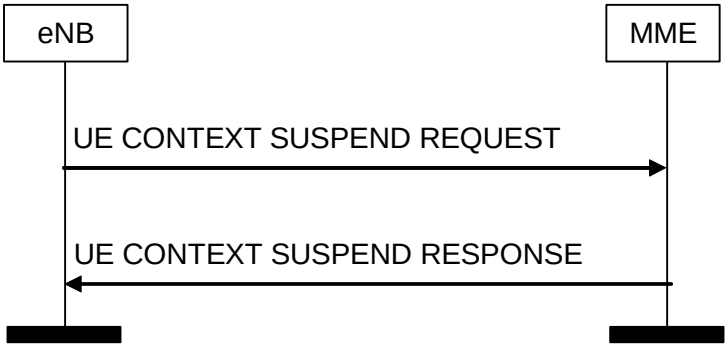

Figure 8.3.7.2-1: UE Context Suspend procedure. Successful operation.

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.

If the *Secondary RAT Usage Report List* IE is included in the UE CONTEXT SUSPEND REQUEST message, the MME shall handle this information as specified in TS 23.401 [11].

If the *Security Context* IE is included in the UE CONTEXT SUSPEND RESPONSE message, the eNB shall store the received *Security Context* IE in the UE context and remove any existing unused stored {NH, NCC} as specified in TS 33.401 [15].

The eNB shall, if supported, report in the UE CONTEXT SUSPEND REQUEST message location information of the UE in the *User Location Information* IE. If the *PSCell Information* IE is included in the *User Location Information* IE, it indicates the UE was configured with EN-DC radio resources at the eNB. Also, if the *Time Since Secondary Node Release* IE is included in the UE CONTEXT SUSPEND REQUEST message, it indicates the time elapsed since EN-DC operation in the eNB was stopped for the UE.

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 or accesses for early data transmission 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

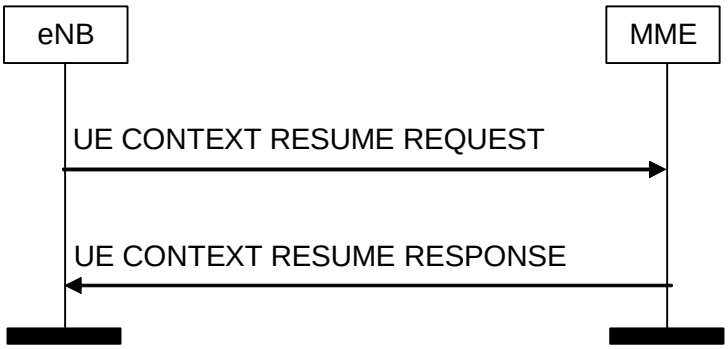

Figure 8.3.8.2-1: UE Context Resume procedure. Successful operation.

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.

If the *Security Context* IE is included in the UE CONTEXT RESUME RESPONSE message, the eNB shall store the received *Security Context* IE in the UE context and the eNB shall use it for the next suspend/resume or X2 handover or Intra eNB handovers as specified in TS 33.401 [15].

If the *Pending Data Indication* IE is included in the UE CONTEXT RESUME RESPONSE message, the eNB shall use it as defined in TS 23.401 [11].

If the UE Context Resume procedure was initiated as a result of an EDT session as described in TS 36.300 [14] and the *Pending Data Indication* IE is received in the UE CONTEXT RESUME RESPONSE message, the eNB shall, if supported, use it to decide whether to proceed to set up an RRC connection for the UE.

8.3.8.3 Unsuccessful Operation

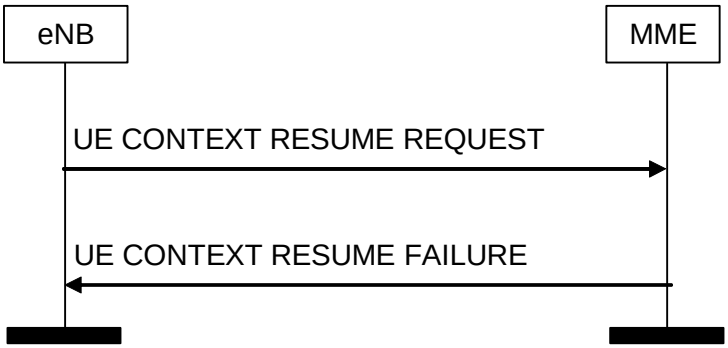

Figure 8.3.8.3-1: UE Context Resume procedure. Unsuccessful operation.

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, and/or trigger the eNB to obtain and report UE Radio Capability. 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 eNB.

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 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].

If the *Enhanced Coverage Restricted* IE is included in the CONNECTION ESTABLISHMENT INDICATION message, the eNB shall store this information in the UE context and use it as defined in TS 23.401 [11].

If the *DL CP Security Information* IE is included in the CONNECTION ESTABLISHMENT INDICATION message, the eNB shall forward this information to the UE as described in TS 36.300 [14].

If the *CE-Mode-B Restricted* IE is included in the CONNECTION ESTABLISHMENT INDICATION message and the *Enhanced Coverage Restricted* IE is not set to *restricted* and the Enhanced Coverage Restricted information stored in the UE context is not set to *restricted*, the eNB shall store this information in the UE context and use it as defined in TS 23.401 [11].

If the *End Indication* IE is included in the CONNECTION ESTABLISHMENT INDICATION message and set to "no further data", the eNB shall consider that there are no further NAS PDUs to be transmitted for this UE.

If the *Subscription Based UE Differentiation Information* IE is included in the CONNECTION ESTABLISHMENT INDICATION message, the eNB shall, if supported, store this information in the UE context for further use according to TS 23.401 [11].

If the *UE Level QoS Parameters* IE is contained in the CONNECTION ESTABLISHMENT INDICATION message, the eNB shall, if supported, store this information in the UE context, and use it as specified in TS 23.401 [11].

If the *UE Radio Capability ID* IE is contained in the CONNECTION ESTABLISHMENT INDICATION message, the eNB shall, if supported, use it as defined in TS 23.401 [11].

8.3.9.3 Unsuccessful Operation

Not applicable.

8.3.9.4 Abnormal Conditions

Not applicable.

8.3.10 Retrieve UE Information

8.3.10.1 General

The purpose of the Retrieve UE information procedure is for the eNB to request the UE information including QoS Parameters and UE Radio capability from MME, for a NB-IoT UE using Control Plane CIoT EPS Optimisation.

8.3.10.2 Successful Operation

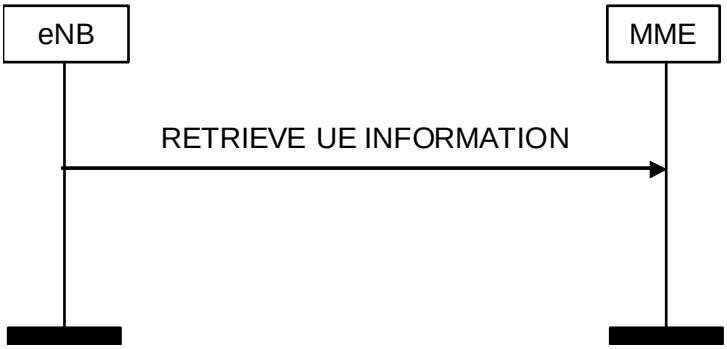

Figure 8.3.10.1: Retrieve UE Information Procedure. Successful operation.

The eNB initiates the procedure by sending the RETRIEVE UE INFORMATION message to the MME.

8.3.10.3 Unsuccessful Operation

Not applicable.

8.3.10.4 Abnormal Conditions

Not applicable.

8.3.11 UE Information Transfer

8.3.11.1 General

The purpose of the UE information transfer procedure is for the MME to send the UE information including QoS Parameters and UE Radio capability to the eNB, for a NB-IoT UE using Control Plane CIoT EPS Optimisation.

8.3.11.2 Successful Operation

Figure 8.3.11.1: UE Information Transfer Procedure. Successful operation.

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

If the *UE Level QoS Parameters* IE is contained in the UE INFORMATION TRANSFER message, the eNB shall store this information in the UE context, and use it as specified in TS 23.401 [11].

If the *UE Radio Capability* IE is contained in the UE INFORMATION TRANSFER message, the eNB shall store this information in the UE context, and use it as specified in TS 23.401 [11].

If the *Subscription Based UE Differentiation Information* IE is included in the UE INFORMATION TRANSFER message, the eNB shall, if supported, store this information in the UE context for further use according to TS 23.401 [11].

If the *Pending Data Indication* IE is contained in the UE INFORMATION TRANSFER message, the eNB shall store this information in the UE context, and use it as specified in TS 23.401 [11].

8.3.11.3 Unsuccessful Operation

Not applicable.

8.3.11.4 Abnormal Conditions

Not applicable.

8.3.12 eNB CP Relocation Indication

8.3.12.1 General

The purpose of the eNB CP Relocation Indication procedure is to request the MME to authenticate the UE's re-establishment request as described in TS 36.300 [14], and trigger the establishment of the respective UE-associated logical S1-connection, for a NB-IoT UE using Control Plane CIoT EPS Optimisation.

The procedure uses UE-associated signalling.

8.3.12.2 Successful Operation

Figure 8.3.12.2-1: eNB CP Relocation Indication. Successful operation.

The eNB initiates the procedure by sending a eNB CP RELOCATION INDICATION message to the MME.

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 eNB CP RELOCATION INDICATION message.

8.3.12.3 Unsuccessful Operation

Not applicable.

8.3.12.4 Abnormal Conditions

Not applicable.

8.3.13 MME CP Relocation Indication

8.3.13.1 General

The purpose of the MME CP Relocation Indication procedure is to inform the eNB that the UE's connection is to be relocated to another eNB as described in TS 36.300 [14], for a UE using Control Plane CIoT EPS Optimisation.

The procedure uses UE-associated signalling.

8.3.13.2 Successful Operation

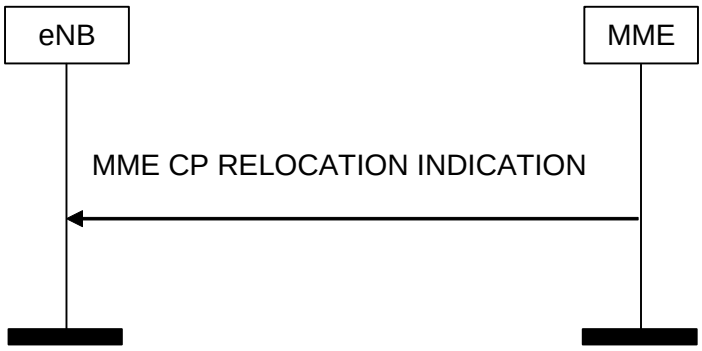

Figure 8.3.13.2-1: MME CP Relocation Indication. Successful operation.

The MME initiates the procedure by sending a MME CP RELOCATION INDICATION message to the eNB.

Upon reception of the MME CP RELOCATION INDICATION message, the eNB shall terminate the delivery of NAS messages that have been received from the MME, and proceed as described in TS 36.300 [14].

8.3.13.3 Unsuccessful Operation

Not applicable.

8.3.13.4 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

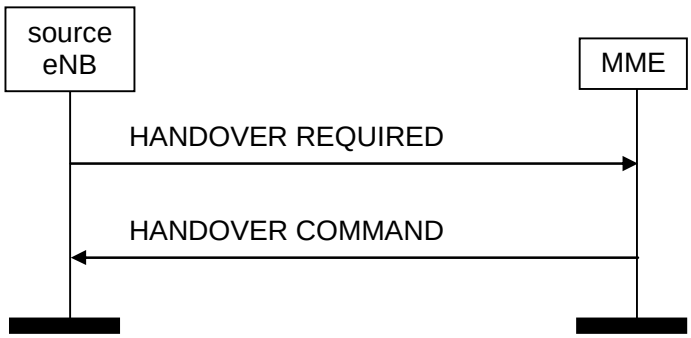

Figure 8.4.1.2-1: Handover preparation: successful operation

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]. If the handover is to NG-RAN, the information in the *Source to Target Transparent Container* IE shall be encoded according to the *Source NG-RAN Node to Target NG-RAN Node Transparent Container*IE definition as specified in TS 38.413 [44].

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

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

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

In case of intra-system handover, the information in the *Target to Source Transparent Container* IE shall be encoded according to the definition of the *Target eNB to Source eNB Transparent Container* IE. In case of inter-system handover to UTRAN, the information in the *Target to Source Transparent Container* IE shall be encoded according to the *Target RNC to Source RNC Transparent Container* IE definition as specified in TS 25.413 [19]. In case of inter-system handover to GERAN A/Gb mode, the information in the *Target to Source Transparent Container* IE shall be encoded according to the *Target BSS to Source BSS Transparent Container* IE definition as described in TS 48.018 [18]. In case of inter-system handover to NG-RAN, the information in the *Target to Source Transparent Container* IE shall be encoded according to the *Target NG-RAN Node to Source NG-RAN Node Transparent Container* IE definition as specified in TS 38.413 [44].

If the *Direct Forwarding Path Availability* IE is included in the *Target NG-RAN Node to Source NG-RAN Node Transparent Container* IE within the HANDOVER COMMAND message, the source eNB shall, if supported, use it for direct data forwarding between the source SN and the target NG-RAN node.

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, and in case the target system is NG-RAN the Target NG-RAN Node ID of the NG-RAN node 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.

If the *DAPS Request Information* IE is included for an E-RAB in the *Source eNB to Target eNB Transparent Container* IE within the HANDOVER REQUIRED message, it indicates that the request concerns a DAPS Handover for that E-RAB, as described in TS 36.300 [14].

If the *Direct Forwarding Path Availability* IE is included in the *Target eNB to Source eNB Transparent Container* IE, the source eNB shall, if supported, use it for direct data forwarding between the source SN and the target eNB as specified in TS 37.340 [32].

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:

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

or

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

8.4.1.3 Unsuccessful Operation

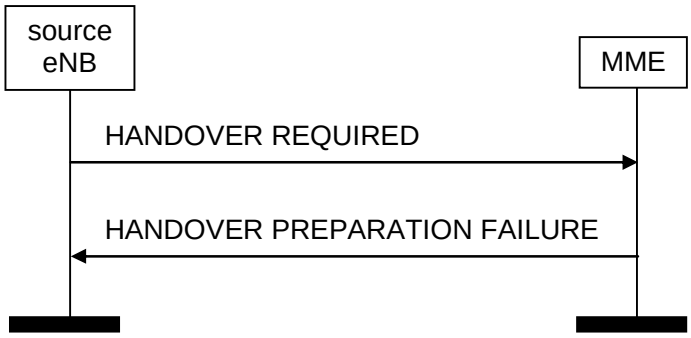

Figure 8.4.1.3-1: Handover preparation: unsuccessful operation

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

If the *CSG Id* IE and no *Cell Access Mode* IE are received in the HANDOVER REQUIRED message and the access control is unsuccessful and none of the E-RABs has 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

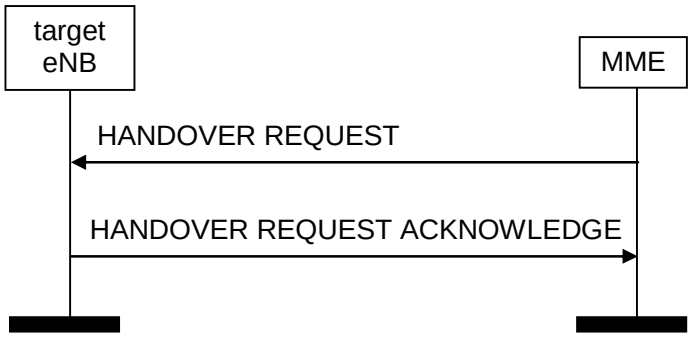

Figure 8.4.2.2-1: Handover resource allocation: successful operation

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-AreaId* 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 *Trace Activation* IE includes the *UE Application layer measurement configuration* IE, initiate the requested trace session and QoE Measurement Collection function as described in TS 36.300 [14].

- if the *Trace Activation* IE includes the *Bluetooth Measurement Configuration* 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 *WLAN Measurement Configuration* 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 *MDT Configuration NR* IE, store and forward the *MDT Configuration NR* IE to the SgNB, if the eNB has configured EN-DC for the UE.

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].

If the *Additional RRM Policy Index* IE is contained in the *Source eNB to Target eNB Transparent Container* IE, the target eNB shall, if supported, store it 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 *Emergency Indicator* IE is included within the *Source eNB to Target eNB Transparent Container* IE in the HANDOVER REQUEST message, the target eNB shall, if supported, use it to allocate radio bearer resources as specified in TS 23.502 [51].

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 IP header compression for the concerned E-RAB.

If the *Ethernet Type* IE is included in the HANDOVER REQUEST message and is set to "True", then the eNB shall, if supported, take this into account to perform header compression appropriately for the concerned E-RAB.

In case of inter-system handover from gNB with direct forwarding, if the target eNB receives the *UE Context Reference at Source* IE in the *Source eNB to Target eNB Transparent Container* IE, it may use it for internal forwarding as specified in TS 37.340 [47].

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, take this information into account when setting NAS timer values for the UE as specified in TS 24.301[24].

If the *V2X Services 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 service(s).

If the *UE Sidelink Aggregate Maximum Bit Rate* IE is included in the HANDOVER REQUEST message, the eNB shall, if supported, use the received value for the concerned UE’s sidelink communication in network scheduled mode for V2X services.

If the *Enhanced Coverage Restricted* IE is included in the HANDOVER REQUEST message, the eNB shall store this information in the UE context and use it as defined in TS 23.401 [11].

If the *CE-Mode-B Restricted* IE is included in the HANDOVER REQUEST message and the *Enhanced Coverage Restricted* IE is not set to *restricted* and the Enhanced Coverage Restricted information stored in the UE context is not set to *restricted*, the eNB shall store this information in the UE context and use it as defined in TS 23.401 [11].

If the *NR UE Security Capabilities* IE is included in the HANDOVER REQUEST message, the eNB shall, if supported, store this information in the UE context and use it as defined in TS 33.401 [15].

If the *Aerial UE subscription information* IE is included in the HANDOVER REQUEST message, the eNB shall, if supported, store this information in the UE context and use it as defined in TS 36.300 [14].

If the *Pending Data Indication* IE is included in the HANDOVER REQUEST message, the eNB shall use it as defined in TS 23.401 [11].

If the *Subscription Based UE Differentiation Information* IE is included in the HANDOVER REQUEST message, the eNB shall, if supported, store this information in the UE context for further use according to TS 23.401 [11].

If the *Additional RRM Policy Index* IE is contained in the HANDOVER REQUEST message, the eNB shall, if supported, store it and use it as defined in TS 36.300 [14].

If the HANDOVER REQUEST message is received for an handover originating from a source NG-RAN node, the list of E-RABs contained in the source eNB to target eNB Transparent Container which are not included in the HANDOVER REQUEST message shall be considered as not to be handed over and ignored.

If the *IAB Authorized* IE is contained in the HANDOVER REQUEST message, the target eNB shall, if supported, consider that the handover is for an IAB-node.

If the *NR V2X Services 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 service(s).

If the *NR UE Sidelink Aggregate Maximum Bit Rate* IE is included in the HANDOVER REQUEST message, the eNB shall, if supported, use the received value for the concerned UE’s sidelink communication in network scheduled mode for NR V2X services.

If the *PC5 QoS Parameters* IE is included in the HANDOVER REQUEST message, the eNB shall, if supported, use it for the concerned UE’s NR sidelink communication as specified in TS 23.285 [49].

If the *Inter-system measurement Configuration* IE is included within the *Source eNB to Target eNB Transparent Container* IE in the HANDOVER REQUEST message, the target eNB shall, if supported, use it as defined in TS 38.300 [45]. The *Inter System Measurement Configuration* IE shall contain at least one of the RSRP, RSRQ or SINR thresholds. If only one of the thresholds is present, the LTE eNB shall use the present threshold to compare against the measurement results received from the UE. If more than one thresholds are present, the received radio measurements must exceed all thresholds in order to satisfy the indicated radio conditions. The target eNB shall, if supported, report the measurement results to the source NR node by including the *Inter-System Handover Report* IE (defined in TS 38. 413 [44]) in the eNB CONFIGURATION TRANSFER message only if:

- there is either a single source NR related cell whose measurement results exceed the threshold(s) for the whole measurement duration, or a group of source NR associated cells which together provide such coverage; and

- the above is fulfilled for the whole measurement duration, in which case the *Early IRAT HO* IE contained in the *Inter-System Handover Report* IE (defined in TS 38. 413 [44]) shall be set to "false", or the above is fulfilled

until the UE is handed over back to NR within the measurement duration, in which case the *Early IRAT HO* IE contained in the *Inter-System Handover Report* IE (defined in TS 38. 413 [44]) shall be set to "true".

The cells that exceed the threshold in the first UE measurement report are included in the Inter-system Handover Report.

If the *UE Radio Capability ID* IE is included in the HANDOVER REQUEST message, the eNB shall, if supported, use it as defined in TS 23.401 [11].

If the *DAPS Request Information* IE is included for an E-RAB in the *Source eNB to Target eNB Transparent Container* IE within the HANDOVER REQUEST message, the target eNB shall consider that the request concerns a DAPS Handover for that E-RAB, as described in TS 36.300 [14]. The target eNB shall include the *DAPS Response information List* IE in the *Target eNB to Source eNB Transparent Container* IE within the HANDOVER REQUEST ACKNOWLEDGE message, containing the *DAPS Response Information* IE for each E-RAB requested to be configured with DAPS Handover.

If the *IMS voice EPS fallback from 5G* IE is included in the *Source eNB to Target eNB Transparent Container* IE within the HANDOVER REQUEST message, the target eNB shall, if supported, store the information in the UE context and consider that the UE is handed over from NG-RAN to E-UTRAN due to an IMS voice fallback.

If for a given E-RAB the *Source Transport Layer Address* 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 part of its ACL functionality configuration actions for direct data forwarding, if such ACL functionality is deployed.

If for a given E-RAB the *Source Node Transport Layer Address* 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 part of its ACL functionality configuration actions for direct data forwarding, if such ACL functionality is deployed.

If the *Direct Forwarding Path Availability* IE is included in the *Source eNB to Target eNB Transparent Container* IE within the HANDOVER REQUEST message, the target eNB may use the information to assign tunnel endpoints in case of inter-system handover.

If the *Source SN ID* IE is included in the *Source eNB to Target eNB Transparent Container* IE within the HANDOVER REQUEST message, the target eNB shall, if supported, use it to decide whether direct forwarding path is available between the target eNB and this source RAN node. If the direct forwarding path is available, the target eNB shall include the *Direct Forwarding Path Availability* IE in the *Target eNB to Source eNB Transparent Container* IE within the HANDOVER REQUEST ACKNOWLEDGE message.

8.4.2.3 Unsuccessful Operation

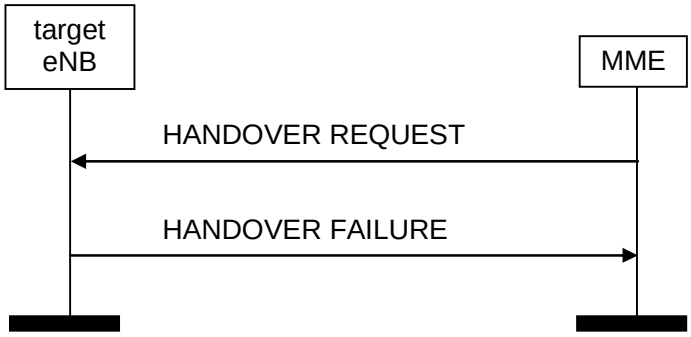

Figure 8.4.2.3-1: Handover resource allocation: unsuccessful operation

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].

If the UE is configured with EN-DC radio resources and the PSCell information is available, the *PSCell Information* IE shall be included in the HANDOVER NOTIFY message.

Interactions with Handover Success procedure:

If the *Notify Source eNB* IE is included in the HANDOVER NOTIFY message, the MME shall, if supported, notify the source eNB that the UE has successfully accessed the target eNB by sending the HANDOVER SUCCESS message.

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 establish a UE associated signalling connection to the EPC and, if applicable, to request the switch of a downlink GTP tunnel towards a new GTP tunnel endpoint.

8.4.4.2 Successful Operation

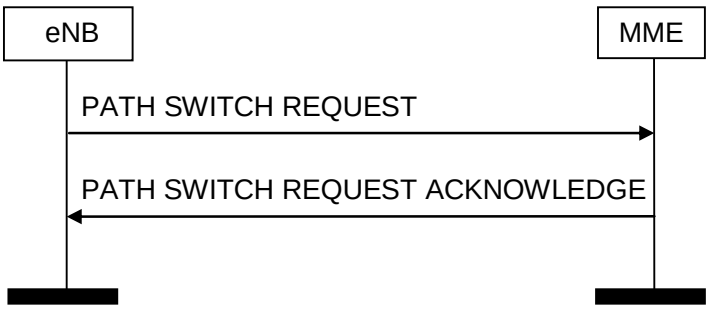

Figure 8.4.4.2-1: Path switch request: successful operation

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.

When the eNB has received from the radio interface the *RRC Resume Cause* IE, it shall include it in the PATH SWITCH REQUEST message.

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 CIoT 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 CIoT EPS Optimisation as specified in TS 23.401 [11] is supported for the UE.

If the *V2X Services Authorized* IE is contained in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall, if supported, update its V2X services authorization information for the UE accordingly. If the *V2X Services 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 service(s).

If the *UE Sidelink Aggregate Maximum Bit Rate* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall, if supported:

- replace the previously provided UE Sidelink Aggregate Maximum Bit Rate, if available in the UE context, with the received value;

- use the received value for the concerned UE's sidelink communication in network scheduled mode for V2X services.

If the *Enhanced Coverage Restricted* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall store this information in the UE context and use it as defined in TS 23.401 [11].

If the *CE-Mode-B Restricted* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message and the *Enhanced Coverage Restricted* IE is not set to *restricted* and the Enhanced Coverage Restricted information stored in the UE context is not set to *restricted*, the eNB shall store this information in the UE context and use it as defined in TS 23.401 [11].

If information on the UE's NR security capabilities is available at the eNB (see TS 33.401 [15]) the eNB shall include the *NR UE Security Capabilities* IE within the PATH SWITCH REQUEST message.

If the *NR UE Security Capabilities* IE is included in the PATH SWITCH REQUEST message, the MME shall, if supported, consider that the eNB has stored the respective information in the UE context, and proceed as defined in TS 33.401 [15].

If the *NR UE Security Capabilities* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall, if supported, store this information in the UE context and use it as defined in TS 33.401 [15].

If the *Aerial UE subscription information* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall, if supported, store this information in the UE context and use it as defined in TS 36.300 [14].

If the *Pending Data Indication* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall use it as defined in TS 23.401 [11].

If the *Subscription Based UE Differentiation Information* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall, if supported, store this information in the UE context for further use according to TS 23.401 [11].

If the *Handover Restriction List* IE is contained in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall, if supported, overwrite any previously stored handover restriction information in the UE context and use the information in the *Handover Restriction List* IE 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;

The PATH SWITCH REQUEST ACKNOWLEDGE message may contain the *Additional RRM Policy Index* IE, if available in the MME for cases specified in TS 23.401 [11]. The eNB shall, if supported, store it and use it as specified in TS 36.300 [14].

If the *UE Radio Capability ID* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall, if supported, use it as defined in TS 23.401 [11].

If the UE is configured with EN-DC radio resources and the PSCell information is available, the *PSCell Information* IE shall be included in the PATH SWITCH REQUEST message.

If the *NR V2X Services Authorized* IE is contained in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall, if supported, update its V2X services authorization information for the UE accordingly. If the *NR V2X Services 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 service(s).

If the *NR UE Sidelink Aggregate Maximum Bit Rate* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall, if supported:

- replace the previously provided NR UE Sidelink Aggregate Maximum Bit Rate, if available in the UE context, with the received value;

- use the received value for the concerned UE's sidelink communication in network scheduled mode for NR V2X services.

If the *PC5 QoS Parameters* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall, if supported, use it for the concerned UE's NR sidelink communication as specified in TS 23.285 [49].

8.4.4.3 Unsuccessful Operation

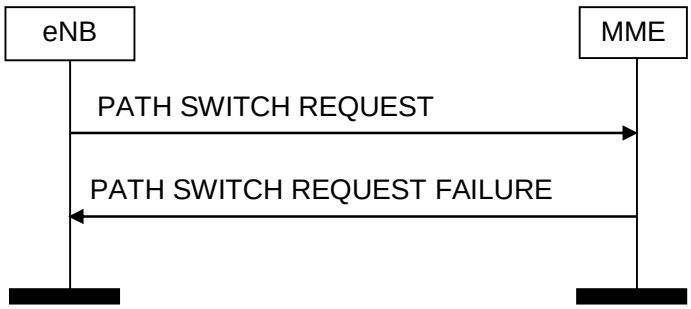

Figure 8.4.4.3-1: Path switch request: unsuccessful operation

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

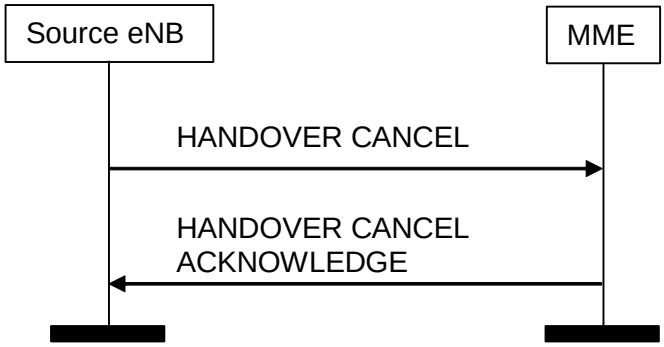

Figure 8.4.5.2-1: Handover Cancel procedure. Successful operation.

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.

8.4.8 Handover Success

8.4.8.1 General

The Handover Success procedure is used during a DAPS Handover, to inform the source eNB that the UE has successfully accessed the target eNB. The procedure uses UE-associated signalling.

8.4.8.2 Successful Operation

Figure 8.4.8.2-1: Handover Success

The MME initiates the procedure by sending the HANDOVER SUCCESS message to the source eNB.

8.4.8.3 Abnormal Conditions

If the HANDOVER SUCCESS message refers to a context that does not exist, the source eNB shall ignore the message.

8.4.9 eNB Early Status Transfer

8.4.9.1 General

The purpose of the eNB Early Status Transfer procedure is to transfer the COUNT of the first downlink SDU that the source eNB forwards to the target eNB, for each respective E-RAB for which DAPS Handover applies, from the source eNB to the target eNB via the MME during an intra LTE S1 handover.

8.4.9.2 Successful Operation

Figure 8.4.9.2-1: eNB Early Status Transfer procedure

The source eNB initiates the procedure by sending the eNB EARLY STATUS TRANSFER message to the MME at the point in time when it considers starting early data forwarding to the target eNB.

For each E-RAB for which DAPS Handover applies, the source eNB shall include the *E-RAB ID* IE and the COUNT of the first downlink SDU that the source eNB forwards to the target eNB within the *E-RABs Subject to Early Status Transfer Item* IE in the *eNB Early Status Transfer Transparent Container* IE of the eNB EARLY STATUS TRANSFER message.

8.4.9.3 Unsuccessful Operation

Not applicable.

8.4.9.4 Abnormal Conditions

Not applicable.

8.4.10 MME Early Status Transfer

8.4.10.1 General

The purpose of the MME Early Status Transfer procedure is to transfer the COUNT of the first downlink SDU that the source eNB forwards to the target eNB, for each respective E-RAB for which DAPS Handover applies, from the source eNB to the target eNB via the MME during an S1 handover.

8.4.10.2 Successful Operation

Figure 8.4.10.2-1: MME Early Status Transfer procedure

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

The *E-RABs Subject To Early Status Transfer List* IE within the *eNB Early Status Transfer Transparent Container* IE included in the MME EARLY STATUS TRANSFER message contains the E-RAB ID(s) corresponding to the E-RAB(s) subject to be simultaneously served by the source eNB and the target eNB during DAPS Handover.

For each E-RAB in the *E-RABs Subject to Early Status Transfer List* IE, the target eNB shall use the information contained in the *DL COUNT PDCP-SN length* IE as the COUNT of the first downlink SDU that the source eNB forwards to the target eNB.

8.4.10.3 Unsuccessful Operation

Not applicable.

8.4.10.4 Abnormal Conditions

If the target eNB receives this message for a UE for which no prepared DAPS 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

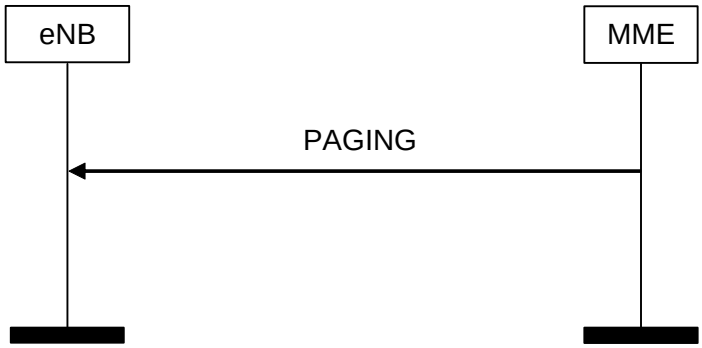

Figure 8.5.2-1: Paging procedure

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 *Enhanced Coverage Restricted* IE is included in the PAGING message, the eNB shall, if supported, use it as defined in TS 23.401 [11].

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]. The MME shall, if supported, include the *Extended UE Identity Index Value* IE in the PAGING message.

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].

If the *CE-Mode-B Restricted* IE is included in the PAGING message and the *Enhanced Coverage Restricted* IE is not set to *restricted*, the eNB shall use it as defined in TS 23.401 [11].

If the *Data Size* IE is included in the PAGING message, the eNB shall, if supported, use it to decide whether to initiate Mobile Terminated EDT procedures towards the UE as described in TS 36.300 [14].

If the *WUS Assistance Information* IE is included in the PAGING message, the eNB shall, if supported, use it to determine the WUS group for the UE, as specified in TS 36.304 [20].

If the *NB-IoT Paging DRX* IE is included in the PAGING message, the eNB shall use it 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 via RRC message 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 [11].

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

NOTE: The first UL NAS message is always received in the RRC CONNECTION SETUP COMPLETE message, except that in cases of NB-IoT and MTC the first UL NAS message may be received in RRCEarlyDataRequest 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].

If the *Coverage Level* IE is included in the INITIAL UE MESSAGE message, the MME shall, if supported, use it as specified in TS 24.301[24].

If the *UE Application Layer Measurement Capability* IE is included in the INITIAL UE MESSAGE message, the MME shall, if supported, use it when initiating UE Application Layer Measurement.

If the *EDT Session* IE set to “true” is included in the INITIAL UE MESSAGE message, the MME shall, if supported, consider that the message has been received as a result of an EDT session as described in TS 36.300 [14].

If the *IAB Node Indication* IE is included in the INITIAL UE MESSAGE message, the MME shall consider that the message is related to an IAB-node.

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 *Additional RRM Policy Index* 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].

If the *Enhanced Coverage Restricted* IE is included in the DOWNLINK NAS TRANSPORT message, the eNB shall store this information in the UE context and use it as defined in TS 23.401 [11].

If the *CE-Mode-B Restricted* IE is included in the DOWNLINK NAS TRANSPORT message and the *Enhanced Coverage Restricted* IE is not set to *restricted* and the Enhanced Coverage Restricted information stored in the UE context is not set to *restricted*, the eNB shall store this information in the UE context and use it as defined in TS 23.401 [11].

If the *NR UE Security Capabilities* IE is included in the DOWNLINK NAS TRANSPORT message, the eNB shall, if supported, store this information in the UE context and use it as defined in TS 33.401 [15].

If the *End Indication* IE is included in the DOWNLINK NAS TRANSPORT message and set to "no further data", the eNB shall consider that besides the included NAS PDU in this message, there are no further NAS PDUs to be transmitted for this UE.

If the *Pending Data Indication* IE is included in the DOWNLINK NAS TRANSPORT message, the eNB shall use it as defined in TS 23.401 [11].

If the *Subscription Based UE Differentiation Information* IE is included in the DOWNLINK NAS TRANSPORT message, the eNB shall, if supported, store this information in the UE context for further use according to TS 23.401 [11].

If the *UE Radio Capability ID* IE is included in the DOWNLINK NAS TRANSPORT message, the eNB shall, if supported, use it as defined in TS 23.401 [11].

Interaction with the NAS Delivery Indication procedure:

If the *DL NAS PDU Delivery Acknowledgment Request* IE set to "requested" was included in the DOWNLINK NAS TRANSPORT message (see 23.401 [11]), the eNB shall trigger the NAS Delivery Indication procedure, if the downlink NAS PDU was successfully delivered to the UE.

Interaction with the UE Capability Info Indication procedure:

If the *UE Capability Info Request* IE set to “requested” is included in the DOWNLINK NAS TRANSPORT message, the eNB shall trigger the UE Capability Info Indication procedure if UE capability related information was successfully retrieved from the UE.

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].

If the UE is configured with EN-DC radio resources and the PSCell information is available, the *PSCell Information* IE shall be included in the UPLINK NAS TRANSPORT message.

8.6.2.4 NAS NON DELIVERY INDICATION

Figure 8.6.2.4-1: NAS NON DELIVERY INDICATION Procedure

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

8.6.2.4a NAS DELIVERY INDICATION

Figure 8.6.2.4a-1: NAS DELIVERY INDICATION Procedure

If the eNB has been requested by the MME to provide an indication upon successful delivery of a downlink NAS PDU the eNB sends the NAS DELIVERY INDICATION message to the MME upon successful delivery of the downlink NAS PDU to the UE, see TS 23.401 [11].

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 [11].

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.

The behaviour of an eNB that has been requested by the MME to provide an indication upon successful delivery of a downlink NAS PDU to the UE and that receives a DOWNLINK NAS TRANSPORT message before it has reported to the MME either successful or unsuccessful delivery of the NAS PDU to the UE, is not specified.

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

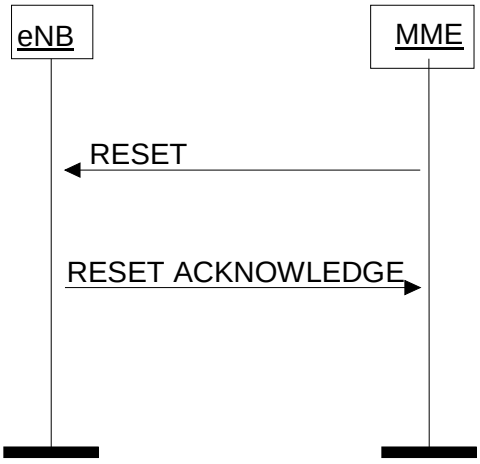

Figure 8.7.1.2.1-1: Reset procedure initiated from the MME. Successful operation.

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

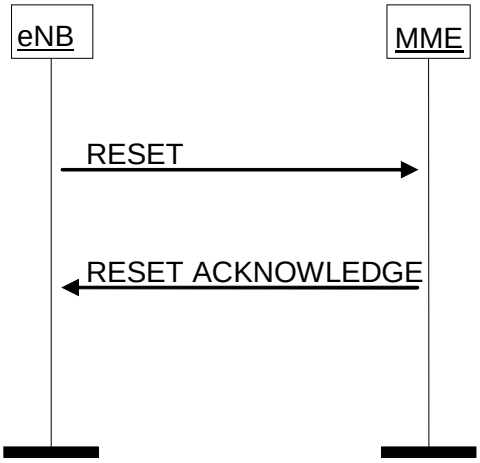

Figure 8.7.1.2.2-1: Reset procedure initiated from the E-UTRAN. Successful operation.

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

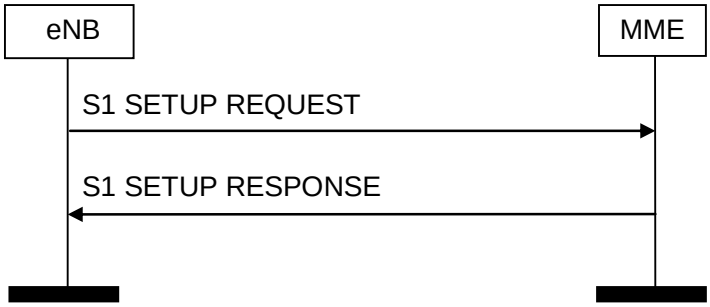

Figure 8.7.3.2-1: S1 Setup procedure: Successful Operation.

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 TS 36.300 [14].

If the *Connected en-gNB List* IE is included in the S1 SETUP REQUEST message, the MME shall take it into account as specified in TS 36.300 [14].

If the S1 SETUP RESPONSE message contains the *ServedDCNs* IE then the eNB shall, if supported, use it as defined in TS 23.401 [11].

If the S1 SETUP RESPONSE message contains the *GUMMEI Type* IE then the eNB shall, if supported, use it to route the UE to the correct MME as specified in TS 23.401 [11].

If the MME supports IAB, the MME shall include the *IAB Supported* IE in the S1 SETUP RESPONSE message.

8.7.3.3 Unsuccessful Operation

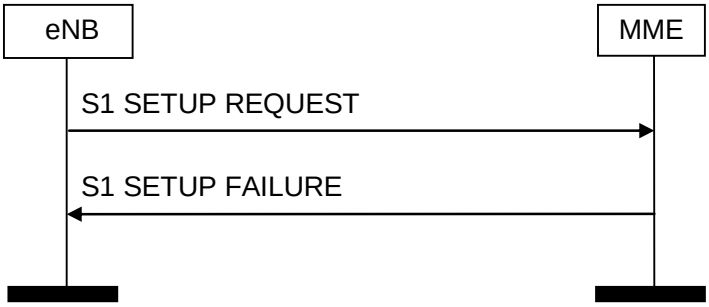

Figure 8.7.3.3-1: S1 Setup procedure: Unsuccessful Operation.

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".

If none of the RATs indicated by the eNB in the S1 SETUP REQUEST message is supported by the MME, then the MME shall fail the S1 Setup procedure with an appropriate cause value.

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

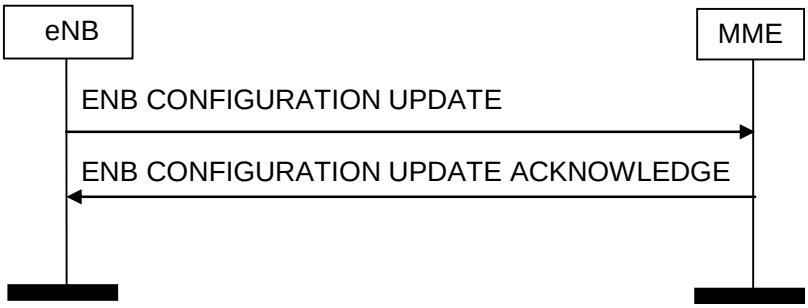

Figure 8.7.4.2-1: ENB Configuration Update procedure: Successful Operation.

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.

If the *Connected en-gNB to be Added List* IE is included in the ENB CONFIGURATION UPDATE message, the MME shall replace, if applicable, any previously received information for the concerned en-gNBs and take it into account as specified in TS 36.300 [14].

If the *Connected en-gNB to be Removed List* IE is included in the ENB CONFIGURATION UPDATE message, the MME shall remove any stored information for the concerned en-gNBs.

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

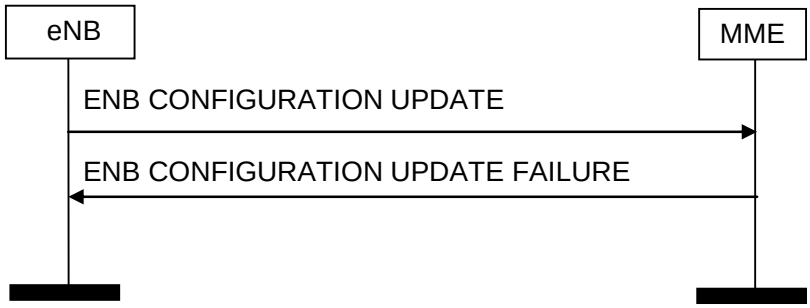

Figure 8.7.4.3-1: ENB Configuration Update procedure: Unsuccessful Operation.

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

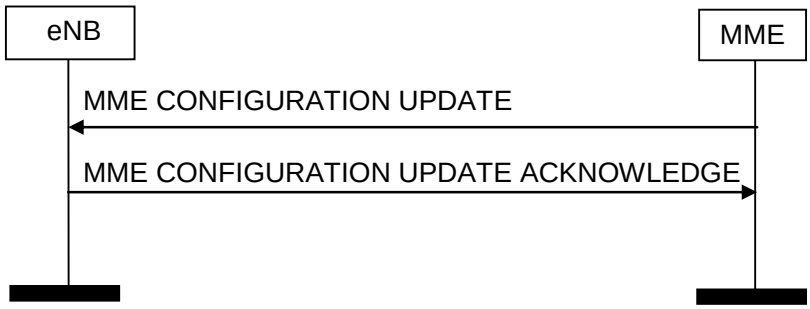

Figure 8.7.5.2-1: MME Configuration Update procedure: Successful Operation.

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.

If the MME CONFIGURATION UPDATE message contains the *ServedDCNs* IE then the eNB shall, if supported, use it as defined in TS 23.401 [11].

If the MME CONFIGURATION UPDATE message contains the *GUMMEI Type* IE then the eNB shall, if supported, use it to route the UE to the correct MME as specified in TS 23.401 [11].

8.7.5.3 Unsuccessful Operation

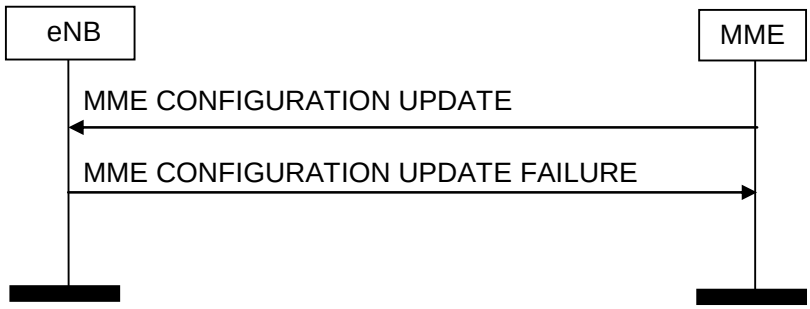

Figure 8.7.5.3-1: MME Configuration Update: Unsuccessful Operation.

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]), or
- "not accept RRC connection requests for data transmission from UEs that only support Control Plane CIoT EPS Optimisation" (i.e. not accept traffic corresponding to RRC cause "mo-data" or "delayTolerantAccess" in TS 36.331 [16] for those UEs), or
- "only permit RRC connection establishments for high priority sessions, exception reporting and mobile terminated services" (i.e., only permit traffic corresponding to RRC cause "highPriorityAccess", “mo-ExceptionData” and "mt-Access" 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/not accepted 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

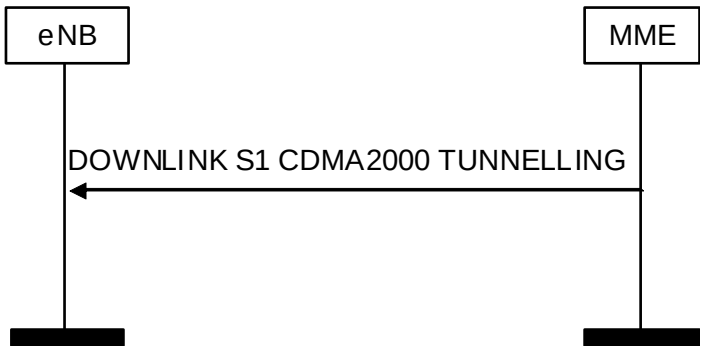

Figure 8.8.2.1-1: Downlink S1 CDMA2000 Tunnelling Procedure

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

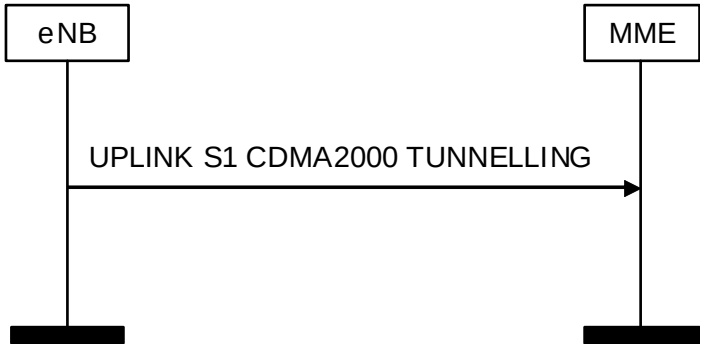

Figure 8.8.2.2-1: Uplink S1 CDMA2000 Tunnelling Procedure

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

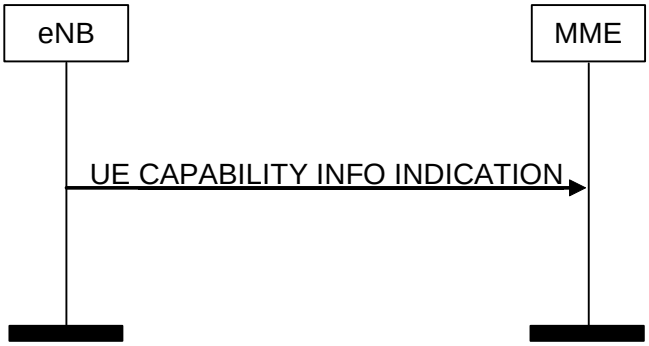

Figure 8.9.2-1: UE Capability Info Indication procedure. Successful operation.

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 previously stored corresponding UE capability information in the MME for the UE, as described in TS 23.401 [11].

If UE CAPABILITY INFO INDICATION message contains the *LTE-M indication* IE, the MME shall, if supported, store this information in the UE context and use it according to TS 23.401 [11].

If the UE indicates the support for UE Application Layer Measurement, the eNB shall if supported include the UE Application Layer Measurement Capability IE in the UE CAPABILITY INFO INDICATION message. The MME shall, if supported, store and use thie information when initiating UE Application Layer Measurement.

If UE CAPABILITY INFO INDICATION message contains the *UE Radio Capability – NR Format* IE, the MME shall, if supported, use it according to TS 23.401 [11].

If the UE RADIO CAPABILITY INFO INDICATION message includes the *UE Radio Capability for Paging* IE and the *UE Radio Capability for Paging – NR Format* IE, the MME shall, if supported, use it according to TS 23.401 [11].

8.9.3 Abnormal Conditions

If the UE RADIO CAPABILITY INFO INDICATION message includes the *UE Radio Capability for Paging – NR Format* IE without the *UE Radio Capability for Paging* IE, the MME shall consider it as a logical error and act as described in subclause 10.4.

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-AreaId* 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].

If the *Trace Activation* IE includes the *UE Application layer measurement configuration* IE, the eNB shall, if supported, initiate the requested trace session and QoE Measurement Collection function as described in TS 36.300 [14].

If the *Trace Activation* IE includes the *Bluetooth Measurement Configuration* 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 *WLAN Measurement Configuration* 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 *MDT Configuration NR* IE, the eNB shall, if supported, store and forward *MDT Configuration NR* IE to the SgNB, if the eNB has configured EN-DC for the UE.

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

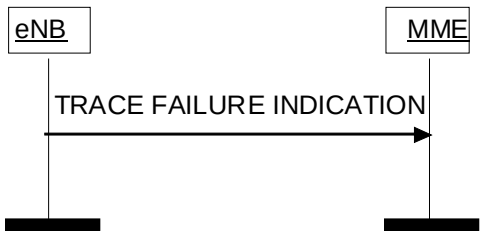

Figure 8.10.2.2-1: Trace Failure Indication procedure.

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.

If the *Additional Location Information* IE is included in the LOCATION REPORTING CONTROL message and set to "Include PSCell" then, if EN-DC is activated, the eNB shall include the current PSCell in the report. If a report upon change of serving cell is requested, the eNB shall provide the report also whenever the UE changes the PSCell, and when EN-DC is activated, as specified in TS 23.401 [11].

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

If the *PSCell Information* IE is included in the LOCATION REPORT message, then the MME may consider both *E-UTRAN CGI* IE and *PSCell Information* IE to determine the UE's location.

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

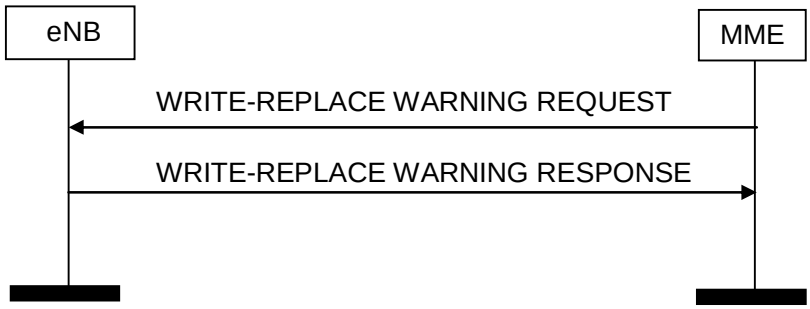

Figure 8.12.1.2-1: Write-Replace Warning procedure. Successful operation.

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 include this information together with the warning type 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].

If the *Warning Area Coordinates* IE is included in the WRITE-REPLACE WARNING REQUEST message, the eNB shall include this information together with the warning message being broadcast 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

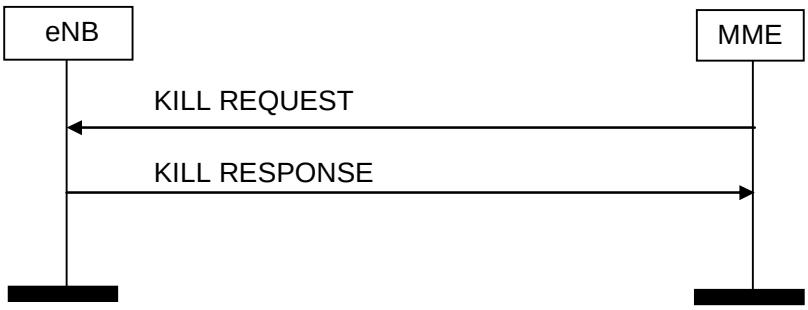

Figure 8.12.2.2-1: Kill procedure. Successful operation.

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

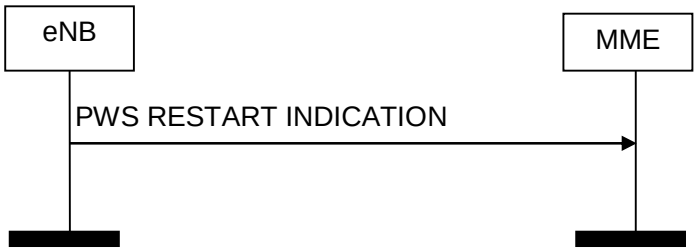

Figure 8.12.3.2-1: PWS Restart Indication procedure. Successful operation.

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

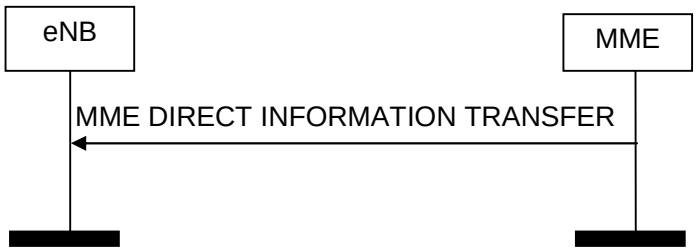

Figure 8.14.1.2-1: MME Direct Information Transfer procedure. Successful operation.

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

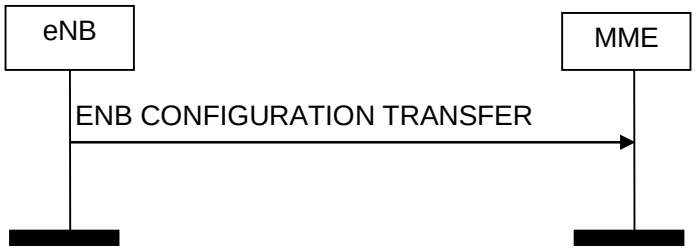

Figure 8.15.2.1-1: eNB Configuration Transfer procedure. Successful operation.

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*.

If the MME receives the *EN-DC SON Configuration Transfer* IE, it shall transparently transfer the *EN-DC SON Configuration Transfer* IE either towards the eNB indicated in the *Target eNB-ID* IE or towards an eNB connected to

the en-gNB indicated in the *Target en-gNB-ID* IE which is included in the *EN-DC SON Configuration Transfer* IE. The *EN-DC SON Configuration Transfer* IE may also contain, if available,

- the *Target eNB ID* IE,
- the *Associated TAI* IE,
- the *Broadcast* 5GS TAI IE,

for purposes described in TS 36.300 [14].

If the MME receives the *Inter-system SON Configuration Transfer* IE, it shall transparently transfer the *Inter-system SON Configuration Transfer* IE towards the AMF serving the NG-RAN Node indicated in the *Target gNB-ID* IE which is included in the *Inter-system 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

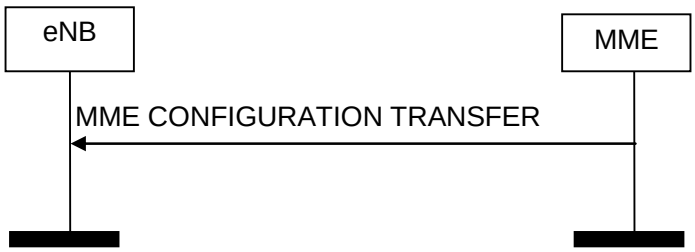

Figure 8.16.2.1-1: MME Configuration Transfer procedure. Successful operation.

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 or the *EN-DC SON Configuration Transfer* IE, the *SON Information* IE containing the *SON Information Request* IE, it may transfer back the requested information either towards the eNB indicated in the *Source eNB-ID* IE of the *SON Configuration Transfer* IE or towards the eNB indicated in the *Source eNB-ID* IE of the *EN-DC 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 or towards the eNB indicated in the *Source eNB-ID* IE of the *EN-DC 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 or the *EN-DC 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 *Inter-system SON Configuration Transfer* IE containing the *Inter-system SON Information Report* IE, it may use it as specified in TS 38.300 [45] or 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

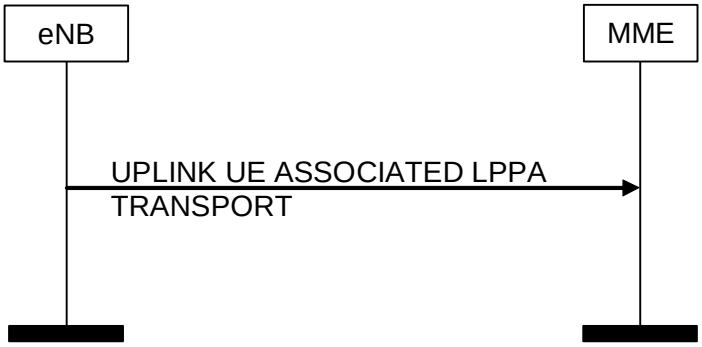

Figure 8.17.2.2-1: UPLINK UE ASSOCIATED LPPA TRANSPORT Procedure

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.

8.18 Secondary RAT Data Usage Report

8.18.1 General

The purpose of the Secondary RAT Data Usage Report procedure is to provides information on the used resources of the secondary RAT (e.g. NR resources during EN-DC operation) as specified in TS 23.401 [11].

8.18.2 Successful Operations

8.18.2.1 SECONDARY RAT DATA USAGE REPORT

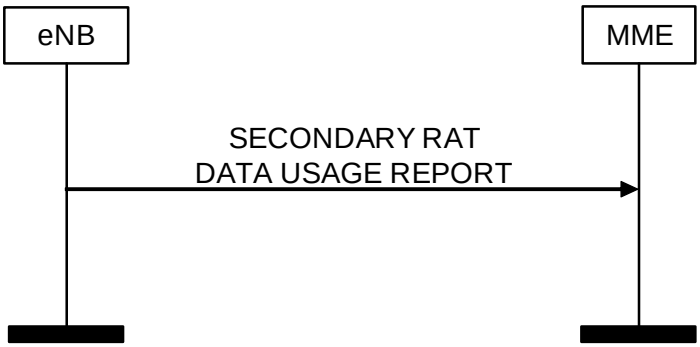

Figure 8.18.2.1-1: Secondary RAT Data Usage Report Procedure

The eNB initiates the procedure by sending the SECONDARY RAT DATA USAGE REPORT message to MME.

If the *PSCell Information* IE is included in the SECONDARY RAT DATA USAGE REPORT message, then the MME may use it to determine the UE's location.

If the *Time Since Secondary Node Release* IE is included in the SECONDARY RAT DATA USAGE REPORT message, it indicates the time elapsed since EN-DC operation in the eNB was stopped for the UE.

8.18.3 Unsuccessful Operation

Not applicable

8.18.4 Abnormal Conditions

Not applicable

8.19 UE Radio Capability ID Mapping

8.19.1 General

The purpose of the UE Radio Capability ID Mapping procedure is to enable the eNB to request the MME to provide the UE Radio Capability information that maps to a specific UE Radio Capability ID. The procedure uses non UE-associated signalling.

8.19.2 Successful Operation

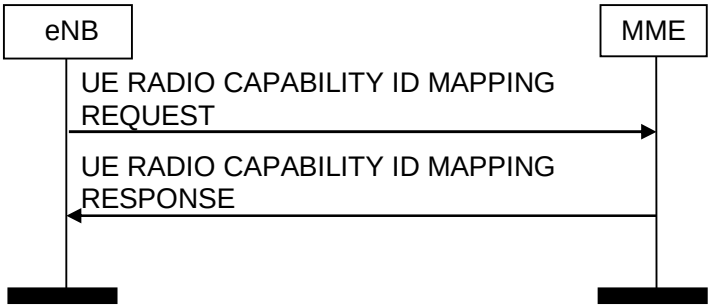

Figure 8.19.2-1: UE Radio Capability ID mapping Request procedure. Successful operation.

The eNB initiates the procedure by sending a UE RADIO CAPABILITY ID MAPPING REQUEST message to the MME.

Upon receipt of the UE RADIO CAPABILITY ID MAPPING REQUEST message, the MME shall include the UE Radio Capability information that maps to the UE Radio Capability ID indicated in the UE RADIO CAPABILITY ID MAPPING REQUEST message in the UE RADIO CAPABILITY ID MAPPING RESPONSE message.

8.19.3 Unsuccessful Operation

Not applicable.

8.19.4 Abnormal Conditions

Void.

9 Elements for S1AP Communication

9.1 Message Functional Definition and Content

9.1.1 General

9.1.2 Message Contents

9.1.2.1 Presence

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

Table 4: Meaning of abbreviations used in S1AP messages

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

9.1.2.2 Criticality

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

Table 5: Meaning of content within "Criticality" column

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

9.1.2.3 Range

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

9.1.2.4 Assigned Criticality

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

9.1.3 E-RAB Management Messages

9.1.3.1 E-RAB SETUP REQUEST

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
UE Aggregate Maximum Bit Rate	O		9.2.1.20		YES	reject
E-RAB to be Setup List		*1*			YES	reject
>E-RAB To Be Setup Item IEs		*1 .. <maxnoof E-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>E-RAB Level QoS Parameters	M		9.2.1.15	Includes necessary QoS parameters.	-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	EPC TEID.	-	
>>NAS-PDU	M		9.2.3.5		-	
>>Correlation ID	O		9.2.1.80		YES	ignore
>>SIPTO Correlation ID	O		Correlation ID 9.2.1.80		YES	ignore
>>Bearer Type	O		9.2.1.116		YES	reject
>>Ethernet Type	O		9.2.1.147		YES	ignore

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

9.1.3.2 E-RAB SETUP RESPONSE

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
E-RAB Setup List		*0..1*			YES	ignore
>E-RAB Setup Item IEs		*1 .. <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M				-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	eNB TEID.	-	
E-RAB Failed to Setup List	O		E-RAB List 9.2.1.36	A value for *E-RAB ID* shall only be present once in *E-RAB Setup List* IE and in *E-RAB Failed to Setup List* IE.	YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

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

9.1.3.3 E-RAB MODIFY REQUEST

This message is sent by the MME and is used to request the eNB to modify the Data Radio Bearers and the allocated resources on Uu and S1 for one or several E-RABs or to change the S-GW as defined in TS 23.401 [11].

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
UE Aggregate Maximum Bit Rate	O		9.2.1.20		YES	reject
E-RAB to be Modified List		*1*			YES	reject
>E-RAB To Be Modified Item IEs		*1 .. <maxnoofE-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>E-RAB Level QoS Parameters	M		9.2.1.15	Includes necessary QoS parameters.	-	
>>NAS-PDU	M		9.2.3.5		-	
>>Transport Information	O				YES	reject
>>>Transport Layer Address	M		9.2.2.1		-	
>>>UL GTP TEID	M		GTP-TEID 9.2.2.2		-	
Secondary RAT Data Usage Request	O		ENUMERATED (requested, …)		Yes	ignore

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

9.1.3.4 E-RAB MODIFY RESPONSE

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
E-RAB Modify List		*0..1*			YES	ignore
>E-RAB Modify Item IEs		*1 .. <maxnoofE-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
E-RAB Failed to Modify List	O		E-RAB List 9.2.1.36	A value for *E-RAB ID* shall only be present once in *E-RAB Modify List* IE and *E-RAB Failed to Modify List* IE.	YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore
Secondary RAT Usage Report List	O		9.2.1.124		Yes	ignore

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

9.1.3.5 E-RAB RELEASE COMMAND

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

Direction: MME → eNB

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

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

9.1.3.6 E-RAB RELEASE RESPONSE

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
E-RAB Release List		*0..1*			YES	ignore
>E-RAB Release Item IEs		*1 .. <maxnoofE-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
E-RAB Failed to Release List	O		E-RAB List 9.2.1.36	A value for *E-RAB ID* shall only be present once in *E-RAB Release List* IE and *E-RAB Failed to Release List* IE.	YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore
User Location Information	O		9.2.1.93		YES	ignore
Secondary RAT Usage Report List	O		9.2.1.124		Yes	ignore

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

9.1.3.7 E-RAB RELEASE INDICATION

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
E-RAB Released List	M		E-RAB List 9.2.1.36	A value for *E-RAB ID* shall only be present once in *E-RAB Released List* IE.	YES	ignore
User Location Information	O		9.2.1.93		YES	ignore
Secondary RAT Usage Report List	O		9.2.1.124		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.

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 to be Modified List		*1*			YES	reject
>E-RAB to Be Modified Item IEs		*1 .. <maxnoofE-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>DL GTP TEID	M		GTP-TEID 9.2.2.2		-	
E-RAB not to be Modified List		*0..1*			YES	reject
>E-RAB not to Be Modified Item IEs		*1 .. <maxnoofE-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>DL GTP TEID	M		GTP-TEID 9.2.2.2		-	
CSG Membership Info		*0..1*			YES	reject
>CSG Membership Status	M		9.2.1.73		-	
>CSG Id	M		9.2.1.62		-	
>Cell Access Mode	O		9.2.1.74		-	
>PLMN Identity	O		9.2.3.8		-	
Tunnel Information for BBF	O		Tunnel Information 9.2.2.3	Indicating HeNB's Local IP Address assigned by the broadband access provider, UDP port Number.	YES	ignore
Secondary RAT Usage Report List	O		9.2.1.124		Yes	ignore
User Location Information	O		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.

9.1.3.9 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 → 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
E-RAB Modify List		*0..1*			YES	ignore
>E-RAB Modify Item IEs		*1 .. <maxnoofE-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
E-RAB Failed to Modify List	O		E-RAB List 9.2.1.36	A value for *E-RAB ID* shall only be present once in the E-RAB MODIFICATION CONFIRM message.	YES	ignore
E-RAB To Be Released List	O		E-RAB List 9.2.1.36	A value for *E-RAB ID* shall only be present once in the E-RAB MODIFICATION CONFIRM message.	YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore
CSG Membership Status	O		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 → 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>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>E-RAB Level QoS Parameters	M		9.2.1.15	Includes necessary QoS parameters.	-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2		-	
>>NAS-PDU	O		9.2.3.5		-	
>>Correlation ID	O		9.2.1.80		YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
>>SIPTO Correlation ID	O		Correlation ID 9.2.1.80		YES	ignore
>>Bearer Type	O		9.2.1.116		YES	reject
>>Ethernet Type	O		9.2.1.147		YES	ignore
UE Security Capabilities	M		9.2.1.40		YES	reject
Security Key	M		9.2.1.41	The KeNB is provided after the key-generation in the MME, see TS 33.401 [15].	YES	reject
Trace Activation	O		9.2.1.4		YES	ignore
Handover Restriction List	O		9.2.1.22		YES	ignore
UE Radio Capability	O		9.2.1.27		YES	ignore
Subscriber Profile ID for RAT/Frequency priority	O		9.2.1.39		YES	ignore
CS Fallback Indicator	O		9.2.3.21		YES	reject
SRVCC Operation Possible	O		9.2.1.58		YES	ignore
CSG Membership Status	O		9.2.1.73		YES	ignore
Registered LAI	O		9.2.3.1		YES	ignore
GUMMEI	O		9.2.3.9	This IE indicates the MME serving the UE.	YES	ignore
MME UE S1AP ID 2	O		9.2.3.3	This IE indicates the MME UE S1AP ID assigned by the MME.	YES	ignore
Management Based MDT Allowed	O		9.2.1.83		YES	ignore
Management Based MDT PLMN List	O		MDT PLMN List 9.2.1.89		YES	ignore
Additional CS Fallback Indicator	C-ifCSFBhighpriority		9.2.3.37		YES	ignore
Masked IMEISV	O		9.2.3.38		YES	ignore
Expected UE Behaviour	O		9.2.1.96		YES	ignore
ProSe Authorized	O		9.2.1.99		YES	ignore
UE User Plane CIoT Support Indicator	O		9.2.1.113		YES	ignore
V2X Services Authorized	O		9.2.1.120		YES	ignore
UE Sidelink Aggregate Maximum Bit Rate	O		9.2.1.122	This IE applies only if the UE is authorized for V2X services.	YES	ignore
Enhanced Coverage Restricted	O		9.2.1.123		YES	ignore
NR UE Security Capabilities	O		9.2.1.127		YES	ignore
CE-mode-B Restricted	O		9.2.1.129		YES	ignore
Aerial UE subscription information	O		9.2.1.136		YES	ignore
Pending Data Indication	O		9.2.3.55		YES	ignore
Subscription Based UE Differentiation Information	O		9.2.1.140		YES	ignore
Additional RRM Policy Index	O		9.2.1.39a		YES	ignore
IAB Authorized	O		9.2.1.146		YES	ignore
NR V2X Services Authorized	O		9.2.1.148		YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
NR UE Sidelink Aggregate Maximum Bit Rate	O		9.2.1.149	This IE applies only if the UE is authorized for NR V2X services.	YES	ignore
PC5 QoS Parameters	O		9.2.1.150	This IE applies only if the UE is authorized for NR V2X services.	YES	ignore
UE Radio Capability ID	O		9.2.1.153		YES	reject

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.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
E-RAB Setup List		*1*			YES	ignore
>E-RAB Setup Item IEs		*1 .. <maxnoofE-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2		-	
E-RAB Failed to Setup List	O		E-RAB List 9.2.1.36	A value for *E-RAB ID* shall only be present once in *E-RAB Setup List* IE and *E-RAB Failed to Setup List* IE.	YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

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

9.1.4.4 INITIAL CONTEXT SETUP FAILURE

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

Direction: eNB → MME

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

9.1.4.5 UE CONTEXT RELEASE REQUEST

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Cause	M		9.2.1.3		YES	ignore
GW Context Release Indication	O		9.2.1.84		YES	reject
Secondary RAT Usage Report List	O		9.2.1.124		Yes	ignore

9.1.4.6 UE CONTEXT RELEASE COMMAND

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

Direction: MME → eNB

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore
User Location Information	O		9.2.1.93		YES	ignore
Information on Recommended Cells and eNBs for Paging	O		9.2.1.105		YES	ignore
Cell Identifier and Coverage Enhancement Level	O		9.2.1.109		YES	ignore
Secondary RAT Usage Report List	O		9.2.1.124		Yes	ignore
Time Since Secondary Node Release	O		9.2.1.143		Yes	ignore

9.1.4.8 UE CONTEXT MODIFICATION REQUEST

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Security Key	O		9.2.1.41	A fresh KeNB is provided after performing a key-change on the fly procedure in the MME, see TS 33.401 [15].	YES	reject
Subscriber Profile ID for RAT/Frequency priority	O		9.2.1.39		YES	ignore
UE Aggregate Maximum Bit Rate	O		9.2.1.20		YES	ignore
CS Fallback Indicator	O		9.2.3.21		YES	reject
UE Security Capabilities	O		9.2.1.40		YES	reject
CSG Membership Status	O		9.2.1.73		YES	ignore
Registered LAI	O		9.2.3.1		YES	ignore
Additional CS Fallback Indicator	C-ifCSFBhighpriority		9.2.3.37		YES	ignore
ProSe Authorized	O		9.2.1.99		YES	ignore
SRVCC Operation Possible	O		9.2.1.58		YES	ignore
SRVCC Operation Not Possible	O		9.2.1.119		YES	ignore
V2X Services Authorized	O		9.2.1.120		YES	ignore
UE Sidelink Aggregate Maximum Bit Rate	O		9.2.1.122	This IE applies only if the UE is authorized for V2X services.	YES	ignore
NR UE Security Capabilities	O		9.2.1.127		YES	ignore
Aerial UE subscription information	O		9.2.1.136		YES	ignore
Additional RRM Policy Index	O		9.2.1.39a		YES	ignore
IAB Authorized	O		9.2.1.146		YES	ignore
NR V2X Services Authorized	O		9.2.1.148		YES	ignore
NR UE Sidelink Aggregate Maximum Bit Rate	O		9.2.1.149	This IE applies only if the UE is authorized for NR V2X services.	YES	ignore
PC5 QoS Parameters	O		9.2.1.150	This IE applies only if the UE is authorized for NR V2X services.	YES	ignore
UE Radio Capability ID	O		9.2.1.153		YES	reject

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 → MME

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

9.1.4.10 UE CONTEXT MODIFICATION FAILURE

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

Direction: eNB → MME

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

9.1.4.11 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 → 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	O		9.2.1.27		YES	ignore
UE Radio Capability ID	O		9.2.1.153		YES	reject

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 → 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	O		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 → 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
CSG Membership Info		*0..1*			YES	reject
>CSG Membership Status	M		9.2.1.73		-	
>CSG Id	M		9.2.1.62		-	
>Cell Access Mode	O		9.2.1.74		-	
>PLMN Identity	O		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 → 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
CSG Membership Status	O		9.2.1.73		YES	ignore
Criticality Diagnostics	O		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 → 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	O		9.2.1.105		YES	ignore
Cell Identifier and Coverage Enhancement Level	O		9.2.1.109		YES	ignore
Secondary RAT Usage Report List	O		9.2.1.124		Yes	ignore
User Location Information	O		9.2.1.93		YES	ignore
Time Since Secondary Node Release	O		9.2.1.143		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 → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore
Security Context	O		9.2.1.26		YES	reject

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, or the UE accesses for early data transmission.

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		*0..1*			YES	reject
>E-RAB Failed To Resume Item IEs		*1 .. <maxnoofE-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Cause	M		9.2.1.3		-	
RRC Resume Cause	O		RRC Establishment Cause 9.2.1.3a		YES	ignore

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 → 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
E-RAB Failed To Resume List		*0..1*			YES	reject
>E-RAB Failed To Resume Item IEs		*1 .. <maxnoofE-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Cause	M		9.2.1.3		-	
Criticality Diagnostics	O		9.2.1.21		YES	ignore
Security Context	O		9.2.1.26		YES	reject
Pending Data Indication	O		9.2.3.55		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 → eNB

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

9.1.4.20 CONNECTION ESTABLISHMENT INDICATION

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

Direction: MME → 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	O		9.2.1.27		YES	ignore
Enhanced Coverage Restricted	O		9.2.1.123		YES	ignore
DL CP Security Information	O		9.2.3.49		YES	ignore
CE-Mode-B Restricted	O		9.2.1.129		YES	ignore
End Indication	O		9.2.3.54		YES	ignore
Subscription Based UE Differentiation Information	O		9.2.1.140		YES	ignore
UE Level QoS Parameters	O		E-RAB Level QoS Parameters 9.2.1.15	Includes QoS parameters.	YES	ignore
UE Radio Capability ID	O		9.2.1.153		YES	reject

9.1.4.21 RETRIEVE UE INFORMATION

The message is sent by the eNB to request UE information over the S1 interface.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
S-TMSI	M		9.2.3.6		YES	reject

9.1.4.22 UE INFORMATION TRANSFER

The message is sent by the MME to transfer UE information over the S1 interface.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
S-TMSI	M		9.2.3.6		YES	reject
UE Level QoS Parameters	O		E-RAB Level QoS Parameters 9.2.1.15	Includes QoS parameters.	YES	ignore
UE Radio Capability	O		9.2.1.27		YES	ignore
Subscription Based UE Differentiation Information	O		9.2.1.140		YES	ignore
Pending Data Indication	O		9.2.3.55		YES	ignore

9.1.4.23 eNB CP RELOCATION INDICATION

This message is sent by the eNB to initiate the establishment of a UE-associated logical S1-connection, following the reception of re-establishment request as described in TS. 36.300 [14].

Direction: eNB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
S-TMSI	M		9.2.3.6		YES	reject
E-UTRAN CGI	M		9.2.1.38		YES	ignore
TAI	M		9.2.3.16		YES	ignore
UL CP Security Information	M		9.2.3.50		YES	reject

9.1.4.24 MME CP RELOCATION INDICATION

This message is sent by the MME to inform the eNB that the UE is to be relocated as described in TS. 36.300 [14].

Direction: MME → eNB.

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

9.1.5 Handover Signalling Messages

9.1.5.1 HANDOVER REQUIRED

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

Direction: eNB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Handover Type	M		9.2.1.13		YES	reject
Cause	M		9.2.1.3		YES	ignore
Target ID	M		9.2.1.6		YES	reject
Direct Forwarding Path Availability	O		9.2.3.15		YES	ignore
SRVCC HO Indication	O		9.2.1.59		YES	reject
Source to Target Transparent Container	M		9.2.1.56		YES	reject
Source to Target Transparent Container Secondary	O		Source to Target Transparent Container 9.2.1.56		YES	reject
MS Classmark 2	C-ifSRVCCtoGERAN		9.2.1.64		YES	reject
MS Classmark 3	C-ifSRVCCtoGERAN		9.2.1.65		YES	ignore
CSG Id	O		9.2.1.62		YES	reject
Cell Access Mode	O		9.2.1.74		YES	reject
PS Service Not Available	O		9.2.1.77		YES	ignore

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

9.1.5.2 HANDOVER COMMAND

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

Direction: MME → eNB.

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

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

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

9.1.5.3 HANDOVER PREPARATION FAILURE

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

Direction: MME → eNB.

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

9.1.5.4 HANDOVER REQUEST

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

Direction: MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
Handover Type	M		9.2.1.13		YES	reject
Cause	M		9.2.1.3		YES	ignore
UE Aggregate Maximum Bit Rate	M		9.2.1.20		YES	reject
E-RABs To Be Setup List		*1*			YES	reject
>E-RABs To Be Setup Item IEs		*1 .. <maxnoofE-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	To deliver UL PDUs.	-	
>>E-RAB Level QoS Parameters	M		9.2.1.15	Includes necessary QoS parameters.	-	
>>Data Forwarding Not Possible	O		9.2.1.76		YES	ignore
>>Bearer Type	O		9.2.1.116		YES	reject
>>Ethernet Type	O		9.2.1.147		YES	ignore
Source to Target Transparent Container	M		9.2.1.56		YES	reject
UE Security Capabilities	M		9.2.1.40		YES	reject
Handover Restriction List	O		9.2.1.22		YES	ignore
Trace Activation	O		9.2.1.4		YES	ignore
Request Type	O		9.2.1.34		YES	ignore
SRVCC Operation Possible	O		9.2.1.58		YES	ignore
Security Context	M		9.2.1.26		YES	reject
NAS Security Parameters to E-UTRAN	C-iffromUTRANGERAN		9.2.3.31	The eNB shall use this IE as specified in TS 33.401 [15].	YES	reject
CSG Id	O		9.2.1.62		YES	reject
CSG Membership Status	O		9.2.1.73		YES	ignore
GUMMEI	O		9.2.3.9	This IE indicates the MME serving the UE.	YES	ignore
MME UE S1AP ID 2	O		9.2.3.3	This IE indicates the MME UE S1AP ID assigned by the MME.	YES	ignore
Management Based MDT Allowed	O		9.2.1.83		YES	ignore
Management Based MDT PLMN List	O		MDT PLMN List 9.2.1.89		YES	ignore
Masked IMEISV	O		9.2.3.38		YES	ignore
Expected UE Behaviour	O		9.2.1.96		YES	ignore
ProSe Authorized	O		9.2.1.99		YES	ignore
UE User Plane CIoT Support Indicator	O		9.2.1.113		YES	ignore
V2X Services Authorized	O		9.2.1.120		YES	ignore
UE Sidelink Aggregate Maximum Bit Rate	O		9.2.1.122	This IE applies only if the UE is authorized for V2X services.	YES	ignore
Enhanced Coverage Restricted	O		9.2.1.123		YES	ignore
NR UE Security Capabilities	O		9.2.1.127		YES	ignore
CE-mode-B Restricted	O		9.2.1.129		YES	ignore
Aerial UE subscription information	O		9.2.1.136		YES	ignore
Pending Data Indication	O		9.2.3.55		YES	ignore
Subscription Based UE Differentiation Information	O		9.2.1.140		YES	ignore

Additional RRM Policy Index	O		9.2.1.39a		YES	ignore
IAB Authorized	O		9.2.1.146		YES	reject
NR V2X Services Authorized	O		9.2.1.148		YES	ignore
NR UE Sidelink Aggregate Maximum Bit Rate	O		9.2.1.149	This IE applies only if the UE is authorized for NR V2X services.	YES	ignore
PC5 QoS Parameters	O		9.2.1.150	This IE applies only if the UE is authorized for NR V2X services.	YES	ignore
UE Radio Capability ID	O		9.2.1.153		YES	reject

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

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

9.1.5.5 HANDOVER REQUEST ACKNOWLEDGE

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

Direction: eNB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4	Allocated at the target eNB.	YES	ignore
E-RABs Admitted List		*1*			YES	ignore
>E-RABs Admitted Item IEs		*1 .. <maxnoofE-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	To deliver DL PDUs.	-	
>>DL Transport Layer Address	O		9.2.2.1		-	
>>DL GTP-TEID	O		9.2.2.2	To deliver forwarded DL PDCP SDUs.	-	
>>UL Transport Layer Address	O		9.2.2.1		-	
>>UL GTP-TEID	O		9.2.2.2	To deliver forwarded UL PDCP SDUs.	-	
E-RABs Failed to Setup List	O		E-RAB List 9.2.1.36	A value for *E-RAB ID* shall only be present once in *E-RABs Admitted List* IE and *E-RABs Failed to Setup List* IE.	YES	ignore
Target to Source Transparent Container	M		9.2.1.57		YES	reject
CSG Id	O		9.2.1.62		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore
Cell Access Mode	O		9.2.1.74		YES	ignore
CE-mode-B Support Indicator	O		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 → MME.

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

9.1.5.7 HANDOVER NOTIFY

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

Direction: eNB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
E-UTRAN CGI	M		9.2.1.38		YES	ignore
TAI	M		9.2.3.16		YES	ignore
Tunnel Information for BBF	O		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	O		9.2.1.92		YES	ignore
PSCell Information	O		9.2.1.141		YES	ignore
Notify Source eNB	O		ENUMERATED (NotifySource, …)		YES	ignore

9.1.5.8 PATH SWITCH REQUEST

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

Direction: eNB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
E-RAB To Be Switched in Downlink List		*1*			YES	reject
>E-RABs Switched in Downlink Item IEs		*1 .. <maxnoofE-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	To deliver DL PDUs.	-	
Source MME UE S1AP ID	M		9.2.3.3		YES	reject
E-UTRAN CGI	M		9.2.1.38		YES	ignore
TAI	M		9.2.3.16		YES	ignore
UE Security Capabilities	M		9.2.1.40		YES	ignore
CSG Id	O		9.2.1.62		YES	ignore
Cell Access Mode	O		9.2.1.74		YES	ignore
Source MME GUMMEI	O		9.2.3.9		YES	ignore
CSG Membership Status	O		9.2.1.73		YES	ignore
Tunnel Information for BBF	O		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	O		9.2.1.92		YES	ignore
RRC Resume Cause	O		RRC Establishment Cause 9.2.1.3a		YES	ignore
NR UE Security Capabilities	O		9.2.1.127		YES	ignore
PSCell Information	O		9.2.1.141		YES	ignore

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

9.1.5.9 PATH SWITCH REQUEST ACKNOWLEDGE

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

Direction: MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
UE Aggregate Maximum Bit Rate	O		9.2.1.20		YES	ignore
E-RAB To Be Switched in Uplink List		*0..1*			YES	ignore
>E-RABs Switched in Uplink Item IEs		*1 .. <maxnoofE-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2		-	
E-RAB To Be Released List	O		E-RAB List 9.2.1.36	A value for *E-RAB ID* shall only be present once in *E-RAB To Be Switched in Uplink List* IE 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	O		9.2.1.21		YES	ignore
MME UE S1AP ID 2	O		9.2.3.3	This IE indicates the MME UE S1AP ID assigned by the MME.	YES	ignore
CSG Membership Status	O		9.2.1.73		YES	ignore
ProSe Authorized	O		9.2.1.99		YES	ignore
UE User Plane CIoT Support Indicator	O		9.2.1.113		YES	ignore
V2X Services Authorized	O		9.2.1.120		YES	ignore
UE Sidelink Aggregate Maximum Bit Rate	O		9.2.1.122	This IE applies only if the UE is authorized for V2X services.	YES	ignore
Enhanced Coverage Restricted	O		9.2.1.123		YES	ignore
NR UE Security Capabilities	O		9.2.1.127		YES	ignore
CE-mode-B Restricted	O		9.2.1.129		YES	ignore
Aerial UE subscription information	O		9.2.1.136		YES	ignore
Pending Data Indication	O		9.2.3.55		YES	ignore
Subscription Based UE Differentiation Information	O		9.2.1.140		YES	ignore
Handover Restriction List	O		9.2.1.22		YES	ignore
Additional RRM Policy Index	O		9.2.1.39a		YES	ignore
NR V2X Services Authorized	O		9.2.1.148		YES	ignore
NR UE Sidelink Aggregate Maximum Bit Rate	O		9.2.1.149	This IE applies only if the UE is authorized for NR V2X services.	YES	ignore
PC5 QoS Parameters	O		9.2.1.150	This IE applies only if the UE is authorized for NR V2X services.	YES	ignore
UE Radio Capability ID	O		9.2.1.153		YES	reject

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

9.1.5.10 PATH SWITCH REQUEST FAILURE

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

Direction: MME → eNB.

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

9.1.5.11 HANDOVER CANCEL

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

Direction: eNB → MME.

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

9.1.5.12 HANDOVER CANCEL ACKNOWLEDGE

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

Direction: MME → eNB.

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

9.1.5.13 eNB STATUS TRANSFER

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

Direction: eNB → MME.

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

9.1.5.14 MME STATUS TRANSFER

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

Direction: MME → eNB

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

9.1.5.15 HANDOVER SUCCESS

This message is sent by the MME to the source eNB to indicate the successful access of the UE toward the target eNB.

Direction: MME →source 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

9.1.5.16 eNB EARLY STATUS TRANSFER

This message is sent by the source eNB to transfer the COUNT value(s) of the first forwarded downlink SDU(s) during S1 DAPS Handover.

Direction: eNB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
eNB Early Status Transfer Transparent Container	M		9.2.1.157		YES	reject

9.1.5.17 MME EARLY STATUS TRANSFER

This message is sent by the MME to transfer the COUNT value(s) of the first forwarded downlink SDU(s) during S1 DAPS Handover.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
eNB Early Status Transfer Transparent Container	M		9.2.1.157		YES	reject

9.1.6 PAGING

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
UE Identity Index value	M		9.2.3.10		YES	ignore
UE Paging Identity	M		9.2.3.13		YES	ignore
Paging DRX	O		9.2.1.16	If the *NB-IoT Paging DRX* IE is included, the *Paging DRX* IE is ignored.	YES	ignore
CN Domain	M		9.2.3.22		YES	ignore
List of TAIs		*1*			YES	ignore
>TAI List Item		*1 .. <maxnoofTAIs>*			EACH	ignore
>>TAI	M		9.2.3.16		-	
CSG Id List		*0..1*			GLOBAL	ignore
>CSG Id		*1 .. <maxnoofCSGId>*	9.2.1.62		-	
Paging Priority	O		9.2.1.78		YES	ignore
UE Radio Capability for Paging	O		9.2.1.98		YES	ignore
Assistance Data for Paging	O		9.2.1.103		YES	ignore
Paging eDRX Information	O		9.2.1.111		YES	ignore
Extended UE Identity Index Value	O		9.2.3.46		YES	ignore
NB-IoT Paging eDRX Information	O		9.2.1.115		YES	ignore
NB-IoT UE Identity Index value	O		9.2.3.47		YES	ignore
Enhanced Coverage Restricted	O		9.2.1.123		YES	ignore
CE-Mode-B Restricted	O		9.2.1.129		YES	ignore
Data size	O		INTEGER (1..4095, …)	The unit is: bit	YES	ignore
WUS Assistance Information	O		9.2.1.158		YES	ignore
NB-IoT Paging DRX	O		9.2.1.159x		YES	ignore

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

9.1.7 NAS Transport Messages

9.1.7.1 INITIAL UE MESSAGE

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	reject
NAS-PDU	M		9.2.3.5		YES	reject
TAI	M		9.2.3.16	Indicating the Tracking Area from which the UE has sent the NAS message.	YES	reject
E-UTRAN CGI	M		9.2.1.38	Indicating the E-UTRAN CGI from which the UE has sent the NAS message.	YES	ignore
RRC Establishment Cause	M		9.2.1.3a		YES	ignore
S-TMSI	O		9.2.3.6		YES	reject
CSG Id	O		9.2.1.62		YES	reject
GUMMEI	O		9.2.3.9		YES	reject
Cell Access Mode	O		9.2.1.74		YES	reject
GW Transport Layer Address	O		Transport Layer Address 9.2.2.1	Indicating GW Transport Layer Address if the GW is collocated with eNB.	YES	ignore
Relay Node Indicator	O		9.2.1.79	Indicating a relay node.	YES	reject
GUMMEI Type	O		ENUMERATED (native, mapped, …, mappedFrom5G)		YES	ignore
Tunnel Information for BBF	O		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	O		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	O		9.2.1.92		YES	ignore
MME Group ID	O		9.2.3.44		YES	ignore
UE Usage Type	O		INTEGER (0..255)		YES	ignore
CE-mode-B Support Indicator	O		9.2.1.118		YES	ignore
DCN ID	O		INTEGER (0..65535)		YES	ignore
Coverage Level	O		ENUMERATED (extendedcoverage, …)		YES	ignore

UE Application Layer Measurement Capability	O		BIT STRING (SIZE(8))	Each bit in the bitmap indicates an UE Application layer measurement capability, refer to TS 25.331[10]. Bit 0 = QoE Measurement for streaming service Bit 1 = QoE Measurement for MTSI service Value '1' indicates "Capable" and value '0' indicates "not Capable". Unused bits are reserved for future use.	YES	ignore
EDT Session	O		ENUMERATED (true, …)		YES	
IAB Node Indication	O		ENUMERATED (true, ...)	Indication of an IAB-node.	YES	reject

9.1.7.2 DOWNLINK NAS TRANSPORT

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
NAS-PDU	M		9.2.3.5		YES	reject
Handover Restriction List	O		9.2.1.22		YES	ignore
Subscriber Profile ID for RAT/Frequency priority	O		9.2.1.39		YES	ignore
SRVCC Operation Possible	O		9.2.1.58		YES	ignore
UE Radio Capability	O		9.2.1.27		YES	ignore
DL NAS PDU Delivery Acknowledgment Request	O		9.2.3.48		YES	ignore
Enhanced Coverage Restricted	O		9.2.1.123		YES	ignore
CE-mode-B Restricted	O		9.2.1.129		YES	ignore
NR UE Security Capabilities	O		9.2.1.127		YES	ignore
UE Capability Info Request	O		9.2.3.51		YES	ignore
End Indication	O		9.2.3.54		YES	ignore
Pending Data Indication	O		9.2.3.55		YES	ignore
Subscription Based UE Differentiation Information	O		9.2.1.140		YES	ignore
Additional RRM Policy Index	O		9.2.1.39a		YES	ignore
UE Radio Capability ID	O		9.2.1.153		YES	reject

9.1.7.3 UPLINK NAS TRANSPORT

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
NAS-PDU	M		9.2.3.5		YES	reject
E-UTRAN CGI	M		9.2.1.38		YES	ignore
TAI	M		9.2.3.16		YES	ignore
GW Transport Layer Address	O		Transport Layer Address 9.2.2.1	Indicating GW Transport Layer Address if the GW is collocated with eNB.	YES	ignore
SIPTO L-GW Transport Layer Address	O		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	O		9.2.1.92		YES	ignore
PSCell Information	O		9.2.1.141		YES	ignore

9.1.7.4 NAS NON DELIVERY INDICATION

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

Direction: eNB → MME

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

9.1.7.4a NAS DELIVERY INDICATION

This message is sent by the eNB and is used for reporting the successful delivery of a NAS PDU to the UE that was previously received within a DOWNLINK NAS TRANSPORT message.

Direction: eNB → MME

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

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 → eNB

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
MME UE S1AP ID	O		9.2.3.3		YES	ignore
S1 Message	M		OCTET STRING	Contains the INITIAL UE MESSAGE	YES	reject
MME Group ID	M		9.2.3.44		YES	reject
Additional GUTI	O		9.2.3.45		YES	ignore
UE Usage Type	O		INTEGER (0..255)		YES	ignore

9.1.8 Management messages

9.1.8.1 RESET

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

Direction: MME → eNB and eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Cause	M		9.2.1.3		YES	ignore
CHOICE *Reset Type*	M				YES	reject
>S1 interface						
>>Reset All	M		ENUMERATED (Reset all,…)		-	
>Part of S1 interface						
>>UE-associated logical S1-connection list		*1*			-	
>>>UE-associated logical S1-connection Item		*1 .. <maxnoofIndividualS1ConnectionsToReset>*			EACH	reject
>>>>MME UE S1AP ID	O		9.2.3.3		-	
>>>>eNB UE S1AP ID	O		9.2.3.4		-	

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

9.1.8.2 RESET ACKNOWLEDGE

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

Direction: eNB → MME and MME → eNB.

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

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

9.1.8.3 ERROR INDICATION

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

Direction: MME → eNB and eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	O		9.2.3.3		YES	ignore
eNB UE S1AP ID	O		9.2.3.4		YES	ignore
Cause	O		9.2.1.3		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore
S-TMSI	O		9.2.3.6		YES	ignore

9.1.8.4 S1 SETUP REQUEST

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Global eNB ID	M		9.2.1.37		YES	reject
eNB Name	O		PrintableString(SIZE(1..150,…))		YES	ignore
Supported TAs		*1..<maxnoofTACs>*		Supported TAs in the eNB.	GLOBAL	reject
>TAC	M		9.2.3.7	Broadcast TAC.	-	
>Broadcast PLMNs		*1..<maxnoofBPLMNs>*		Broadcast PLMNs.	-	
>>PLMN Identity	M		9.2.3.8			
>RAT-Type	O		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		*0..1*			GLOBAL	reject
>CSG Id		*1 .. <maxnoofCSGIds>*	9.2.1.62			
UE Retention Information	O		9.2.1.112		YES	ignore
NB-IoT Default Paging DRX	O		9.2.1.114		YES	ignore
Connected en-gNB List		*<0.. maxnoofConnecteden-gNBs>*			GLOBAL	ignore
>en-gNB ID	M		BIT STRING (SIZE(22..32))	The MME derives the Global en-gNB ID based on the *en-gNB ID* IE and the first PLMN Identity in the Supported TAs list for the en-gNB.		
>Supported TAs		*1..<maxnoofTACs>*		Supported (EPS) TAs in the en-gNB.	-	
>>Configured TAC	M		TAC 9.2.3.7	This information is used as specified in TS 36.300 [14].	-	
>>Broadcast PLMNs		*1..<maxnoofBPLMNs>*		Broadcast PLMNs.	-	
>>>PLMN Identity	M		9.2.3.8			

Range bound	Explanation
maxnoofTACs	Maximum no. of TACs. Value is 256.
maxnoofBPLMNs	Maximum no. of Broadcast PLMNs. Value is 6.
maxnoofCSGIds	Maximum no. of CSG Ids within the CSG Id List. Value is 256.
maxnoofConnecteden-gNBs	Maximum no. of en-gNBs connected to the eNB. Value is 256.

9.1.8.5 S1 SETUP RESPONSE

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME Name	O		PrintableString (SIZE(1..150, …))		YES	ignore
Served GUMMEIs		*1..<maxnoofRATs>*		The LTE related pool configuration is included on the first place in the list.	GLOBAL	reject
>Served PLMNs		1..<maxnoofPLMNsPerMME>			-	
>>PLMN Identity	M		9.2.3.8		-	
>Served GroupIDs		*1..<maxnoofGroupIDs>*			-	
>>MME Group ID	M		OCTET STRING (SIZE(2))		-	
>Served MMECs		*1..<maxnoofMMECs>*			-	
>>MME Code	M		9.2.3.12		-	
>GUMMEI Type	O		ENUMERATED (native, mapped, …, mappedFrom5G)		-	ignore
Relative MME Capacity	M		9.2.3.17		YES	ignore
MME Relay Support Indicator	O		9.2.1.82		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore
UE Retention Information	O		9.2.1.112		YES	ignore
Served DCNs		*0..<maxnoofDCNs>*			GLOBAL	ignore
>Served DCNs Items	M		9.2.1.121		-	
IAB Supported	O		ENUMERATED (true, ...)	Indication of support for IAB.	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.
maxnoofDCNs	Maximum no. of DCNs servered by one MME. Value is 32.

9.1.8.6 S1 SETUP FAILURE

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

Direction: MME → eNB

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

9.1.8.7 ENB CONFIGURATION UPDATE

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
eNB Name	O		PrintableString(SIZE(1..150,…))		YES	ignore
Supported TAs		*0..<maxnoofTACs>*		Supported TAs in the eNB.	GLOBAL	reject
>TAC	M		9.2.3.7	Broadcast TAC.	-	
>Broadcast PLMNs		*1..<maxnoofBPLMNs>*		Broadcast PLMNs.	-	
>>PLMN Identity	M		9.2.3.8		-	
>RAT-Type	O		9.2.1.117	RAT Type associated with the TAC of the indicated PLMN(s).	YES	reject
CSG Id List		*0..1*			GLOBAL	reject
>CSG Id		*1 .. <maxnoofCSGId>*	9.2.1.62		-	
Default Paging DRX	O		9.2.1.16		YES	ignore
NB-IoT Default Paging DRX	O		9.2.1.114		YES	ignore
Connected en-gNB To Be Added List		*<0.. maxnoofConnectedeng-NBs>*			GLOBAL	ignore
>en-gNB ID	M		BIT STRING (SIZE(22..32))	The MME derives the Global en-gNB ID based on the *en-gNB ID* IE and the first PLMN Identity in the Supported TAs list of the added en-gNB.		
>**Supported TAs**		*1..<maxnoofTACs>*		Supported TAs in the en-gNB.	-	
>>Configured TAC	M		TAC 9.2.3.7		-	
>>**Broadcast PLMNs**		*1..<maxnoofBPLMNs>*		Broadcast PLMNs.	-	
>>>PLMN Identity	M		9.2.3.8			
Connected en-gNB To Be Removed List		*<0.. maxnoofConnectedeng-NBs>*			GLOBAL	ignore
>en-gNB ID	M		BIT STRING (SIZE(22..32))	The MME derives the Global en-gNB ID based on the *en-gNB ID* IE and the first PLMN Identity in the Supported TAs list of the en-gNB to be removed.		
>**Supported TAs**		*1..<maxnoofTACs>*		Supported TAs in the en-gNB.	-	
>>Configured TAC	M		TAC 9.2.3.7		-	
>>**Broadcast PLMNs**		*1..<maxnoofBPLMNs>*		Broadcast PLMNs.	-	
>>>PLMN Identity	M		9.2.3.8			

Range bound	Explanation
maxnoofTACs	Maximum no. of TACs. Value is 256.
maxnoofBPLMNs	Maximum no. of Broadcast PLMNs. Value is 6.
maxnoofCSGIds	Maximum no. of CSG Ids within the CSG Id List. Value is 256.
maxnoofConnecteden-gNBs	Maximum no. of en-gNBs connected to the eNB. Value is 256.

9.1.8.8 ENB CONFIGURATION UPDATE ACKNOWLEDGE

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.8.9 ENB CONFIGURATION UPDATE FAILURE

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

Direction: MME → eNB

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

9.1.8.10 MME CONFIGURATION UPDATE

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME Name	O		PrintableString(SIZE(1..150,…))		YES	ignore
Served GUMMEIs		*0..<maxnoofRATs>*		The LTE related pool configuration is included on the first place in the list.	GLOBAL	reject
>Served PLMNs		*1..<maxnoofPLMNsPerMME>*			-	
>>PLMN Identity	M		9.2.3.8		-	
>Served GroupIDs		*1..<maxnoofGroupIDs>*			-	
>>MME GroupID	M		OCTET STRING (SIZE(2))		-	
>Served MMECs		*1..<maxnoofMMECs>*			-	
>>MME Code	M		9.2.3.12		-	
>GUMMEI Type	O		ENUMERATED (native, mapped, …, mappedFrom5G)		-	ignore
Relative MME Capacity	O		9.2.3.17		YES	reject
Served DCNs		*0..<maxnoofDCNs>*			GLOBAL	ignore
>Served DCNs Items	M		9.2.1.121		-	

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.
maxnoofDCNs	Maximum no. of DCNs servered by one MME. Value is 32.

9.1.8.11 MME CONFIGURATION UPDATE ACKNOWLEDGE

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.8.12 MME CONFIGURATION UPDATE FAILURE

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

Direction: eNB → MME

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

9.1.8.13 OVERLOAD START

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

Direction: MME → eNB

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

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

9.1.8.14 OVERLOAD STOP

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

Direction: MME → eNB

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

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

9.1.9 S1 CDMA2000 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 → eNB

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

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

9.1.9.2 UPLINK S1 CDMA2000 TUNNELLING

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

Direction: eNB → MME

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

9.1.10 UE CAPABILITY INFO INDICATION

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
UE Radio Capability	M		9.2.1.27		YES	ignore
UE Radio Capability for Paging	O		9.2.1.98		YES	ignore
UE Application Layer Measurement Capability	O		BIT STRING (SIZE(8))	Each bit in the bitmap indicates an UE Application layer measurement capability, refer to TS 25.331[10]. Bit 0 = QoE Measurement for streaming service Bit 1 = QoE Measurement for MTSI service Value '1' indicates "Capable" and value '0' indicates "not Capable". Unused bits are reserved for future use.	YES	ignore
LTE-M Indication	O		9.2.1.135		YES	ignore
UE Radio Capability – NR Format	O		9.2.1.154		YES	ignore
UE Radio Capability for Paging – NR Format	O		9.2.1.160		YES	ignore

9.1.11 Trace Messages

9.1.11.1 TRACE START

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

Direction: MME → eNB

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

9.1.11.2 TRACE FAILURE INDICATION

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

Direction: eNB → MME

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

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

9.1.12.2 LOCATION REPORT FAILURE INDICATION

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

Direction: eNB → MME

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

9.1.12.3 LOCATION REPORT

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
E-UTRAN CGI	M		9.2.1.38		YES	ignore
TAI	M		9.2.3.16		YES	ignore
Request Type	M		9.2.1.34	The Request Type IE is sent as it has been provided.	YES	ignore
PSCell Information	O		9.2.1.141		YES	ignore

9.1.13 Warning Message Transmission Messages

9.1.13.1 WRITE-REPLACE WARNING REQUEST

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Message Identifier	M		9.2.1.44		YES	reject
Serial Number	M		9.2.1.45		YES	reject
Warning Area List	O		9.2.1.46		YES	ignore
Repetition Period	M		9.2.1.48		YES	reject
Extended Repetition Period	O		9.2.1.75		YES	reject
Number of Broadcasts Requested	M		9.2.1.49		YES	reject
Warning Type	O		9.2.1.50		YES	ignore
Warning Security Information	O		9.2.1.51	See TS 23.041 [29].	YES	ignore
Data Coding Scheme	O		9.2.1.52		YES	ignore
Warning Message Contents	O		9.2.1.53		YES	ignore
Concurrent Warning Message Indicator	O		9.2.1.72		YES	reject
Warning Area Coordinates	O		9.2.1.139		YES	ignore

9.1.13.2 WRITE-REPLACE WARNING RESPONSE

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

Direction: eNB → MME

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

9.1.13.3 KILL REQUEST

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

Direction: MME → eNB

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

Direction: eNB → MME

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

9.1.13.5 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 → 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..<maxnoofCellsforRestart>*			EACH	reject
>E-CGI	M		9.2.1.38		-	-
Global eNB ID	M		9.2.1.37		YES	reject
TAI List for Restart		*1 .. <maxnoofRestartTAIs>*			EACH	reject
>TAI	M		9.2.3.16		-	-
Emergency Area ID List for Restart		*0 .. <maxnoofRestartEmergencyAreaIDs>*			EACH	reject
>Emergency Area ID	M		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.

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
PWS failed E-CGI List		*1..<maxnoofCellsineNB>*			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 → MME.

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

9.1.15 MME DIRECT INFORMATION TRANSFER

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

Direction: MME → eNB.

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

9.1.16 eNB CONFIGURATION TRANSFER

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

Direction: eNB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
SON Configuration Transfer	O		9.2.3.26		YES	ignore
EN-DC SON Configuration Transfer	O		9.2.3.26a		YES	ignore
Inter-system SON Configuration Transfer	O		OCTET STRING	Contains the *Inter-system SON Configuration Transfer* IE as defined in TS 38.413 [44].	YES	ignore

9.1.17 MME CONFIGURATION TRANSFER

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

Direction: MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
SON Configuration Transfer	O		9.2.3.26		YES	ignore
EN-DC SON Configuration Transfer	O		9.2.3.26a		YES	ignore
Inter-system SON Configuration Transfer	O		OCTET STRING	Contains the *Inter-system SON Configuration Transfer* IE as defined in TS 38.413 [44].	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	M		Transport Layer Address 9.2.2.1	Defined in TS 32.422 [10]	YES	ignore
Privacy Indicator	O		ENUMERATED (Immediate MDT, Logged MDT, ...)		YES	ignore

9.1.19 LPPa Transport Messages

9.1.19.1 DOWNLINK UE ASSOCIATED LPPA TRANSPORT

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

Direction: MME → eNB

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

9.1.19.2 UPLINK UE ASSOCIATED LPPA TRANSPORT

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

Direction: eNB → MME

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

9.1.19.3 DOWNLINK NON UE ASSOCIATED LPPA TRANSPORT

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

Direction: MME → eNB

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

9.1.19.4 UPLINK NON UE ASSOCIATED LPPA TRANSPORT

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

Direction: eNB → MME

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

9.1.20 Secondary RAT Report Data Usage Messages

9.1.20.1 SECONDARY RAT DATA USAGE REPORT

This message is sent by the eNB to report Secondary RAT data usage.

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	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
Secondary RAT Usage Report list	M		9.2.1.124		YES	ignore
Handover Flag	O		9.2.1.125		YES	ignore
User Location Information	O		9.2.1.93		YES	ignore
Time Since Secondary Node Release	O		9.2.1.143		Yes	ignore

9.1.21 UE Radio Capability ID Mapping Messages

9.1.21.1 UE RADIO CAPABILITY ID MAPPING REQUEST

This message is sent by the eNB and is used to request the UE Radio Capability information that maps to a specific UE Radio Capability ID.

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
UE Radio Capability ID	M		9.2.1.153		YES	reject

9.1.21.2 UE RADIO CAPABILITY ID MAPPING RESPONSE

This message is sent by the MME and is used to provide the UE Radio Capability information that maps to a specific UE Radio Capability ID indicated in the UE RADIO CAPABILITY ID MAPPING REQUEST message.

Direction: MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
UE Radio Capability ID	M		9.2.1.153		YES	reject
UE Radio Capability	M		9.2.1.27		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

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 Code	M		INTEGER (0..255)	
>Type of Message	M		CHOICE (Initiating Message, Successful Outcome, Unsuccessful Outcome, …)	

9.2.1.2 E-RAB ID

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

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

9.2.1.3 Cause

The purpose of the *Cause* IE is to indicate the reason for a particular event for the S1AP protocol.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Cause Group*	M			
>Radio Network Layer				
>>Radio Network Layer Cause	M		ENUMERATED (Unspecified, $TX2_{RELOCoverall}$ Expiry, Successful Handover, Release due to E-UTRAN Generated Reason, Handover Cancelled, Partial Handover, Handover Failure In Target EPC/eNB Or Target System, Handover Target not allowed, $TS1_{RELOCoverall}$ Expiry, $TS1_{RELOCprep}$ Expiry, Cell not available, Unknown Target ID, No Radio Resources Available in Target Cell, Unknown or already allocated MME UE S1AP ID, Unknown or already allocated eNB UE S1AP ID, Unknown or inconsistent pair of UE S1AP ID, Handover desirable for radio reasons, Time critical handover, Resource optimisation handover, Reduce load in serving cell, User inactivity, Radio Connection With UE Lost, Load Balancing TAU Required, CS Fallback Triggered, UE Not Available For PS Service, Radio resources not available, Failure in the Radio Interface Procedure, Invalid QoS combination, Inter-RAT redirection, Interaction with other procedure, Unknown E-RAB ID, Multiple E-RAB ID instances, Encryption and/or integrity protection algorithms not supported, S1 intra system Handover triggered, S1 inter system Handover triggered, X2 Handover triggered …, Redirection towards 1xRTT, Not supported QCI value, invalid CSG Id, Release due to Pre-Emption, N26 interface not available, Insufficient UE Capabilities, Maximum bearer pre-emption rate exceeded)	
>Transport Layer				
>>Transport Layer Cause	M		ENUMERATED (Transport Resource Unavailable, Unspecified, …)	
>NAS				
>>NAS Cause	M		ENUMERATED (Normal Release, Authentication failure, Detach, Unspecified, …, CSG Subscription Expiry)	
>Protocol				
>>Protocol Cause	M		ENUMERATED (Transfer Syntax Error, Abstract Syntax Error (Reject), Abstract Syntax Error (Ignore and Notify), Message not Compatible with Receiver State, Semantic Error, Abstract Syntax Error (Falsely Constructed Message), Unspecified, …)	
>Misc				

>>Miscellaneous Cause	M		ENUMERATED (Control Processing Overload, Not enough User Plane Processing Resources, Hardware Failure, O&M Intervention, Unspecified, Unknown PLMN, …)	

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

Radio Network Layer cause	Meaning
Unspecified	Sent for radio network layer cause when none of the specified cause values applies.
TX2RELOCOverall Expiry	The timer guarding the handover that takes place over X2 has abnormally expired.
Successful Handover	Successful handover.
Release due to E-UTRAN generated reason	Release is initiated due to E-UTRAN generated reason.
Handover Cancelled	The reason for the action is cancellation of Handover.
Partial Handover	Provides a reason for the handover cancellation. The HANDOVER COMMAND message from MME contained *E-RABs to Release List* IE and the source eNB estimated service continuity for the UE would be better by not proceeding with handover towards this particular target eNB.
Handover Failure In Target EPC/eNB Or Target System	The handover failed due to a failure in target EPC/eNB or target system.
Handover Target not allowed	Handover to the indicated target cell is not allowed for the UE in question.
$TS1_{RELOCoverall}$ Expiry	The reason for the action is expiry of timer $TS1_{RELOCoverall}$.
$TS1_{RELOCprep}$ Expiry	Handover Preparation procedure is cancelled when timer $TS1_{RELOCprep}$ expires.
Cell not available	The concerned cell is not available.
Unknown Target ID	Handover rejected because the target ID is not known to the EPC.
No radio resources available in target cell	Load on target cell is too high.
Unknown or already allocated MME UE S1AP ID	The action failed because the MME UE S1AP ID is either unknown, or (for a first message received at the eNB) is known and already allocated to an existing context.
Unknown or already allocated eNB UE S1AP ID	The action failed because the eNB UE S1AP ID is either unknown, or (for a first message received at the MME) is known and already allocated to an existing context.
Unknown or inconsistent pair of UE S1AP ID	The action failed because both UE S1AP IDs are unknown, or are known but do not define a single UE context.
Handover Desirable for Radio Reasons	The reason for requesting handover is radio related.
Time Critical Handover	Handover is requested for time critical reason i.e., this cause value is reserved to represent all critical cases where the connection is likely to be dropped if handover is not performed.
Resource Optimisation Handover	The reason for requesting handover is to improve the load distribution with the neighbour cells.
Reduce Load in Serving Cell	Load on serving cell needs to be reduced. 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 or intra-LTE redirection. When it is included in UE CONTEXT RELEASE REQUEST message, the behaviour of the EPC is specified in TS 23.401 [11].
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.
Release due to Pre-Emption	Release is initiated due to pre-emption.
N26 interface not available	The action failed due to a temporary failure of the N26 interface.
Insufficient UE Capabilities	The procedure can’t proceed due to insufficient UE capabilities.
Maximum bearer pre-emption rate exceeded	The procedure can’t proceed because the number of requests exceed the maximum bearer pre-emption rate.

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

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

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

Miscellaneous cause	Meaning
Control Processing Overload	Control processing overload.
Not Enough User Plane Processing Resources Available	No enough resources are available related to user plane processing.
Hardware Failure	Action related to hardware failure.
O&M Intervention	The action is due to O&M intervention.
Unspecified Failure	Sent when none of the above cause values applies and the cause is not related to any of the categories Radio Network Layer, Transport Network Layer, NAS or Protocol.
Unknown PLMN	The MME does not identify any PLMN provided by the eNB.

9.2.1.3a RRC Establishment Cause

The purpose of the *RRC Establishment Cause* IE is to indicate to the MME the reason for RRC Connection Establishment or RRC Connection Resume as received from the UE in the *EstablishmentCause, EstablishmentCause-NB* or *ResumeCause* 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 Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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).		
Interfaces To Trace	M		BIT STRING (SIZE(8))	Each position in the bitmap represents an eNB or en-gNB interface: first bit =S1-MME, second bit =X2, third bit =Uu, fourth bit =F1-C, fifth bit =E1: other bits reserved for future use. Value '1' indicates 'should be traced'. Value '0' indicates 'should not be traced'.		
Trace depth	M		ENUMERATED(minimum, medium, maximum, MinimumWithoutVendorSpecificExtension, MediumWithoutVendorSpecificExtension, MaximumWithoutVendorSpecificExtension, …)	Defined in TS 32.422 [10].		
Trace Collection Entity IP Address	M		Transport Layer Address 9.2.2.1	For File based Reporting. Defined in TS 32.422 [10]. This IE is ignored if the *Trace Collection Entity URI* IE is present		
MDT Configuration	O		9.2.1.81		YES	ignore
UE Application layer measurement configuration	O		9.2.1.128		YES	Ignore
MDT Configuration NR	O		OCTET STRING	Defined in TS 38.413 [44]. Only the immediate MDT configurations are included in the IE in this version of the specification.	YES	ignore
Trace Collection Entity URI	O		URI 9.2.2.4	For Streaming based Reporting. Defined in TS 32.422 [10] Replaces Trace Collection Entity IP Address if present	YES	ignore

9.2.1.5 Source ID

Void.

9.2.1.6 Target ID

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
CHOICE *Target ID*	M				-	-
>Target eNB-ID					-	-
>>Global eNB ID	M		9.2.1.37		-	-
>>Selected TAI	M		TAI 9.2.3.16		-	-
>Target RNC-ID					-	-
>>LAI	M		9.2.3.1		-	-
>>RAC	O		9.2.3.2		-	-
>>RNC-ID	M		INTEGER (0..4095)	If the *Extended RNC-ID* IE is included in the *Target ID* IE, the *RNC-ID* IE shall be ignored.	-	-
>>Extended RNC-ID	O		9.2.1.14	The *Extended RNC-ID* IE shall be used if the RNC identity has a value larger than 4095.	-	-
>CGI					-	-
>>PLMN Identity	M		9.2.3.8		-	-
>>LAC	M		OCTET STRING (SIZE(2))	0000 and FFFE not allowed.	-	-
>>CI	M		OCTET STRING (SIZE(2))		-	-
>>RAC	O		9.2.3.2		-	-
>Target NG-RAN Node ID					-	-
>>Global RAN Node ID	M		9.2.1.131		-	-
>>Selected TAI	M		5GS TAI 9.2.3.52		-	-

9.2.1.7 Source eNB to Target eNB Transparent Container

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

This IE is transparent to the EPC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
RRC Container	M		OCTET STRING	Includes the RRC Handover Preparation Information message as defined in subclause 10.2.2 of TS 36.331 [16].	-	
E-RABs Information List		*0..1*			-	
>E-RABs Information Item		*1 .. <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>DL Forwarding	O		9.2.3.14		-	
>>DAPS Request Information	O		9.2.1.155		YES	ignore
>>Source Transport Layer Address	O		9.2.2.1	Identifies the TNL address used by the sending node for direct data forwarding towards the target eNB	YES	ignore
>>Source Node Transport Layer Address	O		9.2.2.1	Identifies the TNL address used by the source SN node for direct data forwarding towards the target eNB	YES	ignore
Target Cell ID	M		E-UTRAN CGI 9.2.1.38		-	
Subscriber Profile ID for RAT/Frequency priority	O		9.2.1.39		-	
UE History Information	M		9.2.1.42		-	
Mobility Information	O		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	O		OCTET STRING	VisitedCellInfoList contained in the UEInformationResponse message (TS 36.331 [16])	YES	ignore
IMS voice EPS fallback from 5G	O		ENUMERATED (true, …)		YES	ignore
Additional RRM Policy Index	O		9.2.1.39a		YES	ignore
UE Context Reference at Source	O		9.2.1.144		YES	ignore
Inter-system measurement Configuration	O		9.2.1.151		YES	ignore
Source Node ID	O		9.2.1.152		YES	ignore
Emergency Indicator	O		ENUMERATED (true, …)	Indicates an emergency EPS voice fallback	YES	ignore

Direct Forwarding Path Availability	O		9.2.3.15	Indicates whether a direct forwarding path between the source RAN node and the target eNB is available	YES	ignore
Source SN ID	O		Global RAN Node ID 9.2.1.131		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 reference	Semantics description	Criticality	Assigned Criticality
RRC Container	M		OCTET STRING	Includes the RRC E-UTRA Handover Command message as defined in subclause 10.2.2 of TS 36.331 [16].	-	
DAPS Response Information List		*0..1*			YES	ignore
>DAPS Response Information Item		*1 .. <maxnoofE-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>DAPS Response Information	M		9.2.1.156	Indicates the response to a requested DAPS Handover	-	
Direct Forwarding Path Availability	O		9.2.3.15	Indicates whether a direct forwarding path between the source SN and the target eNB is available for intra-system and inter-system handover with 5GS	YES	ignore

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

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, EPSto5GS, 5GStoEPS)	

9.2.1.14 Extended RNC-ID

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

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

9.2.1.15 E-RAB Level QoS Parameters

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
E-RAB Level QoS Parameters				
>QCI	M		INTEGER (0..255)	QoS Class Identifier defined in TS 23.401 [11]. Coding specified in TS 23.203 [13].
>Allocation and Retention Priority	M		9.2.1.60	
>GBR QoS Information	O		9.2.1.18	This IE applies to GBR bearers only and shall be ignored otherwise.
>Downlink Maximum Packet Loss Rate	O		Packet Loss Rate 9.2.1.130	This IE applies only to bearers with specific QCI (see TS 23.401 [11]) and indicates the maximum rate for lost packets that can be tolerated in the downlink direction as specified in TS 23.401 [11].
>Uplink Maximum Packet Loss Rate	O		Packet Loss Rate 9.2.1.130	This IE applies only to bearers with specific QCI (see TS 23.401 [11]) and indicates the maximum rate for lost packets that can be tolerated in the uplilnk direction as specified in TS 23.401 [11].

9.2.1.16 Paging DRX

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

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

9.2.1.17 Paging Cause

Void.

9.2.1.18 GBR QoS Information

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
E-RAB Maximum Bit Rate Downlink	M		Bit Rate 9.2.1.19	**Desc**.: This IE indicates the maximum downlink E-RAB Bit Rate as specified in TS 23.401 [11] for this bearer. If the *Extended E-RAB Maximum Bit Rate Downlink* IE is included, the *E-RAB Maximum Bit Rate Downlink* IE shall be ignored.
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. If the *Extended E-RAB Maximum Bit Rate Uplink* IE is included, the *E-RAB Maximum Bit Rate Uplink* IE shall be ignored.
E-RAB Guaranteed Bit Rate Downlink	M		Bit Rate 9.2.1.19	**Desc**.: This IE indicates the downlink guaranteed E-RAB Bit Rate as specified in TS 23.401 [11] (provided that there is data to deliver) for this bearer. If the *Extended E-RAB Guaranteed Bit Rate Downlink* IE is included, the *E-RAB Guaranteed Bit Rate Downlink* IE shall be ignored.
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. If the *Extended E-RAB Guaranteed Bit Rate Uplink* IE is included, the *E-RAB Guaranteed Bit Rate Uplink* IE shall be ignored.
Extended E-RAB Maximum Bit Rate Downlink	O		Extended Bit Rate 9.2.1.126	Desc.: This IE indicates the maximum downlink E-RAB Bit Rate as specified in TS 23.401 [11] for this bearer.
Extended E-RAB Maximum Bit Rate Uplink	O		Extended Bit Rate 9.2.1.126	Desc.: This IE indicates the maximum uplink E-RAB Bit Rate as specified in TS 23.401 [11] for this bearer.
Extended E-RAB Guaranteed Bit Rate Downlink	O		Extended Bit Rate 9.2.1.126	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.
Extended E-RAB Guaranteed Bit Rate Uplink	O		Extended Bit Rate 9.2.1.126	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 or by UE in sidelink within a period of time, divided by the duration of the period. It is used, for example, to indicate the maximum or guaranteed bit rate for a GBR bearer, or an aggregated maximum bit rate.

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

9.2.1.20 UE Aggregate Maximum Bit Rate

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Aggregate Maximum Bit Rate				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. If the *Extended UE Aggregate Maximum Bit Rate Downlink* IE is included, the *UE Aggregate Maximum Bit Rate Downlink* IE shall be ignored.
>UE Aggregate Maximum Bit Rate Uplink	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 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. If the *Extended UE Aggregate Maximum Bit Rate Uplink* IE is included, the *UE Aggregate Maximum Bit Rate Uplink* IE shall be ignored.
>Extended UE Aggregate Maximum Bit Rate Downlink	O		Extended Bit Rate 9.2.1.126	This IE indicates the UE Aggregate Maximum Bit Rate as specified in TS 23.401 [11] in the downlink direction.
>Extended UE Aggregate Maximum Bit Rate Uplink	O		Extended Bit Rate 9.2.1.126	This IE indicates the UE Aggregate Maximum Bit Rate as specified in TS 23.401 [11] in the uplink direction.

9.2.1.21 Criticality Diagnostics

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

For further details on how to use the *Criticality Diagnostics* IE, (see clause 10).

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

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

9.2.1.22 Handover Restriction List

This IE defines 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	Criticality	Assigned Criticality
Serving PLMN	M		9.2.3.8			
Equivalent PLMNs		*0..<maxnoofEPLMNs>*		Allowed PLMNs in addition to Serving PLMN. This list corresponds to the list of "equivalent PLMNs" as defined in TS 24.301 [24]. This list is part of the roaming restriction information. Roaming restrictions apply to PLMNs other than the Serving PLMN and Equivalent PLMNs.		
>PLMN Identity	M		9.2.3.8			
Forbidden TAs		*0..<maxnoofEPLMNsPlusOne>*		Intra LTE roaming restrictions.		
>PLMN Identity	M		9.2.3.8	The PLMN of forbidden TACs.		
>Forbidden TACs		*1..<maxnoofForbTACs>*				
>>TAC	M		9.2.3.7	The TAC of the forbidden TAI.		
Forbidden LAs		*0..<maxnoofEPLMNsPlusOne>*		Inter-3GPP RAT roaming restrictions.		
>PLMN Identity	M		9.2.3.8			
>Forbidden LACs		*1..<maxnoofForbLACs>*				
>>LAC	M		OCTET STRING (SIZE(2))			
Forbidden inter RATs	O		ENUMERATED(ALL, GERAN, UTRAN, CDMA2000, …, GERAN and UTRAN, CDMA2000 and UTRAN)	Inter-3GPP and 3GPP2 RAT access restrictions. "ALL" means that all RATs mentioned in the enumeration of this IE are restricted.		
NR Restriction in EPS as Secondary RAT	O		ENUMERATED(NRrestrictedinEPSasSecondaryRAT, …)	Restriction to use NR when the NR is used as secondary RAT in EN-DC.	YES	ignore
Unlicensed Spectrum Restriction	O		ENUMERATED(UnlicensedRestricted, …)	Restriction to use unlicensed spectrum in the form of LAA or LWA/LWIP or NR-U as described in TS 23.401 [11].	YES	ignore
Core Network Type Restrictions		*0..<maxnoofEPLMNsPlusOne>*		Includes any of the Serving PLMN or any PLMN of the Equivalent PLMNs listed in the *Mobility Restriction List* IE for which Core network type restriction applies as specified in TS 23.501 [46].		
>PLMN Identity	M		9.2.3.8			

>Core Network Type	M		ENUMERATED(5GCForbidden, …,EPCForbidden)	Indicates whether the UE is restricted to connect to 5GC or to EPC for this PLMN.		
NR Restriction in 5GS	O		ENUMERATED(NRrestrictedin5GS, …)	Restriction to use NR when the NR connects to 5GS.	YES	ignore
Last NG-RAN PLMN Identity	O		9.2.3.8	Indicates the NG-RAN PLMN ID from where the UE formerly handed over to EPS and which is preferred in case of subsequent mobility to 5GS.	YES	ignore

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

9.2.1.23 CDMA2000-PDU

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

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

9.2.1.24 CDMA2000 RAT Type

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

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

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

9.2.1.25 CDMA2000 Sector ID

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CDMA2000 Sector ID	M		OCTET STRING	This IE is set to CDMA2000 Reference Cell ID corresponding to the HRPD/1xRTT sector under the HRPD AN/1xBS towards which the signalling is performed. The CDMA2000 Reference Cell ID is statically configured in the eNB. If the RAT type is HRPD, this IE contains the HRPD Sector ID as specified in 3GPP2 C.S0024-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 (0..7)	Next Hop Chaining Counter (NCC) defined in TS 33.401 [15]. For handover from 5GS to EPS, *Next Hop Chaining Count* IE = “2” as defined in TS 33.501 [48]. For other inter-RAT Handover into LTE the *Next Hop Chaining Count* IE takes the value defined for NCC at initial setup, i.e., *Next Hop Chaining Count* IE = “0”.
Next-Hop NH	M		9.2.1.41 Security Key	The NH together with the NCC is used to derive the security configuration as defined in TS 33.401 [15]. For inter RAT Handover the *Next-Hop NH* IE is the KeNB to be used in the new configuration.

9.2.1.27 UE Radio Capability

This IE contains UE Radio Capability information.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
UE Radio Capability	M		OCTET STRING	Includes either the UERadioAccessCapabilityInformation message as defined in 10.2.2 of TS 36.331 [16], or the *UERadioAccessCapabilityInformation-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	M		ENUMERATED (HO Success, HO Failure, …)	This IE indicates the status of the handover resource allocation in the CDMA2000 RAT.

9.2.1.29 CDMA2000 HO Required Indication

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

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

9.2.1.30 1xRTT MEID

Void.

9.2.1.31 eNB Status Transfer Transparent Container

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

This IE is transparent to the EPC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
E-RABs Subject to Status Transfer List		*1*			-	-
>E-RABs Subject to Status Transfer Item		*1 .. <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	-
>>UL COUNT value	M		COUNT Value 9.2.1.32	PDCP-SN and HFN of first missing UL PDCP SDU 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	O		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	O		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	O		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	O		BIT STRING (SIZE(1..16384))	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 been received correctly.	YES	ignore
>>UL COUNT Value for PDCP SN Length 18	O		COUNT Value for PDCP SN Length 18 9.2.1.100	PDCP-SN and HFN of first missing UL PDCP SDU in case of 18 bit long PDCP-SN.	YES	ignore

>>DL COUNT Value for PDCP SN Length 18	O		COUNT Value for PDCP SN Length 18 9.2.1.100	PDCP-SN and HFN that the target eNB should assign for the next DL SDU not having an SN yet in case of 18 bit long PDCP-SN.	YES	ignore
>>Receive Status Of UL PDCP SDUs for PDCP SN Length 18	O		BIT STRING (SIZE(1..131072))	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 (0..4095)		-	-
HFN	M		INTEGER (0..1048575)		-	-

9.2.1.33 CDMA2000 1xRTT RAND

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

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

9.2.1.34 Request Type

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

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Request Type						
>Event Type	M		ENUMERATED(Direct, Change of service cell, Stop Change of service cell, …)			
>Report Area	M		ENUMERATED (ECGI, …)			
>Additional Location Information	O		ENUMERATED (Include PSCell, ...)		YES	ignore

9.2.1.35 CDMA2000 1xRTT SRVCC Info

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

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

9.2.1.36 E-RAB List

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

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

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

9.2.1.37 Global eNB ID

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.8	
CHOICE *eNB ID*	M			
>*Macro eNB ID*				
>>Macro eNB ID	M		BIT STRING (SIZE(20))	Equal to the 20 leftmost bits of the *Cell Identity* IE contained in the *E-UTRAN CGI* IE (see subclause 9.2.1.38) of each cell served by the eNB.
>*Home eNB ID*				
>>Home eNB ID	M		BIT STRING (SIZE(28))	Equal to the *Cell Identity* IE contained in the *E-UTRAN CGI* IE (see subclause 9.2.1.38) of the cell served by the eNB.
>*Short Macro eNB ID*				
>> Short Macro eNB ID	M		BIT STRING (SIZE(18))	Equal to the 18 leftmost bits of the *Cell Identity* IE (see subclause 9.2.1.38) of each cell served by the eNB.
>*Long Macro eNB ID*				
>> Long Macro eNB ID	M		BIT STRING (SIZE(21))	Equal to the 21 leftmost bits of the *Cell Identity* IE (see subclause 9.2.1.38) of each cell served by the eNB.

9.2.1.37a Global en-gNB ID

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.8	
en-gNB ID	M		BIT STRING (SIZE(22..32))	

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 (1..256)	

9.2.1.39a Additional RRM Policy Index

The *Additional RRM Policy Index* IE is used to provide additional information independent from the Subscriber Profile ID for RAT/Frequency priority as specified in TS 36.300 [14].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Additional RRM Policy Index	M		BIT STRING (32)	

9.2.1.40 UE Security Capabilities

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

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
UE Security Capabilities				
>Encryption Algorithms	M		BIT STRING (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 EIA0, "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	M		BIT STRING (SIZE(256))	Key material for KeNB or Next Hop Key as defined in TS 33.401 [15]

9.2.1.42 UE History Information

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

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

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

9.2.1.43 Last Visited Cell Information

The Last Visited Cell Information may contain 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		-	-
>NG-RAN Cell					-	-
>>Last Visited NG-RAN Cell Information	M		OCTET STRING	Defined in TS 38.413 [44] (see subclause 9.3.1.97).		

9.2.1.43a Last Visited E-UTRAN Cell Information

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Global Cell ID	M		E-UTRAN CGI 9.2.1.38		-	
Cell Type	M		9.2.1.66		-	
Time UE stayed in Cell	M		INTEGER (0..4095)	The duration of the time the UE stayed in the cell in seconds. If the UE stays in a cell more than 4095s, this IE is set to 4095.	-	
Time UE stayed in Cell Enhanced Granularity	O		INTEGER (0..40950)	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	O		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 Reference	Semantics Description
Message Identifier	M		BIT STRING (SIZE(16))	This IE is set by the EPC, transferred to the UE by the eNB. The eNB shall treat it as an identifier of the message.

9.2.1.45 Serial Number

The *Serial Number* IE identifies a particular message from the source and type indicated by the Message Identifier and is altered every time the message with a given Message Identifier is changed.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Serial Number	M		BIT STRING (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 Reference	Semantics Description
CHOICE *Warning Area*	M			
>*Cell ID List*		*1 .. <maxnoofCellID>*		
>>E-CGI	M		9.2.1.38	
>*TAI List for Warning*		*1 .. <maxnoofTAIforWarning>*		
>>TAI	M		9.2.3.16	
>*Emergency Area ID List*		*1 .. <maxnoofEmergencyAreaID>*		
>>Emergency Area ID	M		9.2.1.47	

Range bound	Explanation
maxnoofCellID	Maximum no. of Cell ID subject for warning message broadcast. Value is 65535.
maxnoofTAIforWarning	Maximum no. of TAI subject for warning message broadcast. Value is 65535.
maxnoofEmergencyAreaID	Maximum no. of Emergency Area ID subject for warning message broadcast. Value is 65535.

9.2.1.47 Emergency Area ID

The *Emergency Area ID* IE is used to indicate the area which has the emergency impact.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Emergency Area ID	M		OCTET STRING (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	M		INTEGER (0..4095)	The unit of value 1 to 4095 is [second].

9.2.1.49 Number of Broadcasts Requested

The *Number of Broadcast Requested* IE indicates the number of times a message is to be broadcast.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Number of Broadcasts Requested	M		INTEGER (0..65535)	

9.2.1.50 Warning Type

The *Warning Type* IE indicates types of the disaster. This IE also indicates that a Primary Notification is included. This IE can be used by the UE to differentiate the type of alert according to the type of disaster.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Warning Type	M		OCTET STRING (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	M		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(1..9600))	The length of this IE varies between 1 to 9600 bytes.

9.2.1.54 Broadcast Completed Area List

The *Broadcast Completed Area List* IE indicates the areas where 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 Area*	M			
>Broadcast Completed Area				
>>Cell ID Broadcast		*1 .. <maxnoofCellID>*		
>>>E-CGI	M		9.2.1.38	
>TAI Broadcast				
>>TAI Broadcast		*1 .. <maxnoofTAIforWarning>*		
>>>TAI	M		9.2.3.16	
>>>Completed Cell in TAI List		*1 .. <maxnoofCellinTAI>*		
>>>>E-CGI	M			
>Emergency Area ID				
>>Emergency Area ID Broadcast		*1 .. <maxnoofEmergencyAreaID>*		
>>>Emergency Area ID	M		9.2.1.47	
>>>Completed Cell in Emergency Area ID List		*1 .. <maxnoofCellinEAI>*		
>>>>E-CGI	M			

Range bound	Explanation
maxnoofCellID	Maximum no. of Cell ID subject for warning message broadcast. Value is 65535.
maxnoofTAIforWarning	Maximum no. of TAI subject for warning message broadcast. Value is 65535.
maxnoofEmergencyAreaID	Maximum no. of Emergency Area ID subject for warning message broadcast. Value is 65535.
maxnoofCellinTAI	Maximum no. of Cell ID within a TAI. Value is 65535.
maxnoofCellinEAI	Maximum no. of Cell ID within an Emergency Area. Value is 65535.

9.2.1.55 Inter-system Information Transfer Type

The *Inter-system Information Type* IE indicates the type of information that the eNB requests to transfer.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Inter-system Information Transfer Type*	M			
>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* 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], or the *Source NG-RAN Node to Target NG-RAN Node Transparent Container* IE as defined in TS 38.413 [44].

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], or the *Target NG-RAN Node to Source NG-RAN Node Transparent Container* IE as defined in TS 38.413 [44].

9.2.1.58 SRVCC Operation Possible

This element indicates that both UE and MME are SRVCC-capable. E-UTRAN behaviour on receipt of this IE is specified in TS 23.216 [9].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SRVCC operation possible	M		ENUMERATED (Possible, …)	

9.2.1.59 SRVCC HO Indication

This information element is set by the source eNB to provide an indication that E-RAB may be subjected to handover via SRVCC means.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SRVCC HO Indication	M		ENUMERATED (PS and CS, CS only, …)	

9.2.1.60 Allocation and Retention Priority

This IE specifies the relative importance compared to other E-RABs for allocation and retention of the E-UTRAN Radio Access Bearer.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Allocation/Retention Priority				
>Priority Level	M		INTEGER (0..15)	**Desc.:** This IE should be understood as “priority of allocation and retention” (see TS 23.401 [11]). **Usage:** Value 15 means “no priority”. Values between 1 and 14 are ordered in decreasing order of priority, i.e., 1 is the highest and 14 the lowest. Value 0 shall be treated as a logical error if received.
>Pre-emption Capability	M		ENUMERATED(shall not trigger pre-emption, may trigger pre-emption)	**Desc.:** This IE indicates the pre-emption capability of the request on other E-RABs **Usage:** The E-RAB shall not pre-empt other E-RABs or, the E-RAB may pre-empt other E-RABs The Pre-emption Capability indicator applies to the allocation of resources for an E-RAB and as such it provides the trigger to the pre-emption procedures/processes of the eNB.
>Pre-emption Vulnerability	M		ENUMERATED(not pre-emptable, pre-emptable)	**Desc.:** This IE indicates the vulnerability of the E-RAB to preemption of other E-RABs. **Usage**: The E-RAB shall not be pre-empted by other E-RABs or the E-RAB may be pre-empted by other RABs. Pre-emption Vulnerability indicator applies for the entire duration of the E-RAB, unless modified and as such indicates whether the E-RAB is a target of the pre-emption procedures/processes of the eNB.

9.2.1.61 Time to wait

This IE defines the minimum allowed waiting times.

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

9.2.1.62 CSG Id

This information element indicates the identifier of the Closed Subscriber Group, as defined in TS 23.003 [21].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CSG Id	M		BIT STRING (SIZE (27))	

9.2.1.63 CSG Id List

Void.

9.2.1.64 MS Classmark 2

The coding of this element is described in TS 48.008 [23].

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
MS Classmark 2	M		OCTET STRING	Coded 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 (0..2047)	Includes the Round Trip Delay between the eNB and the UE. The unit is $16T_s$ (see subclause 4.2.3 in TS 36.213 [26]).

9.2.1.70 Broadcast Cancelled Area List

The *Broadcast Cancelled Area List* IE indicates the areas where broadcast was stopped successfully.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Broadcast Cancelled Area*	M			
>CID Cancelled				
>>Cell ID Cancelled		*1 .. <maxnoofCellID>*		
>>>E-CGI	M		9.2.1.38	
>>>Number of Broadcasts	M		9.2.1.71	
>TAI Cancelled				
>>TAI Cancelled		*1 .. <maxnoofTAIforWarning >*		
>>>TAI	M		9.2.3.16	
>>>**Cancelled Cell in TAI List**		*1 .. <maxnoofCellinTAI>*		
>>>>E-CGI	M			
>>>>Number of Broadcasts	M		9.2.1.71	
>Emergency Area Cancelled				
>>Emergency Area ID Cancelled		*1 .. <maxnoofEmergencyAreaID>*		
>>>Emergency Area ID	M		9.2.1.47	
>>>**Cancelled Cell in Emergency Area ID List**		*1 .. <maxnoofCellinEAI>*		
>>>>E-CGI	M			
>>>>Number of Broadcasts	M		9.2.1.71	

Range bound	Explanation
maxnoofCellID	Maximum no. of Cell ID subject for warning message broadcast. Value is 65535.
maxnoofTAIforWarning	Maximum no. of TAI subject for warning message broadcast. Value is 65535.
maxnoofEmergencyAreaID	Maximum no. of Emergency Area ID subject for warning message broadcast. Value is 65535.
maxnoofCellinTAI	Maximum no. of Cell ID within a TAI. Value is 65535.
maxnoofCellinEAI	Maximum no. of Cell ID within an Emergency Area. Value is 65535.

9.2.1.71 Number of Broadcasts

The *Number of Broadcasts* IE indicates the number of times that a particular message has been broadcast in a given warning area.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Number of Broadcasts	M		INTEGER(0..65535)	This IE is set to '0' if valid results are not known or not available. It is set to 65535 if the counter results have overflown.

9.2.1.72 Concurrent Warning Message Indicator

The *Concurrent Warning Message Indicator* IE indicates to eNB that the received warning message is a new message to be scheduled for concurrent broadcast with any other ongoing broadcast of warning messages.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Concurrent Warning Message Indicator	M		ENUMERATED(true)	This IE is used to identify a PWS type warning system which allows the broadcast of multiple concurrent warning messages over the radio.

9.2.1.73 CSG Membership Status

This element indicates the membership status of the UE to a particular CSG.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CSG Membership Status	M		ENUMERATED (member, not-member)	

9.2.1.74 Cell Access Mode

This element indicates the access mode of the cell accessed by the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cell Access Mode	M		ENUMERATED (hybrid, …)	

9.2.1.75 Extended Repetition Period

The *Extended Repetition Period* IE indicates the periodicity of the warning message to be broadcast.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Extended Repetition Period	M		INTEGER (4096..2^{17}-1)	The *Extended Repetition Period* IE is used if the Repetition Period has a value larger than 4095. Unit [second].

9.2.1.76 Data Forwarding Not Possible

This information element indicates that the MME decided that the corresponding E-RAB bearer will not be subject to data forwarding.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Data Forwarding Not Possible	M		ENUMERATED (Data forwarding not possible, …)	

9.2.1.77 PS Service Not Available

This IE indicates that the UE is not available for the PS service in the target cell in case of SRVCC to GERAN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PS Service Not Available	M		ENUMERATED (PS service not Available, …)	

9.2.1.78 Paging Priority

This element indicates the paging priority for paging a UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Paging Priority	M		ENUMERATED (PrioLevel1, PrioLevel2, PrioLevel3, PrioLevel4, PrioLevel5, PrioLevel6, PrioLevel7, PrioLevel8, …)	Lower value codepoint indicates higher priority.

9.2.1.79 Relay Node Indicator

This element indicates a relay node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Relay Node Indicator	M		ENUMERATED (true, …)	

9.2.1.80 Correlation ID

This information element is the GTP Tunnel Endpoint Identifier or GRE key to be used for the user plane transport between eNB and the L-GW described in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Correlation ID	M		OCTET STRING (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	M		ENUMERATED(Immediate 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 .. <maxnoofCellIDforMDT>*				-
>>>E-CGI	M		9.2.1.38		-	-
>*TA based*						-
>>**TA List for MDT**		*1 .. <maxnoofTAforMDT>*				-
>>>TAC	M		9.2.3.7	The TAI is derived using the current serving PLMN.	-	-
>*PLMN Wide*			NULL		-	-
>*TAI based*					-	-
>>**TAI List for MDT**		*1 .. <maxnoofTAforMDT>*			-	-
>>>TAI	M		9.2.3.16		-	-
CHOICE *MDT Mode*	M				-	-
>*Immediate MDT*						-
>>Measurements to Activate	M		BITSTRING (SIZE(8))	Each position in the bitmap indicates a MDT measurement, as defined in TS 37.320 [31]. First Bit = M1, Second Bit= M2, 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 *Measurements to Activate* IE has the first bit set to “0”.	-	-
>>M1 Threshold Event A2	C-ifM1A2trigger			Included in case of event-triggered or event-triggered periodic reporting for measurement M1.	-	-
>>>CHOICE *Threshold*	M				-	-
>>>>*RSRP*						-

>>>>>Threshold RSRP	M		INTEGER (0..97)	This IE is defined in TS 36.331 [16].	-	-
>>>>*RSRQ*						-
>>>>>Threshold RSRQ	M		INTEGER (0..34)	This IE is defined in TS 36.331 [16].	-	-
>>M1 Periodic reporting	C-ifperiodic MDT			Included in case of periodic or event-triggered periodic reporting for measurement M1.	-	-
>>>Report interval	M		ENUMERATED (ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, min1, min6, min12, min30, min60)	This IE is defined in TS 36.331 [16].	-	-
>>>Report amount	M		ENUMERATED (1, 2, 4, 8, 16, 32, 64, infinity)	Number of reports.	-	-
>>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	O		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
>>Bluetooth Measurement Configuration	O		9.2.1.137		YES	Ignore
>>WLAN Measurement Configuration	O		9.2.1.138		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	M		ENUMERATED (10, 20, 40, 60, 90 and 120)	This IE is defined in TS 36.331 [16]. Unit: [minute].	-	-
>>Bluetooth Measurement Configuration	O		9.2.1.137		YES	Ignore
>>WLAN Measurement Configuration	O		9.2.1.138		YES	Ignore
>*Logged MBSFN MDT*					YES	ignore

>>Logging interval	M		ENUMERATED (1.28, 2.56, 5.12, 10.24, 20.48, 30.72, 40.96 and 61.44)	This IE is defined in TS 36.331 [16]. Unit: [second].	-	-
>>Logging duration	M		ENUMERATED (10, 20, 40, 60, 90 and 120)	This IE is defined in TS 36.331 [16]. Unit: [minute].	-	-
>>MBSFN-ResultToLog	O		MBSFN-ResultToLog 9.2.1.94		-	-
Signalling based MDT PLMN List	O		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 Indicator	M		ENUMERATED (true, ...)	

9.2.1.83 Management Based MDT Allowed

This information element is used by the eNB to allow selection of the UE for management based MDT as described in TS 32.422 [10].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Management Based MDT Allowed	M		ENUMERATED (Allowed, ...)	

9.2.1.84 GW Context Release Indication

This information element is set by the eNB to provide an indication that 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 reference	Semantics description
GW Context Release Indication	M		ENUMERATED (true, …)	This IE indicates to the MME 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 Indicator	M		ENUMERATED (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, …, ms1024, ms1280, ms2048, ms2560, ms5120, ms10240, min1)	

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(uplink, 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	M		ENUMERATED (ms1024, ms2048, ms5120, ms10240, min1, …)	
M5 Links to log	M		ENUMERATED(uplink, 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..<maxnoofMDTPLMNs>*		
>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 reference	Semantics description	Criticality	Assigned Criticality
PDCP-SN Extended	M		INTEGER (0..32767)		-	-
HFN Modified	M		INTEGER (0..131071)		-	-

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	M		OCTET STRING (SIZE (32..256))	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	Criticality	Assigned Criticality
User Location Information					–	–
>E-UTRAN CGI	M		9.2.1.38		–	–
>TAI	M		9.2.3.16		–	–
>PSCell Information	O		9.2.1.141		YES	ignore

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 MBSFNArea MDT >*		
>MBSFN-AreaId	O		INTEGER (0..255)	
>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	O		9.2.1.97	
Expected HO Interval	O		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	O		INTEGER (1..30|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	O		INTEGER (1..30|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	O		ENUMERATED (subscription information, statistics, ...)	If "subscription information" is indicated, the information contained in the *Expected Activity Period* IE and the *Expected Idle Period* IE, if present, is derived from subscription information. If "statistics" is indicated, the information contained in the *Expected Activity Period* IE and the *Expected Idle Period* 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	O		ENUMERATED (authorized, not authorized, ...)	Indicates whether the UE is authorized for ProSe Direct Discovery	-	-
ProSe Direct Communication	O		ENUMERATED (authorized, not authorized, ...)	Indicates whether the UE is authorized for ProSe Direct Communication	-	-
ProSe UE-to-Network Relaying	O		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 (0..262143)		-	-
HFN for PDCP-SN Length 18	M		INTEGER (0..16383)		-	-

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	M		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	M		ENUMERATED(uplink, 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 reference	Semantics description
M7 Collection Period	M		INTEGER (1..60, …)	Unit: minutes
M7 Links to log	M		ENUMERATED(uplink, 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 Recommended Cells	O		9.2.1.104	
Assistance Data for CE capable UEs	O		9.2.1.108	
Paging Attempt Information	O		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 .. <maxnoofRecommended Cells>*		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	O		INTEGER (0..4095)	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 .. <maxnoofRecommended eNBs>*		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	M		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 Coverage Enhancement Level	M		9.2.1.109	

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	M		E-UTRAN CGI 9.2.1.38	
Coverage Enhancement Level	M		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	M		INTEGER (1..16,...)	Shall be set as specified in TS 36.300 [14].
Intended Number of Paging Attempts	M		INTEGER (1..16,…)	Intended number of paging attempts (see TS 36.300 [14]).
Next Paging Area Scope	O		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	M		ENUMERATED (hfhalf, hf1, hf2, hf4, hf6, hf8, hf10, hf12, hf14, hf16, hf32, hf64, hf128, hf256, …)	T_{eDRX} defined in TS 36.304 [20]. Unit: [number of hyperframes].
Paging Time Window	O		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 CIoT 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 CIoT Support Indicator	M		ENUMERATED (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 Cycle	M		ENUMERATED (hf2, hf4, hf6, hf8, hf10, hf12, hf14, hf16, hf32, hf64, hf128, hf256, hf512, hf1024, …)	T_{eDRX} defined in TS 36.304 [20]. Unit: [number of hyperframes].
NB-IoT Paging Time Window	O		ENUMERATED (s1, s2, s3, s4, s5, s6, s7, s8, s9, s10, s11, s12, s13, s14, s15, s16, …)	Unit: [2.56 seconds]

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	M		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 Indicator	M		ENUMERATED (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	M		ENUMERATED (notPossible, …)	

9.2.1.120 V2X Services Authorized

This IE provides information on the authorization status of the UE to use the sidelink for V2X services.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Vehicle UE	O		ENUMERATED (authorized, not authorized, ...)	Indicates whether the UE is authorized as Vehicle UE	-	-
Pedestrian UE	O		ENUMERATED (authorized, not authorized, ...)	Indicates whether the UE is authorized as Pedestrian UE	-	-

9.2.1.121 Served DCNs Items

The Served DCNs Items indicates the relative processing capacity for a DCN-ID in the MME as defined in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Served DCNs Items				
>DCN ID	M		INTEGER (0..65535)	
>Relative DCN Capacity	M		Relative MME Capacity 9.2.3.17	Relatvie capacity per DCN in one MME

9.2.1.122 UE Sidelink Aggregate Maximum Bit Rate

This IE provides information on the Aggregate Maximum Bitrate of the UE's sidelink communication for V2X services.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Sidelink Aggregate Maximum Bit Rate	M		Bit Rate 9.2.1.19	Value 0 shall be considered as a logical error by the receiving eNB.

9.2.1.123 Enhanced Coverage Restricted

This IE provides information on the restriction information of using Coverage Enhancement.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Enhanced Coverage Restricted	O		ENUMERATED (restricted, ...)	Indicates whether the UE is restricted to use coverage enhancement. Value "restricted" indicates that the UE is not allowed to use coverage enhancement.	-	-

9.2.1.124 Secondary RAT Usage Report List

This IE provides information on the NR resources used with EN-DC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Secondary RAT usage report Item		1 .. <maxnoofE-RABs>			EACH	ignore
>E-RAB ID	M		9.2.1.2		-	-
>Secondary RAT Type	M		ENUMERATED (nR, …, unlicensed)		-	-
>E-RAB Usage Report List		1			-	-
>>E-RAB Usage Report Item		1.. <maxnoof time periods>			EACH	ignore
>>>Start timestamp	M		OCTET STRING (SIZE(4))	UTC time encoded in the same format as the first four octets of the 64-bit timestamp format as defined in section 6 of IETF RFC 5905 [42]. It indicates the start time of the collecting period of the included *Usage Count UL* IE and *Usage Count DL* IE.	-	-
>>>End timestamp	M		OCTET STRING (SIZE(4))	UTC time encoded in the same format as the first four octets of the 64-bit timestamp format as defined in section 6 of IETF RFC 5905 [42]. It indicates the end time of the collecting period of the included *Usage Count UL* IE and *Usage Count DL* IE.	-	-
>>>Usage count UL	M		INTEGER (0..2^{64}-1)	The unit is: octets	-	-
>>>Usage count DL	M		INTEGER (0..2^{64}-1)	The unit is: octets	-	-

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RABs for one UE. Value is 256.
maxnoof time periods	Maximum no. of time reporting periods. Value is 2.

9.2.1.125 Handover Flag

This IE indicates that the MME should buffer the secondary RAT data usage report since the report is sent due to handover as defined in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Handover Flag	M		ENUMERATED (handover_preparation, …)	

9.2.1.126 Extended 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
Extended Bit Rate			INTEGER (10,000,000,001..4,000,000,000,000, ...)	The unit is: bit/s

9.2.1.127 NR UE Security Capabilities

This IE defines the supported algorithms for encryption and integrity protection in NR as defined in TS 33.401 [15].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
NR Encryption Algorithms	M		BIT STRING (SIZE(16, …))	Each position in the bitmap represents an encryption algorithm: “all bits equal to 0” – UE supports no other NR algorithm than NEA0, “first bit” – 128-NEA1, “second bit” – 128-NEA2, “third bit” – 128-NEA3, 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].
NR 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 NR algorithm than NIA0, “first bit” – 128-NIA1, “second bit” – 128-NIA2, “third bit” – 128-NIA3, 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].

9.2.1.128 UE Application layer measurement configuration

The IE defines configuration information for the QoE Measurement Collection (QMC) function.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigne Criticalit
Container for application layer measurement configuration	M		Octet string (1..1000)	Indicates application layer measurement configuration, see Annex L in [43].	-	-
CHOICE *Area Scope of QMC*	M				-	-
>Cell based						-
>>**Cell ID List for QMC**		*1 .. <maxnoofCellIDforQMC>*				-
>>>E-CGI	M		9.2.1.38		-	-
>TA based						-
>>**TA List for QMC**		*1 .. <maxnoofTAforQMC>*				-
>>>TAC	M		9.2.3.7	The TAI is derived using the current serving PLMN.	-	-
>TAI based					-	-
>>**TAI List for QMC**		*1 .. <maxnoofTAforQMC>*			-	-
>>>TAI	M		9.2.3.16		-	-
>PLMN area based						-
>>**PLMN List for QMC**		*1 .. <maxnoofPLMNforQMC>*				-
>>>PLMN Identity	M		9.2.3.8		-	-
Service Type	M		ENUMERATED (QMC for streaming service, QMC for MTSI service, ...)	This IE indicates the service type of UE application layer measurements.	-	-

Range bound	Explanation
maxnoofCellIDforQMC	Maximum no. of Cell ID subject for QMC scope. Value is 32.
maxnoofTAforQMC	Maximum no. of TA subject for QMC scope. Value is 8.
maxnoofPLMNforQMC	Maximum no. of PLMNs in the PLMN list for QMC scope. Value is 16.

9.2.1.129 CE-mode-B Restricted

This IE provides information on the restriction information of using Coverage Enhancement Mode B.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
CE-mode-B Restricted	O		ENUMERATED (restricted, not-restricted...)	Indicates whether the UE is restricted to use coverage enhancement. Value “restricted” indicates that the UE is not allowed to use coverage enhancement mode B. Value “not-restricted” indicates that the UE is allowed to use coverage enhancement mode B.	-	-

9.2.1.130 Packet Loss Rate

This IE indicates the packet loss rate.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Packet Loss Rate	M		INTEGER(0..1000)	Ratio of lost packets per number of packets sent, expressed in tenth of percent.	-	-

9.2.1.131 Global RAN Node ID

This IE is used to globally identify an NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *NG-RAN node*	M			
>gNB				
>>Global gNB ID	M		9.2.1.132	
>ng-eNB				
>>Global ng-eNB ID	M		Global eNB ID 9.2.1.37	

9.2.1.132 Global gNB ID

This IE is used to globally identify a gNB (see TS 38.300 [45]).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.8	
CHOICE *gNB ID*	M			
>gNB ID				
>>gNB ID	M		BIT STRING (SIZE(22..32))	Equal to the leftmost bits of the *NR Cell Identity* IE contained in the *NR CGI* IE of each cell served by the gNB.

9.2.1.133 Source NG-RAN Node To Target NG-RAN Node 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 EPS to 5GS.

This IE defined in TS 38.413 [44].

9.2.1.134 Target NG-RAN Node To Source NG-RAN Node 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 for inter 3GPP RAT handovers from EPS to 5GS.

This IE defined in TS 38.413 [44].

9.2.1.135 LTE-M Indication

This element is provided by the eNB to inform that the UE indicates category M1 or M2 in its UE Radio Capability.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
LTE-M Indication	M		ENUMERATED (LTE-M, ...)	

9.2.1.136 Aerial UE subscription information

This information element is used by the eNB to know if the UE is allowed to use aerial UE function, refer to TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Aerial UE subscription information	M		ENUMERATED (allowed, not allowed,…)	

9.2.1.137 Bluetooth Measurement Configuration

This IE defines the parameters for Bluetooth measurement collection.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Bluetooth Measurement Configuration	M		ENUMERATED (Setup, …)	
Bluetooth Measurement Configuration Name List		*0..1*		This IE is present if the *Bluetooth Measurement Configuration* IE is set to "Setup".
>Bluetooth Measurement Configuration Name Item		*1 .. <maxnoofBluetoothName>*		
>>Bluetooth Measurement Configuration Name	M		OCTET STRING (SIZE (1..248))	
BT RSSI	O		ENUMERATED (True, …)	In case of Immediate MDT, it corresponds to M8 measurement as defined in 37.320 [31].

Range bound	Explanation
maxnoofBluetoothName	Maximum no. of Bluetooth local name used for Bluetooth measurement collection. Value is 4.

9.2.1.138 WLAN Measurement Configuration

This IE defines the parameters for WLAN measurement collection.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
WLAN Measurement Configuration	M		ENUMERATED (Setup, …)	
WLAN Measurement Configuration Name List		*0..1*		This IE is present if the *WLAN Measurement Configuration* IE is set to "Setup".
>WLAN Measurement Configuration Name Item		*1 .. <maxnoofWLANName>*		
>>WLAN Measurement Configuration Name	M		OCTET STRING (SIZE (1..32))	
WLAN RSSI	O		ENUMERATED (True, …)	In case of Immediate MDT, it corresponds to M8 as defined in 37.320 [31].
WLAN RTT	O		ENUMERATED (True, …)	In case of Immediate MDT, it corresponds to M9 as defined in 37.320 [31].

Range bound	Explanation
maxnoofWLANName	Maximum no. of WLAN SSID used for WLAN measurement collection. Value is 4.

9.2.1.139 Warning Area Coordinates

This IE contains the affected alert area coordinates of a warning message, and will be broadcast over the radio interface.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Warning Area Coordinates	M		OCTET STRING (SIZE(1..1024))	The length of this IE varies between 1 to 1024 bytes.

9.2.1.140 Subscription Based UE Differentiation Information

This IE is generated by the MME based on the UE subscription information, it provides the Subscription Based UE differentiation Information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Periodic Communication Indicator	O		ENUMERATED(periodically, on demand, …)	This IE indicates whether the UE communicates periodically or not, e.g. only on demand.
Periodic Time	O		INTEGER (1..3600, …)	This IE indicates the interval time of periodic communication, the unit is: second
Scheduled Communication Time		*0..1*		This IE indicates the time zone and day of the week when the UE is available for communication.
>>Day of Week	O		BIT STRING (SIZE(7))	If Day-Of-Week is not provided this shall be interpreted as every day of the week. Each position in the bitmap represents a day of the week: first bit = Mon, second bit =Tue, third bit =Wed, and so on. Value '1' indicates 'scheduled. Value '0' indicates 'not scheduled'.
>>Time of Day Start	O		INTEGER (0..86399, …)	This IE indicates the time to start of the day, each value represent the corresponding second since 00:00 of the day. If Time-Of-Day-Start is not provided, starting time shall be set to start of the day(s) indicated by Day-Of-Week-Mask.
>>Time of Day End	O		INTEGER (0..86399, …)	This IE indicates the time to start of the day, each value represent the corresponding second since 00:00 of the day. The value of this IE should be bigger than the value of *Time of Day Start* IE. If Time-Of-Day-End is not provided, ending time is end of the day(s) indicated by Day-Of-Week-Mask.
Stationary Indication	O		ENUMERATED(stationary, mobile, …)	
Traffic Profile	O		ENUMERATED(single packet, dual packets, multiple packets, …)	"single packet" indicates single packet transmission (UL or DL), "dual packets" indicates dual packet transmission (UL with subsequent DL, or DL with subsequent UL), "multiple packets" indicates multiple packets transmission.
Battery Indication	O		ENUMERATED(battery powered, battery powered not rechargeable or replaceable, not battery powered, …)	"battery powered" indicates that the UE is battery powered and the battery is rechargeable/replaceable, "battery powered not rechargeable or replaceable" indicates that the UE is battery powered but the battery is not rechargeable/replaceable,, "not battery powered" indicates that the UE is not battery powered.

9.2.1.141 PSCell Information

This IE includes the information of the UE's PSCell.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
NR Cell Identity	M		9.2.1.142	

9.2.1.142 NR CGI

This IE is used to globally identify an NR cell (see TS 38.300 [45]).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.8	
Cell Identity	M		BIT STRING (SIZE(36))	

9.2.1.143 Time Since Secondary Node Release

This IE indicates the time elapsed since the completion of the EN-DC release procedure.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Time Since Secondary Node Release	O		OCTET STRING (SIZE(4))	Time in seconds. Max value indicates the elapsed time was equal or longer than the value.

9.2.1.144 UE Context Reference at Source

This IE uniquely identifies a UE association over an NG interface and the source NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Source NG-RAN node	M		Global RAN Node ID 9.2.1.131		–	
RAN UE NGAP ID	M		9.2.1.145	Allocated at the source (Master-)NG-RAN node.	–	

NOTE: This IE is used in case of inter-system handover to 4G to enable node-internal data forwarding in case of shared en-gNB/gNBs.

9.2.1.145 RAN UE NGAP ID

This IE uniquely identifies the UE association over the NG interface within the NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAN UE NGAP ID	M		INTEGER (0..2^{32}-1)	

9.2.1.146 IAB Authorized

This IE provides information about the authorization status of the IAB-node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
IAB Authorized	M		ENUMERATED (authorized, not authorized, ...)	Indicates the IAB-node authorization status.

9.2.1.147 Ethernet Type

This IE is used to indicate that Ethernet data is expected.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Ethernet Type	M		ENUMERATED (True, …,)	

9.2.1.148 NR V2X Services Authorized

This IE provides information on the authorization status of the UE to use the NR sidelink for V2X services.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Vehicle UE	O		ENUMERATED (authorized, not authorized, ...)	Indicates whether the UE is authorized as Vehicle UE.
Pedestrian UE	O		ENUMERATED (authorized, not authorized, ...)	Indicates whether the UE is authorized as Pedestrian UE.

9.2.1.149 NR UE Sidelink Aggregate Maximum Bit Rate

This IE provides information on the Aggregate Maximum Bitrate of the UE's sidelink communication for NR V2X services.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
NR UE Sidelink Aggregate Maximum Bit Rate	M		Bit Rate 9.2.1.19	Value 0 shall be considered as a logical error by the receiving eNB.

9.2.1.150 PC5 QoS Parameters

This IE provides information on the PC5 QoS parameters of the UE's sidelink communication for NR PC5.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PC5 QoS Flow List		*1*		
>PC5 QoS Flow Item		*1..<maxnoofPC5QoSFlows>*		
>>PQI	M		INTEGER (0..255, …)	PQI is a special 5QI as specified in TS 23.501 [9].
>>PC5 Flow Bit Rates	O			Only applies for GBR QoS Flows.
>>>Guaranteed Flow Bit Rate	M		Bit Rate 9.2.1.19	Guaranteed Bit Rate for the PC5 QoS flow. Details in TS 23.501 [9].
>>>Maximum Flow Bit Rate	M		Bit Rate 9.2.1.19	Maximum Bit Rate for the PC5 QoS flow. Details in TS 23.501 [9].
>>Range	O		ENUMERATED (m50, m80, m180, m200, m350, m400, m500, m700, m1000, …)	Only applies for groupcast.
PC5 Link Aggregated Bit Rates	O		Bit Rate 9.2.1.19	Only applies for non-GBR QoS Flows.

Range bound	Explanation
maxnoofPC5QoSFlows	Maximum no. of PC5 QoS flows allowed towards one UE. Value is 2048.

9.2.1.151 Inter System Measurement Configuration

The *Inter-System Measurement Configuration* IE contains information for instructing the incoming UE to continue measuring the cells of the NR RAT after a successful inter-system handover to LTE network.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
RSRP	O		INTEGER (0..127)	Threshold of RSRP.	-	-
RSRQ	O		INTEGER (0..127)	Threshold of RSRQ.	-	-
SINR	O		INTEGER (0..127)	Threshold of SINR	-	-
Inter-System Measurement Parameters	M				-	-
>Measurement Duration	M		INTEGER (1..100)	The period of time following the successful IRAT handover, during which the target RAT instructs the UE to measure cells of the source RAT. Unit: [second].	-	-
>Inter-System Measurement List		*0..1*			EACH	reject
>>Inter-System Measurement Item		*1.. <maxnoofrfrequencies>*		List of inter-system measurements configured	YES	reject
>>>FreqBandIndicatorNR	M		INTEGER (1..1024)	The frequency band in which the *ssbFrequency* is located and according to which the UE shall perform the RRC measurements.		
>>>SSB frequencies	M		INTEGER (0..maxNARFCN)	Designates the specific SSB frequencies i.e., ARFCN-ValueNR which the target RAT may instruct the UE to measure.	-	-
>>>SubcarrierSpacingSSB	M		ENUMERATED (kHz15, kHz30, kHz60, kHz120, kHz240, ...)	Subcarrier spacing of SSB according to TS 36.331 [16].		
>>>maxRS-IndexCellQual	O		INTEGER (1..maxRS-IndexCellQual)	Indicates the maximum number of RS indices to be considered/ averaged to derive the cell quality for RRM.Also defined in TS 36.331 [16]		
>>>SMTC	O		OCTET STRING	Contains the MTC-SSB-NR-15 as defined in TS 36.331 [16].		
>>>threshRS-Index-r15	O		OCTET STRING	threshRS-Index-r15as defined in TS 36.331 [16], List of thresholds for consolidation of L1 measurements per RS index		
>>>SSB-ToMeasure	O		OCTET STRING	Contains the IE SSB-ToMeasure as defined in TS 36.331 [16].		

>>>SS-RSSI-Measurements	O		OCTET STRING	Contains the IE SS-RSSI-Measurement as defined in TS 36.331 [16].		
>>>quantityConfigNR-R15	O		OCTET STRING	Indicates the quantityConfigNR-R15 as defined in TS 36.331 [16].		
>>>blackCellsToAddModList	O		OCTET STRING	List of cells to add/modify in the black list of cells. It applies only to SSB resources. As defined in TS 36.331 [16].		

Range bound	Explanation
maxnooffrequencies	Maximum no. of frequencies. Value is 64.
maxNARFCN	Maximum value of NR carrier frequency, defined in TS 38.331 [50]. Value is 3279165
maxRS-IndexCellQual	Maximum number of RS indices averaged to derive cell quality for RRM, defined in TS 36.331 [16]. Value is 16

9.2.1.152 Source Node ID

The *Source Node ID* IE identifies the source for the handover.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Source Node ID*	M			
>Source NG-RAN Node ID				
>>Global RAN Node ID	M		9.2.1.131	
>>Selected TAI	M		5GS TAI 9.2.3.52	

9.2.1.153 UE Radio Capability ID

This IE contains UE Radio Capability ID.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
UE Radio Capability ID	M		OCTET STRING	Defined in TS 23.003 [21].

9.2.1.154 UE Radio Capability – NR Format

This IE contains UE Radio Capability information format encoded as specified in TS 38.331 [50] in order to support Mode of operation A as specified in TS 23.401 [11].

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
UE Radio Capability – NR Format	M		OCTET STRING	Includes *UERadioAccessCapabilityInformation* message as defined in TS 38.331 [50].

9.2.1.155 DAPS Request Information

The *DAPS Indicator* IE indicates that the source eNB requests a DAPS Handover for the concerned E-RAB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DAPS Indicator	M		ENUMERATED (DAPS HO required, …)	Indicates that DAPS Handover is requested

9.2.1.156 DAPS Response Information

The *DAPS Response Indicator* IE indicates the response to a requested DAPS Handover for the concerned E-RAB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DAPS Response Indicator	M		ENUMERATED (DAPS HO accepted, DAPS HO not accepted, …)	Indicates that DAPS Handover is accepted or not

9.2.1.157 eNB Early Status Transfer Transparent Container

The *eNB Early 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 DAPS 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 Early Status Transfer List		*1*			-	-
>E-RABs Subject to Early Status Transfer Item		*1 .. <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	-
>>CHOICE *DL COUNT PDCP-SN length*	M				YES	reject
>>>12 bit PDCP-SN						
>>>> DL COUNT Value for PDCP SN Length 12	M		COUNT Value 9.2.1.32	PDCP-SN and Hyper frame number of the first DL SDU that the source eNB forwards to the target eNB in case of 12 bit long PDCP-SN.		
>>>15 bit PDCP-SN						
>>>>DL COUNT Value for PDCP SN Length 15	M		COUNT Value Extended 9.2.1.90	PDCP-SN and Hyper frame number of the first DL SDU that the source eNB forwards to the target eNB in case of 15 bit long PDCP-SN.		
>>>18 bit PDCP-SN						
>>>>DL COUNT Value for PDCP SN Length 18	M		COUNT Value for PDCP SN Length 18 9.2.1.100	PDCP-SN and Hyper frame number of the first DL SDU that the source eNB forwards to the target eNB in case of 18 bit long PDCP-SN.		

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

9.2.1.158 WUS Assistance Information

This IE provides WUS Assistance Information to be used by eNB for determining the WUS group for the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Paging Probability Information	M		ENUMERATED(p00, p05, p10, p15, p20, p25, p30, p35, p40, p45, p50, p55, p60, p65, p70, p75, p80, p85, p90, p95, p100, …)	Unit: percentage

9.2.1.159 NB-IoT Paging DRX

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
NB-IoT Paging DRX	M		ENUMERATED(32,64, 128, 256, 512, 1024, …)	Unit: [number of radioframes]	-	-

9.2.1.160 UE Radio Capability for Paging – NR Format

This IE contains paging specific UE Radio Capability information encoded as specified in TS 38.331 [50] in order to support Mode of operation A as specified in TS 23.401 [11].

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
UE Radio Capability for Paging – NR Format	M		OCTET STRING	Includes the RRC *UERadioPagingInformation* message as defined in TS 38.331 [50].

9.2.2 Transport Network Layer Related IEs

9.2.2.1 Transport Layer Address

This information element is an IP address.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Transport Layer Address	M		BIT STRING (SIZE(1..160, …))	The Radio Network Layer is not supposed to interpret the address information. It should pass it to the transport layer for interpretation. For details on the Transport Layer Address, see TS 36.414 [12].

9.2.2.2 GTP-TEID

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
GTP-TEID	M		OCTET STRING (SIZE(4))	For details and range, see TS 29.281 [32].

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	M		9.2.2.1	HeNB's Transport Layer Address.
UDP Port Numbers	O		OCTET STRING (SIZE(2))	UDP Port Numbers if NAT/NAPT is deployed in the BBF access network.

9.2.2.4 URI

This IE is a URI.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
URI	M		VisibleString	String representing URI (Uniform Resource Identifier)

9.2.3 NAS Related IEs

9.2.3.1 LAI

This information element is used to uniquely identify a Location Area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
LAI				
>PLMN Identity	M		9.2.3.8	
>LAC	M		OCTET STRING (SIZE(2))	0000 and FFFE not allowed.

9.2.3.2 RAC

This information element is used to identify a Routing Area within a Location Area. It is used for PS services.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAC	M		OCTET STRING (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	M		INTEGER ($0 .. 2^{32}-1$)	

9.2.3.4 eNB UE S1AP ID

The eNB UE S1AP ID uniquely identifies the UE association over the S1 interface within the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
eNB UE S1AP ID	M		INTEGER ($0 .. 2^{24}-1$)	

9.2.3.5 NAS-PDU

This information element contains an EPC – UE or UE – EPC message that is transferred without interpretation in the eNB.

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

9.2.3.6 S-TMSI

The Temporary Mobile Subscriber Identity is used for security reasons, to hide the identity of a subscriber.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
MMEC	M		9.2.3.12			
M-TMSI	M		OCTET STRING (SIZE (4))	M-TMSI is unique within MME that allocated it.		

9.2.3.7 TAC

This information element is used to uniquely identify a Tracking Area Code.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
TAC	M		OCTET STRING (SIZE (2))	

9.2.3.8 PLMN Identity

This information element indicates the PLMN Identity.

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

9.2.3.9 GUMMEI

This information element indicates the globally unique MME identity.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
GUMMEI				
>PLMN Identity	M		9.2.3.8	
>MME Group ID	M		OCTET STRING (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	M		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 (3..8))	- digits 0 to 9, encoded 0000 to 1001, - 1111 used as filler digit, two digits per octet, - bit 4 to 1 of octet n encoding digit 2n-1 - bit 8 to 5 of octet n encoding digit 2n -Number of decimal digits shall be from 6 to 15 starting with the digits from the PLMN identity. When the IMSI is made of an odd number of digits, the filler digit shall be added at the end to make an even number of digits of length 2N. The filler digit shall then be consequently encoded as bit 8 to 5 of octet N.

9.2.3.12 MMEC

This information element represents the MME Code to uniquely identify an MME within an MME pool area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MMEC	M		OCTET STRING (SIZE (1))	

9.2.3.13 UE Paging Identity

This IE represents the Identity with which the UE is paged.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *UE Paging Identity*	M			
>*S-TMSI*				
>>S-TMSI	M		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. For inter-system handover to NG-RAN, the availability of a direct forwarding path between the source SN and the target NG-RAN node shall be determined by the target NG-RAN node. The EPC behaviour on receipt of this IE is specified in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Direct Forwarding Path Availability	M		ENUMERATED (Direct Path Available, …)	

9.2.3.16 TAI

This information element is used to uniquely identify a Tracking Area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
TAI				
>PLMN Identity	M		9.2.3.8	
>TAC	M		9.2.3.7	

9.2.3.17 Relative MME Capacity

This IE indicates the relative processing capacity of an MME with respect to the other MMEs in the pool in order to load-balance MMEs within a pool defined in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Relative MME Capacity	M		INTEGER (0..255)	

9.2.3.18 UE S1AP ID pair

This IE contains a pair of UE S1AP identities.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
MME UE S1AP ID	M		9.2.3.3		-	-
eNB UE S1AP ID	M		9.2.3.4		-	-

9.2.3.19 Overload Response

The *Overload Response* IE indicates the required behaviour of the eNB in an overload situation.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Overload Response*	M			
>Overload Action				
>>Overload Action	M		9.2.3.20	

9.2.3.20 Overload Action

The *Overload Action* IE indicates which signalling traffic is subject to rejection by the eNB in an MME overload situation as defined in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Overload Action	M		ENUMERATED (Reject RRC connection establishments for non-emergency MO DT, Reject RRC connection establishments for Signalling, Permit Emergency Sessions and mobile terminated services only, …, Permit High Priority Sessions and mobile terminated services only, Reject delay tolerant access, Permit high priority sessions and exception reporting and mobile terminated services only, not accept mo-data or delay tolerant access from CP CIoT)	

9.2.3.21 CS Fallback Indicator

The IE indicates that a fallback to the CS domain is needed.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CS Fallback Indicator	M		ENUMERATED(CS Fallback required, … , CS Fallback High Priority)	

9.2.3.22 CN Domain

This IE indicates whether Paging is originated from the CS or PS domain.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CN Domain	M		ENUMERATED(PS, CS)	

9.2.3.23 RIM Transfer

This IE contains the RIM Information (e.g. NACC information) and additionally in uplink transfers the RIM routing address of the destination of this RIM information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RIM Transfer				
>RIM Information	M		9.2.3.24	
>RIM Routing Address	O		9.2.3.25	

9.2.3.24 RIM Information

This IE contains the RIM Information (e.g., NACC information) i.e., the BSSGP RIM PDU from the RIM application part contained in the eNB, or the BSSGP RIM PDU to be forwarded to the RIM application part in the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RIM Information				
>RIM Information	M		OCTET STRING	Contains the BSSGP RIM PDU as defined in 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*	M					
>GERAN-Cell-ID					-	
>>LAI	M		9.2.3.1		-	
>>RAC	M		9.2.3.2		-	
>>CI	M		OCTET STRING (SIZE(2))		-	
>Target RNC-ID					-	
>>LAI	M		9.2.3.1		-	
>>RAC	O		9.2.3.2		-	
>>RNC-ID	M		INTEGER (0..4095)	If the *Extended RNC-ID* IE is included in the *Target ID* IE, the *RNC-ID* IE shall be ignored.	-	
>>Extended RNC-ID	O		9.2.1.14	The *Extended RNC-ID* IE shall be used if the RNC identity has a value larger than 4095.	-	
>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	M		TAI 9.2.3.16			
>Source eNB-ID	M					
>>Global eNB ID	M		9.2.1.37			
>>Selected TAI	M		TAI 9.2.3.16			
>SON Information	M		9.2.3.27			
>X2 TNL Configuration Info	C-ifSONInformationRequest		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”

9.2.3.26a EN-DC SON Configuration Transfer

This IE contains the configuration information, used by SON functionality for EN-DC for communication between a destination (target) en-gNB and a source eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
EN-DC SON Configuration Transfer				
>CHOICE *Transfer Type*	M			
>>*Request*				NOTE: Used if the *SON Information* IE indicates a request.
>>>Source eNB-ID		*1*		
>>>>Global eNB ID	M		9.2.1.37	
>>>>Selected TAI	M		TAI 9.2.3.16	
>>>Target en-gNB-ID		*1*		
>>>>Global en-gNB ID	M		9.2.1.37a	
>>>>Selected TAI	M		TAI 9.2.3.16	The MME may ignore this IE if any of the following IEs are present in the *EN-DC SON Configuration Transfer* IE: Target eNB-ID, Associated TAI, Broadcast 5GS TAI. NOTE: The Selected TAI is a 4G TAI and should, if available, correspond to the TAI configured at the en-gNB, however, this TAI is not broadcast by the respective NR cell and may not always be available from UE reporting TAIs of overlapping E-UTRA cells.
>>>Target eNB-ID		*0..1*		
>>>>Global eNB ID	M		9.2.1.37	
>>>>Selected TAI	M		TAI 9.2.3.16	
>>>Associated TAI	O		TAI 9.2.3.16	A 4G TAI associated with the target en-gNB as specified in TS 36.300 [15].
>>>Broadcast 5GS TAI	O		5GS TAI 9.3.2.52	A Broadcast 5GS TAI of the en-gNB as specified in TS 36.300 [15].
>>*Reply*				NOTE: Used if the *SON Information* IE indicates a reply.
>>>Source en-gNB-ID		*1*		
>>>>Global en-gNB ID	M		9.2.1.37a	
>>>>Selected TAI	M		TAI 9.2.3.16	NOTE: The Selected TAI contains a configured TAC of the en-gNB.
>>>Target eNB-ID		*1*		
>>>>Global eNB ID	M		9.2.1.37	
>>>>Selected TAI	M		TAI 9.2.3.16	
>SON Information	M		9.2.3.27	
>X2 TNL Configuration Info	C-ifSONInformationRequest		9.2.3.29	Source eNB X2 TNL Configuration Info.

Condition	Explanation
ifSONInformationRequest	This IE shall be present if the *SON Information* IE contains the *SON Information Request* IE set to “X2 TNL Configuration Info”

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		ENUMERATED(X2 TNL Configuration Info, …, Time synchronisation Info, Activate Muting, Deactivate Muting)	In the current version of the specification only "X2 NTL Configuration Info" is applicable for EN-DC.	-	
>*SON Information Reply*						
>>SON Information Reply	M		9.2.3.28		-	
>*SON Information Report*						
>>SON Information Report	M		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	O		9.2.3.29			
>Time Synchronisation Info	O		9.2.3.34		YES	ignore
>Muting Pattern Information	O		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. It contains TNL addresses of either an eNB or, in the context of EN-DC, of an en-gNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
eNB X2 Transport Layer Addresses		*1 .. <maxnoofeNBX2TLAs>*				
>Transport Layer Address	M		9.2.2.1	Transport Layer Addresses for X2 SCTP end-point.		
eNB X2 Extended Transport Layer Addresses		*0 .. <maxnoofeNBX2ExtTLAs>*			YES	ignore
>IP-Sec Transport Layer Address	O		9.2.2.1	Transport Layer Addresses for IP-Sec end-point.	-	-
>**eNB GTP Transport Layer Addresses**		*0 .. <maxnoofeNBX2GTPTLAs>*			-	-
>>GTP Transport Layer Address	M		9.2.2.1	GTP Transport Layer Addresses for GTP end-points (used for data forwarding over X2 or for transport of X2-U user data for dual connectivity).	-	-
eNB Indirect X2 Transport Layer Addresses		*0 .. <maxnoofeNBX2TLAs>*			YES	ignore
>Transport Layer Address	O		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	M		OCTET STRING	

9.2.3.33 Routing ID

This information element is used to identify an E-SMLC within the EPC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Routing ID	M		INTEGER (0..255)	

9.2.3.34 Time 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	M		INTEGER (0..3, …)			
>Synchronisation status	M		ENUMERATED(Synchronous, Asynchronous, …)			
>Muting Availability Indication	O		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 Indication	M		INTEGER (1..99)	

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 Indicator	M		ENUMERATED(no restriction, 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	M		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 Report*	M			
>RLF Report Information				
>>RLF Report Information	M		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 reference	Semantics description
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	O		OCTET STRING	rlf-Report-v9e0 contained in the UEInformationResponse message (TS 36.331 [16])
NB-IoT RLF Report Container	O		OCTET STRING	rlf-Report-NB-r16 contained in UEInformationResponse-NB message, as defined in 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	M		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	O		INTEGER (0..10239,…)	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	O		INTEGER (0..3, …)	Stratum Level of cell selected as synchronisation source. The range of this IE is limited to 0..2.
Listening Subframe Pattern	O		9.2.3.43	Subframe pattern where the Reference Signals can be detected for synchronisation.
Aggressor Cell List		*0..1*		List of cells for which the muting pattern need to be activated.
>Aggressor E-CGI List		*1..<maxnoofCellsineNB>*		
>>E-CGI	M		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 reference	Semantics description
Pattern Period	M		ENUMERATED (1280, 2560, 5120, 10240, …)	Period in milliseconds for repetition of the subframe where reference signals are available.
Pattern Offset	M		INTEGER (0..10239,…)	Offset in number of subframes of the reference 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 and the NB-IoT paging carrier 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 Value	M		BIT STRING (SIZE(12))	Coded as specified in TS 36.304 [20].

9.2.3.48 DL NAS PDU Delivey Request

This IE indicates the request to acknowledge the successful delivery of a downlink NAS PDU as specified in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL NAS PDU Delivery Request	M		ENUMERATED (requested, …)	

9.2.3.49 DL CP Security Information

The *DL CP Security Information* IE contains NAS level security information to be forwarded to the UE as described in TS 33.401 [15].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL NAS MAC	M		BIT STRING (SIZE(16))	Defined in TS 33.401 [15].

9.2.3.50 UL CP Security Information

The *UL CP Security Information* IE contains NAS level security information to enable UE authentication by the MME as described in TS 33.401 [15].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UL NAS MAC	M		BIT STRING (SIZE(16))	Defined in TS 33.401 [15].
UL NAS Count	M		BIT STRING (SIZE(5))	Defined in TS 33.401 [15].

9.2.3.51 UE Capability Info Request

This IE indicates the request to provide to the MME the UE capability related information when retrieved from the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Capability Info Request	M		ENUMERATED (requested, …)	

9.2.3.52 5GS TAI

This information element is used to uniquely identify a 5GS Tracking Area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
TAI				
>PLMN Identity	M		9.2.3.8	
>5GS TAC	M		9.2.3.53	

9.2.3.53 5GS TAC

This information element is used to uniquely identify a 5GS Tracking Area Code.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
5GS TAC	M		OCTET STRING (SIZE (3))	

9.2.3.54 End Indication

The *End Indication* IE indicates that there are no further NAS PDUs to be transmitted for this UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
End Indication	M		ENUMERATED (no further data, further data exists, …)	

9.2.3.55 Pending Data Indication

This IE indicates that the MME is aware of pending signalling or data in the network for the UE, or that the MME expects a response from the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Pending Data Indication	M		ENUMERATED (true, …)	

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

9.3.0 General

S1AP ASN.1 definition conforms to ITU-T Rec. X.691 [4], ITU-T Rec. X.680 [5] and ITU-T Rec. X.681 [6].

The ASN.1 definition specifies the structure and content of S1AP messages. S1AP messages can contain any IEs specified in the object set definitions for that message without the order or number of occurrence being restricted by ASN.1. However, for this version of the standard, a sending entity shall construct a S1AP message according to the PDU definitions module and with the following additional rules:

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

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

NOTE: In the above “IE” means an IE in the object set with an explicit ID. If one IE needs to appear more than once in one object set, then the different occurrences will have different IE IDs.

If a S1AP message that is not constructed as defined above is received, this shall be considered as Abstract Syntax Error, and the message shall be handled as defined for Abstract Syntax Error in subclause 10.3.6.

Subclause 9.3 presents the Abstract Syntax of S1AP protocol with ASN.1. In case there is contradiction between the ASN.1 definition in this subclause and the tabular format in subclause 9.1 and 9.2, the ASN.1 shall take precedence, except for the definition of conditions for the presence of conditional elements, where the tabular format shall take precedence.

9.3.1 Usage of private message mechanism for non-standard use

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

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

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

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

9.3.2 Elementary Procedure Definitions

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

S1AP-PDU-Descriptions  {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) s1ap (1) version1 (1) s1ap-PDU-Descriptions (0)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    ProcedureCode
FROM S1AP-CommonDataTypes

    CellTrafficTrace,
    DeactivateTrace,
    DownlinkUEAssociatedLPPaTransport,
    DownlinkNASTransport,
    DownlinkNonUEAssociatedLPPaTransport,
    DownlinkS1cdma2000tunnelling,
    ENBDirectInformationTransfer,
    ENBStatusTransfer,
    ENBConfigurationUpdate,
    ENBConfigurationUpdateAcknowledge,
    ENBConfigurationUpdateFailure,
    ErrorIndication,
    HandoverCancel,
    HandoverCancelAcknowledge,
    HandoverCommand,
    HandoverFailure,
    HandoverNotify,
    HandoverPreparationFailure,
    HandoverRequest,
    HandoverRequestAcknowledge,
    HandoverRequired,
    InitialContextSetupFailure,
    InitialContextSetupRequest,
    InitialContextSetupResponse,
    InitialUEMessage,
    KillRequest,
```

```
    KillResponse,
    LocationReportingControl,
    LocationReportingFailureIndication,
    LocationReport,
    MMEConfigurationUpdate,
    MMEConfigurationUpdateAcknowledge,
    MMEConfigurationUpdateFailure,
    MMEDirectInformationTransfer,
    MMEStatusTransfer,
    NASNonDeliveryIndication,
    OverloadStart,
    OverloadStop,
    Paging,
    PathSwitchRequest,
    PathSwitchRequestAcknowledge,
    PathSwitchRequestFailure,
    PrivateMessage,
    Reset,
    ResetAcknowledge,
    S1SetupFailure,
    S1SetupRequest,
    S1SetupResponse,
    E-RABModifyRequest,
    E-RABModifyResponse,
    E-RABModificationIndication,
    E-RABModificationConfirm,
    E-RABReleaseCommand,
    E-RABReleaseResponse,
    E-RABReleaseIndication,
    E-RABSetupRequest,
    E-RABSetupResponse,
    TraceFailureIndication,
    TraceStart,
    UECapabilityInfoIndication,
    UEContextModificationFailure,
    UEContextModificationRequest,
    UEContextModificationResponse,
    UEContextReleaseCommand,
    UEContextReleaseComplete,
    UEContextReleaseRequest,
    UERadioCapabilityMatchRequest,
    UERadioCapabilityMatchResponse,
    UplinkUEAssociatedLPPaTransport,
    UplinkNASTransport,
    UplinkNonUEAssociatedLPPaTransport,
    UplinkS1cdma2000tunnelling,
    WriteReplaceWarningRequest,
    WriteReplaceWarningResponse,
    ENBConfigurationTransfer,
    MMEConfigurationTransfer,
    PWSRestartIndication,
    UEContextModificationIndication,
    UEContextModificationConfirm,
    RerouteNASRequest,
```

```
    PWSFailureIndication,
    UEContextSuspendRequest,
    UEContextSuspendResponse,
    UEContextResumeRequest,
    UEContextResumeResponse,
    UEContextResumeFailure,
    ConnectionEstablishmentIndication,
    NASDeliveryIndication,
    RetrieveUEInformation,
    UEInformationTransfer,
    ENBCPRelocationIndication,
    MMECPRelocationIndication,
    SecondaryRATDataUsageReport,
    UERadioCapabilityIDMappingRequest,
    UERadioCapabilityIDMappingResponse,
    HandoverSuccess,
    ENBEarlyStatusTransfer,
    MMEEarlyStatusTransfer


FROM S1AP-PDU-Contents

    id-CellTrafficTrace,
    id-DeactivateTrace,
    id-downlinkUEAssociatedLPPaTransport,
    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-LocationReportingControl,
    id-LocationReportingFailureIndication,
    id-LocationReport,
    id-eNBDirectInformationTransfer,
    id-MMEConfigurationUpdate,
    id-MMEDirectInformationTransfer,
    id-MMEStatusTransfer,
    id-NASNonDeliveryIndication,
    id-OverloadStart,
    id-OverloadStop,
    id-Paging,
    id-PathSwitchRequest,
    id-PrivateMessage,
    id-Reset,
    id-S1Setup,
    id-E-RABModify,
```

```
    id-E-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-uplinkUEAssociatedLPPaTransport,
    id-uplinkNASTransport,
    id-uplinkNonUEAssociatedLPPaTransport,
    id-UplinkS1cdma2000tunnelling,
    id-WriteReplaceWarning,
    id-eNBConfigurationTransfer,
    id-MMEConfigurationTransfer,
    id-PWSRestartIndication,
    id-UEContextModificationIndication,
    id-RerouteNASRequest,
    id-PWSFailureIndication,
    id-UEContextSuspend,
    id-UEContextResume,
    id-ConnectionEstablishmentIndication,
    id-NASDeliveryIndication,
    id-RetrieveUEInformation,
    id-UEInformationTransfer,
    id-eNBCPRelocationIndication,
    id-MMECPRelocationIndication,
    id-SecondaryRATDataUsageReport,
    id-UERadioCapabilityIDMapping,
    id-HandoverSuccess,
    id-eNBEarlyStatusTransfer,
    id-MMEEarlyStatusTransfer


FROM S1AP-Constants;


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

S1AP-ELEMENTARY-PROCEDURE ::= CLASS {
    &InitiatingMessage              ,
    &SuccessfulOutcome                          OPTIONAL,
    &UnsuccessfulOutcome                        OPTIONAL,
    &procedureCode              ProcedureCode   UNIQUE,
    &criticality                Criticality     DEFAULT ignore
}
WITH SYNTAX {
```

```
    INITIATING MESSAGE          &InitiatingMessage
    [SUCCESSFUL OUTCOME         &SuccessfulOutcome]
    [UNSUCCESSFUL OUTCOME       &UnsuccessfulOutcome]
    PROCEDURE CODE              &procedureCode
    [CRITICALITY                &criticality]
}

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

S1AP-PDU ::= CHOICE {
    initiatingMessage   InitiatingMessage,
    successfulOutcome   SuccessfulOutcome,
    unsuccessfulOutcome UnsuccessfulOutcome,
    ...
}

InitiatingMessage ::= SEQUENCE {
    procedureCode   S1AP-ELEMENTARY-PROCEDURE.&procedureCode        ({S1AP-ELEMENTARY-PROCEDURES}),
    criticality     S1AP-ELEMENTARY-PROCEDURE.&criticality          ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    value           S1AP-ELEMENTARY-PROCEDURE.&InitiatingMessage    ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

SuccessfulOutcome ::= SEQUENCE {
    procedureCode   S1AP-ELEMENTARY-PROCEDURE.&procedureCode        ({S1AP-ELEMENTARY-PROCEDURES}),
    criticality     S1AP-ELEMENTARY-PROCEDURE.&criticality          ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    value           S1AP-ELEMENTARY-PROCEDURE.&SuccessfulOutcome    ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

UnsuccessfulOutcome ::= SEQUENCE {
    procedureCode   S1AP-ELEMENTARY-PROCEDURE.&procedureCode        ({S1AP-ELEMENTARY-PROCEDURES}),
    criticality     S1AP-ELEMENTARY-PROCEDURE.&criticality          ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    value           S1AP-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome  ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

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

S1AP-ELEMENTARY-PROCEDURES S1AP-ELEMENTARY-PROCEDURE ::= {
    S1AP-ELEMENTARY-PROCEDURES-CLASS-1          |
    S1AP-ELEMENTARY-PROCEDURES-CLASS-2,
    ...
}


S1AP-ELEMENTARY-PROCEDURES-CLASS-1 S1AP-ELEMENTARY-PROCEDURE ::= {
    handoverPreparation                         |
    handoverResourceAllocation                  |
```

```
    pathSwitchRequest                       |
    e-RABSetup                              |
    e-RABModify                             |
    e-RABRelease                            |
    initialContextSetup                     |
    handoverCancel                          |
    kill                                    |
    reset                                   |
    s1Setup                                 |
    uEContextModification                   |
    uEContextRelease                        |
    eNBConfigurationUpdate                  |
    mMEConfigurationUpdate                  |
    writeReplaceWarning                    ,
    ...,
    uERadioCapabilityMatch                  |
    e-RABModificationIndication             |
    uEContextModificationIndication         |
    uEContextSuspend                        |
    uEContextResume                         |
    uERadioCapabilityIDMapping
}

S1AP-ELEMENTARY-PROCEDURES-CLASS-2 S1AP-ELEMENTARY-PROCEDURE ::= {
    handoverNotification                    |
    e-RABReleaseIndication                  |
    paging                                  |
    downlinkNASTransport                    |
    initialUEMessage                        |
    uplinkNASTransport                      |
    errorIndication                         |
    nASNonDeliveryIndication                |
    uEContextReleaseRequest                 |
    downlinkS1cdma2000tunnelling            |
    uplinkS1cdma2000tunnelling              |
    uECapabilityInfoIndication              |
    eNBStatusTransfer                       |
    mMEStatusTransfer                       |
    deactivateTrace                         |
    traceStart                              |
    traceFailureIndication                  |
    cellTrafficTrace                        |
    locationReportingControl                |
    locationReportingFailureIndication      |
    locationReport                          |
    overloadStart                           |
    overloadStop                            |
    eNBDirectInformationTransfer            |
    mMEDirectInformationTransfer            |
    eNBConfigurationTransfer                |
    mMEConfigurationTransfer                |
    privateMessage                         ,
    ...,
    downlinkUEAssociatedLPPaTransport       |
```

```
    uplinkUEAssociatedLPPaTransport             |
    downlinkNonUEAssociatedLPPaTransport        |
    uplinkNonUEAssociatedLPPaTransport          |
    pWSRestartIndication                        |
    rerouteNASRequest                           |
    pWSFailureIndication                        |
    connectionEstablishmentIndication           |
    nASDeliveryIndication                       |
    retrieveUEInformation                       |
    uEInformationTransfer                       |
    eNBCPRelocationIndication                   |
    mMECPRelocationIndication                   |
    secondaryRATDataUsageReport                 |
    handoverSuccess                             |
    eNBEarlyStatusTransfer                      |
    mMEEarlyStatusTransfer
}

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

handoverPreparation S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      HandoverRequired
    SUCCESSFUL OUTCOME      HandoverCommand
    UNSUCCESSFUL OUTCOME    HandoverPreparationFailure
    PROCEDURE CODE          id-HandoverPreparation
    CRITICALITY             reject
}

handoverResourceAllocation S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      HandoverRequest
    SUCCESSFUL OUTCOME      HandoverRequestAcknowledge
    UNSUCCESSFUL OUTCOME    HandoverFailure
    PROCEDURE CODE          id-HandoverResourceAllocation
    CRITICALITY             reject
}

handoverNotification S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      HandoverNotify
    PROCEDURE CODE          id-HandoverNotification
    CRITICALITY             ignore
}

pathSwitchRequest S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PathSwitchRequest
    SUCCESSFUL OUTCOME      PathSwitchRequestAcknowledge
    UNSUCCESSFUL OUTCOME    PathSwitchRequestFailure
    PROCEDURE CODE          id-PathSwitchRequest
    CRITICALITY             reject
}
```

```
e-RABSetup S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      E-RABSetupRequest
    SUCCESSFUL OUTCOME      E-RABSetupResponse
    PROCEDURE CODE          id-E-RABSetup
    CRITICALITY             reject
}

e-RABModify S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      E-RABModifyRequest
    SUCCESSFUL OUTCOME      E-RABModifyResponse
    PROCEDURE CODE          id-E-RABModify
    CRITICALITY             reject
}

e-RABRelease S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      E-RABReleaseCommand
    SUCCESSFUL OUTCOME      E-RABReleaseResponse
    PROCEDURE CODE          id-E-RABRelease
    CRITICALITY             reject
}

e-RABReleaseIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      E-RABReleaseIndication
    PROCEDURE CODE          id-E-RABReleaseIndication
    CRITICALITY             ignore
}

initialContextSetup S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      InitialContextSetupRequest
    SUCCESSFUL OUTCOME      InitialContextSetupResponse
    UNSUCCESSFUL OUTCOME    InitialContextSetupFailure
    PROCEDURE CODE          id-InitialContextSetup
    CRITICALITY             reject
}

uEContextReleaseRequest S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UEContextReleaseRequest
    PROCEDURE CODE          id-UEContextReleaseRequest
    CRITICALITY             ignore
}

paging S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      Paging
    PROCEDURE CODE          id-Paging
    CRITICALITY             ignore
}

downlinkNASTransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DownlinkNASTransport
    PROCEDURE CODE          id-downlinkNASTransport
    CRITICALITY             ignore
}

initialUEMessage S1AP-ELEMENTARY-PROCEDURE ::= {
```

```
    INITIATING MESSAGE      InitialUEMessage
    PROCEDURE CODE          id-initialUEMessage
    CRITICALITY             ignore
}

uplinkNASTransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkNASTransport
    PROCEDURE CODE          id-uplinkNASTransport
    CRITICALITY             ignore
}
nASNonDeliveryIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      NASNonDeliveryIndication
    PROCEDURE CODE          id-NASNonDeliveryIndication
    CRITICALITY             ignore
}

handoverCancel S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      HandoverCancel
    SUCCESSFUL OUTCOME      HandoverCancelAcknowledge
    PROCEDURE CODE          id-HandoverCancel
    CRITICALITY             reject
}

reset S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      Reset
    SUCCESSFUL OUTCOME      ResetAcknowledge
    PROCEDURE CODE          id-Reset
    CRITICALITY             reject
}

errorIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ErrorIndication
    PROCEDURE CODE          id-ErrorIndication
    CRITICALITY             ignore
}

s1Setup S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      S1SetupRequest
    SUCCESSFUL OUTCOME      S1SetupResponse
    UNSUCCESSFUL OUTCOME    S1SetupFailure
    PROCEDURE CODE          id-S1Setup
    CRITICALITY             reject
}

eNBConfigurationUpdate S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENBConfigurationUpdate
    SUCCESSFUL OUTCOME      ENBConfigurationUpdateAcknowledge
    UNSUCCESSFUL OUTCOME    ENBConfigurationUpdateFailure
    PROCEDURE CODE          id-ENBConfigurationUpdate
    CRITICALITY             reject
}

mMEConfigurationUpdate S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MMEConfigurationUpdate
```

```
    SUCCESSFUL OUTCOME      MMEConfigurationUpdateAcknowledge
    UNSUCCESSFUL OUTCOME    MMEConfigurationUpdateFailure
    PROCEDURE CODE          id-MMEConfigurationUpdate
    CRITICALITY             reject
}

downlinkS1cdma2000tunnelling S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DownlinkS1cdma2000tunnelling
    PROCEDURE CODE          id-DownlinkS1cdma2000tunnelling
    CRITICALITY             ignore
}

uplinkS1cdma2000tunnelling S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkS1cdma2000tunnelling
    PROCEDURE CODE          id-UplinkS1cdma2000tunnelling
    CRITICALITY             ignore
}

uEContextModification S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UEContextModificationRequest
    SUCCESSFUL OUTCOME      UEContextModificationResponse
    UNSUCCESSFUL OUTCOME    UEContextModificationFailure
    PROCEDURE CODE          id-UEContextModification
    CRITICALITY             reject
}

uECapabilityInfoIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UECapabilityInfoIndication
    PROCEDURE CODE          id-UECapabilityInfoIndication
    CRITICALITY             ignore
}

uEContextRelease S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UEContextReleaseCommand
    SUCCESSFUL OUTCOME      UEContextReleaseComplete
    PROCEDURE CODE          id-UEContextRelease
    CRITICALITY             reject
}

eNBStatusTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENBStatusTransfer
    PROCEDURE CODE          id-eNBStatusTransfer
    CRITICALITY             ignore
}

mMEStatusTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MMEStatusTransfer
    PROCEDURE CODE          id-MMEStatusTransfer
    CRITICALITY             ignore
}

deactivateTrace S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DeactivateTrace
    PROCEDURE CODE          id-DeactivateTrace
```

```
    CRITICALITY             ignore
}

traceStart S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      TraceStart
    PROCEDURE CODE          id-TraceStart
    CRITICALITY             ignore
}

traceFailureIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      TraceFailureIndication
    PROCEDURE CODE          id-TraceFailureIndication
    CRITICALITY             ignore
}
cellTrafficTrace S1AP-ELEMENTARY-PROCEDURE ::={
    INITIATING MESSAGE      CellTrafficTrace
    PROCEDURE CODE          id-CellTrafficTrace
    CRITICALITY             ignore
}

locationReportingControl S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      LocationReportingControl
    PROCEDURE CODE          id-LocationReportingControl
    CRITICALITY             ignore
}

locationReportingFailureIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      LocationReportingFailureIndication
    PROCEDURE CODE          id-LocationReportingFailureIndication
    CRITICALITY             ignore
}

locationReport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      LocationReport
    PROCEDURE CODE          id-LocationReport
    CRITICALITY             ignore
}

overloadStart S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      OverloadStart
    PROCEDURE CODE          id-OverloadStart
    CRITICALITY             ignore
}

overloadStop S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      OverloadStop
    PROCEDURE CODE          id-OverloadStop
    CRITICALITY             reject
}

writeReplaceWarning S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      WriteReplaceWarningRequest
    SUCCESSFUL OUTCOME      WriteReplaceWarningResponse
    PROCEDURE CODE          id-WriteReplaceWarning
```

```
    CRITICALITY             reject
}

eNBDirectInformationTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENBDirectInformationTransfer
    PROCEDURE CODE          id-eNBDirectInformationTransfer
    CRITICALITY             ignore
}

mMEDirectInformationTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MMEDirectInformationTransfer
    PROCEDURE CODE          id-MMEDirectInformationTransfer
    CRITICALITY             ignore
}

eNBConfigurationTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENBConfigurationTransfer
    PROCEDURE CODE          id-eNBConfigurationTransfer
    CRITICALITY             ignore
}

mMEConfigurationTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MMEConfigurationTransfer
    PROCEDURE CODE          id-MMEConfigurationTransfer
    CRITICALITY             ignore
}


privateMessage S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PrivateMessage
    PROCEDURE CODE          id-PrivateMessage
    CRITICALITY             ignore
}

pWSRestartIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PWSRestartIndication
    PROCEDURE CODE          id-PWSRestartIndication
    CRITICALITY             ignore
}

kill S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      KillRequest
    SUCCESSFUL OUTCOME      KillResponse
    PROCEDURE CODE          id-Kill
    CRITICALITY             reject
}

downlinkUEAssociatedLPPaTransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DownlinkUEAssociatedLPPaTransport
    PROCEDURE CODE          id-downlinkUEAssociatedLPPaTransport
    CRITICALITY             ignore
}

uplinkUEAssociatedLPPaTransport S1AP-ELEMENTARY-PROCEDURE ::= {
```

```
    INITIATING MESSAGE      UplinkUEAssociatedLPPaTransport
    PROCEDURE CODE          id-uplinkUEAssociatedLPPaTransport
    CRITICALITY             ignore
}
downlinkNonUEAssociatedLPPaTransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DownlinkNonUEAssociatedLPPaTransport
    PROCEDURE CODE          id-downlinkNonUEAssociatedLPPaTransport
    CRITICALITY             ignore
}

uplinkNonUEAssociatedLPPaTransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkNonUEAssociatedLPPaTransport
    PROCEDURE CODE          id-uplinkNonUEAssociatedLPPaTransport
    CRITICALITY             ignore
}

uERadioCapabilityMatch S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UERadioCapabilityMatchRequest
    SUCCESSFUL OUTCOME      UERadioCapabilityMatchResponse
    PROCEDURE CODE          id-UERadioCapabilityMatch
    CRITICALITY             reject
}

e-RABModificationIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      E-RABModificationIndication
    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      UEContextSuspendResponse
    PROCEDURE CODE          id-UEContextSuspend
    CRITICALITY             reject
```

```
}

uEContextResume S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UEContextResumeRequest
    SUCCESSFUL OUTCOME      UEContextResumeResponse
    UNSUCCESSFUL OUTCOME    UEContextResumeFailure
    PROCEDURE CODE          id-UEContextResume
    CRITICALITY             reject
}

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

nASDeliveryIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      NASDeliveryIndication
    PROCEDURE CODE          id-NASDeliveryIndication
    CRITICALITY             ignore
}

retrieveUEInformation S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      RetrieveUEInformation
    PROCEDURE CODE          id-RetrieveUEInformation
    CRITICALITY             reject
}

uEInformationTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UEInformationTransfer
    PROCEDURE CODE          id-UEInformationTransfer
    CRITICALITY             reject
}

eNBCPRelocationIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENBCPRelocationIndication
    PROCEDURE CODE          id-eNBCPRelocationIndication
    CRITICALITY             reject
}

mMECPRelocationIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MMECPRelocationIndication
    PROCEDURE CODE          id-MMECPRelocationIndication
    CRITICALITY             reject
}

secondaryRATDataUsageReport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      SecondaryRATDataUsageReport
    PROCEDURE CODE          id-SecondaryRATDataUsageReport
    CRITICALITY         ignore
}

uERadioCapabilityIDMapping S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UERadioCapabilityIDMappingRequest
```

```
    SUCCESSFUL OUTCOME      UERadioCapabilityIDMappingResponse
    PROCEDURE CODE          id-UERadioCapabilityIDMapping
    CRITICALITY             reject
}

handoverSuccess S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      HandoverSuccess
    PROCEDURE CODE          id-HandoverSuccess
    CRITICALITY             ignore
}

eNBEarlyStatusTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENBEarlyStatusTransfer
    PROCEDURE CODE          id-eNBEarlyStatusTransfer
    CRITICALITY             reject
}

mMEEarlyStatusTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MMEEarlyStatusTransfer
    PROCEDURE CODE          id-MMEEarlyStatusTransfer
    CRITICALITY             ignore
}

END
```

9.3.3 PDU Definitions

```
-- **************************************************************
--
-- PDU definitions for S1AP.
--
-- **************************************************************

S1AP-PDU-Contents {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) s1ap (1) version1 (1) s1ap-PDU-Contents (1) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS

    UEAggregateMaximumBitrate,
    BearerType,
    Cause,
    CellAccessMode,
    Cdma2000HORequiredIndication,
    Cdma2000HOStatus,
    Cdma2000OneXSRVCCInfo,
    Cdma2000OneXRAND,
    Cdma2000PDU,
    Cdma2000RATType,
    Cdma2000SectorID,
    EUTRANRoundTripDelayEstimationInfo,
    CNDomain,
    ConcurrentWarningMessageIndicator,
    CriticalityDiagnostics,
    CSFallbackIndicator,
    CSG-Id,
    CSG-IdList,
    CSGMembershipStatus,
    Data-Forwarding-Not-Possible,
    Direct-Forwarding-Path-Availability,
    Global-ENB-ID,
    EUTRAN-CGI,
    ENBname,
    ENB-StatusTransfer-TransparentContainer,
    ENB-UE-S1AP-ID,
    ExtendedRepetitionPeriod,
    GTP-TEID,
    GUMMEI,
```

```
    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,
    ProSeAuthorized,
    RIMTransfer,
    RelativeMMECapacity,
    RequestType,
    E-RAB-ID,
    E-RABLevelQoSParameters,
    E-RABList,
    RelayNode-Indicator,
    Routing-ID,
    SecurityKey,
    SecurityContext,
    ServedGUMMEIs,
    SONConfigurationTransfer,
    Source-ToTarget-TransparentContainer,
    SourceBSS-ToTargetBSS-TransparentContainer,
    SourceeNB-ToTargeteNB-TransparentContainer,
    SourceRNC-ToTargetRNC-TransparentContainer,
    SubscriberProfileIDforRFP,
    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,
    WarningAreaList,
    RepetitionPeriod,
    NumberofBroadcastRequest,
    WarningType,
    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,
    EmergencyAreaIDListForRestart,
    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,
    V2XServicesAuthorized,
    DCN-ID,
    ServedDCNs,
    UESidelinkAggregateMaximumBitrate,
```

```
    DLNASPDUDeliveryAckRequest,
    Coverage-Level,
    EnhancedCoverageRestricted,
    DL-CP-SecurityInformation,
    UL-CP-SecurityInformation,
    SecondaryRATDataUsageRequest,
    SecondaryRATDataUsageReportList,
    HandoverFlag,
    NRUESecurityCapabilities,
    UE-Application-Layer-Measurement-Capability,
    CE-ModeBRestricted,
    Packet-LossRate,
    UECapabilityInfoRequest,
    SourceNgRanNode-ToTargetNgRanNode-TransparentContainer,
    TargetNgRanNode-ToSourceNgRanNode-TransparentContainer,
    EndIndication,
    EDT-Session,
    LTE-M-Indication,
    AerialUEsubscriptionInformation,
    PendingDataIndication,
    WarningAreaCoordinates,
    Subscription-Based-UE-DifferentiationInfo,
    PSCellInformation,
    NR-CGI,
    ConnectedengNBList,
    EN-DCSONConfigurationTransfer,
    TimeSinceSecondaryNodeRelease,
    AdditionalRRMPriorityIndex,
    IAB-Authorized,
    IAB-Node-Indication,
    IAB-Supported,
    DataSize,
    Ethernet-Type,
    NRV2XServicesAuthorized,
    NRUESidelinkAggregateMaximumBitrate,
    PC5QoSParameters,
    IntersystemSONConfigurationTransfer,
    UERadioCapabilityID,
    NotifySourceeNB,
    ENB-EarlyStatusTransfer-TransparentContainer,
    WUS-Assistance-Information,
    NB-IoT-PagingDRX



FROM S1AP-IEs

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

```
    ProtocolIE-SingleContainer{},
    S1AP-PRIVATE-IES,
    S1AP-PROTOCOL-EXTENSION,
    S1AP-PROTOCOL-IES,
    S1AP-PROTOCOL-IES-PAIR
FROM S1AP-Containers


    id-AssistanceDataForPaging,
    id-AerialUEsubscriptionInformation,
    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-RequestType,
    id-Routing-ID,
    id-E-RABAdmittedItem,
    id-E-RABAdmittedList,
    id-E-RABDataForwardingItem,
    id-E-RABFailedToModifyList,
    id-E-RABFailedToReleaseList,
    id-E-RABFailedtoSetupItemHOReqAck,
    id-E-RABFailedToSetupListBearerSURes,
    id-E-RABFailedToSetupListCtxtSURes,
    id-E-RABFailedToSetupListHOReqAck,
    id-E-RABFailedToBeReleasedList,
    id-E-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-ToSource-TransparentContainer-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-V2XServicesAuthorized,
    id-ResetType,
    id-MessageIdentifier,
    id-SerialNumber,
    id-WarningAreaList,
    id-RepetitionPeriod,
    id-NumberofBroadcastRequest,
    id-WarningType,
    id-WarningSecurityInfo,
    id-DataCodingScheme,
    id-WarningMessageContents,
```

```
    id-BroadcastCompletedAreaList,
    id-BroadcastCancelledAreaList,
    id-RRC-Establishment-Cause,
    id-TraceCollectionEntityIPAddress,
    id-AdditionalRRMPriorityIndex,
    id-MDTConfigurationNR,
    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-MMERelaySupportIndicator,
    id-GWContextReleaseIndication,
    id-PrivacyIndicator,
    id-VoiceSupportMatchIndicator,
    id-Tunnel-Information-for-BBF,
    id-SIPTO-Correlation-ID,
    id-SIPTO-L-GW-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-NB-IoT-UEIdentityIndexValue,
```

```
    id-RRC-Resume-Cause,
    id-DCN-ID,
    id-ServedDCNs,
    id-UESidelinkAggregateMaximumBitrate,
    id-DLNASPDUDeliveryAckRequest,
    id-Coverage-Level,
    id-EnhancedCoverageRestricted,
    id-UE-Level-QoS-Parameters,
    id-DL-CP-SecurityInformation,
    id-UL-CP-SecurityInformation,
    id-SecondaryRATDataUsageRequest,
    id-SecondaryRATDataUsageReportList,
    id-HandoverFlag,
    id-NRUESecurityCapabilities,
    id-UE-Application-Layer-Measurement-Capability,
    id-CE-ModeBRestricted,
    id-DownlinkPacketLossRate,
    id-UplinkPacketLossRate,
    id-UECapabilityInfoRequest,
    id-EndIndication,
    id-EDT-Session,
    id-LTE-M-Indication,
    id-PendingDataIndication,
    id-WarningAreaCoordinates,
    id-Subscription-Based-UE-DifferentiationInfo,
    id-PSCellInformation,
    id-ConnectedengNBList,
    id-ConnectedengNBToAddList,
    id-ConnectedengNBToRemoveList,
    id-EN-DCSONConfigurationTransfer-ECT,
    id-EN-DCSONConfigurationTransfer-MCT,
    id-TimeSinceSecondaryNodeRelease,
    id-IAB-Authorized,
    id-IAB-Node-Indication,
    id-IAB-Supported,
    id-DataSize,
    id-Ethernet-Type,
    id-NRV2XServicesAuthorized,
    id-NRUESidelinkAggregateMaximumBitrate,
    id-PC5QoSParameters,
    id-IntersystemSONConfigurationTransferMCT,
    id-IntersystemSONConfigurationTransferECT,
    id-UERadioCapabilityID,
    id-UERadioCapability-NR-Format,
    id-NotifySourceeNB,
    id-eNB-EarlyStatusTransfer-TransparentContainer,
    id-WUS-Assistance-Information,
    id-NB-IoT-PagingDRX,
    id-UERadioCapabilityForPaging-NR-Format


FROM S1AP-Constants;
```

```
-- ************************************************************
--
-- Common Container Lists
--
-- ************************************************************

E-RAB-IE-ContainerList          { S1AP-PROTOCOL-IES      : IEsSetParam }    ::= 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      : IEsSetParam }    ::= ProtocolIE-ContainerList     { 1, maxnoofE-RABs,   {IEsSetParam} }

-- ************************************************************
--
-- HANDOVER PREPARATION ELEMENTARY PROCEDURE
--
-- ************************************************************

-- ************************************************************
--
-- Handover Required
--
-- ************************************************************

HandoverRequired ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { { HandoverRequiredIEs} },
    ...
}

HandoverRequiredIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                          CRITICALITY reject  TYPE MME-UE-S1AP-ID              PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID                          CRITICALITY reject  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory}|
    { ID id-HandoverType                            CRITICALITY reject  TYPE HandoverType                PRESENCE mandatory}|
    { ID id-Cause                                   CRITICALITY ignore  TYPE Cause                       PRESENCE mandatory}|
    { ID id-TargetID                                CRITICALITY reject  TYPE TargetID                    PRESENCE mandatory}|
    { ID id-Direct-Forwarding-Path-Availability     CRITICALITY ignore  TYPE Direct-Forwarding-Path-Availability   PRESENCE optional}|
    { ID id-SRVCCHOIndication                       CRITICALITY reject  TYPE SRVCCHOIndication           PRESENCE optional}|
    { ID id-Source-ToTarget-TransparentContainer    CRITICALITY reject  TYPE Source-ToTarget-TransparentContainer  PRESENCE mandatory}|
    { ID id-Source-ToTarget-TransparentContainer-Secondary  CRITICALITY reject  TYPE Source-ToTarget-TransparentContainer PRESENCE optional}|
    { ID id-MSClassmark2                            CRITICALITY reject  TYPE MSClassmark2                PRESENCE conditional}|
    { ID id-MSClassmark3                            CRITICALITY ignore  TYPE MSClassmark3                PRESENCE conditional}|
    { ID id-CSG-Id                                  CRITICALITY reject  TYPE CSG-Id                      PRESENCE optional}|
    { ID id-CellAccessMode                          CRITICALITY reject  TYPE CellAccessMode              PRESENCE optional}|
    { ID id-PS-ServiceNotAvailable                  CRITICALITY ignore  TYPE PS-ServiceNotAvailable      PRESENCE optional},
    ...
}


-- ************************************************************
--
-- Handover Command
--
-- ************************************************************

HandoverCommand ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { { HandoverCommandIEs} },
```

```
    ...
}

HandoverCommandIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                          CRITICALITY reject  TYPE MME-UE-S1AP-ID                  PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID                          CRITICALITY reject  TYPE ENB-UE-S1AP-ID                  PRESENCE mandatory}|
    { ID id-HandoverType                            CRITICALITY reject  TYPE HandoverType                    PRESENCE mandatory}|
    { ID id-NASSecurityParametersfromE-UTRAN        CRITICALITY reject  TYPE NASSecurityParametersfromE-UTRAN      PRESENCE conditional
    -- This IE shall be present if HandoverType IE is set to value "LTEtoUTRAN" or "LTEtoGERAN" --}|
    { ID id-E-RABSubjecttoDataForwardingList        CRITICALITY ignore  TYPE E-RABSubjecttoDataForwardingList      PRESENCE optional}|
    { ID id-E-RABtoReleaseListHOCmd                 CRITICALITY ignore  TYPE E-RABList                       PRESENCE optional}|
    { ID id-Target-ToSource-TransparentContainer    CRITICALITY reject  TYPE Target-ToSource-TransparentContainer     PRESENCE mandatory}|
    { ID id-Target-ToSource-TransparentContainer-Secondary  CRITICALITY reject  TYPE Target-ToSource-TransparentContainer PRESENCE optional}|
    { ID id-CriticalityDiagnostics                  CRITICALITY ignore  TYPE CriticalityDiagnostics          PRESENCE optional},
    ...
}

E-RABSubjecttoDataForwardingList ::= E-RAB-IE-ContainerList { {E-RABDataForwardingItemIEs} }

E-RABDataForwardingItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABDataForwardingItem                 CRITICALITY ignore  TYPE E-RABDataForwardingItem      PRESENCE mandatory   },
    ...
}

E-RABDataForwardingItem ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    dL-transportLayerAddress        TransportLayerAddress                                               OPTIONAL,
    dL-gTP-TEID                     GTP-TEID                                                            OPTIONAL,
    uL-TransportLayerAddress        TransportLayerAddress                                               OPTIONAL,
    uL-GTP-TEID                     GTP-TEID                                                            OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { { E-RABDataForwardingItem-ExtIEs} }        OPTIONAL,
    ...
}

E-RABDataForwardingItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}



-- **************************************************************
--
-- Handover Preparation Failure
--
-- **************************************************************

HandoverPreparationFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { { HandoverPreparationFailureIEs} },
    ...
}

HandoverPreparationFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY ignore  TYPE MME-UE-S1AP-ID              PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY ignore  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory   }|
```

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

-- **************************************************************
--
-- HANDOVER RESOURCE ALLOCATION ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Handover Request
--
-- **************************************************************

HandoverRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {HandoverRequestIEs} },
    ...
}

HandoverRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                          CRITICALITY reject  TYPE MME-UE-S1AP-ID               PRESENCE mandatory}|
    { ID id-HandoverType                            CRITICALITY reject  TYPE HandoverType                 PRESENCE mandatory}|
    { ID id-Cause                                   CRITICALITY ignore  TYPE Cause                        PRESENCE mandatory}|
    { ID id-uEaggregateMaximumBitrate               CRITICALITY reject  TYPE UEAggregateMaximumBitrate       PRESENCE mandatory}|
    { ID id-E-RABToBeSetupListHOReq                 CRITICALITY reject  TYPE E-RABToBeSetupListHOReq      PRESENCE mandatory}|
    { ID id-Source-ToTarget-TransparentContainer    CRITICALITY reject  TYPE Source-ToTarget-TransparentContainer  PRESENCE mandatory}|
    { ID id-UESecurityCapabilities                  CRITICALITY reject  TYPE UESecurityCapabilities       PRESENCE mandatory}|
    { ID id-HandoverRestrictionList                 CRITICALITY ignore  TYPE HandoverRestrictionList      PRESENCE optional}|
    { ID id-TraceActivation                         CRITICALITY ignore  TYPE TraceActivation              PRESENCE optional}|
    { ID id-RequestType                             CRITICALITY ignore  TYPE RequestType                  PRESENCE optional}|
    { ID id-SRVCCOperationPossible                  CRITICALITY ignore  TYPE SRVCCOperationPossible       PRESENCE optional}|
    { ID id-SecurityContext                         CRITICALITY reject  TYPE SecurityContext              PRESENCE mandatory}|
    { ID id-NASSecurityParameterstoE-UTRAN          CRITICALITY reject  TYPE NASSecurityParameterstoE-UTRAN     PRESENCE conditional
    -- This IE shall be present if the Handover Type IE is set to the value "UTRANtoLTE" or "GERANtoLTE" --          }|
    { ID id-CSG-Id                                  CRITICALITY reject  TYPE CSG-Id                       PRESENCE optional}|
    { ID id-CSGMembershipStatus                     CRITICALITY ignore  TYPE CSGMembershipStatus          PRESENCE optional}|
    { ID id-GUMMEI-ID                               CRITICALITY ignore  TYPE GUMMEI                       PRESENCE optional}|
    { ID id-MME-UE-S1AP-ID-2                        CRITICALITY ignore  TYPE MME-UE-S1AP-ID               PRESENCE optional}|
    { ID id-ManagementBasedMDTAllowed               CRITICALITY ignore  TYPE ManagementBasedMDTAllowed       PRESENCE optional}|
    { 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}|
    { ID id-ProSeAuthorized                         CRITICALITY ignore  TYPE ProSeAuthorized              PRESENCE optional}|
    { ID id-UEUserPlaneCIoTSupportIndicator         CRITICALITY ignore  TYPE UEUserPlaneCIoTSupportIndicator    PRESENCE optional}|
    { ID id-V2XServicesAuthorized                   CRITICALITY ignore  TYPE V2XServicesAuthorized        PRESENCE optional}|
    { ID id-UESidelinkAggregateMaximumBitrate       CRITICALITY ignore  TYPE UESidelinkAggregateMaximumBitrate     PRESENCE optional}|
    { ID id-EnhancedCoverageRestricted              CRITICALITY ignore  TYPE EnhancedCoverageRestricted      PRESENCE optional}|
    { ID id-NRUESecurityCapabilities                CRITICALITY ignore  TYPE NRUESecurityCapabilities        PRESENCE optional}|
    { ID id-CE-ModeBRestricted                      CRITICALITY ignore  TYPE CE-ModeBRestricted           PRESENCE optional}|
    { ID id-AerialUEsubscriptionInformation         CRITICALITY ignore  TYPE AerialUEsubscriptionInformation          PRESENCE optional}|
    { ID id-PendingDataIndication                   CRITICALITY ignore  TYPE PendingDataIndication        PRESENCE optional}|
```

```
    { ID id-Subscription-Based-UE-DifferentiationInfo       CRITICALITY ignore  TYPE Subscription-Based-UE-DifferentiationInfo    PRESENCE
optional}|
    { ID id-AdditionalRRMPriorityIndex          CRITICALITY ignore  TYPE AdditionalRRMPriorityIndex     PRESENCE optional }|
    { ID id-IAB-Authorized                      CRITICALITY reject  TYPE IAB-Authorized                 PRESENCE optional}|
    { ID id-NRV2XServicesAuthorized                     CRITICALITY ignore  TYPE NRV2XServicesAuthorized                    PRESENCE optional }|
    { ID id-NRUESidelinkAggregateMaximumBitrate         CRITICALITY ignore  TYPE NRUESidelinkAggregateMaximumBitrate        PRESENCE optional }|
    { ID id-PC5QoSParameters                            CRITICALITY ignore  TYPE PC5QoSParameters                       PRESENCE optional }|
    { ID id-UERadioCapabilityID                         CRITICALITY reject  TYPE UERadioCapabilityID                    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}|
    { ID id-Ethernet-Type                       CRITICALITY ignore  EXTENSION Ethernet-Type             PRESENCE optional},
    ...
}

-- **************************************************************
--
-- Handover Request Acknowledge
--
-- **************************************************************

HandoverRequestAcknowledge ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {HandoverRequestAcknowledgeIEs} },
    ...
}

HandoverRequestAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                          CRITICALITY ignore  TYPE MME-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID                          CRITICALITY ignore  TYPE ENB-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-E-RABAdmittedList                       CRITICALITY ignore  TYPE E-RABAdmittedList             PRESENCE mandatory}|
    { ID id-E-RABFailedToSetupListHOReqAck          CRITICALITY ignore  TYPE E-RABFailedtoSetupListHOReqAck      PRESENCE optional}|
    { ID id-Target-ToSource-TransparentContainer    CRITICALITY reject  TYPE Target-ToSource-TransparentContainer   PRESENCE mandatory}|
    { ID id-CSG-Id                                  CRITICALITY ignore  TYPE CSG-Id                        PRESENCE optional}|
    { ID id-CriticalityDiagnostics                  CRITICALITY ignore  TYPE CriticalityDiagnostics        PRESENCE optional}|
    { ID id-CellAccessMode                          CRITICALITY ignore  TYPE CellAccessMode                PRESENCE optional}|
    { ID id-CE-mode-B-SupportIndicator              CRITICALITY ignore  TYPE CE-mode-B-SupportIndicator       PRESENCE optional},
```

```
    ...
}

E-RABAdmittedList                   ::= E-RAB-IE-ContainerList { {E-RABAdmittedItemIEs} }

E-RABAdmittedItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABAdmittedItem           CRITICALITY ignore  TYPE E-RABAdmittedItem          PRESENCE mandatory   },
    ...
}

E-RABAdmittedItem ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    transportLayerAddress           TransportLayerAddress,
    gTP-TEID                        GTP-TEID,
    dL-transportLayerAddress        TransportLayerAddress   OPTIONAL,
    dL-gTP-TEID                     GTP-TEID                OPTIONAL,
    uL-TransportLayerAddress        TransportLayerAddress   OPTIONAL,
    uL-GTP-TEID                     GTP-TEID                OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABAdmittedItem-ExtIEs} }   OPTIONAL,
    ...
}

E-RABAdmittedItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABFailedtoSetupListHOReqAck                  ::= E-RAB-IE-ContainerList { {E-RABFailedtoSetupItemHOReqAckIEs} }

E-RABFailedtoSetupItemHOReqAckIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABFailedtoSetupItemHOReqAck          CRITICALITY ignore  TYPE E-RABFailedToSetupItemHOReqAck        PRESENCE mandatory   },
    ...
}

E-RABFailedToSetupItemHOReqAck ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    cause               Cause,
    iE-Extensions                   ProtocolExtensionContainer { { E-RABFailedToSetupItemHOReqAckExtIEs} }      OPTIONAL,
    ...
}

E-RABFailedToSetupItemHOReqAckExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- Handover Failure
--
-- **************************************************************

HandoverFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { HandoverFailureIEs} },
    ...
```

```
}

HandoverFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID             CRITICALITY ignore  TYPE MME-UE-S1AP-ID               PRESENCE mandatory }|
    { ID id-Cause                      CRITICALITY ignore  TYPE Cause                        PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics     CRITICALITY ignore  TYPE CriticalityDiagnostics       PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- HANDOVER NOTIFICATION ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Handover Notify
--
-- **************************************************************

HandoverNotify ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { HandoverNotifyIEs} },
    ...
}

HandoverNotifyIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                 CRITICALITY reject  TYPE MME-UE-S1AP-ID         PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID                 CRITICALITY reject  TYPE ENB-UE-S1AP-ID         PRESENCE mandatory}|
    { ID id-EUTRAN-CGI                     CRITICALITY ignore  TYPE EUTRAN-CGI             PRESENCE mandatory}|
    { ID id-TAI                            CRITICALITY ignore  TYPE TAI                    PRESENCE mandatory}|
-- 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}|
    { ID id-PSCellInformation              CRITICALITY ignore  TYPE PSCellInformation      PRESENCE optional }|
    { ID id-NotifySourceNB                 CRITICALITY ignore  TYPE NotifySourceNB         PRESENCE optional},
    ...
}

-- **************************************************************
--
-- PATH SWITCH REQUEST ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Path Switch Request
--
-- **************************************************************

PathSwitchRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { PathSwitchRequestIEs} },
    ...
```

```
}

PathSwitchRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory}|
    { ID id-E-RABToBeSwitchedDLList         CRITICALITY reject  TYPE E-RABToBeSwitchedDLList    PRESENCE mandatory}|
    { ID id-SourceMME-UE-S1AP-ID            CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory}|
    { ID id-EUTRAN-CGI                      CRITICALITY ignore  TYPE EUTRAN-CGI                 PRESENCE mandatory}|
    { ID id-TAI                             CRITICALITY ignore  TYPE TAI                        PRESENCE mandatory}|
    { ID id-UESecurityCapabilities          CRITICALITY ignore  TYPE UESecurityCapabilities     PRESENCE mandatory}|
    { ID id-CSG-Id                          CRITICALITY ignore  TYPE CSG-Id                     PRESENCE optional}|
    { ID id-CellAccessMode                  CRITICALITY ignore  TYPE CellAccessMode             PRESENCE optional}|
    { ID id-SourceMME-GUMMEI                CRITICALITY ignore  TYPE GUMMEI                     PRESENCE optional}|
    { 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}|
    { ID id-RRC-Resume-Cause                CRITICALITY ignore  TYPE RRC-Establishment-Cause    PRESENCE optional }|
    { ID id-NRUESecurityCapabilities                CRITICALITY ignore  TYPE NRUESecurityCapabilities        PRESENCE optional}|
    { ID id-PSCellInformation               CRITICALITY ignore  TYPE PSCellInformation          PRESENCE optional },
    ...
}

E-RABToBeSwitchedDLList                ::= E-RAB-IE-ContainerList { {E-RABToBeSwitchedDLItemIEs} }

E-RABToBeSwitchedDLItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABToBeSwitchedDLItem         CRITICALITY reject  TYPE E-RABToBeSwitchedDLItem        PRESENCE mandatory   },
    ...
}

E-RABToBeSwitchedDLItem ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    transportLayerAddress           TransportLayerAddress,
    gTP-TEID                        GTP-TEID,
    iE-Extensions                   ProtocolExtensionContainer { { E-RABToBeSwitchedDLItem-ExtIEs} }      OPTIONAL,
    ...
}

E-RABToBeSwitchedDLItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- Path Switch Request Acknowledge
--
-- **************************************************************

PathSwitchRequestAcknowledge ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { PathSwitchRequestAcknowledgeIEs} },
    ...
}

PathSwitchRequestAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY ignore  TYPE MME-UE-S1AP-ID                PRESENCE mandatory}|
```

```
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY ignore  TYPE ENB-UE-S1AP-ID                 PRESENCE mandatory}|
    { ID id-uEaggregateMaximumBitrate       CRITICALITY ignore  TYPE UEAggregateMaximumBitrate      PRESENCE optional}|
    { ID id-E-RABToBeSwitchedULList         CRITICALITY ignore  TYPE E-RABToBeSwitchedULList        PRESENCE optional}|
    { ID id-E-RABToBeReleasedList           CRITICALITY ignore  TYPE E-RABList                      PRESENCE optional}|
    { ID id-SecurityContext                 CRITICALITY reject  TYPE SecurityContext                PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional}|
    { ID id-MME-UE-S1AP-ID-2                CRITICALITY ignore  TYPE MME-UE-S1AP-ID                 PRESENCE optional}|
    { 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}|
    { ID id-V2XServicesAuthorized           CRITICALITY ignore  TYPE V2XServicesAuthorized          PRESENCE optional}|
    { ID id-UESidelinkAggregateMaximumBitrate       CRITICALITY ignore  TYPE UESidelinkAggregateMaximumBitrate   PRESENCE optional}|
    { ID id-EnhancedCoverageRestricted      CRITICALITY ignore  TYPE EnhancedCoverageRestricted      PRESENCE optional}|
    { ID id-NRUESecurityCapabilities                CRITICALITY ignore  TYPE NRUESecurityCapabilities        PRESENCE optional}|
    { ID id-CE-ModeBRestricted              CRITICALITY ignore  TYPE CE-ModeBRestricted         PRESENCE optional}|
    { ID id-AerialUEsubscriptionInformation         CRITICALITY ignore  TYPE AerialUEsubscriptionInformation          PRESENCE optional}|
    { ID id-PendingDataIndication           CRITICALITY ignore  TYPE PendingDataIndication          PRESENCE optional}|
    { ID id-Subscription-Based-UE-DifferentiationInfo       CRITICALITY ignore  TYPE Subscription-Based-UE-DifferentiationInfo    PRESENCE
optional}|
    { ID id-HandoverRestrictionList         CRITICALITY ignore  TYPE HandoverRestrictionList        PRESENCE optional}|
    { ID id-AdditionalRRMPriorityIndex      CRITICALITY ignore  TYPE AdditionalRRMPriorityIndex     PRESENCE optional }|
    { ID id-NRV2XServicesAuthorized                     CRITICALITY ignore  TYPE NRV2XServicesAuthorized                    PRESENCE optional }|
    { ID id-NRUESidelinkAggregateMaximumBitrate         CRITICALITY ignore  TYPE NRUESidelinkAggregateMaximumBitrate        PRESENCE optional }|
    { ID id-PC5QoSParameters                            CRITICALITY ignore  TYPE PC5QoSParameters                       PRESENCE optional }|
    { ID id-UERadioCapabilityID                         CRITICALITY reject  TYPE UERadioCapabilityID                    PRESENCE optional},
    ...
}

E-RABToBeSwitchedULList ::= E-RAB-IE-ContainerList { {E-RABToBeSwitchedULItemIEs} }

E-RABToBeSwitchedULItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABToBeSwitchedULItem     CRITICALITY ignore  TYPE E-RABToBeSwitchedULItem        PRESENCE mandatory },
    ...
}

E-RABToBeSwitchedULItem ::= SEQUENCE {
    e-RAB-ID                            E-RAB-ID,
    transportLayerAddress               TransportLayerAddress,
    gTP-TEID                            GTP-TEID,
    iE-Extensions                       ProtocolExtensionContainer { { E-RABToBeSwitchedULItem-ExtIEs} }   OPTIONAL,
    ...
}

E-RABToBeSwitchedULItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- Path Switch Request Failure
--
-- **************************************************************
```

```
PathSwitchRequestFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { PathSwitchRequestFailureIEs} },
    ...
}

PathSwitchRequestFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY ignore  TYPE MME-UE-S1AP-ID              PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY ignore  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory   }|
    { ID id-Cause                           CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory   }|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional },
    ...
}

-- **************************************************************
--
-- HANDOVER CANCEL ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Handover Cancel
--
-- **************************************************************

HandoverCancel ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { HandoverCancelIEs} },
    ...
}

HandoverCancelIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY reject  TYPE MME-UE-S1AP-ID              PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY reject  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory   }|
    { ID id-Cause                           CRITICALITY ignore  TYPE Cause                       PRESENCE mandatory   },
    ...
}

-- **************************************************************
--
-- Handover Cancel Request Acknowledge
--
-- **************************************************************

HandoverCancelAcknowledge ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { HandoverCancelAcknowledgeIEs} },
    ...
}

HandoverCancelAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY ignore  TYPE MME-UE-S1AP-ID              PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY ignore  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory   }|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional },
    ...
}
```

```
-- ********************************************************************
--
-- HANDOVER SUCCESS ELEMENTARY PROCEDURE
--
-- ********************************************************************

-- ********************************************************************
--
-- Handover Success
--
-- ********************************************************************

HandoverSuccess ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { HandoverSuccessIEs} },
    ...
}

HandoverSuccessIEs 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},
    ...
}

-- ********************************************************************
--
-- eNB EARLY STATUS TRANSFER ELEMENTARY PROCEDURE
--
-- ********************************************************************

-- ********************************************************************
--
-- eNB Early Status Transfer
--
-- ********************************************************************

ENBEarlyStatusTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {ENBEarlyStatusTransferIEs} },
    ...
}

ENBEarlyStatusTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                              CRITICALITY reject  TYPE MME-UE-S1AP-ID         PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID                                  CRITICALITY reject  TYPE ENB-UE-S1AP-ID          PRESENCE mandatory}|
    { ID id-eNB-EarlyStatusTransfer-TransparentContainer    CRITICALITY reject  TYPE ENB-EarlyStatusTransfer-TransparentContainer PRESENCE
mandatory},
    ...
}

-- ********************************************************************
--
-- MME EARLY STATUS TRANSFER ELEMENTARY PROCEDURE
--
-- ********************************************************************
```

```
-- **************************************************************
--
-- MME Early Status Transfer
--
-- **************************************************************

MMEEarlyStatusTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {MMEEarlyStatusTransferIEs} },
    ...
}

MMEEarlyStatusTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                              CRITICALITY reject  TYPE MME-UE-S1AP-ID         PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID                              CRITICALITY reject  TYPE ENB-UE-S1AP-ID         PRESENCE mandatory}|
    { ID id-eNB-EarlyStatusTransfer-TransparentContainer CRITICALITY reject TYPE ENB-EarlyStatusTransfer-TransparentContainer  PRESENCE mandatory},
    ...
}

-- **************************************************************
--
-- E-RAB SETUP ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- E-RAB Setup Request
--
-- **************************************************************

E-RABSetupRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {E-RABSetupRequestIEs} },
    ...
}

E-RABSetupRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY reject  TYPE MME-UE-S1AP-ID                  PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY reject  TYPE ENB-UE-S1AP-ID                  PRESENCE mandatory   }|
    { ID id-uEaggregateMaximumBitrate       CRITICALITY reject  TYPE UEAggregateMaximumBitrate       PRESENCE optional }|
    { ID id-E-RABToBeSetupListBearerSUReq   CRITICALITY reject  TYPE E-RABToBeSetupListBearerSUReq   PRESENCE mandatory   },
    ...
}

E-RABToBeSetupListBearerSUReq ::= SEQUENCE (SIZE(1.. 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,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABToBeSetupItemBearerSUReqExtIEs} } OPTIONAL,
    ...
}


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}|
    { ID id-BearerType              CRITICALITY reject  EXTENSION BearerType            PRESENCE optional}|
    { ID id-Ethernet-Type           CRITICALITY ignore  EXTENSION Ethernet-Type         PRESENCE optional},
    ...
}


-- **************************************************************
--
-- E-RAB Setup Response
--
-- **************************************************************

E-RABSetupResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {E-RABSetupResponseIEs} },
    ...
}

E-RABSetupResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                          CRITICALITY ignore  TYPE MME-UE-S1AP-ID          PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                          CRITICALITY ignore  TYPE ENB-UE-S1AP-ID          PRESENCE mandatory   }|
    { ID id-E-RABSetupListBearerSURes               CRITICALITY ignore  TYPE E-RABSetupListBearerSURes  PRESENCE optional }|
    { ID id-E-RABFailedToSetupListBearerSURes       CRITICALITY ignore  TYPE E-RABList               PRESENCE optional }|
    { ID id-CriticalityDiagnostics                  CRITICALITY ignore  TYPE CriticalityDiagnostics  PRESENCE optional },
    ...
}


E-RABSetupListBearerSURes ::= SEQUENCE (SIZE(1.. 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,
    iE-Extensions               ProtocolExtensionContainer { {E-RABSetupItemBearerSUResExtIEs} } OPTIONAL,
    ...
}
```

```
E-RABSetupItemBearerSUResExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}



-- **************************************************************
--
-- E-RAB MODIFY ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- E-RAB Modify Request
--
-- **************************************************************

E-RABModifyRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {E-RABModifyRequestIEs} },
    ...
}

E-RABModifyRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                      CRITICALITY reject  TYPE MME-UE-S1AP-ID                    PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                      CRITICALITY reject  TYPE ENB-UE-S1AP-ID                    PRESENCE mandatory   }|
    { ID id-uEaggregateMaximumBitrate           CRITICALITY reject  TYPE UEAggregateMaximumBitrate         PRESENCE optional }|
    { ID id-E-RABToBeModifiedListBearerModReq   CRITICALITY reject  TYPE E-RABToBeModifiedListBearerModReq    PRESENCE mandatory   }|
    { ID id-SecondaryRATDataUsageRequest        CRITICALITY ignore  TYPE SecondaryRATDataUsageRequest      PRESENCE optional },
    ...
}

E-RABToBeModifiedListBearerModReq ::= SEQUENCE (SIZE(1.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { {E-RABToBeModifiedItemBearerModReqIEs} }

E-RABToBeModifiedItemBearerModReqIEs    S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABToBeModifiedItemBearerModReq    CRITICALITY reject     TYPE E-RABToBeModifiedItemBearerModReq   PRESENCE mandatory },
    ...
}

E-RABToBeModifiedItemBearerModReq ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    e-RABLevelQoSParameters         E-RABLevelQoSParameters,
    nAS-PDU                         NAS-PDU,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABToBeModifyItemBearerModReqExtIEs} } OPTIONAL,
    ...
}


E-RABToBeModifyItemBearerModReqExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    { ID id-TransportInformation    CRITICALITY reject  EXTENSION TransportInformation      PRESENCE optional},
    ...
}
```

```
-- ********************************************************
--
-- E-RAB Modify Response
--
-- ********************************************************

E-RABModifyResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {E-RABModifyResponseIEs} },
    ...
}

E-RABModifyResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY ignore  TYPE MME-UE-S1AP-ID                  PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY ignore  TYPE ENB-UE-S1AP-ID                  PRESENCE mandatory   }|
    { ID id-E-RABModifyListBearerModRes     CRITICALITY ignore  TYPE E-RABModifyListBearerModRes     PRESENCE optional }|
    { ID id-E-RABFailedToModifyList         CRITICALITY ignore  TYPE E-RABList                       PRESENCE optional }|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics          PRESENCE optional }|
    { ID id-SecondaryRATDataUsageReportList     CRITICALITY ignore  TYPE SecondaryRATDataUsageReportList        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,
    iE-Extensions               ProtocolExtensionContainer { {E-RABModifyItemBearerModResExtIEs} } OPTIONAL,
    ...
}


E-RABModifyItemBearerModResExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}




-- ********************************************************
--
-- E-RAB RELEASE ELEMENTARY PROCEDURE
--
-- ********************************************************

-- ********************************************************
--
-- E-RAB Release Command
```

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

E-RABReleaseCommand ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {E-RABReleaseCommandIEs} },
    ...
}

E-RABReleaseCommandIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY reject  TYPE MME-UE-S1AP-ID              PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY reject  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory   }|
    { ID id-uEaggregateMaximumBitrate       CRITICALITY reject  TYPE UEAggregateMaximumBitrate   PRESENCE optional }|
    { ID id-E-RABToBeReleasedList           CRITICALITY ignore  TYPE E-RABList                   PRESENCE mandatory   }|
    { ID id-NAS-PDU                         CRITICALITY ignore  TYPE NAS-PDU                     PRESENCE optional },
    ...
}


-- **************************************************************
--
-- E-RAB Release Response
--
-- **************************************************************

E-RABReleaseResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { E-RABReleaseResponseIEs } },
    ...
}

E-RABReleaseResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY ignore  TYPE MME-UE-S1AP-ID                 PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY ignore  TYPE ENB-UE-S1AP-ID                 PRESENCE mandatory   }|
    { ID id-E-RABReleaseListBearerRelComp   CRITICALITY ignore  TYPE E-RABReleaseListBearerRelComp  PRESENCE optional }|
    { ID id-E-RABFailedToReleaseList        CRITICALITY ignore  TYPE E-RABList                      PRESENCE optional }|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional }|
-- Extension for Release 12 to support User Location Information --
    { ID id-UserLocationInformation         CRITICALITY ignore  TYPE UserLocationInformation        PRESENCE optional }|
    { ID id-SecondaryRATDataUsageReportList     CRITICALITY ignore  TYPE SecondaryRATDataUsageReportList        PRESENCE optional },
    ...
}


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,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABReleaseItemBearerRelCompExtIEs} } OPTIONAL,
    ...
}
```

```
E-RABReleaseItemBearerRelCompExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}



-- **************************************************************
--
-- E-RAB RELEASE INDICATION ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- E-RAB Release Indication
--
-- **************************************************************

E-RABReleaseIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {E-RABReleaseIndicationIEs} },
    ...
}

E-RABReleaseIndicationIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY reject  TYPE MME-UE-S1AP-ID              PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY reject  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory   }|
    { ID id-E-RABReleasedList               CRITICALITY ignore  TYPE E-RABList                   PRESENCE mandatory   }|
-- Extension for Release 12 to support User Location Information --
    { ID id-UserLocationInformation         CRITICALITY ignore  TYPE UserLocationInformation     PRESENCE optional }|
    { ID id-SecondaryRATDataUsageReportList     CRITICALITY ignore  TYPE SecondaryRATDataUsageReportList     PRESENCE optional },
    ...
}
-- **************************************************************
--
-- INITIAL CONTEXT SETUP ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Initial Context Setup Request
--
-- **************************************************************

InitialContextSetupRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {InitialContextSetupRequestIEs} },
    ...
}

InitialContextSetupRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY reject  TYPE MME-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY reject  TYPE ENB-UE-S1AP-ID                PRESENCE mandatory}|
```

```
    { ID id-uEaggregateMaximumBitrate       CRITICALITY reject  TYPE UEAggregateMaximumBitrate      PRESENCE mandatory}|
    { ID id-E-RABToBeSetupListCtxtSUReq     CRITICALITY reject  TYPE E-RABToBeSetupListCtxtSUReq    PRESENCE mandatory}|
    { ID id-UESecurityCapabilities          CRITICALITY reject  TYPE UESecurityCapabilities         PRESENCE mandatory}|
    { ID id-SecurityKey                     CRITICALITY reject  TYPE SecurityKey                    PRESENCE mandatory}|
    { ID id-TraceActivation                 CRITICALITY ignore  TYPE TraceActivation                PRESENCE optional}|
    { ID id-HandoverRestrictionList         CRITICALITY ignore  TYPE HandoverRestrictionList        PRESENCE optional}|
    { ID id-UERadioCapability               CRITICALITY ignore  TYPE UERadioCapability              PRESENCE optional}|
    { ID id-SubscriberProfileIDforRFP       CRITICALITY ignore  TYPE SubscriberProfileIDforRFP      PRESENCE optional}|
    { ID id-CSFallbackIndicator             CRITICALITY reject  TYPE CSFallbackIndicator            PRESENCE optional}|
    { ID id-SRVCCOperationPossible          CRITICALITY ignore  TYPE SRVCCOperationPossible         PRESENCE optional}|
    { ID id-CSGMembershipStatus             CRITICALITY ignore  TYPE CSGMembershipStatus            PRESENCE optional}|
    { ID id-RegisteredLAI                   CRITICALITY ignore  TYPE LAI                            PRESENCE optional}|
    { ID id-GUMMEI-ID                       CRITICALITY ignore  TYPE GUMMEI                         PRESENCE optional}|
    { ID id-MME-UE-S1AP-ID-2                CRITICALITY ignore  TYPE MME-UE-S1AP-ID                 PRESENCE optional}|
    { ID id-ManagementBasedMDTAllowed       CRITICALITY ignore  TYPE ManagementBasedMDTAllowed      PRESENCE optional}|
    { ID id-ManagementBasedMDTPLMNList      CRITICALITY ignore  TYPE MDTPLMNList                    PRESENCE optional}|
    { ID id-AdditionalCSFallbackIndicator   CRITICALITY ignore  TYPE AdditionalCSFallbackIndicator  PRESENCE conditional}|
    { 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-UEUserPlaneCIoTSupportIndicator CRITICALITY ignore  TYPE UEUserPlaneCIoTSupportIndicator PRESENCE optional}|
    { ID id-V2XServicesAuthorized           CRITICALITY ignore  TYPE V2XServicesAuthorized          PRESENCE optional}|
    { ID id-UESidelinkAggregateMaximumBitrate       CRITICALITY ignore  TYPE UESidelinkAggregateMaximumBitrate  PRESENCE optional}|
    { ID id-EnhancedCoverageRestricted      CRITICALITY ignore  TYPE EnhancedCoverageRestricted     PRESENCE optional}|
    { ID id-NRUESecurityCapabilities                CRITICALITY ignore  TYPE NRUESecurityCapabilities        PRESENCE optional}|
    { ID id-CE-ModeBRestricted              CRITICALITY ignore  TYPE CE-ModeBRestricted         PRESENCE optional}|
    { ID id-AerialUEsubscriptionInformation CRITICALITY ignore  TYPE AerialUEsubscriptionInformation         PRESENCE optional}|
    { ID id-PendingDataIndication           CRITICALITY ignore  TYPE PendingDataIndication          PRESENCE optional}|
    { ID id-Subscription-Based-UE-DifferentiationInfo       CRITICALITY ignore  TYPE Subscription-Based-UE-DifferentiationInfo    PRESENCE
optional}|
    { ID id-AdditionalRRMPriorityIndex      CRITICALITY ignore  TYPE AdditionalRRMPriorityIndex      PRESENCE optional }|
    { ID id-IAB-Authorized                  CRITICALITY ignore  TYPE IAB-Authorized                 PRESENCE optional}|
    { ID id-NRV2XServicesAuthorized                     CRITICALITY ignore  TYPE NRV2XServicesAuthorized                     PRESENCE optional }|
    { ID id-NRUESidelinkAggregateMaximumBitrate         CRITICALITY ignore  TYPE NRUESidelinkAggregateMaximumBitrate         PRESENCE optional }|
    { ID id-PC5QoSParameters                            CRITICALITY ignore  TYPE PC5QoSParameters                        PRESENCE optional }|
    { ID id-UERadioCapabilityID                         CRITICALITY reject  TYPE UERadioCapabilityID                     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}|
    { ID id-SIPTO-Correlation-ID            CRITICALITY ignore  EXTENSION Correlation-ID         PRESENCE optional}|
    { ID id-BearerType                      CRITICALITY reject  EXTENSION BearerType             PRESENCE optional}|
    { ID id-Ethernet-Type                   CRITICALITY ignore  EXTENSION Ethernet-Type          PRESENCE optional},
    ...
}


-- **************************************************************
--
-- Initial Context Setup Response
--
-- **************************************************************

InitialContextSetupResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {InitialContextSetupResponseIEs} },
    ...
}

InitialContextSetupResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                      CRITICALITY ignore  TYPE MME-UE-S1AP-ID             PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                      CRITICALITY ignore  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory   }|
    { ID id-E-RABSetupListCtxtSURes             CRITICALITY ignore  TYPE E-RABSetupListCtxtSURes    PRESENCE mandatory   }|
    { ID id-E-RABFailedToSetupListCtxtSURes     CRITICALITY ignore  TYPE E-RABList                  PRESENCE optional }|
    { ID id-CriticalityDiagnostics              CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional },
    ...
}


E-RABSetupListCtxtSURes ::= SEQUENCE (SIZE(1.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { {E-RABSetupItemCtxtSUResIEs} }

E-RABSetupItemCtxtSUResIEs  S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABSetupItemCtxtSURes     CRITICALITY ignore  TYPE E-RABSetupItemCtxtSURes    PRESENCE mandatory   },
    ...
}

E-RABSetupItemCtxtSURes ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    transportLayerAddress           TransportLayerAddress,
    gTP-TEID                        GTP-TEID,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABSetupItemCtxtSUResExtIEs} } OPTIONAL,
    ...
}


E-RABSetupItemCtxtSUResExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}


-- **************************************************************
--
-- Initial Context Setup Failure
--
-- **************************************************************

InitialContextSetupFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {InitialContextSetupFailureIEs} },
    ...
}

InitialContextSetupFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY ignore  TYPE MME-UE-S1AP-ID                PRESENCE mandatory }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY ignore  TYPE ENB-UE-S1AP-ID                PRESENCE mandatory }|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                         PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics        PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- PAGING ELEMENTARY PROCEDURE
--
-- **************************************************************


-- **************************************************************
--
-- Paging
--
-- **************************************************************

Paging ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       {{PagingIEs}},
    ...
}

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

```
    { ID id-NB-IoT-UEIdentityIndexValue     CRITICALITY ignore  TYPE NB-IoT-UEIdentityIndexValue    PRESENCE optional}|
    { ID id-EnhancedCoverageRestricted      CRITICALITY ignore  TYPE EnhancedCoverageRestricted     PRESENCE optional}|
    { ID id-CE-ModeBRestricted              CRITICALITY ignore  TYPE CE-ModeBRestricted             PRESENCE optional}|
    { ID id-DataSize                        CRITICALITY ignore  TYPE DataSize                       PRESENCE optional}|
    { ID id-WUS-Assistance-Information      CRITICALITY ignore  TYPE WUS-Assistance-Information     PRESENCE optional}|
    { ID id-NB-IoT-PagingDRX                CRITICALITY ignore  TYPE NB-IoT-PagingDRX               PRESENCE optional},
    ...
}

TAIList::= SEQUENCE (SIZE(1.. maxnoofTAIs)) OF ProtocolIE-SingleContainer {{TAIItemIEs}}

TAIItemIEs  S1AP-PROTOCOL-IES ::= {
    { ID id-TAIItem  CRITICALITY ignore     TYPE TAIItem    PRESENCE mandatory },
    ...
}

TAIItem ::= SEQUENCE {
    tAI                             TAI,
    iE-Extensions                   ProtocolExtensionContainer { {TAIItemExtIEs} } OPTIONAL,
    ...
}


TAIItemExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- UE CONTEXT RELEASE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- UE Context Release Request
--
-- **************************************************************

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

UEContextReleaseRequest-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory   }|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory   }|
    { ID id-Cause                           CRITICALITY ignore  TYPE Cause                         PRESENCE mandatory   }|
    { ID id-GWContextReleaseIndication      CRITICALITY reject  TYPE GWContextReleaseIndication  PRESENCE optional }|
    { ID id-SecondaryRATDataUsageReportList CRITICALITY ignore  TYPE SecondaryRATDataUsageReportList PRESENCE optional },
    ...
}

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

```
--
-- UE Context Release Command
--
-- **************************************************************

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

UEContextReleaseCommand-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-UE-S1AP-IDs                CRITICALITY reject  TYPE UE-S1AP-IDs                   PRESENCE mandatory }|
    { ID id-Cause                      CRITICALITY ignore  TYPE Cause                         PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- UE Context Release Complete
--
-- **************************************************************

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

UEContextReleaseComplete-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                          CRITICALITY ignore  TYPE MME-UE-S1AP-ID              PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID                          CRITICALITY ignore  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics                  CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional}|
-- Extension for Release 12 to support User Location Information --
    { ID id-UserLocationInformation                 CRITICALITY ignore  TYPE UserLocationInformation           PRESENCE optional}|
-- Extension for Release 13 to support Paging Optimisation
    { ID id-InformationOnRecommendedCellsAndENBsForPaging   CRITICALITY ignore  TYPE InformationOnRecommendedCellsAndENBsForPaging   PRESENCE
optional}|
-- Extension for Release 13 to support coverage enhancement paging –
    { ID id-CellIdentifierAndCELevelForCECapableUEs     CRITICALITY ignore  TYPE CellIdentifierAndCELevelForCECapableUEs PRESENCE optional}|
    { ID id-SecondaryRATDataUsageReportList             CRITICALITY ignore  TYPE SecondaryRATDataUsageReportList   PRESENCE optional }|
    { ID id-TimeSinceSecondaryNodeRelease               CRITICALITY ignore  TYPE TimeSinceSecondaryNodeRelease           PRESENCE optional },
    ...
}


-- **************************************************************
--
-- UE CONTEXT MODIFICATION ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- UE Context Modification Request
--
```

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

UEContextModificationRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { UEContextModificationRequestIEs} },
    ...
}

UEContextModificationRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                      CRITICALITY reject  TYPE MME-UE-S1AP-ID                    PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID                      CRITICALITY reject  TYPE ENB-UE-S1AP-ID                    PRESENCE mandatory}|
    { ID id-SecurityKey                         CRITICALITY reject  TYPE SecurityKey                       PRESENCE optional}|
    { ID id-SubscriberProfileIDforRFP           CRITICALITY ignore  TYPE SubscriberProfileIDforRFP         PRESENCE optional}|
    { ID id-uEaggregateMaximumBitrate           CRITICALITY ignore  TYPE UEAggregateMaximumBitrate         PRESENCE optional}|
    { ID id-CSFallbackIndicator                 CRITICALITY reject  TYPE CSFallbackIndicator               PRESENCE optional}|
    { ID id-UESecurityCapabilities              CRITICALITY reject  TYPE UESecurityCapabilities            PRESENCE optional}|
    { ID id-CSGMembershipStatus                 CRITICALITY ignore  TYPE CSGMembershipStatus               PRESENCE optional}|
    { ID id-RegisteredLAI                       CRITICALITY ignore  TYPE LAI                               PRESENCE optional}|
    { ID id-AdditionalCSFallbackIndicator       CRITICALITY ignore  TYPE AdditionalCSFallbackIndicator     PRESENCE conditional}|
    { ID id-ProSeAuthorized                     CRITICALITY ignore  TYPE ProSeAuthorized                   PRESENCE optional}|
    { ID id-SRVCCOperationPossible              CRITICALITY ignore  TYPE SRVCCOperationPossible            PRESENCE optional}|
    { ID id-SRVCCOperationNotPossible           CRITICALITY ignore  TYPE SRVCCOperationNotPossible         PRESENCE optional}|
    { ID id-V2XServicesAuthorized               CRITICALITY ignore  TYPE V2XServicesAuthorized             PRESENCE optional}|
    { ID id-UESidelinkAggregateMaximumBitrate   CRITICALITY ignore  TYPE UESidelinkAggregateMaximumBitrate PRESENCE optional}|
    { ID id-NRUESecurityCapabilities            CRITICALITY ignore  TYPE NRUESecurityCapabilities          PRESENCE optional}|
    { ID id-AerialUEsubscriptionInformation     CRITICALITY ignore  TYPE AerialUEsubscriptionInformation   PRESENCE optional}|
    { ID id-AdditionalRRMPriorityIndex          CRITICALITY ignore  TYPE AdditionalRRMPriorityIndex        PRESENCE optional}|
    { ID id-IAB-Authorized                      CRITICALITY ignore  TYPE IAB-Authorized                    PRESENCE optional}|
    { ID id-NRV2XServicesAuthorized                     CRITICALITY ignore  TYPE NRV2XServicesAuthorized                    PRESENCE optional }|
    { ID id-NRUESidelinkAggregateMaximumBitrate         CRITICALITY ignore  TYPE NRUESidelinkAggregateMaximumBitrate        PRESENCE optional }|
    { ID id-PC5QoSParameters                            CRITICALITY ignore  TYPE PC5QoSParameters                       PRESENCE optional }|
    { ID id-UERadioCapabilityID                         CRITICALITY reject  TYPE UERadioCapabilityID                    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 {
    protocolIEs         ProtocolIE-Container       { { UERadioCapabilityMatchRequestIEs} },
    ...
}

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  }|
    { ID id-UERadioCapabilityID         CRITICALITY reject  TYPE UERadioCapabilityID           PRESENCE optional  },
    ...
}

-- ************************************************************
--
-- UE Radio Capability Match Response
--
-- ************************************************************

UERadioCapabilityMatchResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { 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 }|
```

```
    { ID id-VoiceSupportMatchIndicator  CRITICALITY reject  TYPE VoiceSupportMatchIndicator     PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- NAS TRANSPORT ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- DOWNLINK NAS TRANSPORT
--
-- **************************************************************

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

DownlinkNASTransport-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID                 PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID                 PRESENCE mandatory}|
    { ID id-NAS-PDU                     CRITICALITY reject  TYPE NAS-PDU                        PRESENCE mandatory}|
    { ID id-HandoverRestrictionList     CRITICALITY ignore  TYPE HandoverRestrictionList        PRESENCE optional}|
    { ID id-SubscriberProfileIDforRFP   CRITICALITY ignore  TYPE SubscriberProfileIDforRFP      PRESENCE optional}|
    { ID id-SRVCCOperationPossible      CRITICALITY ignore  TYPE SRVCCOperationPossible         PRESENCE optional}|
    { ID id-UERadioCapability           CRITICALITY ignore  TYPE UERadioCapability              PRESENCE optional}|
    { ID id-DLNASPDUDeliveryAckRequest  CRITICALITY ignore  TYPE DLNASPDUDeliveryAckRequest PRESENCE optional}|
    { ID id-EnhancedCoverageRestricted  CRITICALITY ignore  TYPE EnhancedCoverageRestricted     PRESENCE optional}|
    { ID id-NRUESecurityCapabilities    CRITICALITY ignore  TYPE NRUESecurityCapabilities       PRESENCE optional}|
    { ID id-CE-ModeBRestricted          CRITICALITY ignore  TYPE CE-ModeBRestricted             PRESENCE optional}|
    { ID id-UECapabilityInfoRequest     CRITICALITY ignore  TYPE UECapabilityInfoRequest    PRESENCE optional}|
    { ID id-EndIndication               CRITICALITY ignore  TYPE EndIndication                  PRESENCE optional}|
    { ID id-PendingDataIndication       CRITICALITY ignore  TYPE PendingDataIndication          PRESENCE optional}|
    { ID id-Subscription-Based-UE-DifferentiationInfo       CRITICALITY ignore  TYPE Subscription-Based-UE-DifferentiationInfo    PRESENCE
optional}|
    { ID id-AdditionalRRMPriorityIndex  CRITICALITY ignore  TYPE AdditionalRRMPriorityIndex     PRESENCE optional}|
    { ID id-UERadioCapabilityID         CRITICALITY reject  TYPE UERadioCapabilityID            PRESENCE optional},
    ...
}


-- **************************************************************
--
-- INITIAL UE MESSAGE
--
-- **************************************************************

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

```
}

InitialUEMessage-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-NAS-PDU                     CRITICALITY reject  TYPE NAS-PDU                       PRESENCE mandatory}|
    { ID id-TAI                         CRITICALITY reject  TYPE TAI                           PRESENCE mandatory}|
    { ID id-EUTRAN-CGI                  CRITICALITY ignore  TYPE EUTRAN-CGI                    PRESENCE mandatory}|
    { ID id-RRC-Establishment-Cause     CRITICALITY ignore  TYPE RRC-Establishment-Cause        PRESENCE mandatory}|
    { ID id-S-TMSI                      CRITICALITY reject  TYPE S-TMSI                        PRESENCE optional}|
    { ID id-CSG-Id                      CRITICALITY reject  TYPE CSG-Id                        PRESENCE optional}|
    { ID id-GUMMEI-ID                   CRITICALITY reject  TYPE GUMMEI                        PRESENCE optional}|
    { ID id-CellAccessMode              CRITICALITY reject  TYPE CellAccessMode                PRESENCE optional}|
    { ID id-GW-TransportLayerAddress    CRITICALITY ignore  TYPE TransportLayerAddress         PRESENCE optional}|
    { ID id-RelayNode-Indicator         CRITICALITY reject  TYPE RelayNode-Indicator           PRESENCE optional}|
    { ID id-GUMMEIType                  CRITICALITY ignore  TYPE GUMMEIType                    PRESENCE optional}|
-- Extension for Release 11 to support BBAI --
    { ID id-Tunnel-Information-for-BBF  CRITICALITY ignore  TYPE TunnelInformation             PRESENCE optional}|
    { ID id-SIPTO-L-GW-TransportLayerAddress    CRITICALITY ignore  TYPE TransportLayerAddress  PRESENCE optional}|
    { ID id-LHN-ID                      CRITICALITY ignore  TYPE LHN-ID                        PRESENCE optional}|
    { ID id-MME-Group-ID                CRITICALITY ignore  TYPE MME-Group-ID                  PRESENCE optional}|
    { ID id-UE-Usage-Type               CRITICALITY ignore  TYPE UE-Usage-Type                 PRESENCE optional}|
    { ID id-CE-mode-B-SupportIndicator  CRITICALITY ignore  TYPE CE-mode-B-SupportIndicator    PRESENCE optional}|
    { ID id-DCN-ID                      CRITICALITY ignore  TYPE DCN-ID                        PRESENCE optional}|
    { ID id-Coverage-Level              CRITICALITY ignore  TYPE Coverage-Level            PRESENCE optional}|
    { ID id-UE-Application-Layer-Measurement-Capability     CRITICALITY ignore  TYPE UE-Application-Layer-Measurement-Capability
    PRESENCE optional}|
    { ID id-EDT-Session                 CRITICALITY ignore  TYPE EDT-Session                   PRESENCE optional}|
    { ID id-IAB-Node-Indication         CRITICALITY reject  TYPE IAB-Node-Indication           PRESENCE optional},
    ...
}


-- ************************************************************
--
-- UPLINK NAS TRANSPORT
--
-- ************************************************************

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

UplinkNASTransport-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-NAS-PDU                     CRITICALITY reject  TYPE NAS-PDU                       PRESENCE mandatory}|
    { ID id-EUTRAN-CGI                  CRITICALITY ignore  TYPE EUTRAN-CGI                    PRESENCE mandatory}|
    { ID id-TAI                         CRITICALITY ignore  TYPE TAI                           PRESENCE mandatory}|
    { ID id-GW-TransportLayerAddress    CRITICALITY ignore  TYPE TransportLayerAddress         PRESENCE optional}|
    { ID id-SIPTO-L-GW-TransportLayerAddress    CRITICALITY ignore  TYPE TransportLayerAddress  PRESENCE optional}|
    { ID id-LHN-ID                      CRITICALITY ignore  TYPE LHN-ID                        PRESENCE optional}|
    { ID id-PSCellInformation           CRITICALITY ignore  TYPE PSCellInformation             PRESENCE optional },
    ...
```

```
}
-- **************************************************************
--
-- NAS NON DELIVERY INDICATION
--
-- **************************************************************

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

NASNonDeliveryIndication-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID            PRESENCE mandatory  }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID            PRESENCE mandatory  }|
    { ID id-NAS-PDU                     CRITICALITY ignore  TYPE NAS-PDU                   PRESENCE mandatory  }|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                     PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- 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  TYPE MME-UE-S1AP-ID         PRESENCE optional}|
    { ID id-S1-Message              CRITICALITY reject  TYPE OCTET STRING           PRESENCE mandatory}|
    { ID id-MME-Group-ID            CRITICALITY reject  TYPE MME-Group-ID           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},
    ...
}


-- **************************************************************
--
-- NAS DELIVERY INDICATION
--
-- **************************************************************

NASDeliveryIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container { { NASDeliveryIndicationIEs} },
    ...
}

NASDeliveryIndicationIEs 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},
    ...
}

-- **************************************************************
--
-- RESET ELEMENTARY PROCEDURE
--
-- **************************************************************

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

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

ResetIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory  }|
    { ID id-ResetType                   CRITICALITY reject  TYPE ResetType                  PRESENCE mandatory  },
    ...
}

ResetType ::= CHOICE {
    s1-Interface                    ResetAll,
    partOfS1-Interface              UE-associatedLogicalS1-ConnectionListRes,
    ...
}



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

UE-associatedLogicalS1-ConnectionListRes ::= SEQUENCE (SIZE(1.. maxnoofIndividualS1ConnectionsToReset)) OF ProtocolIE-SingleContainer { { UE-
associatedLogicalS1-ConnectionItemRes } }

UE-associatedLogicalS1-ConnectionItemRes S1AP-PROTOCOL-IES ::= {
    { ID id-UE-associatedLogicalS1-ConnectionItem   CRITICALITY reject  TYPE UE-associatedLogicalS1-ConnectionItem  PRESENCE mandatory},
    ...
}


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

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

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

ResetAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-UE-associatedLogicalS1-ConnectionListResAck     CRITICALITY ignore  TYPE UE-associatedLogicalS1-ConnectionListResAck        PRESENCE
optional    }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional  },
    ...
}

UE-associatedLogicalS1-ConnectionListResAck ::= SEQUENCE (SIZE(1.. maxnoofIndividualS1ConnectionsToReset)) OF ProtocolIE-SingleContainer { { UE-
associatedLogicalS1-ConnectionItemResAck } }

UE-associatedLogicalS1-ConnectionItemResAck     S1AP-PROTOCOL-IES ::= {
    { ID id-UE-associatedLogicalS1-ConnectionItem    CRITICALITY ignore     TYPE UE-associatedLogicalS1-ConnectionItem   PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- ERROR INDICATION ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Error Indication
--
-- **************************************************************

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

ErrorIndicationIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY ignore  TYPE MME-UE-S1AP-ID             PRESENCE optional }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY ignore  TYPE ENB-UE-S1AP-ID             PRESENCE optional }|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE optional }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional }|
    { ID id-S-TMSI                      CRITICALITY ignore  TYPE S-TMSI                     PRESENCE optional },
    ...
}

-- **************************************************************
--
-- S1 SETUP ELEMENTARY PROCEDURE
--
-- **************************************************************
```

```
-- **************************************************************
--
-- S1 Setup Request
--
-- **************************************************************

S1SetupRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {S1SetupRequestIEs} },
    ...
}

S1SetupRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Global-ENB-ID               CRITICALITY reject  TYPE Global-ENB-ID             PRESENCE mandatory}|
    { ID id-eNBname                     CRITICALITY ignore  TYPE ENBname                   PRESENCE optional}|
    { ID id-SupportedTAs                CRITICALITY reject  TYPE SupportedTAs              PRESENCE mandatory}|
    { ID id-DefaultPagingDRX            CRITICALITY ignore  TYPE PagingDRX                 PRESENCE mandatory}|
    { ID id-CSG-IdList                  CRITICALITY reject  TYPE CSG-IdList                PRESENCE optional}|
    { ID id-UE-RetentionInformation     CRITICALITY ignore  TYPE UE-RetentionInformation   PRESENCE optional}|
    { ID id-NB-IoT-DefaultPagingDRX     CRITICALITY ignore  TYPE NB-IoT-DefaultPagingDRX   PRESENCE optional}|
    { ID id-ConnectedengNBList          CRITICALITY ignore  TYPE ConnectedengNBList        PRESENCE optional},
    ...
}

-- **************************************************************
--
-- S1 Setup Response
--
-- **************************************************************

S1SetupResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {S1SetupResponseIEs} },
    ...
}


S1SetupResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MMEname                     CRITICALITY ignore  TYPE MMEname                   PRESENCE optional}|
    { ID id-ServedGUMMEIs               CRITICALITY reject  TYPE ServedGUMMEIs             PRESENCE mandatory}|
    { ID id-RelativeMMECapacity         CRITICALITY ignore  TYPE RelativeMMECapacity       PRESENCE mandatory}|
    { ID id-MMERelaySupportIndicator    CRITICALITY ignore  TYPE MMERelaySupportIndicator  PRESENCE optional}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics    PRESENCE optional}|
    { ID id-UE-RetentionInformation     CRITICALITY ignore  TYPE UE-RetentionInformation   PRESENCE optional}|
    { ID id-ServedDCNs                  CRITICALITY ignore  TYPE ServedDCNs                PRESENCE optional}|
    { ID id-IAB-Supported               CRITICALITY ignore  TYPE IAB-Supported             PRESENCE optional},
    ...
}

-- **************************************************************
--
-- S1 Setup Failure
--
-- **************************************************************

S1SetupFailure ::= SEQUENCE {
```

```
    protocolIEs         ProtocolIE-Container       { {S1SetupFailureIEs} },
    ...
}

S1SetupFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                       PRESENCE mandatory   }|
    { ID id-TimeToWait                  CRITICALITY ignore  TYPE TimeToWait                  PRESENCE optional }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional },
    ...
}

-- **************************************************************
--
-- ENB CONFIGURATION UPDATE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- eNB Configuration Update
--
-- **************************************************************

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

ENBConfigurationUpdateIEs S1AP-PROTOCOL-IES ::= {
    { ID id-eNBname                     CRITICALITY ignore  TYPE ENBname                     PRESENCE optional}|
    { ID id-SupportedTAs                CRITICALITY reject  TYPE SupportedTAs                PRESENCE optional}|
    { ID id-CSG-IdList                  CRITICALITY reject  TYPE CSG-IdList                  PRESENCE optional}|
    { ID id-DefaultPagingDRX            CRITICALITY ignore  TYPE PagingDRX                   PRESENCE optional}|
    { ID id-NB-IoT-DefaultPagingDRX     CRITICALITY ignore  TYPE NB-IoT-DefaultPagingDRX     PRESENCE optional}|
    { ID id-ConnectedengNBToAddList     CRITICALITY ignore  TYPE ConnectedengNBList          PRESENCE optional}|
    { ID id-ConnectedengNBToRemoveList  CRITICALITY ignore  TYPE ConnectedengNBList          PRESENCE optional},
    ...
}

-- **************************************************************
--
-- eNB Configuration Update Acknowledge
--
-- **************************************************************

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


ENBConfigurationUpdateAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional  },
    ...
```

```
}

-- **************************************************************
--
-- eNB Configuration Update Failure
--
-- **************************************************************

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

ENBConfigurationUpdateFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory  }|
    { ID id-TimeToWait                  CRITICALITY ignore  TYPE TimeToWait                 PRESENCE optional}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional},
...
}


-- **************************************************************
--
-- MME CONFIGURATION UPDATE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- MME Configuration Update
--
-- **************************************************************

MMEConfigurationUpdate ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {MMEConfigurationUpdateIEs} },
    ...
}

MMEConfigurationUpdateIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MMEname                 CRITICALITY ignore  TYPE MMEname                PRESENCE optional  }|
    { ID id-ServedGUMMEIs           CRITICALITY reject  TYPE ServedGUMMEIs          PRESENCE optional  }|
    { ID id-RelativeMMECapacity     CRITICALITY reject  TYPE RelativeMMECapacity    PRESENCE optional  }|
    { ID id-ServedDCNs              CRITICALITY ignore  TYPE ServedDCNs             PRESENCE optional},
    ...
}

-- **************************************************************
--
-- MME Configuration Update Acknowledge
--
-- **************************************************************

MMEConfigurationUpdateAcknowledge ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {MMEConfigurationUpdateAcknowledgeIEs} },
```

```
    ...
}


MMEConfigurationUpdateAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- MME Configuration Update Failure
--
-- **************************************************************

MMEConfigurationUpdateFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {MMEConfigurationUpdateFailureIEs} },
    ...
}

MMEConfigurationUpdateFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory  }|
    { ID id-TimeToWait                  CRITICALITY ignore  TYPE TimeToWait                 PRESENCE optional}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional},
    ...
}

-- **************************************************************
--
-- DOWNLINK S1 CDMA2000 TUNNELLING ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Downlink S1 CDMA2000 Tunnelling
--
-- **************************************************************

DownlinkS1cdma2000tunnelling ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {DownlinkS1cdma2000tunnellingIEs} },
    ...
}

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            CRITICALITY ignore  TYPE Cdma2000HORequiredIndication    PRESENCE optional }|
    { ID id-cdma2000OneXSRVCCInfo                   CRITICALITY reject  TYPE Cdma2000OneXSRVCCInfo         PRESENCE optional }|
    { ID id-cdma2000OneXRAND                        CRITICALITY reject  TYPE Cdma2000OneXRAND              PRESENCE optional }|
    { ID id-cdma2000PDU                             CRITICALITY reject  TYPE Cdma2000PDU                   PRESENCE mandatory   }|
    { ID id-EUTRANRoundTripDelayEstimationInfo      CRITICALITY ignore  TYPE EUTRANRoundTripDelayEstimationInfo    PRESENCE optional },
    -- Extension for Release 9 to assist target HRPD access with the acquisition of the UE --
    ...
}


-- ********************************************************************
--
-- UE CAPABILITY INFO INDICATION ELEMENTARY PROCEDURE
--
-- ********************************************************************

-- ********************************************************************
--
-- UE Capability Info Indication
--
-- ********************************************************************

UECapabilityInfoIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { UECapabilityInfoIndicationIEs} },
    ...
}

UECapabilityInfoIndicationIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-UERadioCapability           CRITICALITY ignore  TYPE UERadioCapability             PRESENCE mandatory}|
    { ID id-UERadioCapabilityForPaging  CRITICALITY ignore  TYPE UERadioCapabilityForPaging     PRESENCE optional}|
```

```
    { ID id-UE-Application-Layer-Measurement-Capability     CRITICALITY ignore  TYPE UE-Application-Layer-Measurement-Capability
    PRESENCE optional}|
    { ID id-LTE-M-Indication               CRITICALITY ignore  TYPE LTE-M-Indication            PRESENCE optional}|
    { ID id-UERadioCapability-NR-Format CRITICALITY ignore  TYPE UERadioCapability             PRESENCE optional}|
    { ID id-UERadioCapabilityForPaging-NR-Format    CRITICALITY ignore  TYPE UERadioCapabilityForPaging         PRESENCE optional},
    ...
}

-- **************************************************************
--
-- eNB STATUS TRANSFER ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- eNB Status Transfer
--
-- **************************************************************

ENBStatusTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {ENBStatusTransferIEs} },
    ...
}

ENBStatusTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                          CRITICALITY reject  TYPE MME-UE-S1AP-ID                          PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID                          CRITICALITY reject  TYPE ENB-UE-S1AP-ID                          PRESENCE mandatory}|
    { ID id-eNB-StatusTransfer-TransparentContainer     CRITICALITY reject  TYPE ENB-StatusTransfer-TransparentContainer    PRESENCE mandatory},
    ...
}


-- **************************************************************
--
-- MME STATUS TRANSFER ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- MME Status Transfer
--
-- **************************************************************

MMEStatusTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {MMEStatusTransferIEs} },
    ...
}

MMEStatusTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                          CRITICALITY reject  TYPE MME-UE-S1AP-ID                          PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID                          CRITICALITY reject  TYPE ENB-UE-S1AP-ID                          PRESENCE mandatory}|
    { ID id-eNB-StatusTransfer-TransparentContainer     CRITICALITY reject  TYPE ENB-StatusTransfer-TransparentContainer    PRESENCE mandatory},
```

```
    ...
}


-- **************************************************************
--
-- TRACE ELEMENTARY PROCEDURES
--
-- **************************************************************
-- **************************************************************
--
-- Trace Start
--
-- **************************************************************

TraceStart ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {TraceStartIEs} },
    ...
}

TraceStartIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory  }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory  }|
    { ID id-TraceActivation             CRITICALITY ignore  TYPE TraceActivation            PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- Trace Failure Indication
--
-- **************************************************************

TraceFailureIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {TraceFailureIndicationIEs} },
    ...
}

TraceFailureIndicationIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory  }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory  }|
    { ID id-E-UTRAN-Trace-ID            CRITICALITY ignore  TYPE E-UTRAN-Trace-ID           PRESENCE mandatory  }|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- DEACTIVATE TRACE ELEMENTARY PROCEDURE
--
-- **************************************************************

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

```
-- Deactivate Trace
--
-- **************************************************************

DeactivateTrace ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { DeactivateTraceIEs} },
    ...
}

DeactivateTraceIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID      CRITICALITY reject  TYPE MME-UE-S1AP-ID     PRESENCE mandatory  }|
    { ID id-eNB-UE-S1AP-ID      CRITICALITY reject  TYPE ENB-UE-S1AP-ID     PRESENCE mandatory  }|
    { ID id-E-UTRAN-Trace-ID    CRITICALITY ignore  TYPE E-UTRAN-Trace-ID   PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- CELL TRAFFIC TRACE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Cell Traffic Trace
--
-- **************************************************************

CellTrafficTrace ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container    { { CellTrafficTraceIEs } },
    ...
}

CellTrafficTraceIEs S1AP-PROTOCOL-IES ::= {
    {ID id-MME-UE-S1AP-ID                   CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory }|
    {ID id-eNB-UE-S1AP-ID                   CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory }|
    {ID id-E-UTRAN-Trace-ID                 CRITICALITY ignore  TYPE E-UTRAN-Trace-ID           PRESENCE mandatory }|
    {ID id-EUTRAN-CGI                       CRITICALITY ignore  TYPE EUTRAN-CGI                 PRESENCE mandatory }|
    {ID id-TraceCollectionEntityIPAddress   CRITICALITY ignore  TYPE TransportLayerAddress      PRESENCE mandatory }|
    {ID id-PrivacyIndicator                 CRITICALITY ignore  TYPE PrivacyIndicator           PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- LOCATION ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- Location Reporting Control
--
-- **************************************************************
```

```
LocationReportingControl ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { LocationReportingControlIEs} },
    ...
}

LocationReportingControlIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID            PRESENCE mandatory }|
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID            PRESENCE mandatory }|
    { ID id-RequestType             CRITICALITY ignore  TYPE RequestType               PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- Location Report Failure Indication
--
-- **************************************************************

LocationReportingFailureIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { LocationReportingFailureIndicationIEs} },
    ...
}

LocationReportingFailureIndicationIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID            PRESENCE mandatory }|
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID            PRESENCE mandatory }|
    { ID id-Cause                   CRITICALITY ignore  TYPE Cause                     PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- Location Report
--
-- **************************************************************

LocationReport ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { LocationReportIEs} },
    ...
}

LocationReportIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID            PRESENCE mandatory }|
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID            PRESENCE mandatory }|
    { ID id-EUTRAN-CGI              CRITICALITY ignore  TYPE EUTRAN-CGI                PRESENCE mandatory }|
    { ID id-TAI                     CRITICALITY ignore  TYPE TAI                       PRESENCE mandatory }|
    { ID id-RequestType             CRITICALITY ignore  TYPE RequestType               PRESENCE mandatory }|
    { ID id-PSCellInformation       CRITICALITY ignore  TYPE PSCellInformation         PRESENCE optional },
    ...
}

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

```
-- OVERLOAD ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- Overload Start
--
-- **************************************************************

OverloadStart ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {OverloadStartIEs} },
    ...
}

OverloadStartIEs S1AP-PROTOCOL-IES ::= {
    { ID id-OverloadResponse                    CRITICALITY reject  TYPE OverloadResponse           PRESENCE mandatory   }|
    { ID id-GUMMEIList                          CRITICALITY ignore  TYPE GUMMEIList                 PRESENCE optional }|
    { ID id-TrafficLoadReductionIndication      CRITICALITY ignore  TYPE TrafficLoadReductionIndication PRESENCE optional },
    ...
}
-- **************************************************************
--
-- Overload Stop
--
-- **************************************************************

OverloadStop ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {OverloadStopIEs} },
    ...
}

OverloadStopIEs S1AP-PROTOCOL-IES ::= {
{ ID id-GUMMEIList                              CRITICALITY ignore  TYPE GUMMEIList                 PRESENCE optional },
    ...
}
-- **************************************************************
--
-- WRITE-REPLACE WARNING ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Write-Replace Warning Request
--
-- **************************************************************


WriteReplaceWarningRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {WriteReplaceWarningRequestIEs} },
    ...
}
```

```
WriteReplaceWarningRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MessageIdentifier                   CRITICALITY reject  TYPE MessageIdentifier              PRESENCE mandatory   }|
    { ID id-SerialNumber                        CRITICALITY reject  TYPE SerialNumber                   PRESENCE mandatory   }|
    { ID id-WarningAreaList                     CRITICALITY ignore  TYPE WarningAreaList                PRESENCE optional }|
    { ID id-RepetitionPeriod                    CRITICALITY reject  TYPE RepetitionPeriod               PRESENCE mandatory   }|
    { ID id-ExtendedRepetitionPeriod            CRITICALITY reject  TYPE ExtendedRepetitionPeriod        PRESENCE optional }|
    { ID id-NumberofBroadcastRequest            CRITICALITY reject  TYPE NumberofBroadcastRequest        PRESENCE mandatory   }|
    { ID id-WarningType                         CRITICALITY ignore  TYPE WarningType                    PRESENCE optional }|
    { ID id-WarningSecurityInfo                 CRITICALITY ignore  TYPE WarningSecurityInfo            PRESENCE optional }|
    { ID id-DataCodingScheme                    CRITICALITY ignore  TYPE DataCodingScheme               PRESENCE optional }|
    { ID id-WarningMessageContents              CRITICALITY ignore  TYPE WarningMessageContents         PRESENCE optional }|
    { ID id-ConcurrentWarningMessageIndicator   CRITICALITY reject  TYPE ConcurrentWarningMessageIndicator PRESENCE optional }|
    { ID id-WarningAreaCoordinates              CRITICALITY ignore  TYPE WarningAreaCoordinates          PRESENCE optional },
    ...
}
-- **************************************************************
--
-- Write-Replace Warning Response
--
-- **************************************************************

WriteReplaceWarningResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {WriteReplaceWarningResponseIEs} },
    ...
}

WriteReplaceWarningResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MessageIdentifier               CRITICALITY reject  TYPE MessageIdentifier              PRESENCE mandatory   }|
    { ID id-SerialNumber                    CRITICALITY reject  TYPE SerialNumber                   PRESENCE mandatory   }|
    { ID id-BroadcastCompletedAreaList      CRITICALITY ignore  TYPE BroadcastCompletedAreaList      PRESENCE optional }|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics          PRESENCE optional },
    ...
}

-- **************************************************************
--
-- eNB DIRECT INFORMATION TRANSFER ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- eNB Direct Information Transfer
--
-- **************************************************************

ENBDirectInformationTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       {{ ENBDirectInformationTransferIEs}},
    ...
}

ENBDirectInformationTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Inter-SystemInformationTransferTypeEDT  CRITICALITY reject  TYPE Inter-SystemInformationTransferType   PRESENCE mandatory   },
    ...
```

```
}

Inter-SystemInformationTransferType ::= CHOICE {
    rIMTransfer     RIMTransfer,
    ...
}

-- **************************************************************
--
-- MME DIRECT INFORMATION TRANSFER ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- MME Direct Information Transfer
--
-- **************************************************************

MMEDirectInformationTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       {{ MMEDirectInformationTransferIEs}},
    ...
}

MMEDirectInformationTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Inter-SystemInformationTransferTypeMDT  CRITICALITY reject  TYPE Inter-SystemInformationTransferType PRESENCE mandatory   },
    ...
}
-- **************************************************************
--
-- eNB CONFIGURATION TRANSFER ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- eNB Configuration Transfer
--
-- **************************************************************

ENBConfigurationTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       {{ ENBConfigurationTransferIEs}},
    ...
}

ENBConfigurationTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SONConfigurationTransferECT         CRITICALITY ignore  TYPE SONConfigurationTransfer       PRESENCE optional }|
    { ID id-EN-DCSONConfigurationTransfer-ECT   CRITICALITY ignore  TYPE EN-DCSONConfigurationTransfer  PRESENCE optional }|
    { ID id-IntersystemSONConfigurationTransferECT  CRITICALITY ignore  TYPE IntersystemSONConfigurationTransfer PRESENCE optional },
    ...
}

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

```
-- MME CONFIGURATION TRANSFER ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- MME Configuration Transfer
--
-- **************************************************************

MMEConfigurationTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       {{ MMEConfigurationTransferIEs}},
    ...
}

MMEConfigurationTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SONConfigurationTransferMCT         CRITICALITY ignore  TYPE SONConfigurationTransfer       PRESENCE optional }|
    { ID id-EN-DCSONConfigurationTransfer-MCT   CRITICALITY ignore  TYPE EN-DCSONConfigurationTransfer  PRESENCE optional }|
    { ID id-IntersystemSONConfigurationTransferMCT  CRITICALITY ignore  TYPE IntersystemSONConfigurationTransfer PRESENCE optional },
    ...
}

-- **************************************************************
--
-- PRIVATE MESSAGE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Private Message
--
-- **************************************************************

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

PrivateMessageIEs S1AP-PRIVATE-IES ::= {
    ...
}

-- **************************************************************
--
-- KILL PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Kill Request
--
-- **************************************************************
```

```
KillRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {KillRequestIEs} },
    ...
}

KillRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MessageIdentifier           CRITICALITY reject  TYPE MessageIdentifier      PRESENCE mandatory}|
    { ID id-SerialNumber                CRITICALITY reject  TYPE SerialNumber           PRESENCE mandatory}|
    { ID id-WarningAreaList             CRITICALITY ignore  TYPE WarningAreaList        PRESENCE optional}|
    { 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   }|
    { ID id-BroadcastCancelledAreaList  CRITICALITY ignore  TYPE BroadcastCancelledAreaList      PRESENCE optional }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics          PRESENCE optional },
    ...
}

-- **************************************************************
--
-- PWS RESTART INDICATION PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- PWS Restart Indication
--
-- **************************************************************

PWSRestartIndication::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       {{ PWSRestartIndicationIEs}},
    ...
}

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}|
    { ID id-EmergencyAreaIDListForRestart   CRITICALITY reject  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 {
    protocolIEs         ProtocolIE-Container       {{DownlinkUEAssociatedLPPaTransport-IEs}},
    ...
}

DownlinkUEAssociatedLPPaTransport-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory }|
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory }|
    { ID id-Routing-ID              CRITICALITY reject  TYPE Routing-ID                 PRESENCE mandatory }|
    { ID id-LPPa-PDU                CRITICALITY reject  TYPE LPPa-PDU                   PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- UPLINK UE ASSOCIATED LPPA TRANSPORT
--
-- **************************************************************

UplinkUEAssociatedLPPaTransport ::= SEQUENCE {
```

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

UplinkUEAssociatedLPPaTransport-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID            PRESENCE mandatory }|
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID            PRESENCE mandatory }|
    { ID id-Routing-ID              CRITICALITY reject  TYPE Routing-ID                PRESENCE mandatory }|
    { ID id-LPPa-PDU                CRITICALITY reject  TYPE LPPa-PDU                  PRESENCE mandatory },
    ...
}


-- **************************************************************
--
-- DOWNLINK NON UE ASSOCIATED LPPA TRANSPORT
--
-- **************************************************************

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

DownlinkNonUEAssociatedLPPaTransport-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-Routing-ID              CRITICALITY reject  TYPE Routing-ID                PRESENCE mandatory }|
    { ID id-LPPa-PDU                CRITICALITY reject  TYPE LPPa-PDU                  PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- UPLINK NON UE ASSOCIATED LPPA TRANSPORT
--
-- **************************************************************

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

UplinkNonUEAssociatedLPPaTransport-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-Routing-ID              CRITICALITY reject  TYPE Routing-ID                PRESENCE mandatory }|
    { ID id-LPPa-PDU                CRITICALITY reject  TYPE LPPa-PDU                  PRESENCE mandatory },
    ...
}


-- **************************************************************
--
-- E-RAB MODIFICATION INDICATION ELEMENTARY PROCEDURE
--
-- **************************************************************
```

```
-- ************************************************************
--
-- E-RAB Modification Indication
--
-- ************************************************************

E-RABModificationIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { E-RABModificationIndicationIEs} },
    ...
}

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}|
    { ID id-SecondaryRATDataUsageReportList         CRITICALITY ignore  TYPE SecondaryRATDataUsageReportList    PRESENCE optional }|
{ ID id-UserLocationInformation                 CRITICALITY ignore  TYPE UserLocationInformation       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,
    dL-GTP-TEID                     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 ::= {
    { ID id-E-RABNotToBeModifiedItemBearerModInd        CRITICALITY reject  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            PLMNidentity    OPTIONAL,
    iE-Extensions           ProtocolExtensionContainer { { CSGMembershipInfo-ExtIEs} }      OPTIONAL,
    ...
}

CSGMembershipInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- E-RAB Modification Confirm
--
-- **************************************************************

E-RABModificationConfirm ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container { {E-RABModificationConfirmIEs} },
    ...
}

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            CRITICALITY ignore  TYPE E-RABModifyListBearerModConf  PRESENCE optional}|
    { ID id-E-RABFailedToModifyListBearerModConf    CRITICALITY ignore  TYPE E-RABList                  PRESENCE optional}|
    { ID id-E-RABToBeReleasedListBearerModConf      CRITICALITY ignore  TYPE E-RABList                  PRESENCE optional}|
    { ID id-CriticalityDiagnostics                  CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional}|
    { ID id-CSGMembershipStatus                     CRITICALITY ignore  TYPE CSGMembershipStatus        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}|
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  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 ::= {
    { 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-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 {
    protocolIEs         ProtocolIE-Container       { { UEContextSuspendRequestIEs} },
    ...
}

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}|
    { ID id-SecondaryRATDataUsageReportList             CRITICALITY ignore  TYPE SecondaryRATDataUsageReportList    PRESENCE optional }|
    { ID id-UserLocationInformation                         CRITICALITY ignore  TYPE UserLocationInformation        PRESENCE optional }|
    { ID id-TimeSinceSecondaryNodeRelease                   CRITICALITY ignore  TYPE TimeSinceSecondaryNodeRelease  PRESENCE optional },
    ...
}

-- **************************************************************
--
-- UE Context Suspend Response
--
-- **************************************************************

UEContextSuspendResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container { {UEContextSuspendResponseIEs} },
    ...
}

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}|
    { ID id-SecurityContext             CRITICALITY reject  TYPE SecurityContext           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  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-RABFailedToResumeListResumeReq            CRITICALITY reject  TYPE E-RABFailedToResumeListResumeReq    PRESENCE optional}|
    { ID id-RRC-Resume-Cause                            CRITICALITY ignore  TYPE RRC-Establishment-Cause  PRESENCE optional},
    ...
}

E-RABFailedToResumeListResumeReq ::= E-RAB-IE-ContainerList { {E-RABFailedToResumeItemResumeReqIEs} }

E-RABFailedToResumeItemResumeReqIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABFailedToResumeItemResumeReq    CRITICALITY reject  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}|
    { ID id-SecurityContext                     CRITICALITY reject  TYPE SecurityContext                  PRESENCE optional}|
    { ID id-PendingDataIndication               CRITICALITY ignore  TYPE PendingDataIndication            PRESENCE optional},
    ...
```

```
}

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,
    iE-Extensions                   ProtocolExtensionContainer { { E-RABFailedToResumeItemResumeRes-ExtIEs} }     OPTIONAL,
    ...
}

E-RABFailedToResumeItemResumeRes-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- UE Context Resume Failure
--
-- **************************************************************

UEContextResumeFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { UEContextResumeFailureIEs} },
    ...
}

UEContextResumeFailureIEs 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},
    ...
}

-- **************************************************************
--
-- Connection Establishment Indication
--
-- **************************************************************

ConnectionEstablishmentIndication::= SEQUENCE {
    protocolIEs         ProtocolIE-Container { {ConnectionEstablishmentIndicationIEs} },
    ...
}

ConnectionEstablishmentIndicationIEs 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-UERadioCapability           CRITICALITY ignore  TYPE UERadioCapability          PRESENCE optional }|
```

```
    { ID id-EnhancedCoverageRestricted  CRITICALITY ignore  TYPE EnhancedCoverageRestricted PRESENCE optional }|
    { ID id-DL-CP-SecurityInformation   CRITICALITY ignore  TYPE DL-CP-SecurityInformation  PRESENCE optional }|
    { ID id-CE-ModeBRestricted          CRITICALITY ignore  TYPE CE-ModeBRestricted         PRESENCE optional}|
    { ID id-EndIndication               CRITICALITY ignore  TYPE EndIndication              PRESENCE optional}|
    { ID id-Subscription-Based-UE-DifferentiationInfo       CRITICALITY ignore  TYPE Subscription-Based-UE-DifferentiationInfo    PRESENCE
optional}|
    { ID id-UE-Level-QoS-Parameters     CRITICALITY ignore  TYPE E-RABLevelQoSParameters    PRESENCE optional}|
    { ID id-UERadioCapabilityID         CRITICALITY reject  TYPE UERadioCapabilityID        PRESENCE optional}
,
    ...
}

-- **************************************************************
--
-- Retrieve UE Information
--
-- **************************************************************

RetrieveUEInformation ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { RetrieveUEInformationIEs} },
    ...
}

RetrieveUEInformationIEs S1AP-PROTOCOL-IES ::= {
  { ID id-S-TMSI                    CRITICALITY reject  TYPE S-TMSI             PRESENCE mandatory},
...

}


-- **************************************************************

-- UE Information Transfer
--
-- **************************************************************
UEInformationTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {  UEInformationTransferIEs} },
    ...
}

UEInformationTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-S-TMSI                      CRITICALITY reject  TYPE S-TMSI                     PRESENCE mandatory}|
    { ID id-UE-Level-QoS-Parameters     CRITICALITY ignore  TYPE E-RABLevelQoSParameters    PRESENCE optional}|
    { ID id-UERadioCapability           CRITICALITY ignore  TYPE UERadioCapability          PRESENCE optional}|
    { ID id-Subscription-Based-UE-DifferentiationInfo       CRITICALITY ignore  TYPE Subscription-Based-UE-DifferentiationInfo    PRESENCE
optional}|
    { ID id-PendingDataIndication       CRITICALITY ignore  TYPE PendingDataIndication      PRESENCE optional},
    ...
}


-- **************************************************************
--
-- eNB CP Relocation Indication
```

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

ENBCPRelocationIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container { { ENBCPRelocationIndicationIEs} },
    ...
}

ENBCPRelocationIndicationIEs S1AP-PROTOCOL-IES ::= {
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory}|
    { ID id-S-TMSI                      CRITICALITY reject  TYPE S-TMSI                     PRESENCE mandatory}|
    { ID id-EUTRAN-CGI                  CRITICALITY ignore  TYPE EUTRAN-CGI                 PRESENCE mandatory}|
    { ID id-TAI                         CRITICALITY ignore  TYPE TAI                        PRESENCE mandatory}|
    { ID id-UL-CP-SecurityInformation   CRITICALITY reject  TYPE UL-CP-SecurityInformation  PRESENCE mandatory},
    ...
}


-- **************************************************************
--
-- MME CP Relocation Indication
--
-- **************************************************************

MMECPRelocationIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container { { MMECPRelocationIndicationIEs} },
    ...
}

MMECPRelocationIndicationIEs 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},
    ...
}


-- **************************************************************
--
-- Secondary RAT Data Usage Report
--
-- **************************************************************

SecondaryRATDataUsageReport ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { SecondaryRATDataUsageReportIEs} },
    ...
}

SecondaryRATDataUsageReportIEs 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-SecondaryRATDataUsageReportList         CRITICALITY ignore  TYPE SecondaryRATDataUsageReportList  PRESENCE mandatory}|
    { ID id-HandoverFlag                            CRITICALITY ignore  TYPE HandoverFlag               PRESENCE optional}|
    { ID id-UserLocationInformation             CRITICALITY ignore  TYPE UserLocationInformation       PRESENCE optional}|
    { ID id-TimeSinceSecondaryNodeRelease       CRITICALITY ignore  TYPE TimeSinceSecondaryNodeRelease  PRESENCE optional },
```

```
    ...
}


-- **************************************************************
--
-- UE RADIO CAPABILITY ID MAPPING PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- UE Radio Capability ID Mapping Request
--
-- **************************************************************

UERadioCapabilityIDMappingRequest::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { UERadioCapabilityIDMappingRequestIEs} },
    ...
}

UERadioCapabilityIDMappingRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-UERadioCapabilityID     CRITICALITY reject  TYPE UERadioCapabilityID        PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- UE Radio Capability ID Mapping Response
--
-- **************************************************************

UERadioCapabilityIDMappingResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { { UERadioCapabilityIDMappingResponseIEs} },
    ...
}

UERadioCapabilityIDMappingResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-UERadioCapabilityID             CRITICALITY reject  TYPE UERadioCapabilityID            PRESENCE mandatory   }|
    { ID id-UERadioCapability                   CRITICALITY ignore  TYPE UERadioCapability          PRESENCE mandatory   }|
    { ID id-CriticalityDiagnostics              CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional },
    ...
}

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-GUMMEIType,
    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-NRrestrictioninEPSasSecondaryRAT,
    id-NRrestrictionin5GS,
    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,
    id-extended-e-RAB-MaximumBitrateDL,
    id-extended-e-RAB-MaximumBitrateUL,
    id-extended-e-RAB-GuaranteedBitrateDL,
    id-extended-e-RAB-GuaranteedBitrateUL,
    id-extended-uEaggregateMaximumBitRateDL,
    id-extended-uEaggregateMaximumBitRateUL,
    id-SecondaryRATDataUsageReportItem,
    id-E-RABUsageReportItem,
    id-UEAppLayerMeasConfig,
    id-serviceType,
    id-UnlicensedSpectrumRestriction,
    id-CNTypeRestrictions,
    id-DownlinkPacketLossRate,
    id-UplinkPacketLossRate,
    id-BluetoothMeasurementConfiguration,
    id-WLANMeasurementConfiguration,
    id-LastNG-RANPLMNIdentity,
    id-PSCellInformation,
    id-IMSvoiceEPSfallbackfrom5G,
    id-RequestTypeAdditionalInfo,
    id-AdditionalRRMPriorityIndex,
    id-ContextatSource,
    id-IntersystemMeasurementConfiguration,
    id-SourceNodeID,
    id-NB-IoT-RLF-Report-Container,
    id-MDTConfigurationNR,
    id-DAPSRequestInfo,
    id-DAPSResponseInfoList,
    id-DAPSResponseInfoItem,
    id-Bearers-SubjectToEarlyStatusTransfer-Item,
    id-TraceCollectionEntityURI,
    id-EmergencyIndicator,
    id-SourceTransportLayerAddress,
    id-SourceNodeTransportLayerAddress,
    id-SourceSNID,
    id-Direct-Forwarding-Path-Availability,
    maxnoofCSGs,
    maxnoofE-RABs,
    maxnoofErrors,
    maxnoofBPLMNs,
    maxnoofPLMNsPerMME,
    maxnoofTACs,
    maxnoofEPLMNs,
    maxnoofEPLMNsPlusOne,
    maxnoofForbLACs,
    maxnoofForbTACs,
    maxnoofCellsinUEHistoryInfo,
    maxnoofCellID,
    maxnoofDCNs,
    maxnoofEmergencyAreaID,
    maxnoofTAIforWarning,
    maxnoofCellinTAI,
    maxnoofCellinEAI,
```

```
    maxnoofeNBX2TLAs,
    maxnoofeNBX2ExtTLAs,
    maxnoofeNBX2GTPTLAs,
    maxnoofRATs,
    maxnoofGroupIDs,
    maxnoofMMECs,
    maxnoofTAforMDT,
    maxnoofCellIDforMDT,
    maxnoofMDTPLMNs,
    maxnoofCellsforRestart,
    maxnoofRestartTAIs,
    maxnoofRestartEmergencyAreaIDs,
    maxnoofMBSFNAreaMDT,
    maxEARFCN,
    maxnoofCellsineNB,
    maxnoofRecommendedCells,
    maxnoofRecommendedENBs,
    maxnooftimeperiods,
    maxnoofCellIDforQMC,
    maxnoofTAforQMC,
    maxnoofPLMNforQMC,
    maxnoofBluetoothName,
    maxnoofWLANName,
    maxnoofConnectedengNBs,
    maxnoofPC5QoSFlows,
    maxnooffrequencies,
    maxNARFCN,
    maxRS-IndexCellQual



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 ::= {
    ...
}

AdditionalRRMPriorityIndex ::= BIT STRING (SIZE(32))

AerialUEsubscriptionInformation ::= ENUMERATED {
    allowed,
    not-allowed,
    ...
}

AreaScopeOfMDT ::= CHOICE {
    cellBased                   CellBasedMDT,
    tABased                     TABasedMDT,
    pLMNWide                    NULL,
    ...,
    tAIBased                    TAIBasedMDT
}


AreaScopeOfQMC ::= CHOICE {
    cellBased                   CellBasedQMC,
    tABased                     TABasedQMC,
    tAIBased                        TAIBasedQMC,
    pLMNAreaBased               PLMNAreaBasedQMC,
    ...
}

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 {
    cellIdentifierAndCELevelForCECapableUEs     CellIdentifierAndCELevelForCECapableUEs,
    iE-Extensions                               ProtocolExtensionContainer { { InformationForCECapableUEs-ExtIEs} } OPTIONAL,
    ...
}

InformationForCECapableUEs-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

AssistanceDataForPaging ::= SEQUENCE {
```

```
    assistanceDataForRecommendedCells   AssistanceDataForRecommendedCells       OPTIONAL,
    assistanceDataForCECapableUEs       AssistanceDataForCECapableUEs           OPTIONAL,
    pagingAttemptInformation            PagingAttemptInformation                OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { AssistanceDataForPaging-ExtIEs} }   OPTIONAL,
    ...
}

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,
    dL-COUNTvalue                       COUNTvalue,
    receiveStatusofULPDCPSDUs           ReceiveStatusofULPDCPSDUs           OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { {Bearers-SubjectToStatusTransfer-ItemExtIEs} } OPTIONAL,
    ...
}

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},
    ...
}

Bearers-SubjectToEarlyStatusTransferList ::= SEQUENCE (SIZE(1.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { { Bearers-
SubjectToEarlyStatusTransfer-ItemIEs } }

Bearers-SubjectToEarlyStatusTransfer-ItemIEs S1AP-PROTOCOL-IES ::= {
```

```
    { ID id-Bearers-SubjectToEarlyStatusTransfer-Item   CRITICALITY ignore  TYPE Bearers-SubjectToEarlyStatusTransfer-Item  PRESENCE mandatory},
    ...
}

Bearers-SubjectToEarlyStatusTransfer-Item ::= SEQUENCE {
    e-RAB-ID                                E-RAB-ID,
    dLCOUNT-PDCP-SNlength                   DLCOUNT-PDCP-SNlength,
    iE-Extensions                           ProtocolExtensionContainer { {Bearers-SubjectToEarlyStatusTransfer-ItemExtIEs} } OPTIONAL,
    ...
}

Bearers-SubjectToEarlyStatusTransfer-ItemExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

BearerType ::= ENUMERATED {
    non-IP,
    ...
}

BitRate ::= INTEGER (0..10000000000)

BluetoothMeasurementConfiguration ::= SEQUENCE {
    bluetoothMeasConfig             BluetoothMeasConfig,
    bluetoothMeasConfigNameList     BluetoothMeasConfigNameList     OPTIONAL,
    bt-rssi                         ENUMERATED {true, ...}          OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { { BluetoothMeasurementConfiguration-ExtIEs } } OPTIONAL,
    ...
}

BluetoothMeasurementConfiguration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

BluetoothMeasConfigNameList ::= SEQUENCE (SIZE(1..maxnoofBluetoothName)) OF BluetoothName

BluetoothMeasConfig::= ENUMERATED {setup,...}

BluetoothName ::= OCTET STRING (SIZE (1..248))

BPLMNs ::= SEQUENCE (SIZE(1.. maxnoofBPLMNs)) OF PLMNidentity

BroadcastCancelledAreaList ::= CHOICE {
    cellID-Cancelled                CellID-Cancelled,
    tAI-Cancelled                   TAI-Cancelled,
    emergencyAreaID-Cancelled       EmergencyAreaID-Cancelled,
    ...
}

BroadcastCompletedAreaList ::= CHOICE {
    cellID-Broadcast                CellID-Broadcast,
    tAI-Broadcast                   TAI-Broadcast,
    emergencyAreaID-Broadcast       EmergencyAreaID-Broadcast,
    ...
```

```
}


-- C

CancelledCellinEAI ::= SEQUENCE (SIZE(1..maxnoofCellinEAI)) OF CancelledCellinEAI-Item

CancelledCellinEAI-Item ::= SEQUENCE {
    eCGI                    EUTRAN-CGI,
    numberOfBroadcasts      NumberOfBroadcasts,
    iE-Extensions           ProtocolExtensionContainer { {CancelledCellinEAI-Item-ExtIEs} } OPTIONAL,
    ...
}

CancelledCellinEAI-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CancelledCellinTAI ::= SEQUENCE (SIZE(1..maxnoofCellinTAI)) OF CancelledCellinTAI-Item

CancelledCellinTAI-Item ::= SEQUENCE{
    eCGI                EUTRAN-CGI,
    numberOfBroadcasts  NumberOfBroadcasts,
    iE-Extensions       ProtocolExtensionContainer { {CancelledCellinTAI-Item-ExtIEs} } OPTIONAL,
    ...
}

CancelledCellinTAI-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

CauseMisc ::= ENUMERATED {
    control-processing-overload,
    not-enough-user-plane-processing-resources,
    hardware-failure,
    om-intervention,
    unspecified,
    unknown-PLMN,
...
}

CauseProtocol ::= ENUMERATED {
    transfer-syntax-error,
    abstract-syntax-error-reject,
    abstract-syntax-error-ignore-and-notify,
```

```
    message-not-compatible-with-receiver-state,
    semantic-error,
    abstract-syntax-error-falsely-constructed-message,
    unspecified,
    ...
}

CauseRadioNetwork ::= ENUMERATED {
    unspecified,
    tx2relocoverall-expiry,
    successful-handover,
    release-due-to-eutran-generated-reason,
    handover-cancelled,
    partial-handover,
    ho-failure-in-target-EPC-eNB-or-target-system,
    ho-target-not-allowed,
    tS1relocoverall-expiry,
    tS1relocprep-expiry,
    cell-not-available,
    unknown-targetID,
    no-radio-resources-available-in-target-cell,
    unknown-mme-ue-s1ap-id,
    unknown-enb-ue-s1ap-id,
    unknown-pair-ue-s1ap-id,
    handover-desirable-for-radio-reason,
    time-critical-handover,
    resource-optimisation-handover,
    reduce-load-in-serving-cell,
    user-inactivity,
    radio-connection-with-ue-lost,
    load-balancing-tau-required,
    cs-fallback-triggered,
    ue-not-available-for-ps-service,
    radio-resources-not-available,
    failure-in-radio-interface-procedure,
    invalid-qos-combination,
    interrat-redirection,
    interaction-with-other-procedure,
    unknown-E-RAB-ID,
    multiple-E-RAB-ID-instances,
    encryption-and-or-integrity-protection-algorithms-not-supported,
    s1-intra-system-handover-triggered,
    s1-inter-system-handover-triggered,
    x2-handover-triggered,
    ...,
    redirection-towards-1xRTT,
    not-supported-QCI-value,
    invalid-CSG-Id,
    release-due-to-pre-emption,
    n26-interface-not-available,
    insufficient-ue-capabilities,
    maximum-bearer-pre-emption-rate-exceeded

}
```

```
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,
    ...
}

CellIdentifierAndCELevelForCECapableUEs-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- 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,
    iE-Extensions       ProtocolExtensionContainer { {CellID-Broadcast-Item-ExtIEs} } OPTIONAL,
    ...
}

CellID-Broadcast-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
CellID-Cancelled::= SEQUENCE (SIZE(1..maxnoofCellID)) OF CellID-Cancelled-Item

CellID-Cancelled-Item ::= SEQUENCE {
    eCGI                EUTRAN-CGI,
    numberOfBroadcasts  NumberOfBroadcasts,
    iE-Extensions       ProtocolExtensionContainer { {CellID-Cancelled-Item-ExtIEs} } OPTIONAL,
    ...
}

CellID-Cancelled-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CellBasedMDT::= SEQUENCE {
    cellIdListforMDT    CellIdListforMDT,
    iE-Extensions       ProtocolExtensionContainer { {CellBasedMDT-ExtIEs} } OPTIONAL,
    ...
}

CellBasedMDT-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CellIdListforMDT ::= SEQUENCE (SIZE(1..maxnoofCellIDforMDT)) OF EUTRAN-CGI

CellBasedQMC::= SEQUENCE {
    cellIdListforQMC        CellIdListforQMC,
    iE-Extensions       ProtocolExtensionContainer { {CellBasedQMC-ExtIEs} } OPTIONAL,
    ...
}

CellBasedQMC-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CellIdListforQMC ::= SEQUENCE (SIZE(1..maxnoofCellIDforQMC)) OF EUTRAN-CGI

Cdma2000PDU ::= OCTET STRING

Cdma2000RATType ::= ENUMERATED {
    hRPD,
    onexRTT,
    ...
}

Cdma2000SectorID ::= OCTET STRING

Cdma2000HOStatus ::= ENUMERATED {
    hOSuccess,
    hOFailure,
    ...
}

Cdma2000HORequiredIndication ::= ENUMERATED {
```

```
    true,
    ...
}

Cdma2000OneXSRVCCInfo ::= SEQUENCE {
    cdma2000OneXMEID            Cdma2000OneXMEID,
    cdma2000OneXMSI             Cdma2000OneXMSI,
    cdma2000OneXPilot           Cdma2000OneXPilot,
    iE-Extensions               ProtocolExtensionContainer { {Cdma2000OneXSRVCCInfo-ExtIEs} } OPTIONAL,
    ...
}

Cdma2000OneXSRVCCInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

Cdma2000OneXMEID ::= OCTET STRING

Cdma2000OneXMSI ::= OCTET STRING

Cdma2000OneXPilot ::= OCTET STRING

Cdma2000OneXRAND ::= OCTET STRING


Cell-Size ::= ENUMERATED {verysmall, small, medium, large, ...}

CellType ::= SEQUENCE {
    cell-Size               Cell-Size,
    iE-Extensions           ProtocolExtensionContainer { { CellType-ExtIEs}}    OPTIONAL,
    ...
}

CellType-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CGI ::= SEQUENCE {
    pLMNidentity    PLMNidentity,
    lAC             LAC,
    cI              CI,
    rAC             RAC                                             OPTIONAL,
    iE-Extensions   ProtocolExtensionContainer { {CGI-ExtIEs} }     OPTIONAL,
    ...
    }

CGI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

CNDomain ::= ENUMERATED {
    ps,
```

```
    cs
}

CNTypeRestrictions::= SEQUENCE (SIZE(1.. maxnoofEPLMNsPlusOne)) OF CNTypeRestrictions-Item

CNTypeRestrictions-Item ::= SEQUENCE {
    pLMN-Identity       PLMNidentity,
    cNType              CNType,
    iE-Extensions       ProtocolExtensionContainer { { CNTypeRestrictions-Item-ExtIEs} } OPTIONAL,
    ...
}

CNTypeRestrictions-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CNType ::= ENUMERATED {
    fiveGCForbidden,
    ...,
    epc-Forbiddden
}

ConcurrentWarningMessageIndicator ::= ENUMERATED {
    true
}

ConnectedengNBList ::= SEQUENCE (SIZE(1..maxnoofConnectedengNBs)) OF ConnectedengNBItem

ConnectedengNBItem ::= SEQUENCE {
    en-gNB-ID       En-gNB-ID,
    supportedTAs    SupportedTAs,
    iE-Extensions   ProtocolExtensionContainer { {ConnectedengNBItem-ExtIEs} }  OPTIONAL,
    ...
}

ConnectedengNBItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ContextatSource ::= SEQUENCE {
    sourceNG-RAN-node-ID                Global-RAN-NODE-ID,
    rAN-UE-NGAP-ID                      RAN-UE-NGAP-ID,
    iE-Extensions       ProtocolExtensionContainer { {ContextatSource-ExtIEs} } OPTIONAL,
    ...
}

ContextatSource-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

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,
    ...
}

COUNTvaluePDCP-SNlength18-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

Coverage-Level ::= ENUMERATED {
    extendedcoverage,
    ...
}

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

CriticalityDiagnostics-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CriticalityDiagnostics-IE-List ::= SEQUENCE (SIZE (1.. maxnoofErrors)) OF CriticalityDiagnostics-IE-Item

CriticalityDiagnostics-IE-Item ::= SEQUENCE {
    iECriticality           Criticality,
    iE-ID                   ProtocolIE-ID,
    typeOfError             TypeOfError,
    iE-Extensions           ProtocolExtensionContainer {{CriticalityDiagnostics-IE-Item-ExtIEs}}  OPTIONAL,
    ...
}

CriticalityDiagnostics-IE-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


-- D

DAPSRequestInfo ::= SEQUENCE {
    dAPSIndicator               ENUMERATED {dAPS-HO-required, ...},
    iE-Extensions               ProtocolExtensionContainer { {DAPSRequestInfo-ExtIEs} } OPTIONAL,
    ...
}

DAPSRequestInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
DAPSResponseInfoList ::= SEQUENCE (SIZE(1.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { { DAPSResponseInfoListIEs } }

DAPSResponseInfoListIEs S1AP-PROTOCOL-IES ::= {
    { ID id-DAPSResponseInfoItem        CRITICALITY ignore  TYPE DAPSResponseInfoItem   PRESENCE mandatory},
    ...
}

DAPSResponseInfoItem ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    dAPSResponseInfo                DAPSResponseInfo,
    iE-Extensions                   ProtocolExtensionContainer { {DAPSResponseInfoItem-ExtIEs} }       OPTIONAL,
    ...
}

DAPSResponseInfoItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


DAPSResponseInfo ::= SEQUENCE {
    dapsresponseindicator       ENUMERATED {dAPS-HO-accepted,dAPS-HO-not-accepted,...},
    iE-Extensions               ProtocolExtensionContainer { { DAPSResponseInfo-ExtIEs} } OPTIONAL,
    ...
}

DAPSResponseInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

DataCodingScheme ::= BIT STRING (SIZE (8))

DataSize ::= INTEGER(1..4095, ...)

DCN-ID ::= INTEGER (0..65535)

ServedDCNs ::= SEQUENCE (SIZE(0..maxnoofDCNs)) OF ServedDCNsItem

ServedDCNsItem ::= SEQUENCE {
    dCN-ID                      DCN-ID,
    relativeDCNCapacity         RelativeMMECapacity,
    iE-Extensions           ProtocolExtensionContainer { {ServedDCNsItem-ExtIEs} }  OPTIONAL,
    ...
}

ServedDCNsItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

DL-CP-SecurityInformation ::= SEQUENCE {
    dl-NAS-MAC              DL-NAS-MAC,
    iE-Extensions           ProtocolExtensionContainer { { DL-CP-SecurityInformation-ExtIEs} }  OPTIONAL,
    ...
}
```

```
DL-CP-SecurityInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

DL-Forwarding ::= ENUMERATED {
    dL-Forwarding-proposed,
    ...
}

DL-NAS-MAC ::= BIT STRING (SIZE (16))

DLCOUNT-PDCP-SNlength ::= CHOICE {
    dLCOUNTValuePDCP-SNlength12                     COUNTvalue,
    dLCOUNTValuePDCP-SNlength15                     COUNTValueExtended,
    dLCOUNTValuePDCP-SNlength18                     COUNTvaluePDCP-SNlength18,
    ...
}

Direct-Forwarding-Path-Availability ::= ENUMERATED {
    directPathAvailable,
    ...
}

Data-Forwarding-Not-Possible ::= ENUMERATED {
    data-Forwarding-not-Possible,
    ...
}

DLNASPDUDeliveryAckRequest ::= ENUMERATED {
    requested,
    ...
}

-- E

EARFCN ::= INTEGER(0..maxEARFCN, ...)

ECGIList ::= SEQUENCE (SIZE(1..maxnoofCellID)) OF EUTRAN-CGI

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

EDT-Session ::= ENUMERATED {
    true,
    ...
}

EmergencyAreaIDList ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaID

EmergencyAreaID ::= OCTET STRING (SIZE (3))

EmergencyAreaID-Broadcast ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaID-Broadcast-Item

EmergencyAreaID-Broadcast-Item ::= SEQUENCE {
    emergencyAreaID         EmergencyAreaID,
```

```
    completedCellinEAI      CompletedCellinEAI,
    iE-Extensions           ProtocolExtensionContainer { {EmergencyAreaID-Broadcast-Item-ExtIEs} }   OPTIONAL,
    ...
}

EmergencyAreaID-Broadcast-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

EmergencyAreaID-Cancelled ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaID-Cancelled-Item

EmergencyAreaID-Cancelled-Item ::= SEQUENCE {
    emergencyAreaID         EmergencyAreaID,
    cancelledCellinEAI      CancelledCellinEAI,
    iE-Extensions           ProtocolExtensionContainer { {EmergencyAreaID-Cancelled-Item-ExtIEs} }   OPTIONAL,
    ...
}

EmergencyAreaID-Cancelled-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CompletedCellinEAI ::= SEQUENCE (SIZE(1..maxnoofCellinEAI)) OF CompletedCellinEAI-Item

CompletedCellinEAI-Item ::= SEQUENCE {
    eCGI                    EUTRAN-CGI,
    iE-Extensions           ProtocolExtensionContainer { {CompletedCellinEAI-Item-ExtIEs} } OPTIONAL,
    ...
}

CompletedCellinEAI-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

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

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

ENB-EarlyStatusTransfer-TransparentContainer ::= SEQUENCE {
    bearers-SubjectToEarlyStatusTransferList        Bearers-SubjectToEarlyStatusTransferList,
    iE-Extensions                                   ProtocolExtensionContainer { {ENB-EarlyStatusTransfer-TransparentContainer-ExtIEs} }OPTIONAL,
    ...
}

ENB-EarlyStatusTransfer-TransparentContainer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ENB-ID ::= CHOICE {
```

```
    macroENB-ID         BIT STRING (SIZE(20)),
    homeENB-ID          BIT STRING (SIZE(28)),
    ... ,
    short-macroENB-ID   BIT STRING (SIZE(18)),
    long-macroENB-ID        BIT STRING (SIZE(21))
}

En-gNB-ID ::= BIT STRING (SIZE(22..32, ...))

GERAN-Cell-ID ::= SEQUENCE {
    lAI             LAI,
    rAC             RAC,
    cI              CI,
    iE-Extensions           ProtocolExtensionContainer { { GERAN-Cell-ID-ExtIEs} }  OPTIONAL,
    ...
}

GERAN-Cell-ID-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

Global-ENB-ID ::= SEQUENCE {
    pLMNidentity            PLMNidentity,
    eNB-ID                  ENB-ID,
    iE-Extensions           ProtocolExtensionContainer { {GlobalENB-ID-ExtIEs} }        OPTIONAL,
    ...
}

GlobalENB-ID-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

Global-en-gNB-ID ::= SEQUENCE {
    pLMNidentity            PLMNidentity,
    en-gNB-ID               En-gNB-ID,
    iE-Extensions           ProtocolExtensionContainer { {Global-en-gNB-ID-ExtIEs} }        OPTIONAL,
    ...
}

Global-en-gNB-ID-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

GUMMEIList::= SEQUENCE (SIZE (1.. maxnoofMMECs)) OF GUMMEI

ENB-StatusTransfer-TransparentContainer     ::= SEQUENCE {
    bearers-SubjectToStatusTransferList     Bearers-SubjectToStatusTransferList,
    iE-Extensions           ProtocolExtensionContainer { {ENB-StatusTransfer-TransparentContainer-ExtIEs} }  OPTIONAL,
    ...
}

ENB-StatusTransfer-TransparentContainer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
ENB-UE-S1AP-ID              ::= INTEGER (0..16777215)

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

ENBX2TLAs ::= SEQUENCE (SIZE(1.. maxnoofeNBX2TLAs)) OF TransportLayerAddress

EncryptionAlgorithms ::= BIT STRING (SIZE (16,...))

EN-DCSONConfigurationTransfer ::= SEQUENCE {
    transfertype                EN-DCSONTransferType,
    sONInformation                  SONInformation,
    x2TNLConfigInfo                 X2TNLConfigurationInfo  OPTIONAL,
    -- 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” --
    iE-Extensions           ProtocolExtensionContainer { {EN-DCSONConfigurationTransfer-ExtIEs} }      OPTIONAL,
...
}

EN-DCSONConfigurationTransfer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

EN-DCSONTransferType ::= CHOICE {
    request             EN-DCTransferTypeRequest,
    reply               EN-DCTransferTypeReply,
    ...
}

EN-DCTransferTypeRequest ::= SEQUENCE {
    sourceeNB               EN-DCSONeNBIdentification,
    targetengNB             EN-DCSONengNBIdentification,
    targeteNB               EN-DCSONeNBIdentification                                       OPTIONAL,
    associatedTAI           TAI                                                             OPTIONAL,
    broadcast5GSTAI         FiveGSTAI                                                       OPTIONAL,
    iE-Extensions           ProtocolExtensionContainer { {EN-DCTransferTypeRequest-ExtIEs} }        OPTIONAL,
...
}

EN-DCTransferTypeRequest-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

EN-DCTransferTypeReply ::= SEQUENCE {
    sourceengNB             EN-DCSONengNBIdentification,
    targeteNB               EN-DCSONeNBIdentification,
    iE-Extensions           ProtocolExtensionContainer { {EN-DCTransferTypeReply-ExtIEs} }       OPTIONAL,
...
}

EN-DCTransferTypeReply-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
EN-DCSONeNBIdentification ::= SEQUENCE {
    globaleNBID             Global-ENB-ID,
    selectedTAI             TAI,
    iE-Extensions           ProtocolExtensionContainer { {EN-DCSONeNBIdentification-ExtIEs} }       OPTIONAL,
...
}

EN-DCSONeNBIdentification-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

EN-DCSONengNBIdentification ::= SEQUENCE {
    globalengNBID           Global-en-gNB-ID,
    selectedTAI             TAI,
    iE-Extensions           ProtocolExtensionContainer { {EN-DCSONengNBIdentification-ExtIEs} }     OPTIONAL,
...
}

EN-DCSONengNBIdentification-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

EndIndication ::= ENUMERATED {
    no-further-data,
    further-data-exists,
    ...
}

EnhancedCoverageRestricted ::= ENUMERATED {
    restricted,
    ...
}

CE-ModeBRestricted ::= ENUMERATED {
    restricted,
    not-restricted,
    ...
}

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 ::= {
    { ID id-DAPSRequestInfo                     CRITICALITY ignore  EXTENSION DAPSRequestInfo               PRESENCE optional }|
    { ID id-SourceTransportLayerAddress         CRITICALITY ignore  EXTENSION TransportLayerAddress         PRESENCE optional}|
    { ID id-SourceNodeTransportLayerAddress     CRITICALITY ignore  EXTENSION TransportLayerAddress         PRESENCE optional},
    ...
}

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,
    iE-Extensions                       ProtocolExtensionContainer { {E-RABQoSParameters-ExtIEs} }   OPTIONAL,
    ...
}

E-RABUsageReportList ::= SEQUENCE (SIZE(1..maxnooftimeperiods)) OF ProtocolIE-SingleContainer { {E-RABUsageReportItemIEs} }

E-RABUsageReportItemIEs     S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABUsageReportItem     CRITICALITY ignore     TYPE E-RABUsageReportItem   PRESENCE mandatory },
    ...
}

E-RABUsageReportItem ::= SEQUENCE {
    startTimestamp                  OCTET STRING (SIZE(4)),
    endTimestamp                    OCTET STRING (SIZE(4)),
    usageCountUL                    INTEGER (0..18446744073709551615),
```

```
    usageCountDL                    INTEGER (0..18446744073709551615),
    iE-Extensions               ProtocolExtensionContainer { { E-RABUsageReportItem-ExtIEs} } OPTIONAL,
    ...
}

E-RABUsageReportItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABQoSParameters-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- Extended for introduction of downlink and uplink packet loss rate for enhanced Voice performance --
    { ID id-DownlinkPacketLossRate      CRITICALITY ignore  EXTENSION Packet-LossRate       PRESENCE optional}|
    { ID id-UplinkPacketLossRate            CRITICALITY ignore  EXTENSION Packet-LossRate       PRESENCE optional},
    ...
}

Ethernet-Type ::= ENUMERATED {
    true,
    ...
}

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,
    iE-Extensions       ProtocolExtensionContainer { { ExpectedUEBehaviour-ExtIEs} } OPTIONAL,
    ...
}

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,...)

ExpectedIdlePeriod ::= 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,
    ...
}

ExtendedBitRate ::= INTEGER (10000000001..4000000000000, ...)

ExtendedRNC-ID                  ::= INTEGER (4096..65535)

ExtendedRepetitionPeriod ::= INTEGER (4096..131071)

Extended-UEIdentityIndexValue ::= BIT STRING (SIZE (14))

-- F

FiveGSTAC ::= OCTET STRING (SIZE (3))

FiveGSTAI ::= SEQUENCE {
    pLMNidentity            PLMNidentity,
    fiveGSTAC               FiveGSTAC,
    iE-Extensions           ProtocolExtensionContainer { {FiveGSTAI-ExtIEs} } OPTIONAL,
    ...
}

FiveGSTAI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

FiveQI ::= INTEGER (0..255, ...)

ForbiddenInterRATs ::= ENUMERATED {
    all,
    geran,
    utran,
    cdma2000,
    ...,
    geranandutran,
    cdma2000andutran

}
```

```
ForbiddenTAs ::= SEQUENCE (SIZE(1.. maxnoofEPLMNsPlusOne)) OF ForbiddenTAs-Item

ForbiddenTAs-Item ::= SEQUENCE {
    pLMN-Identity       PLMNidentity,
    forbiddenTACs       ForbiddenTACs,
    iE-Extensions       ProtocolExtensionContainer { {ForbiddenTAs-Item-ExtIEs} } OPTIONAL,
    ...
}

ForbiddenTAs-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ForbiddenTACs ::= SEQUENCE (SIZE(1..maxnoofForbTACs)) OF TAC

ForbiddenLAs ::= SEQUENCE (SIZE(1..maxnoofEPLMNsPlusOne)) OF ForbiddenLAs-Item

ForbiddenLAs-Item ::= SEQUENCE {
    pLMN-Identity       PLMNidentity,
    forbiddenLACs       ForbiddenLACs,
    iE-Extensions       ProtocolExtensionContainer { {ForbiddenLAs-Item-ExtIEs} } OPTIONAL,
    ...
}

ForbiddenLAs-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ForbiddenLACs ::= SEQUENCE (SIZE(1..maxnoofForbLACs)) OF LAC

-- G

GBR-QosInformation ::= SEQUENCE {
    e-RAB-MaximumBitrateDL          BitRate,
    e-RAB-MaximumBitrateUL          BitRate,
    e-RAB-GuaranteedBitrateDL       BitRate,
    e-RAB-GuaranteedBitrateUL       BitRate,
    iE-Extensions                   ProtocolExtensionContainer { { GBR-QosInformation-ExtIEs} } OPTIONAL,
    ...
}

GBR-QosInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- Extension for maximum bitrate > 10G bps --
    { ID id-extended-e-RAB-MaximumBitrateDL CRITICALITY ignore  EXTENSION ExtendedBitRate   PRESENCE optional}|
    { ID id-extended-e-RAB-MaximumBitrateUL CRITICALITY ignore  EXTENSION ExtendedBitRate   PRESENCE optional}|
    { ID id-extended-e-RAB-GuaranteedBitrateDL  CRITICALITY ignore  EXTENSION ExtendedBitRate   PRESENCE optional}|
    { ID id-extended-e-RAB-GuaranteedBitrateUL  CRITICALITY ignore  EXTENSION ExtendedBitRate   PRESENCE optional},
    ...}


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,
    ...,
    mappedFrom5G
}

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

-- H

HandoverFlag ::= ENUMERATED {
    handoverPreparation,
    ...
}


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 ::= {
    { ID id-NRrestrictioninEPSasSecondaryRAT        CRITICALITY ignore  EXTENSION NRrestrictioninEPSasSecondaryRAT    PRESENCE optional}|
    { ID id-UnlicensedSpectrumRestriction       CRITICALITY ignore  EXTENSION UnlicensedSpectrumRestriction   PRESENCE optional}|
    { ID id-CNTypeRestrictions      CRITICALITY ignore  EXTENSION CNTypeRestrictions    PRESENCE optional}|
    { ID id-NRrestrictionin5GS      CRITICALITY ignore  EXTENSION NRrestrictionin5GS    PRESENCE optional}|
    { ID id-LastNG-RANPLMNIdentity      CRITICALITY ignore  EXTENSION PLMNidentity          PRESENCE optional},
    ...
}

HandoverType ::= ENUMERATED {
    intralte,
    ltetoutran,
    ltetogeran,
    utrantolte,
```

```
    gerantolte,
    ...,
    eps-to-5gs,
    fivegs-to-eps
}

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          M1ThresholdEventA2              OPTIONAL,
-- 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   CRITICALITY ignore  EXTENSION MDT-Location-Info     PRESENCE optional}|
    { ID id-M6Configuration     CRITICALITY ignore  EXTENSION M6Configuration       PRESENCE conditional}|
    { ID id-M7Configuration     CRITICALITY ignore  EXTENSION M7Configuration       PRESENCE conditional}|
    { ID id-BluetoothMeasurementConfiguration       CRITICALITY ignore  EXTENSION BluetoothMeasurementConfiguration   PRESENCE optional}|
    { ID id-WLANMeasurementConfiguration        CRITICALITY ignore  EXTENSION WLANMeasurementConfiguration   PRESENCE optional},
    ...
}

IMSI    ::= OCTET STRING (SIZE (3..8))

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))

IntersystemMeasurementConfiguration ::= SEQUENCE {
    rSRP                                INTEGER (0.. 127)                                   OPTIONAL,
    rSRQ                                INTEGER (0.. 127)                                   OPTIONAL,
    sINR                                INTEGER (0.. 127)                                   OPTIONAL,
    interSystemMeasurementParameters    InterSystemMeasurementParameters,
    iE-Extensions                   ProtocolExtensionContainer { { IntersystemMeasurementConfiguration-ExtIEs} } OPTIONAL,
    ...
}
IntersystemMeasurementConfiguration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

InterSystemMeasurementParameters ::= SEQUENCE {
    measurementDuration                 INTEGER (1..100),
    interSystemMeasurementList          InterSystemMeasurementList          OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { { InterSystemMeasurementParameters-ExtIEs} } OPTIONAL,
    ...
}
InterSystemMeasurementParameters-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

InterSystemMeasurementList ::= SEQUENCE (SIZE(1.. maxnooffrequencies)) OF InterSystemMeasurementItem

InterSystemMeasurementItem ::= SEQUENCE {
    freqBandIndicatorNR         INTEGER (1..1024),
    sSBfrequencies              INTEGER (0..maxNARFCN),
    subcarrierSpacingSSB        ENUMERATED {kHz15, kHz30, kHz60, kHz120, kHz240, ...},
    maxRSIndexCellQual          INTEGER (1..maxRS-IndexCellQual)    OPTIONAL,
    sMTC                        OCTET STRING                        OPTIONAL,
    threshRS-Index-r15          OCTET STRING                        OPTIONAL,
    sSBToMeasure                OCTET STRING                        OPTIONAL,
    sSRSSIMeasurement           OCTET STRING                        OPTIONAL,
    quantityConfigNR-R15        OCTET STRING                        OPTIONAL,
    blackCellsToAddModList      OCTET STRING                        OPTIONAL,
    iE-Extensions               ProtocolExtensionContainer { { InterSystemMeasurementItem-ExtIEs} } OPTIONAL
}

InterSystemMeasurementItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

IntersystemSONConfigurationTransfer ::= OCTET STRING

IMSvoiceEPSfallbackfrom5G ::= ENUMERATED {
    true,
    ...
}

IAB-Authorized ::= ENUMERATED {
```

```
    authorized,
    not-authorized,
    ...
}

IAB-Node-Indication ::= ENUMERATED {
    true,
    ...
}

IAB-Supported ::= ENUMERATED {
    true,
    ...
}

-- J
-- K

KillAllWarningMessages ::= ENUMERATED {true}

-- L


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

LAI ::= SEQUENCE {
    pLMNidentity                PLMNidentity,
    lAC             LAC,
    iE-Extensions           ProtocolExtensionContainer { {LAI-ExtIEs} } OPTIONAL,
    ...
}

LAI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

LastVisitedCell-Item ::= CHOICE {
    e-UTRAN-Cell                    LastVisitedEUTRANCellInformation,
    uTRAN-Cell                      LastVisitedUTRANCellInformation,
    gERAN-Cell                      LastVisitedGERANCellInformation,
    ...,
    nG-RAN-Cell                     LastVisitedNGRANCellInformation
}
LastVisitedEUTRANCellInformation ::= SEQUENCE {
    global-Cell-ID                  EUTRAN-CGI,
    cellType                        CellType,
    time-UE-StayedInCell            Time-UE-StayedInCell,
    iE-Extensions                   ProtocolExtensionContainer { { LastVisitedEUTRANCellInformation-ExtIEs} } OPTIONAL,
    ...
}
LastVisitedEUTRANCellInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- 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},
```

```
    ...
}

LastVisitedNGRANCellInformation ::= OCTET STRING

LastVisitedUTRANCellInformation ::= OCTET STRING

LastVisitedGERANCellInformation ::= CHOICE {
    undefined                       NULL,
    ...
}

L3-Information              ::= OCTET STRING
-- This is a dummy IE used only as a reference to the actual definition in relevant specification.

LPPa-PDU ::=  OCTET STRING

LHN-ID ::=  OCTET STRING(SIZE (32..256))

Links-to-log ::= ENUMERATED {uplink, downlink, both-uplink-and-downlink, ...}

ListeningSubframePattern ::= SEQUENCE {
    pattern-period              ENUMERATED {ms1280, ms2560, ms5120, ms10240, ...},
    pattern-offset              INTEGER (0..10239, ...),
    iE-Extensions               ProtocolExtensionContainer { { ListeningSubframePattern-ExtIEs} } OPTIONAL,
    ...
}

ListeningSubframePattern-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
...
}

LoggedMDT ::= SEQUENCE {
    loggingInterval             LoggingInterval,
    loggingDuration             LoggingDuration,
    iE-Extensions               ProtocolExtensionContainer { {LoggedMDT-ExtIEs} } OPTIONAL,
    ...
}

LoggedMDT-ExtIEs    S1AP-PROTOCOL-EXTENSION ::= {
    { ID id-BluetoothMeasurementConfiguration       CRITICALITY ignore  EXTENSION BluetoothMeasurementConfiguration   PRESENCE optional}|
    { ID id-WLANMeasurementConfiguration            CRITICALITY ignore  EXTENSION WLANMeasurementConfiguration           PRESENCE optional},
...
}

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 ::= {
    ...
}

LTE-M-Indication ::= ENUMERATED {lte-m, ... }

-- M

M3Configuration ::= SEQUENCE {
    m3period            M3period,
    iE-Extensions       ProtocolExtensionContainer { { M3Configuration-ExtIEs} } OPTIONAL,
    ...
}

M3Configuration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

M3period ::= ENUMERATED {ms100, ms1000, ms10000, ...,ms1024, ms1280, ms2048, ms2560, ms5120, ms10240, min1 }

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   M6delay-threshold       OPTIONAL,
-- 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,
```

```
    iE-Extensions       ProtocolExtensionContainer { { M6Configuration-ExtIEs} } OPTIONAL,
    ...
}

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, ... }

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 {
    mBSFN-AreaId        INTEGER (0..255)        OPTIONAL,
    carrierFreq         EARFCN,
```

```
    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 {
    muting-pattern-period               ENUMERATED {ms0, ms1280, ms2560, ms5120, ms10240, ...},
    muting-pattern-offset               INTEGER (0..10239, ...)     OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { {MutingPatternInformation-ExtIEs} } OPTIONAL,
    ...
}

MutingPatternInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

MDT-ConfigurationNR ::= OCTET STRING

-- N

NAS-PDU ::=  OCTET STRING

NASSecurityParametersfromE-UTRAN ::= OCTET STRING

NASSecurityParameterstoE-UTRAN ::= OCTET STRING

NB-IoT-DefaultPagingDRX ::= ENUMERATED {
    v128,
    v256,
    v512,
    v1024,
    ...
    }

NB-IoT-PagingDRX ::= ENUMERATED { v32, v64, 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-RLF-Report-Container ::= OCTET STRING

NB-IoT-UEIdentityIndexValue ::= BIT STRING (SIZE (12))

NextPagingAreaScope ::= ENUMERATED {
    same,
    changed,
    ...
}

NotifySourceeNB ::= ENUMERATED {
    notifySource,
    ...
}

NRCellIdentity ::= BIT STRING (SIZE(36))

NR-CGI ::= SEQUENCE {
    pLMNIdentity        PLMNidentity,
    nRCellIdentity      NRCellIdentity,
    iE-Extensions       ProtocolExtensionContainer { {NR-CGI-ExtIEs} } OPTIONAL,
    ...
}

NR-CGI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


NRencryptionAlgorithms ::= BIT STRING (SIZE (16,...))
NRintegrityProtectionAlgorithms ::= BIT STRING (SIZE (16,...))

NRrestrictioninEPSasSecondaryRAT ::= ENUMERATED {
    nRrestrictedinEPSasSecondaryRAT,
    ...
}

NRrestrictionin5GS ::= ENUMERATED {
    nRrestrictedin5GS,
    ...
}

NRUESecurityCapabilities ::= SEQUENCE {
    nRencryptionAlgorithms              NRencryptionAlgorithms,
    nRintegrityProtectionAlgorithms     NRintegrityProtectionAlgorithms,
    iE-Extensions                       ProtocolExtensionContainer { { NRUESecurityCapabilities-ExtIEs} }  OPTIONAL,
...
}
```

```
NRUESecurityCapabilities-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

NumberofBroadcastRequest ::= INTEGER (0..65535)

NumberOfBroadcasts ::= INTEGER (0..65535)

NRV2XServicesAuthorized ::= SEQUENCE {
    vehicleUE           VehicleUE                           OPTIONAL,
    pedestrianUE        PedestrianUE                            OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {NRV2XServicesAuthorized-ExtIEs} } OPTIONAL,
    ...
}

NRV2XServicesAuthorized-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

NRUESidelinkAggregateMaximumBitrate ::= SEQUENCE {
    uEaggregateMaximumBitRate       BitRate,
    iE-Extensions                   ProtocolExtensionContainer { {NRUESidelinkAggregateMaximumBitrate-ExtIEs} } OPTIONAL,
    ...
}

NRUESidelinkAggregateMaximumBitrate-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- 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,
    permit-high-priority-sessions-and-exception-reporting-and-mobile-terminated-services-only,
    not-accept-mo-data-or-delay-tolerant-access-from-CP-CIoT

}

OverloadResponse ::= CHOICE {
    overloadAction                  OverloadAction,
    ...
}


-- P
```

```
Packet-LossRate ::= INTEGER(0..1000)

PagingAttemptInformation ::= SEQUENCE {
    pagingAttemptCount                PagingAttemptCount,
    intendedNumberOfPagingAttempts    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,
    ...
}

PagingProbabilityInformation ::= ENUMERATED {p00, p05, p10, p15, p20, p25, p30, p35, p40, p45, p50, p55, p60, p65, p70, p75, p80, p85, p90, p95,
p100, ...}
```

```
PC5QoSParameters ::= SEQUENCE {
    pc5QoSFlowList              PC5QoSFlowList,
    pc5LinkAggregatedBitRates   BitRate             OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { { PC5QoSParameters-ExtIEs} }   OPTIONAL,
    ...
}

PC5QoSParameters-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

PC5QoSFlowList ::= SEQUENCE (SIZE(1..maxnoofPC5QoSFlows)) OF PC5QoSFlowItem

PC5QoSFlowItem::= SEQUENCE {
    pQI                         FiveQI,
    pc5FlowBitRates             PC5FlowBitRates             OPTIONAL,
    range                       Range                       OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { { PC5QoSFlowItem-ExtIEs} } OPTIONAL,
    ...
}

PC5QoSFlowItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


PC5FlowBitRates ::= SEQUENCE {
    guaranteedFlowBitRate       BitRate,
    maximumFlowBitRate          BitRate,
    iE-Extensions       ProtocolExtensionContainer { { PC5FlowBitRates-ExtIEs} }    OPTIONAL,
    ...
}

PC5FlowBitRates-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
...
}
PDCP-SN ::= INTEGER (0..4095)

PDCP-SNExtended ::= INTEGER (0..32767)

PDCP-SNlength18 ::= INTEGER (0..262143)

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

M1PeriodicReporting ::= SEQUENCE {
    reportInterval              ReportIntervalMDT,
    reportAmount                ReportAmountMDT,
    iE-Extensions               ProtocolExtensionContainer { { M1PeriodicReporting-ExtIEs} } OPTIONAL,
    ...
}
```

```
M1PeriodicReporting-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

PLMNidentity               ::= TBCD-STRING

PLMNAreaBasedQMC ::= SEQUENCE {
    plmnListforQMC      PLMNListforQMC,
    iE-Extensions       ProtocolExtensionContainer { {PLMNAreaBasedQMC-ExtIEs} } OPTIONAL,
    ...
}

PLMNAreaBasedQMC-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

PLMNListforQMC ::= SEQUENCE (SIZE(1..maxnoofPLMNforQMC)) OF PLMNidentity

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  EXTENSION ProSeUEtoNetworkRelaying    PRESENCE optional},
    ...
}

ProSeDirectDiscovery ::= ENUMERATED {
    authorized,
    not-authorized,
    ...
}

ProSeUEtoNetworkRelaying ::= ENUMERATED {
    authorized,
    not-authorized,
    ...
```

```
}

ProSeDirectCommunication ::= ENUMERATED {
    authorized,
    not-authorized,
    ...
}

PS-ServiceNotAvailable ::= ENUMERATED {
    ps-service-not-available,
    ...
}

PSCellInformation ::= SEQUENCE {
    nCGI                        NR-CGI,
    iE-Extensions               ProtocolExtensionContainer { { PSCellInformation-ExtIEs} }  OPTIONAL,
    ...
}

PSCellInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- Q

QCI                     ::= INTEGER (0..255)

-- R

RAN-UE-NGAP-ID ::= INTEGER (0..4294967295)

Range ::= ENUMERATED {m50, m80, m180, m200, m350, m400, m500, m700, m1000, ...}

ReceiveStatusofULPDCPSDUs ::= BIT STRING (SIZE(4096))

ReceiveStatusOfULPDCPSDUsExtended ::= BIT STRING (SIZE(1..16384))

ReceiveStatusOfULPDCPSDUsPDCP-SNlength18 ::= BIT STRING (SIZE(1..131072))

RecommendedCellsForPaging ::= SEQUENCE {
    recommendedCellList         RecommendedCellList,
    iE-Extensions               ProtocolExtensionContainer { { RecommendedCellsForPaging-ExtIEs} }   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,
    iE-Extensions           ProtocolExtensionContainer { { RecommendedENBsForPaging-ExtIEs} }   OPTIONAL,
    ...
}

RecommendedENBsForPaging-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

RecommendedENBList::= SEQUENCE (SIZE(1.. maxnoofRecommendedENBs)) OF ProtocolIE-SingleContainer { { RecommendedENBItemIEs } }

RecommendedENBItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-RecommendedENBItem  CRITICALITY ignore  TYPE RecommendedENBItem     PRESENCE mandatory },
    ...
}

RecommendedENBItem ::= SEQUENCE {
    mMEPagingTarget         MMEPagingTarget,
    iE-Extensions           ProtocolExtensionContainer { { RecommendedENBItem-ExtIEs} } OPTIONAL,
    ...
}

RecommendedENBItem-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,
    iE-Extensions           ProtocolExtensionContainer { { RequestType-ExtIEs} }    OPTIONAL,
    ...
}


RequestType-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    { ID id-RequestTypeAdditionalInfo   CRITICALITY ignore  EXTENSION RequestTypeAdditionalInfo   PRESENCE optional },
    ...
}

RequestTypeAdditionalInfo ::= ENUMERATED {
    includePSCell,
    ...
}

RIMTransfer ::= SEQUENCE {
    rIMInformation          RIMInformation,
    rIMRoutingAddress       RIMRoutingAddress       OPTIONAL,
    iE-Extensions           ProtocolExtensionContainer { { RIMTransfer-ExtIEs} }    OPTIONAL,
    ...
}

RIMTransfer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

RIMInformation ::= OCTET STRING

RIMRoutingAddress ::= CHOICE {
    gERAN-Cell-ID           GERAN-Cell-ID,
    ...,
    targetRNC-ID            TargetRNC-ID,
    eHRPD-Sector-ID         OCTET STRING (SIZE(16))
}

ReportArea ::= ENUMERATED {
    ecgi,
    ...
}
```

```
RepetitionPeriod ::= INTEGER (0..4095)

RLFReportInformation ::= SEQUENCE {
    uE-RLF-Report-Container                         UE-RLF-Report-Container,
    uE-RLF-Report-Container-for-extended-bands      UE-RLF-Report-Container-for-extended-bands    OPTIONAL,
    iE-Extensions                                   ProtocolExtensionContainer {{ RLFReportInformation-ExtIEs}} OPTIONAL,
    ...
}

RLFReportInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    {ID id-NB-IoT-RLF-Report-Container      CRITICALITY ignore  EXTENSION NB-IoT-RLF-Report-Container   PRESENCE optional},
    ...
}

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 ::= {
    ...
}

SecondaryRATType ::= ENUMERATED {
```

```
    nR,
    ...,
    unlicensed
}


SecondaryRATDataUsageRequest ::= ENUMERATED {
    requested,
    ...
}

SecondaryRATDataUsageReportList ::= SEQUENCE (SIZE(1.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { {SecondaryRATDataUsageReportItemIEs} }

SecondaryRATDataUsageReportItemIEs  S1AP-PROTOCOL-IES ::= {
    { ID id-SecondaryRATDataUsageReportItem  CRITICALITY ignore     TYPE SecondaryRATDataUsageReportItem   PRESENCE mandatory },
    ...
}

SecondaryRATDataUsageReportItem ::= SEQUENCE {
    e-RAB-ID                    E-RAB-ID,
    secondaryRATType            SecondaryRATType,
    e-RABUsageReportList        E-RABUsageReportList,
    iE-Extensions               ProtocolExtensionContainer { { SecondaryRATDataUsageReportItem-ExtIEs} } OPTIONAL,
    ...
}

SecondaryRATDataUsageReportItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

SerialNumber ::= BIT STRING (SIZE (16))

ServiceType ::= ENUMERATED{
    qMC-for-streaming-service,
    qMC-for-MTSI-service,
    ...
}

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,
    iE-Extensions           ProtocolExtensionContainer { { SONConfigurationTransfer-ExtIEs} }       OPTIONAL,
...
}

SONConfigurationTransfer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- Extension for Release 10 to transfer the IP addresses of the eNB initiating the ANR action --
    {ID id-x2TNLConfigurationInfo       CRITICALITY ignore  EXTENSION X2TNLConfigurationInfo            PRESENCE conditional
    -- This IE shall be present if the SON Information IE contains the SON Information Request IE and the SON Information Request IE is set to
“X2TNL Configuration Info” --}|
-- 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,
    aggressoreCGI-List              ECGI-List                   OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { {SynchronisationInformation-ExtIEs} } OPTIONAL,
    ...
}

SynchronisationInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
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,
    ...
}

SourceNodeID ::= CHOICE {
    sourceNgRanNode-ID      SourceNgRanNode-ID,
    sourceNodeID-Extension          SourceNodeID-Extension
}

SourceNodeID-Extension ::= ProtocolIE-SingleContainer {{ SourceNodeID-ExtensionIE }}

SourceNodeID-ExtensionIE S1AP-PROTOCOL-IES ::= {
...
}

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 ::= {
    {ID id-MobilityInformation                 CRITICALITY ignore  EXTENSION MobilityInformation                    PRESENCE optional}|
    {ID id-uE-HistoryInformationFromTheUE      CRITICALITY ignore  EXTENSION UE-HistoryInformationFromTheUE         PRESENCE optional}|
    {ID id-IMSvoiceEPSfallbackfrom5G           CRITICALITY ignore  EXTENSION IMSvoiceEPSfallbackfrom5G              PRESENCE optional}|
    {ID id-AdditionalRRMPriorityIndex          CRITICALITY ignore  EXTENSION AdditionalRRMPriorityIndex             PRESENCE optional}|
    {ID id-ContextatSource                     CRITICALITY ignore  EXTENSION ContextatSource                        PRESENCE optional}|
    {ID id-IntersystemMeasurementConfiguration CRITICALITY ignore  EXTENSION IntersystemMeasurementConfiguration    PRESENCE optional}|
    {ID id-SourceNodeID                        CRITICALITY ignore  EXTENSION SourceNodeID                           PRESENCE optional}|
    {ID id-EmergencyIndicator                  CRITICALITY ignore  EXTENSION EmergencyIndicator                     PRESENCE optional}|
    {ID id-Direct-Forwarding-Path-Availability     CRITICALITY ignore  EXTENSION Direct-Forwarding-Path-Availability      PRESENCE optional}|
    {ID id-SourceSNID                          CRITICALITY ignore  EXTENSION Global-RAN-NODE-ID                     PRESENCE optional},
    ...
}

SourceNgRanNode-ID ::= SEQUENCE {
    global-RAN-NODE-ID      Global-RAN-NODE-ID,
    selected-TAI        FiveGSTAI,
    iE-Extensions       ProtocolExtensionContainer { { SourceNgRanNode-ID-ExtIEs} } OPTIONAL,
    ...
}

SourceNgRanNode-ID-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

SourceRNC-ToTargetRNC-TransparentContainer      ::= OCTET STRING
-- This is a dummy IE used only as a reference to the actual definition in relevant specification.

SourceNgRanNode-ToTargetNgRanNode-TransparentContainer      ::= OCTET STRING
-- This is a dummy IE used only as a reference to the actual definition in relevant specification.

ServedGUMMEIs ::= SEQUENCE (SIZE (1.. maxnoofRATs)) OF ServedGUMMEIsItem

ServedGUMMEIsItem ::= SEQUENCE {
    servedPLMNs             ServedPLMNs,
    servedGroupIDs          ServedGroupIDs,
    servedMMECs             ServedMMECs,
    iE-Extensions           ProtocolExtensionContainer { {ServedGUMMEIsItem-ExtIEs} }   OPTIONAL,
    ...
}

ServedGUMMEIsItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    {ID id-GUMMEIType       CRITICALITY ignore  EXTENSION GUMMEIType        PRESENCE optional},
    ...
}

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)
```

```
Subscription-Based-UE-DifferentiationInfo ::= SEQUENCE {
    periodicCommunicationIndicator  ENUMERATED {periodically, ondemand, ...}    OPTIONAL,
    periodicTime                        INTEGER (1..3600, ...)                      OPTIONAL,
    scheduledCommunicationTime      ScheduledCommunicationTime                  OPTIONAL,
    stationaryIndication                ENUMERATED {stationary, mobile, ...}            OPTIONAL,
    trafficProfile                  ENUMERATED {single-packet, dual-packets, multiple-packets, ...}       OPTIONAL,
    batteryIndication               ENUMERATED {battery-powered, battery-powered-not-rechargeable-or-replaceable, not-battery-powered, ...}
    OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { { Subscription-Based-UE-DifferentiationInfo-ExtIEs} } OPTIONAL,
    ...
}

Subscription-Based-UE-DifferentiationInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ScheduledCommunicationTime ::= SEQUENCE {
    dayofWeek               BIT STRING (SIZE(7))                                    OPTIONAL,
    timeofDayStart          INTEGER (0..86399, ...)                                 OPTIONAL,
    timeofDayEnd                INTEGER (0..86399, ...)                                 OPTIONAL,
    iE-Extensions           ProtocolExtensionContainer { { ScheduledCommunicationTime-ExtIEs}}  OPTIONAL,
    ...
}

ScheduledCommunicationTime-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

SupportedTAs ::= SEQUENCE (SIZE(1.. maxnoofTACs)) OF SupportedTAs-Item

SupportedTAs-Item ::=   SEQUENCE  {
    tAC                 TAC,
    broadcastPLMNs      BPLMNs,
    iE-Extensions       ProtocolExtensionContainer { {SupportedTAs-Item-ExtIEs} } OPTIONAL,
    ...
}

SupportedTAs-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    -- 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-TMSI  M-TMSI,
    iE-Extensions       ProtocolExtensionContainer { {S-TMSI-ExtIEs} } OPTIONAL,
    ...
}

S-TMSI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- T

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

TAIBasedMDT ::= SEQUENCE {
    tAIListforMDT           TAIListforMDT,
    iE-Extensions           ProtocolExtensionContainer { {TAIBasedMDT-ExtIEs} } OPTIONAL,
    ...
}

TAIBasedMDT-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAIListforMDT ::= SEQUENCE (SIZE(1..maxnoofTAforMDT)) OF TAI

TAIListforWarning ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAI

TAI ::= SEQUENCE {
    pLMNidentity            PLMNidentity,
    tAC                     TAC,
    iE-Extensions           ProtocolExtensionContainer { {TAI-ExtIEs} } OPTIONAL,
    ...
}

TAI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAI-Broadcast ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAI-Broadcast-Item

TAI-Broadcast-Item ::= SEQUENCE {
    tAI                 TAI,
    completedCellinTAI  CompletedCellinTAI,
    iE-Extensions       ProtocolExtensionContainer { {TAI-Broadcast-Item-ExtIEs} } OPTIONAL,
    ...
}
```

```
TAI-Broadcast-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAI-Cancelled ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAI-Cancelled-Item

TAI-Cancelled-Item ::= SEQUENCE {
    tAI                 TAI,
    cancelledCellinTAI  CancelledCellinTAI,
    iE-Extensions       ProtocolExtensionContainer { {TAI-Cancelled-Item-ExtIEs} } OPTIONAL,
    ...
}

TAI-Cancelled-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TABasedMDT ::= SEQUENCE {
    tAListforMDT        TAListforMDT,
    iE-Extensions       ProtocolExtensionContainer { {TABasedMDT-ExtIEs} } OPTIONAL,
    ...
}

TABasedMDT-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAListforMDT ::= SEQUENCE (SIZE(1..maxnoofTAforMDT)) OF TAC

TABasedQMC ::= SEQUENCE {
    tAListforQMC        TAListforQMC,
    iE-Extensions       ProtocolExtensionContainer { {TABasedQMC-ExtIEs} } OPTIONAL,
    ...
}

TABasedQMC-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAListforQMC ::= SEQUENCE (SIZE(1..maxnoofTAforQMC)) OF TAC

TAIBasedQMC ::= SEQUENCE {
    tAIListforQMC       TAIListforQMC,
    iE-Extensions       ProtocolExtensionContainer { {TAIBasedQMC-ExtIEs} } OPTIONAL,
    ...
}

TAIBasedQMC-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAIListforQMC ::= SEQUENCE (SIZE(1..maxnoofTAforQMC)) OF TAI
```

```
CompletedCellinTAI ::= SEQUENCE (SIZE(1..maxnoofCellinTAI)) OF CompletedCellinTAI-Item

CompletedCellinTAI-Item ::= SEQUENCE{
    eCGI                EUTRAN-CGI,
    iE-Extensions       ProtocolExtensionContainer { {CompletedCellinTAI-Item-ExtIEs} } OPTIONAL,
    ...
}

CompletedCellinTAI-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TBCD-STRING ::= OCTET STRING (SIZE (3))

TargetID ::= CHOICE {
    targeteNB-ID        TargeteNB-ID,
    targetRNC-ID        TargetRNC-ID,
    cGI                 CGI,
    ...,
    targetgNgRanNode-ID     TargetNgRanNode-ID
}

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 ::= {
    ...
}

TargetNgRanNode-ID ::= SEQUENCE {
    global-RAN-NODE-ID      Global-RAN-NODE-ID,
    selected-TAI        FiveGSTAI,
    iE-Extensions       ProtocolExtensionContainer { { TargetNgRanNode-ID-ExtIEs} } OPTIONAL,
    ...
}
```

```
TargetNgRanNode-ID-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

Global-RAN-NODE-ID::= CHOICE {
    gNB        GNB,
    ng-eNB     NG-eNB,
    ...
}

GNB ::= SEQUENCE {
    global-gNB-ID       Global-GNB-ID,
    iE-Extensions       ProtocolExtensionContainer { {GNB-ExtIEs} } OPTIONAL,
    ...
}

GNB-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

Global-GNB-ID ::= SEQUENCE {
    pLMN-Identity       PLMNidentity,
    gNB-ID              GNB-Identity,
    iE-Extensions       ProtocolExtensionContainer { { Global-GNB-ID-ExtIEs} } OPTIONAL,
    ...
}

Global-GNB-ID-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

GNB-Identity ::= CHOICE {
    gNB-ID     GNB-ID,
    ...
}

NG-eNB ::= SEQUENCE {
    global-ng-eNB-ID        Global-ENB-ID,
    iE-Extensions       ProtocolExtensionContainer { { NG-eNB-ExtIEs} } OPTIONAL,
    ...
}

NG-eNB-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

GNB-ID ::= BIT STRING (SIZE(22..32))

TargeteNB-ToSourceeNB-TransparentContainer      ::= SEQUENCE {
    rRC-Container       RRC-Container,
    iE-Extensions       ProtocolExtensionContainer { {TargeteNB-ToSourceeNB-TransparentContainer-ExtIEs} } OPTIONAL,
    ...
}
```

```
TargeteNB-ToSourceeNB-TransparentContainer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    { ID id-DAPSResponseInfoList                    CRITICALITY ignore  EXTENSION DAPSResponseInfoList                   PRESENCE optional}|
    { ID id-Direct-Forwarding-Path-Availability     CRITICALITY ignore  EXTENSION Direct-Forwarding-Path-Availability      PRESENCE optional},
    ...
}

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.

TargetNgRanNode-ToSourceNgRanNode-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)

TimeSinceSecondaryNodeRelease ::= OCTET STRING (SIZE(4))

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,
    traceCollectionEntityIPAddress      TransportLayerAddress,
```

```
    iE-Extensions                       ProtocolExtensionContainer { { TraceActivation-ExtIEs} }  OPTIONAL,
    ...
}

TraceActivation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- Extension for Rel-10 to support MDT --
    { ID id-MDTConfiguration    CRITICALITY ignore  EXTENSION MDT-Configuration     PRESENCE optional }|
-- Extension for Rel-15 to support QMC –
    { ID id-UEAppLayerMeasConfig    CRITICALITY ignore  EXTENSION UEAppLayerMeasConfig      PRESENCE optional }|
    { ID id-MDTConfigurationNR      CRITICALITY ignore  EXTENSION MDT-ConfigurationNR       PRESENCE optional }|
    { ID id-TraceCollectionEntityURI    CRITICALITY ignore  EXTENSION URI-Address           PRESENCE optional },
    ...
}

TraceDepth ::= ENUMERATED {
    minimum,
    medium,
    maximum,
    minimumWithoutVendorSpecificExtension,
    mediumWithoutVendorSpecificExtension,
    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 {
    uEaggregateMaximumBitRateDL     BitRate,
    uEaggregateMaximumBitRateUL     BitRate,
    iE-Extensions                   ProtocolExtensionContainer { {UEAggregate-MaximumBitrates-ExtIEs} } OPTIONAL,
    ...
```

```
}

UEAggregate-MaximumBitrates-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- Extension for maximum bitrate > 10G bps --
    { ID id-extended-uEaggregateMaximumBitRateDL    CRITICALITY ignore  EXTENSION ExtendedBitRate PRESENCE optional}|
    { ID id-extended-uEaggregateMaximumBitRateUL        CRITICALITY ignore  EXTENSION ExtendedBitRate   PRESENCE optional},
    ...
}

UEAppLayerMeasConfig ::= SEQUENCE {
    containerForAppLayerMeasConfig          OCTET STRING (SIZE(1..1000)),
    areaScopeOfQMC      AreaScopeOfQMC,
    iE-Extensions       ProtocolExtensionContainer { {UEAppLayerMeasConfig-ExtIEs} } OPTIONAL,
    ...
}

UEAppLayerMeasConfig-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    {ID id-serviceType  CRITICALITY ignore  EXTENSION ServiceType   PRESENCE optional},
    ...
}

UECapabilityInfoRequest ::= ENUMERATED {
    requested,
    ...
}

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 ::= {
    ...
}


UE-associatedLogicalS1-ConnectionItem ::= SEQUENCE {
    mME-UE-S1AP-ID      MME-UE-S1AP-ID OPTIONAL,
    eNB-UE-S1AP-ID      ENB-UE-S1AP-ID OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { { UE-associatedLogicalS1-ConnectionItemExtIEs} } OPTIONAL,
    ...
}
```

```
UE-associatedLogicalS1-ConnectionItemExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

UEIdentityIndexValue    ::= BIT STRING (SIZE (10))

UE-HistoryInformation ::= SEQUENCE (SIZE(1..maxnoofCellsinUEHistoryInfo)) OF LastVisitedCell-Item

UE-HistoryInformationFromTheUE ::= 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

UERadioCapabilityID ::= 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]

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,
    integrityProtectionAlgorithms   IntegrityProtectionAlgorithms,
    iE-Extensions                   ProtocolExtensionContainer { { UESecurityCapabilities-ExtIEs} }  OPTIONAL,
...
}

UESecurityCapabilities-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

UESidelinkAggregateMaximumBitrate ::= SEQUENCE {
    uESidelinkAggregateMaximumBitRate       BitRate,
    iE-Extensions                   ProtocolExtensionContainer { {UE-Sidelink-Aggregate-MaximumBitrates-ExtIEs} } OPTIONAL,
    ...
}

UE-Sidelink-Aggregate-MaximumBitrates-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
UE-Usage-Type ::= INTEGER (0..255)

UL-CP-SecurityInformation ::= SEQUENCE {
    ul-NAS-MAC              UL-NAS-MAC,
    ul-NAS-Count            UL-NAS-Count,
    iE-Extensions           ProtocolExtensionContainer { { UL-CP-SecurityInformation-ExtIEs} }  OPTIONAL,
    ...
}

UL-CP-SecurityInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

UL-NAS-MAC ::= BIT STRING (SIZE (16))

UL-NAS-Count ::= BIT STRING (SIZE (5))

UnlicensedSpectrumRestriction ::= ENUMERATED {
    unlicensed-restricted,
    ...
}


URI-Address ::= VisibleString

UserLocationInformation ::= SEQUENCE {
    eutran-cgi              EUTRAN-CGI,
    tai                     TAI,
    iE-Extensions           ProtocolExtensionContainer { { UserLocationInformation-ExtIEs} }    OPTIONAL,
    ...
}

UserLocationInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    { ID id-PSCellInformation   CRITICALITY ignore  EXTENSION PSCellInformation         PRESENCE optional},
    ...
}

UEUserPlaneCIoTSupportIndicator ::= ENUMERATED {
    supported,
    ...
}

UE-Application-Layer-Measurement-Capability ::= BIT STRING (SIZE (8))

-- First bit: QoE Measurement for streaming service
-- Second bit: QoE Measurement for MTSI service

-- Note that undefined bits are considered as a spare bit and spare bits shall be set to 0 by the transmitter and shall be ignored by the receiver.

-- V

VoiceSupportMatchIndicator ::= ENUMERATED {
    supported,
    not-supported,
```

```
    ...
}

V2XServicesAuthorized ::= SEQUENCE {
    vehicleUE           VehicleUE                                           OPTIONAL,
    pedestrianUE        PedestrianUE                        OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {V2XServicesAuthorized-ExtIEs} }   OPTIONAL,
    ...
}

V2XServicesAuthorized-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

VehicleUE ::= ENUMERATED {
    authorized,
    not-authorized,
    ...
}

PedestrianUE ::= ENUMERATED {
    authorized,
    not-authorized,
    ...
}

-- W

WarningAreaCoordinates ::= OCTET STRING (SIZE(1..1024))

WarningAreaList ::= CHOICE {
    cellIDList                      ECGIList,
    trackingAreaListforWarning      TAIListforWarning,
    emergencyAreaIDList             EmergencyAreaIDList,
    ...
}


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

WarningSecurityInfo ::= OCTET STRING (SIZE (50))


WarningMessageContents ::= OCTET STRING (SIZE(1..9600))

WLANMeasurementConfiguration ::= SEQUENCE {
    wlanMeasConfig              WLANMeasConfig,
    wlanMeasConfigNameList      WLANMeasConfigNameList           OPTIONAL,
    wlan-rssi                   ENUMERATED {true, ...}           OPTIONAL,
    wlan-rtt                    ENUMERATED {true, ...}           OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { { WLANMeasurementConfiguration-ExtIEs } } OPTIONAL,
    ...
}
```

```
WLANMeasurementConfiguration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

WLANMeasConfigNameList ::= SEQUENCE (SIZE(1..maxnoofWLANName)) OF WLANName

WLANMeasConfig::= ENUMERATED {setup,...}

WLANName ::= OCTET STRING (SIZE (1..32))

WUS-Assistance-Information  ::= SEQUENCE {
    pagingProbabilityInformation            PagingProbabilityInformation,
    iE-Extensions       ProtocolExtensionContainer { { WUS-Assistance-Information-ExtIEs } } OPTIONAL,
    ...
}

WUS-Assistance-Information-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- X


X2TNLConfigurationInfo ::= SEQUENCE {
    eNBX2TransportLayerAddresses    ENBX2TLAs,
    iE-Extensions                   ProtocolExtensionContainer { { X2TNLConfigurationInfo-ExtIEs} } OPTIONAL,
    ...
}

X2TNLConfigurationInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- Extension for Release 10 to transfer the IPsec and U-plane addresses during ANR action --
    {ID id-eNBX2ExtendedTransportLayerAddresses     CRITICALITY ignore  EXTENSION ENBX2ExtTLAs  PRESENCE optional}|
-- Extension for Release 12 to transfer the IP addresses of the X2 GW --
    {ID id-eNBIndirectX2TransportLayerAddresses CRITICALITY ignore  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

ENBIndirectX2TransportLayerAddresses ::= SEQUENCE (SIZE(1..maxnoofeNBX2TLAs)) OF TransportLayerAddress
```

```
-- Y
-- Z

END
```

9.3.5 Common Definitions

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

S1AP-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) s1ap (1) version1 (1) s1ap-CommonDataTypes (3) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

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

PrivateIE-ID    ::= CHOICE {
    local               INTEGER (0..65535),
    global              OBJECT IDENTIFIER
}

ProcedureCode       ::= INTEGER (0..255)

ProtocolExtensionID ::= INTEGER (0..65535)

ProtocolIE-ID       ::= INTEGER (0..65535)

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

END
```

9.3.6 Constant Definitions

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

S1AP-Constants {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) s1ap (1) version1 (1) s1ap-Constants (4) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

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

IMPORTS
    ProcedureCode,
    ProtocolIE-ID

FROM S1AP-CommonDataTypes;


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

id-HandoverPreparation                      ProcedureCode ::= 0
id-HandoverResourceAllocation               ProcedureCode ::= 1
id-HandoverNotification                     ProcedureCode ::= 2
id-PathSwitchRequest                        ProcedureCode ::= 3
id-HandoverCancel                           ProcedureCode ::= 4
id-E-RABSetup                               ProcedureCode ::= 5
id-E-RABModify                              ProcedureCode ::= 6
id-E-RABRelease                             ProcedureCode ::= 7
id-E-RABReleaseIndication                   ProcedureCode ::= 8
id-InitialContextSetup                      ProcedureCode ::= 9
id-Paging                                   ProcedureCode ::= 10
id-downlinkNASTransport                     ProcedureCode ::= 11
id-initialUEMessage                         ProcedureCode ::= 12
id-uplinkNASTransport                       ProcedureCode ::= 13
id-Reset                                    ProcedureCode ::= 14
id-ErrorIndication                          ProcedureCode ::= 15
id-NASNonDeliveryIndication                 ProcedureCode ::= 16
id-S1Setup                                  ProcedureCode ::= 17
id-UEContextReleaseRequest                  ProcedureCode ::= 18
id-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-TraceFailureIndication                   ProcedureCode ::= 28
id-ENBConfigurationUpdate                   ProcedureCode ::= 29
id-MMEConfigurationUpdate                   ProcedureCode ::= 30
id-LocationReportingControl                 ProcedureCode ::= 31
id-LocationReportingFailureIndication       ProcedureCode ::= 32
id-LocationReport                           ProcedureCode ::= 33
id-OverloadStart                            ProcedureCode ::= 34
id-OverloadStop                             ProcedureCode ::= 35
```

```
id-WriteReplaceWarning                      ProcedureCode ::= 36
id-eNBDirectInformationTransfer             ProcedureCode ::= 37
id-MMEDirectInformationTransfer             ProcedureCode ::= 38
id-PrivateMessage                           ProcedureCode ::= 39
id-eNBConfigurationTransfer                 ProcedureCode ::= 40
id-MMEConfigurationTransfer                 ProcedureCode ::= 41
id-CellTrafficTrace                         ProcedureCode ::= 42
id-Kill                                     ProcedureCode ::= 43
id-downlinkUEAssociatedLPPaTransport        ProcedureCode ::= 44
id-uplinkUEAssociatedLPPaTransport          ProcedureCode ::= 45
id-downlinkNonUEAssociatedLPPaTransport     ProcedureCode ::= 46
id-uplinkNonUEAssociatedLPPaTransport       ProcedureCode ::= 47
id-UERadioCapabilityMatch                   ProcedureCode ::= 48
id-PWSRestartIndication                     ProcedureCode ::= 49
id-E-RABModificationIndication              ProcedureCode ::= 50
id-PWSFailureIndication                     ProcedureCode ::= 51
id-RerouteNASRequest                        ProcedureCode ::= 52
id-UEContextModificationIndication          ProcedureCode ::= 53
id-ConnectionEstablishmentIndication        ProcedureCode ::= 54
id-UEContextSuspend                         ProcedureCode ::= 55
id-UEContextResume                          ProcedureCode ::= 56
id-NASDeliveryIndication                    ProcedureCode ::= 57
id-RetrieveUEInformation                    ProcedureCode ::= 58
id-UEInformationTransfer                    ProcedureCode ::= 59
id-eNBCPRelocationIndication                ProcedureCode ::= 60
id-MMECPRelocationIndication                ProcedureCode ::= 61
id-SecondaryRATDataUsageReport              ProcedureCode ::= 62
id-UERadioCapabilityIDMapping               ProcedureCode ::= 63
id-HandoverSuccess                          ProcedureCode ::= 64
id-eNBEarlyStatusTransfer                   ProcedureCode ::= 65
id-MMEEarlyStatusTransfer                   ProcedureCode ::= 66

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

maxPrivateIEs                       INTEGER ::= 65535
maxProtocolExtensions               INTEGER ::= 65535
maxProtocolIEs                      INTEGER ::= 65535
-- ************************************************************
--
-- Lists
--
-- ************************************************************

maxnoofCSGs                         INTEGER ::= 256
maxnoofE-RABs                       INTEGER ::= 256
maxnoofTAIs                         INTEGER ::= 256
maxnoofTACs                         INTEGER ::= 256
maxnoofErrors                       INTEGER ::= 256
maxnoofBPLMNs                       INTEGER ::= 6
maxnoofPLMNsPerMME                  INTEGER ::= 32
```

```
maxnoofEPLMNs                           INTEGER ::= 15
maxnoofEPLMNsPlusOne                    INTEGER ::= 16
maxnoofForbLACs                         INTEGER ::= 4096
maxnoofForbTACs                         INTEGER ::= 4096
maxnoofIndividualS1ConnectionsToReset   INTEGER ::= 256
maxnoofCellsinUEHistoryInfo             INTEGER ::= 16
maxnoofCellsineNB                       INTEGER ::= 256
maxnoofTAIforWarning                    INTEGER ::= 65535
maxnoofCellID                           INTEGER ::= 65535
maxnoofDCNs                             INTEGER ::= 32
maxnoofEmergencyAreaID                  INTEGER ::= 65535
maxnoofCellinTAI                        INTEGER ::= 65535
maxnoofCellinEAI                        INTEGER ::= 65535
maxnoofeNBX2TLAs                        INTEGER ::= 2
maxnoofeNBX2ExtTLAs                     INTEGER ::= 16
maxnoofeNBX2GTPTLAs                     INTEGER ::= 16
maxnoofRATs                             INTEGER ::= 8
maxnoofGroupIDs                         INTEGER ::= 65535
maxnoofMMECs                            INTEGER ::= 256
maxnoofCellIDforMDT                     INTEGER ::= 32
maxnoofTAforMDT                         INTEGER ::= 8
maxnoofMDTPLMNs                         INTEGER ::= 16
maxnoofCellsforRestart                  INTEGER ::= 256
maxnoofRestartTAIs                      INTEGER ::= 2048
maxnoofRestartEmergencyAreaIDs          INTEGER ::= 256
maxEARFCN                               INTEGER ::= 262143
maxnoofMBSFNAreaMDT                     INTEGER ::= 8
maxnoofRecommendedCells                 INTEGER ::= 16
maxnoofRecommendedENBs                  INTEGER ::= 16
maxnooftimeperiods                      INTEGER ::= 2
maxnoofCellIDforQMC                     INTEGER ::= 32
maxnoofTAforQMC                         INTEGER ::= 8
maxnoofPLMNforQMC                       INTEGER ::= 16
maxnoofBluetoothName                    INTEGER ::= 4
maxnoofWLANName                         INTEGER ::= 4
maxnoofConnectedengNBs                  INTEGER ::= 256
maxnoofPC5QoSFlows                      INTEGER ::= 2048
maxnooffrequencies                      INTEGER ::= 64
maxNARFCN                               INTEGER ::= 3279165
maxRS-IndexCellQual                     INTEGER ::= 16


-- ************************************************************
--
-- IEs
--
-- ************************************************************

id-MME-UE-S1AP-ID                               ProtocolIE-ID ::= 0
id-HandoverType                                 ProtocolIE-ID ::= 1
id-Cause                                        ProtocolIE-ID ::= 2
id-SourceID                                     ProtocolIE-ID ::= 3
id-TargetID                                     ProtocolIE-ID ::= 4
id-eNB-UE-S1AP-ID                               ProtocolIE-ID ::= 8
```

```
id-E-RABSubjecttoDataForwardingList             ProtocolIE-ID ::= 12
id-E-RABtoReleaseListHOCmd                      ProtocolIE-ID ::= 13
id-E-RABDataForwardingItem                      ProtocolIE-ID ::= 14
id-E-RABReleaseItemBearerRelComp                ProtocolIE-ID ::= 15
id-E-RABToBeSetupListBearerSUReq                ProtocolIE-ID ::= 16
id-E-RABToBeSetupItemBearerSUReq                ProtocolIE-ID ::= 17
id-E-RABAdmittedList                            ProtocolIE-ID ::= 18
id-E-RABFailedToSetupListHOReqAck               ProtocolIE-ID ::= 19
id-E-RABAdmittedItem                            ProtocolIE-ID ::= 20
id-E-RABFailedtoSetupItemHOReqAck               ProtocolIE-ID ::= 21
id-E-RABToBeSwitchedDLList                      ProtocolIE-ID ::= 22
id-E-RABToBeSwitchedDLItem                      ProtocolIE-ID ::= 23
id-E-RABToBeSetupListCtxtSUReq                  ProtocolIE-ID ::= 24
id-TraceActivation                              ProtocolIE-ID ::= 25
id-NAS-PDU                                      ProtocolIE-ID ::= 26
id-E-RABToBeSetupItemHOReq                      ProtocolIE-ID ::= 27
id-E-RABSetupListBearerSURes                    ProtocolIE-ID ::= 28
id-E-RABFailedToSetupListBearerSURes            ProtocolIE-ID ::= 29
id-E-RABToBeModifiedListBearerModReq            ProtocolIE-ID ::= 30
id-E-RABModifyListBearerModRes                  ProtocolIE-ID ::= 31
id-E-RABFailedToModifyList                      ProtocolIE-ID ::= 32
id-E-RABToBeReleasedList                        ProtocolIE-ID ::= 33
id-E-RABFailedToReleaseList                     ProtocolIE-ID ::= 34
id-E-RABItem                                    ProtocolIE-ID ::= 35
id-E-RABToBeModifiedItemBearerModReq            ProtocolIE-ID ::= 36
id-E-RABModifyItemBearerModRes                  ProtocolIE-ID ::= 37
id-E-RABReleaseItem                             ProtocolIE-ID ::= 38
id-E-RABSetupItemBearerSURes                    ProtocolIE-ID ::= 39
id-SecurityContext                              ProtocolIE-ID ::= 40
id-HandoverRestrictionList                      ProtocolIE-ID ::= 41
id-UEPagingID                                   ProtocolIE-ID ::= 43
id-pagingDRX                                    ProtocolIE-ID ::= 44
id-TAIList                                      ProtocolIE-ID ::= 46
id-TAIItem                                      ProtocolIE-ID ::= 47
id-E-RABFailedToSetupListCtxtSURes              ProtocolIE-ID ::= 48
id-E-RABReleaseItemHOCmd                        ProtocolIE-ID ::= 49
id-E-RABSetupItemCtxtSURes                      ProtocolIE-ID ::= 50
id-E-RABSetupListCtxtSURes                      ProtocolIE-ID ::= 51
id-E-RABToBeSetupItemCtxtSUReq                  ProtocolIE-ID ::= 52
id-E-RABToBeSetupListHOReq                      ProtocolIE-ID ::= 53
id-GERANtoLTEHOInformationRes                   ProtocolIE-ID ::= 55
id-UTRANtoLTEHOInformationRes                   ProtocolIE-ID ::= 57
id-CriticalityDiagnostics                       ProtocolIE-ID ::= 58
id-Global-ENB-ID                                ProtocolIE-ID ::= 59
id-eNBname                                      ProtocolIE-ID ::= 60
id-MMEname                                      ProtocolIE-ID ::= 61
id-ServedPLMNs                                  ProtocolIE-ID ::= 63
id-SupportedTAs                                 ProtocolIE-ID ::= 64
id-TimeToWait                                   ProtocolIE-ID ::= 65
id-uEaggregateMaximumBitrate                    ProtocolIE-ID ::= 66
id-TAI                                          ProtocolIE-ID ::= 67
id-E-RABReleaseListBearerRelComp                ProtocolIE-ID ::= 69
id-cdma2000PDU                                  ProtocolIE-ID ::= 70
id-cdma2000RATType                              ProtocolIE-ID ::= 71
```

```
id-cdma2000SectorID                              ProtocolIE-ID ::= 72
id-SecurityKey                                   ProtocolIE-ID ::= 73
id-UERadioCapability                             ProtocolIE-ID ::= 74
id-GUMMEI-ID                                     ProtocolIE-ID ::= 75
id-E-RABInformationListItem                      ProtocolIE-ID ::= 78
id-Direct-Forwarding-Path-Availability           ProtocolIE-ID ::= 79
id-UEIdentityIndexValue                          ProtocolIE-ID ::= 80
id-cdma2000HOStatus                              ProtocolIE-ID ::= 83
id-cdma2000HORequiredIndication                  ProtocolIE-ID ::= 84
id-E-UTRAN-Trace-ID                              ProtocolIE-ID ::= 86
id-RelativeMMECapacity                           ProtocolIE-ID ::= 87
id-SourceMME-UE-S1AP-ID                          ProtocolIE-ID ::= 88
id-Bearers-SubjectToStatusTransfer-Item          ProtocolIE-ID ::= 89
id-eNB-StatusTransfer-TransparentContainer       ProtocolIE-ID ::= 90
id-UE-associatedLogicalS1-ConnectionItem         ProtocolIE-ID ::= 91
id-ResetType                                     ProtocolIE-ID ::= 92
id-UE-associatedLogicalS1-ConnectionListResAck   ProtocolIE-ID ::= 93
id-E-RABToBeSwitchedULItem                       ProtocolIE-ID ::= 94
id-E-RABToBeSwitchedULList                       ProtocolIE-ID ::= 95
id-S-TMSI                                        ProtocolIE-ID ::= 96
id-cdma2000OneXRAND                              ProtocolIE-ID ::= 97
id-RequestType                                   ProtocolIE-ID ::= 98
id-UE-S1AP-IDs                                   ProtocolIE-ID ::= 99
id-EUTRAN-CGI                                    ProtocolIE-ID ::= 100
id-OverloadResponse                              ProtocolIE-ID ::= 101
id-cdma2000OneXSRVCCInfo                         ProtocolIE-ID ::= 102
id-E-RABFailedToBeReleasedList                   ProtocolIE-ID ::= 103
id-Source-ToTarget-TransparentContainer          ProtocolIE-ID ::= 104
id-ServedGUMMEIs                                 ProtocolIE-ID ::= 105
id-SubscriberProfileIDforRFP                     ProtocolIE-ID ::= 106
id-UESecurityCapabilities                        ProtocolIE-ID ::= 107
id-CSFallbackIndicator                           ProtocolIE-ID ::= 108
id-CNDomain                                      ProtocolIE-ID ::= 109
id-E-RABReleasedList                             ProtocolIE-ID ::= 110
id-MessageIdentifier                             ProtocolIE-ID ::= 111
id-SerialNumber                                  ProtocolIE-ID ::= 112
id-WarningAreaList                               ProtocolIE-ID ::= 113
id-RepetitionPeriod                              ProtocolIE-ID ::= 114
id-NumberofBroadcastRequest                      ProtocolIE-ID ::= 115
id-WarningType                                   ProtocolIE-ID ::= 116
id-WarningSecurityInfo                           ProtocolIE-ID ::= 117
id-DataCodingScheme                              ProtocolIE-ID ::= 118
id-WarningMessageContents                        ProtocolIE-ID ::= 119
id-BroadcastCompletedAreaList                    ProtocolIE-ID ::= 120
id-Inter-SystemInformationTransferTypeEDT        ProtocolIE-ID ::= 121
id-Inter-SystemInformationTransferTypeMDT        ProtocolIE-ID ::= 122
id-Target-ToSource-TransparentContainer          ProtocolIE-ID ::= 123
id-SRVCCOperationPossible                        ProtocolIE-ID ::= 124
id-SRVCCHOIndication                             ProtocolIE-ID ::= 125
id-NAS-DownlinkCount                             ProtocolIE-ID ::= 126
id-CSG-Id                                        ProtocolIE-ID ::= 127
id-CSG-IdList                                    ProtocolIE-ID ::= 128
id-SONConfigurationTransferECT                   ProtocolIE-ID ::= 129
id-SONConfigurationTransferMCT                   ProtocolIE-ID ::= 130
```

```
id-TraceCollectionEntityIPAddress                ProtocolIE-ID ::= 131
id-MSClassmark2                                  ProtocolIE-ID ::= 132
id-MSClassmark3                                  ProtocolIE-ID ::= 133
id-RRC-Establishment-Cause                       ProtocolIE-ID ::= 134
id-NASSecurityParametersfromE-UTRAN              ProtocolIE-ID ::= 135
id-NASSecurityParameterstoE-UTRAN                ProtocolIE-ID ::= 136
id-DefaultPagingDRX                              ProtocolIE-ID ::= 137
id-Source-ToTarget-TransparentContainer-Secondary ProtocolIE-ID ::= 138
id-Target-ToSource-TransparentContainer-Secondary ProtocolIE-ID ::= 139
id-EUTRANRoundTripDelayEstimationInfo            ProtocolIE-ID ::= 140
id-BroadcastCancelledAreaList                    ProtocolIE-ID ::= 141
id-ConcurrentWarningMessageIndicator             ProtocolIE-ID ::= 142
id-Data-Forwarding-Not-Possible                  ProtocolIE-ID ::= 143
id-ExtendedRepetitionPeriod                      ProtocolIE-ID ::= 144
id-CellAccessMode                                ProtocolIE-ID ::= 145
id-CSGMembershipStatus                           ProtocolIE-ID ::= 146
id-LPPa-PDU                                      ProtocolIE-ID ::= 147
id-Routing-ID                                    ProtocolIE-ID ::= 148
id-Time-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-TrafficLoadReductionIndication                ProtocolIE-ID ::= 161
id-MDTConfiguration                              ProtocolIE-ID ::= 162
id-MMERelaySupportIndicator                      ProtocolIE-ID ::= 163
id-GWContextReleaseIndication                    ProtocolIE-ID ::= 164
id-ManagementBasedMDTAllowed                     ProtocolIE-ID ::= 165
id-PrivacyIndicator                              ProtocolIE-ID ::= 166
id-Time-UE-StayedInCell-EnhancedGranularity      ProtocolIE-ID ::= 167
id-HO-Cause                                      ProtocolIE-ID ::= 168
id-VoiceSupportMatchIndicator                    ProtocolIE-ID ::= 169
id-GUMMEIType                                    ProtocolIE-ID ::= 170
id-M3Configuration                               ProtocolIE-ID ::= 171
id-M4Configuration                               ProtocolIE-ID ::= 172
id-M5Configuration                               ProtocolIE-ID ::= 173
id-MDT-Location-Info                             ProtocolIE-ID ::= 174
id-MobilityInformation                           ProtocolIE-ID ::= 175
id-Tunnel-Information-for-BBF                    ProtocolIE-ID ::= 176
id-ManagementBasedMDTPLMNList                    ProtocolIE-ID ::= 177
id-SignallingBasedMDTPLMNList                    ProtocolIE-ID ::= 178
id-ULCOUNTValueExtended                          ProtocolIE-ID ::= 179
id-DLCOUNTValueExtended                          ProtocolIE-ID ::= 180
id-ReceiveStatusOfULPDCPSDUsExtended             ProtocolIE-ID ::= 181
id-ECGIListForRestart                            ProtocolIE-ID ::= 182
id-SIPTO-Correlation-ID                          ProtocolIE-ID ::= 183
id-SIPTO-L-GW-TransportLayerAddress              ProtocolIE-ID ::= 184
```

```
id-TransportInformation                          ProtocolIE-ID ::= 185
id-LHN-ID                                        ProtocolIE-ID ::= 186
id-AdditionalCSFallbackIndicator                 ProtocolIE-ID ::= 187
id-TAIListForRestart                             ProtocolIE-ID ::= 188
id-UserLocationInformation                       ProtocolIE-ID ::= 189
id-EmergencyAreaIDListForRestart                 ProtocolIE-ID ::= 190
id-KillAllWarningMessages                        ProtocolIE-ID ::= 191
id-Masked-IMEISV                                 ProtocolIE-ID ::= 192
id-eNBIndirectX2TransportLayerAddresses          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-RABToBeModifiedListBearerModInd             ProtocolIE-ID ::= 199
id-E-RABToBeModifiedItemBearerModInd             ProtocolIE-ID ::= 200
id-E-RABNotToBeModifiedListBearerModInd          ProtocolIE-ID ::= 201
id-E-RABNotToBeModifiedItemBearerModInd          ProtocolIE-ID ::= 202
id-E-RABModifyListBearerModConf                  ProtocolIE-ID ::= 203
id-E-RABModifyItemBearerModConf                  ProtocolIE-ID ::= 204
id-E-RABFailedToModifyListBearerModConf          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-InformationOnRecommendedCellsAndENBsForPaging ProtocolIE-ID ::= 213
id-RecommendedCellItem                           ProtocolIE-ID ::= 214
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-E-RABFailedToResumeListResumeReq              ProtocolIE-ID ::= 235
id-E-RABFailedToResumeItemResumeReq              ProtocolIE-ID ::= 236
id-E-RABFailedToResumeListResumeRes              ProtocolIE-ID ::= 237
id-E-RABFailedToResumeItemResumeRes              ProtocolIE-ID ::= 238
id-NB-IoT-Paging-eDRXInformation                 ProtocolIE-ID ::= 239
```

```
id-V2XServicesAuthorized                        ProtocolIE-ID ::= 240
id-UEUserPlaneCIoTSupportIndicator              ProtocolIE-ID ::= 241
id-CE-mode-B-SupportIndicator                   ProtocolIE-ID ::= 242
id-SRVCCOperationNotPossible                    ProtocolIE-ID ::= 243
id-NB-IoT-UEIdentityIndexValue                  ProtocolIE-ID ::= 244
id-RRC-Resume-Cause                             ProtocolIE-ID ::= 245
id-DCN-ID                                       ProtocolIE-ID ::= 246
id-ServedDCNs                                   ProtocolIE-ID ::= 247
id-UESidelinkAggregateMaximumBitrate            ProtocolIE-ID ::= 248
id-DLNASPDUDeliveryAckRequest                   ProtocolIE-ID ::= 249
id-Coverage-Level                               ProtocolIE-ID ::= 250
id-EnhancedCoverageRestricted                   ProtocolIE-ID ::= 251
id-UE-Level-QoS-Parameters                      ProtocolIE-ID ::= 252
id-DL-CP-SecurityInformation                    ProtocolIE-ID ::= 253
id-UL-CP-SecurityInformation                    ProtocolIE-ID ::= 254
id-extended-e-RAB-MaximumBitrateDL              ProtocolIE-ID ::= 255
id-extended-e-RAB-MaximumBitrateUL              ProtocolIE-ID ::= 256
id-extended-e-RAB-GuaranteedBitrateDL           ProtocolIE-ID ::= 257
id-extended-e-RAB-GuaranteedBitrateUL           ProtocolIE-ID ::= 258
id-extended-uEaggregateMaximumBitRateDL         ProtocolIE-ID ::= 259
id-extended-uEaggregateMaximumBitRateUL         ProtocolIE-ID ::= 260
id-NRrestrictioninEPSasSecondaryRAT             ProtocolIE-ID ::= 261
id-UEAppLayerMeasConfig                         ProtocolIE-ID ::= 262
id-UE-Application-Layer-Measurement-Capability  ProtocolIE-ID ::= 263
id-SecondaryRATDataUsageReportList              ProtocolIE-ID ::= 264
id-SecondaryRATDataUsageReportItem              ProtocolIE-ID ::= 265
id-HandoverFlag                                 ProtocolIE-ID ::= 266
id-E-RABUsageReportItem                         ProtocolIE-ID ::= 267
id-SecondaryRATDataUsageRequest                 ProtocolIE-ID ::= 268
id-NRUESecurityCapabilities                     ProtocolIE-ID ::= 269
id-UnlicensedSpectrumRestriction                ProtocolIE-ID ::= 270
id-CE-ModeBRestricted                           ProtocolIE-ID ::= 271
id-LTE-M-Indication                             ProtocolIE-ID ::= 272
id-DownlinkPacketLossRate                       ProtocolIE-ID ::= 273
id-UplinkPacketLossRate                         ProtocolIE-ID ::= 274
id-UECapabilityInfoRequest                      ProtocolIE-ID ::= 275
id-serviceType                                  ProtocolIE-ID ::= 276
id-AerialUEsubscriptionInformation              ProtocolIE-ID ::= 277
id-Subscription-Based-UE-DifferentiationInfo    ProtocolIE-ID ::= 278
id-EndIndication                                ProtocolIE-ID ::= 280
id-EDT-Session                                  ProtocolIE-ID ::= 281
id-CNTypeRestrictions                           ProtocolIE-ID ::= 282
id-PendingDataIndication                        ProtocolIE-ID ::= 283
id-BluetoothMeasurementConfiguration            ProtocolIE-ID ::= 284
id-WLANMeasurementConfiguration                 ProtocolIE-ID ::= 285
id-WarningAreaCoordinates                       ProtocolIE-ID ::= 286
id-NRrestrictionin5GS                           ProtocolIE-ID ::= 287
id-PSCellInformation                            ProtocolIE-ID ::= 288
id-LastNG-RANPLMNIdentity                       ProtocolIE-ID ::= 290
id-ConnectedengNBList                           ProtocolIE-ID ::= 291
id-ConnectedengNBToAddList                      ProtocolIE-ID ::= 292
id-ConnectedengNBToRemoveList                   ProtocolIE-ID ::= 293
id-EN-DCSONConfigurationTransfer-ECT            ProtocolIE-ID ::= 294
id-EN-DCSONConfigurationTransfer-MCT            ProtocolIE-ID ::= 295
```

```
id-IMSvoiceEPSfallbackfrom5G                    ProtocolIE-ID ::= 296
id-TimeSinceSecondaryNodeRelease                ProtocolIE-ID ::= 297
id-RequestTypeAdditionalInfo                    ProtocolIE-ID ::= 298
id-AdditionalRRMPriorityIndex                   ProtocolIE-ID ::= 299
id-ContextatSource                              ProtocolIE-ID ::= 300
id-IAB-Authorized                               ProtocolIE-ID ::= 301
id-IAB-Node-Indication                          ProtocolIE-ID ::= 302
id-IAB-Supported                                ProtocolIE-ID ::= 303
id-DataSize                                     ProtocolIE-ID ::= 304
id-Ethernet-Type                                ProtocolIE-ID ::= 305
id-NRV2XServicesAuthorized                      ProtocolIE-ID ::= 306
id-NRUESidelinkAggregateMaximumBitrate          ProtocolIE-ID ::= 307
id-PC5QoSParameters                             ProtocolIE-ID ::= 308
id-IntersystemSONConfigurationTransferMCT       ProtocolIE-ID ::= 309
id-IntersystemSONConfigurationTransferECT       ProtocolIE-ID ::= 310
id-IntersystemMeasurementConfiguration          ProtocolIE-ID ::= 311
id-SourceNodeID                                 ProtocolIE-ID ::= 312
id-NB-IoT-RLF-Report-Container                  ProtocolIE-ID ::= 313
id-UERadioCapabilityID                          ProtocolIE-ID ::= 314
id-UERadioCapability-NR-Format                  ProtocolIE-ID ::= 315
id-MDTConfigurationNR                           ProtocolIE-ID ::= 316
id-DAPSRequestInfo                              ProtocolIE-ID ::= 317
id-DAPSResponseInfoList                         ProtocolIE-ID ::= 318
id-DAPSResponseInfoItem                         ProtocolIE-ID ::= 319
id-NotifySourceeNB                              ProtocolIE-ID ::= 320
id-eNB-EarlyStatusTransfer-TransparentContainer ProtocolIE-ID ::= 321
id-Bearers-SubjectToEarlyStatusTransfer-Item    ProtocolIE-ID ::= 322
id-WUS-Assistance-Information                   ProtocolIE-ID ::= 323
id-NB-IoT-PagingDRX                             ProtocolIE-ID ::= 324
id-TraceCollectionEntityURI                     ProtocolIE-ID ::= 325
id-EmergencyIndicator                           ProtocolIE-ID ::= 326
id-UERadioCapabilityForPaging-NR-Format         ProtocolIE-ID ::= 327
id-SourceTransportLayerAddress                  ProtocolIE-ID ::= 328
id-SourceNodeTransportLayerAddress              ProtocolIE-ID ::= 340
id-SourceSNID                                   ProtocolIE-ID ::= 343

END
```

9.3.7 Container Definitions

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

S1AP-Containers {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) s1ap (1) version1 (1) s1ap-Containers (5) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN
```

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

IMPORTS
    Criticality,
    Presence,
    PrivateIE-ID,
    ProtocolExtensionID,
    ProtocolIE-ID
FROM S1AP-CommonDataTypes

    maxPrivateIEs,
    maxProtocolExtensions,
    maxProtocolIEs
FROM S1AP-Constants;

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

S1AP-PROTOCOL-IES ::= CLASS {
    &id             ProtocolIE-ID                   UNIQUE,
    &criticality    Criticality,
    &Value,
    &presence       Presence
}
WITH SYNTAX {
    ID              &id
    CRITICALITY     &criticality
    TYPE            &Value
    PRESENCE        &presence
}

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

S1AP-PROTOCOL-IES-PAIR ::= CLASS {
    &id                 ProtocolIE-ID               UNIQUE,
    &firstCriticality   Criticality,
    &FirstValue,
    &secondCriticality  Criticality,
    &SecondValue,
    &presence           Presence
}
WITH SYNTAX {
```

```
    ID              &id
    FIRST CRITICALITY       &firstCriticality
    FIRST TYPE              &FirstValue
    SECOND CRITICALITY      &secondCriticality
    SECOND TYPE             &SecondValue
    PRESENCE                &presence
}

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

S1AP-PROTOCOL-EXTENSION ::= CLASS {
    &id             ProtocolExtensionID         UNIQUE,
    &criticality    Criticality,
    &Extension,
    &presence       Presence
}
WITH SYNTAX {
    ID              &id
    CRITICALITY     &criticality
    EXTENSION       &Extension
    PRESENCE        &presence
}

-- **************************************************************
--
-- Class Definition for Private IEs
--
-- **************************************************************

S1AP-PRIVATE-IES ::= CLASS {
    &id             PrivateIE-ID,
    &criticality    Criticality,
    &Value,
    &presence       Presence
}
WITH SYNTAX {
    ID              &id
    CRITICALITY     &criticality
    TYPE            &Value
    PRESENCE        &presence
}

-- **************************************************************
--
-- Container for Protocol IEs
--
-- **************************************************************

ProtocolIE-Container {S1AP-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
```

```
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-SingleContainer {S1AP-PROTOCOL-IES : IEsSetParam} ::=
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Field {S1AP-PROTOCOL-IES : IEsSetParam} ::= SEQUENCE {
    id              S1AP-PROTOCOL-IES.&id              ({IEsSetParam}),
    criticality     S1AP-PROTOCOL-IES.&criticality     ({IEsSetParam}{@id}),
    value           S1AP-PROTOCOL-IES.&Value           ({IEsSetParam}{@id})
}

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

ProtocolIE-ContainerPair {S1AP-PROTOCOL-IES-PAIR : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-FieldPair {{IEsSetParam}}

ProtocolIE-FieldPair {S1AP-PROTOCOL-IES-PAIR : IEsSetParam} ::= SEQUENCE {
    id                  S1AP-PROTOCOL-IES-PAIR.&id                  ({IEsSetParam}),
    firstCriticality    S1AP-PROTOCOL-IES-PAIR.&firstCriticality    ({IEsSetParam}{@id}),
    firstValue          S1AP-PROTOCOL-IES-PAIR.&FirstValue          ({IEsSetParam}{@id}),
    secondCriticality   S1AP-PROTOCOL-IES-PAIR.&secondCriticality   ({IEsSetParam}{@id}),
    secondValue         S1AP-PROTOCOL-IES-PAIR.&SecondValue     ({IEsSetParam}{@id})
}

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

ProtocolIE-ContainerList {INTEGER : lowerBound, INTEGER : upperBound, S1AP-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-SingleContainer {{IEsSetParam}}

ProtocolIE-ContainerPairList {INTEGER : lowerBound, INTEGER : upperBound, S1AP-PROTOCOL-IES-PAIR : IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-ContainerPair {{IEsSetParam}}

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

ProtocolExtensionContainer {S1AP-PROTOCOL-EXTENSION : ExtensionSetParam} ::=
    SEQUENCE (SIZE (1..maxProtocolExtensions)) OF
    ProtocolExtensionField {{ExtensionSetParam}}

ProtocolExtensionField {S1AP-PROTOCOL-EXTENSION : ExtensionSetParam} ::= SEQUENCE {
```

```
    id                  S1AP-PROTOCOL-EXTENSION.&id             ({ExtensionSetParam}),
    criticality         S1AP-PROTOCOL-EXTENSION.&criticality    ({ExtensionSetParam}{@id}),
    extensionValue      S1AP-PROTOCOL-EXTENSION.&Extension      ({ExtensionSetParam}{@id})
}

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

PrivateIE-Container {S1AP-PRIVATE-IES : IEsSetParam } ::=
    SEQUENCE (SIZE (1.. maxPrivateIEs)) OF
    PrivateIE-Field {{IEsSetParam}}

PrivateIE-Field {S1AP-PRIVATE-IES : IEsSetParam} ::= SEQUENCE {
    id                  S1AP-PRIVATE-IES.&id                ({IEsSetParam}),
    criticality         S1AP-PRIVATE-IES.&criticality       ({IEsSetParam}{@id}),
    value               S1AP-PRIVATE-IES.&Value             ({IEsSetParam}{@id})
}

END
```

9.4 Message Transfer Syntax

S1AP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax as specified in ITU-T Rec. X.691 [4].

9.5 Timers

$TS1_{RELOCprep}$

- Specifies the maximum time for the Handover Preparation procedure in the source eNB.

$TS1_{RELOCoverall}$

- Specifies the maximum time for the protection of the overall handover procedure in the source eNB.

$TX2_{RELOCOverall}$

- it is specified in reference TS 36.423 [22].

10 Handling of Unknown, Unforeseen and Erroneous Protocol Data

10.1 General

Protocol Error cases can be divided into three classes:

- Transfer Syntax Error.
- Abstract Syntax Error.
- Logical Error.

Protocol errors can occur in the following functions within a receiving node:

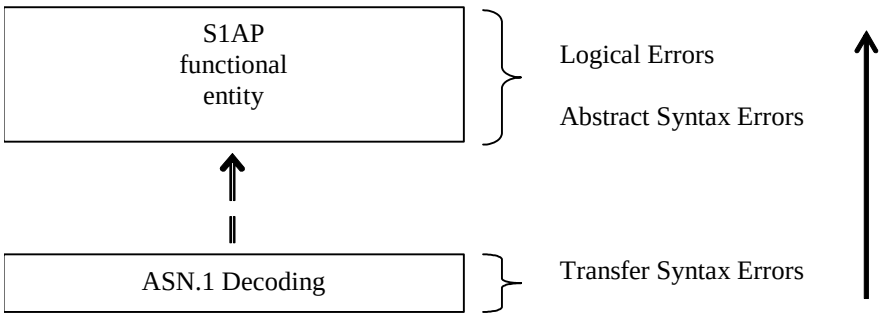

Figure 10.1-1: Protocol Errors in S1AP.

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 NG-RAN, E-UTRAN, UTRAN or GERAN specific information.

NOTE: The definition of generic transparent containers for handover purposes allows to transport them through the core network in a RAT-agnostic way.

In subclause 8.4.1.2, it is described how the transparent container shall be encoded with respect to the scenario in which it is used.

The table below is showing all possible scenarios and definitions according to which the content of the transparent container shall be encoded. Additionally the reference to the specification defining particular IE is given.

Table A.1. Specification of Transparent Containers referenced in S1AP.

Scenario	***Source to Target Transparent Container* IE in S1AP: HANDOVER REQUIRED message**		***Target to Source Transparent Container* IE in S1AP: HANDOVER COMMAND message**	
	Name of the IE	Definition in specification	Name of the IE	Definition in specification
Intra E-UTRAN handover	Source eNB to Target eNB Transparent Container	36.413	Target eNB to Source eNB Transparent Container	36.413
Inter-system handover to UTRAN or SRVCC operation to UTRAN	Source RNC to Target RNC Transparent Container	25.413	Target RNC to Source RNC Transparent Container	25.413
Inter-system handover to GERAN (PS domain only)	Source BSS to Target BSS Transparent Container 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	*Old BSS to New BSS information elements* field of the Old BSS to New BSS information	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* 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)	48.018 48.008	*Layer 3 Information field* of the Layer 3 Information (in the *Target to Source Transparent Container* IE); Target BSS to Source BSS Transparent Container Contents of the Target BSS to Source BSS Transparent Container (in the *Target to Source Transparent Container Secondary* IE)	48.008 48.018
Inter-system handover to NG-RAN	Source NG-RAN Node to Target NG-RAN Node Transparent Container	38.413	*Target NG-RAN Node to Source NG-RAN Node Transparent Container*	38.413

Annex B (normative): IEs for SON Transfer

This annex defines IEs used by the SON Transfer RIM application (TS 48.018 [18]).

B.1 Tabular definition

B.1.1 SON Transfer Application Identity

This IE indicates the application identity within the SON Transfer application.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SON Transfer Application Identity	M		ENUMERATED (Cell Load Reporting, …, Multi-Cell Load Reporting, Event-Triggered Cell Load Reporting, HO Reporting, 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 Application*	M			
>*Cell Load Reporting*			NULL	
>*Multi-Cell Load Reporting*				
>>Multi-Cell Load Reporting Request	M		B.1.7	
>*Event-Triggered Cell Load Reporting*				
>>Event-Triggered Cell Load Reporting Request	M		B.1.11	
>*HO Reporting*				
>>HO Report	M		B.1.13	
>*E-UTRAN Cell Activation*				
>>Cell Activation Request	M		B.1.14	
>*Energy Savings Indication*				
>>Cell State Indication	M		B.1.16	
>*Failure Event Reporting*				
>>Failure Event Report	M		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 Application*	M			
>*Cell Load Reporting*				
>>Cell Load Reporting Response	M		B.1.5	
>*Multi-Cell Load Reporting*				
>>Multi-Cell Load Reporting Response	M		B.1.9	
>*Event-Triggered Cell Load Reporting*				
>>Event-triggered Cell Load Reporting Response	M		B.1.12	
>*HO Reporting*			NULL	
>*E-UTRAN Cell Activation*				
>>Cell Activation Response	M		B.1.15	
>*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 Application*	M			
>*Cell Load Reporting*				
>>Cell Load Reporting Cause	M		B.1.10	
>*Multi-Cell Load Reporting*				
>>Cell Load Reporting Cause	M		B.1.10	
>*Event-Triggered Cell Load Reporting*				
>>Cell Load Reporting Cause	M		B.1.10	
>*HO Reporting*				
>>HO Reporting Cause	M		ENUMERATED (Application Container Syntax Error, Inconsistent Reporting Cell Identifier, Unspecified, …)	
>*E-UTRAN Cell Activation*				
>>Cell Activation Cause	M		ENUMERATED (Application Container Syntax Error, Inconsistent Reporting Cell Identifier, Unspecified, …)	
>*Energy Savings Indication*				
>>Cell State Indication Cause	M		ENUMERATED (Application Container Syntax Error, Inconsistent Reporting Cell Identifier, Unspecified, …)	
>*Failure Event Reporting*				
>>Failure Event Reporting Cause	M		ENUMERATED (Application Container Syntax Error, Inconsistent Reporting Cell Identifier, Unspecified, …)	

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

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	M		OCTET STRING	Contains the *Cell Load Information Group* IE as defined in TS 25.413. The receiver shall ignore the value of the *Source Cell Identifier* IE within the *Cell Load Information Group* IE.
>GERAN				
>>GERAN Response	M		OCTET STRING	Contains the *Cell Load Information Group* IE as defined in TS 48.008. The receiver shall ignore the value of the *Cell Identifier* IE within the *Cell Load Information Group* IE.
>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 reference	Semantics description
Requested Cell List		*1 .. <maxnoofIRATReportingCells>*		One of the IRAT 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).
>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	M		OCTET STRING	Contains the E-UTRAN CGI IE as defined in 9.2.1.38.
>UTRAN				
>>Cell Identifier	M		OCTET STRING	Contains the *Source Cell Identifier* IE as defined in TS 25.413.
>GERAN				
>>Cell Identifier	M		OCTET STRING	Contains the *Cell Identifier* IE as defined in TS 48.018.
>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 .. <maxnoofIRATReportingCells>*		
>CHOICE *Reporting RAT*	M			
>>E-UTRAN				
>>>E-UTRAN Response	M			
>>>>Cell Identifier	M		OCTET STRING	Contains the E-UTRAN CGI IE as defined in 9.2.1.38.
>>>>E-UTRAN Cell Load Reporting Response	M		B.1.6	
>>UTRAN				
>>>UTRAN Response	M		OCTET STRING	Contains the *Cell Load Information Group* IE as defined in TS 25.413.
>>GERAN				
>>>GERAN Response	M		OCTET STRING	Contains the *Cell Load Information Group* IE as defined in TS 48.008.
>>eHRPD				
>>>eHRPD Sector ID	M		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	M		ENUMERATED (Application Container Syntax Error, Inconsistent Reporting Cell Identifier, Unspecified, …)	

The meaning of the different cause values is described in the following table.

Cell Load Reporting Cause	Meaning
Application Container Syntax Error	The *Application Container* IE is syntactically incorrect.
Inconsistent Reporting Cell Identifier	- In case the reporting RAT is GERAN 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	M		Cell Load Reporting Response B.1.5	
Overload Flag	O		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 reference	Semantics description
HO Type	M		ENUMERATED (LTE to UTRAN, LTE to GERAN, …)	
HO Report Type	M		ENUMERATED (Unnecessary HO to another RAT, …, Early IRAT Handover)	The "Early IRAT Handover" code-point shall be used by the RNC according to TS 25.413 [19].
HO Source ID	M		IRAT Cell ID B.1.8	Contains the cell ID of the source cell for the HO. This IE shall contain an E-UTRAN CGI, and shall be set to the same value as the *Reporting Cell Identifier* IE in TS 48.018 [18]
HO Target ID	M		IRAT Cell ID B.1.8	Contains the cell ID of the target cell for the HO. This IE shall contain either a UTRAN Cell ID or a GERAN Cell ID.
Candidate Cell List		*1 .. <maxnoofCandidateCells>*		
>Candidate Cell ID	M		IRAT Cell ID B.1.8	This IE contains an E-UTRAN CGI.
Candidate PCI List		*0..1*		
>Candidate PCIs		*1 .. <maxnoofCandidateCells>*		
>>Candidate PCI	M		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 .. <maxnoofCellineNB>*		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	M		OCTET STRING	Contains the *E-UTRAN CGI* IE as defined in 9.2.1.38.
Minimum Activation Time	O		INTEGER (1..60)	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 .. <maxnoofCellineNB>*		
>Cell Identifier	M		OCTET STRING	Contains the *E-UTRAN CGI* 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 .. <maxnoofCellineNB>*		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	M		OCTET STRING	Contains the *E-UTRAN CGI* IE as defined in 9.2.1.38.
>Notify Flag	M		ENUMERATED (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*	M			
>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	O		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	M		OCTET STRING (SIZE(16))	Defined in 3GPP2 C.S0024-B [27] sub-section 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	M		B.1.21	
eHRPD Capacity Value	M		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 (1..100,...)	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 (0..100)	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	M		INTEGER (0..503)	Physical Cell Identifier of the detected cell
EARFCN	M		OCTET STRING	Contains the EARFCN IE as defined in 9.2.1.95.

B.2 ASN.1 definition

```
-- **************************************************************
--
-- IE definitions for the SON Transfer application
-- The IEs in this ASN.1 module shall be defined and encoded
-- using the same rules as applicable for the S1AP-IEs module.
--
-- **************************************************************
SonTransfer-IEs

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

--
-- Generic IEs for the SON Transfer application
--

SONtransferApplicationIdentity ::= ENUMERATED {
    cell-load-reporting,
    ...,
    multi-cell-load-reporting,
    event-triggered-cell-load-reporting,
    ho-reporting,
    eutran-cell-activation,
    energy-savings-indication,
    failure-event-reporting
```

```
}

SONtransferRequestContainer ::= CHOICE{
    cellLoadReporting                   NULL,
    ...,
    multiCellLoadReporting              MultiCellLoadReportingRequest,
    eventTriggeredCellLoadReporting     EventTriggeredCellLoadReportingRequest,
    hOReporting                         HOReport,
    eutranCellActivation                CellActivationRequest,
    energySavingsIndication             CellStateIndication,
    failureEventReporting               FailureEventReport
}

SONtransferResponseContainer ::= CHOICE{
    cellLoadReporting                   CellLoadReportingResponse,
    ...,
    multiCellLoadReporting              MultiCellLoadReportingResponse,
    eventTriggeredCellLoadReporting EventTriggeredCellLoadReportingResponse,
    hOReporting                         NULL,
    eutranCellActivation                CellActivationResponse,
    energySavingsIndication             NULL,
    failureEventReporting               NULL
}

SONtransferCause ::= CHOICE {
    cellLoadReporting                   CellLoadReportingCause,
    ...,
    multiCellLoadReporting              CellLoadReportingCause,
    eventTriggeredCellLoadReporting     CellLoadReportingCause,
    hOReporting                         HOReportingCause,
    eutranCellActivation                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          EUTRANcellLoadReportingResponse,
    uTRAN           OCTET STRING,
```

```
    gERAN           OCTET STRING,
    ...,
    eHRPD           EHRPDSectorLoadReportingResponse
}

CompositeAvailableCapacityGroup ::= OCTET STRING

EUTRANcellLoadReportingResponse ::= SEQUENCE {
    compositeAvailableCapacityGroup     CompositeAvailableCapacityGroup,
    ...
}

--
-- IEs for Multi-Cell Load Reporting application
--

EUTRANResponse::= SEQUENCE {
    cell-ID         OCTET STRING,
    eUTRANcellLoadReportingResponse     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 {
    requestedCellList                       RequestedCellList,
    ...
}

ReportingCellList-Item ::= SEQUENCE {
    cell-ID                                 IRAT-Cell-ID,
    ...
}

ReportingCellList ::= SEQUENCE (SIZE(1.. maxnoofIRATReportingCells)) OF ReportingCellList-Item

MultiCellLoadReportingResponse ::= SEQUENCE (SIZE(1.. maxnoofIRATReportingCells)) OF
MultiCellLoadReportingResponse-Item

MultiCellLoadReportingResponse-Item ::= CHOICE{
    eUTRANResponse                          EUTRANResponse,
    uTRANResponse                           OCTET STRING,
    gERANResponse                           OCTET STRING,
    ...,
    eHRPD                                   EHRPDMultiSectorLoadReportingResponseItem
}


--
-- IEs for Event-triggered Cell Load Reporting application
--

NumberOfMeasurementReportingLevels ::= ENUMERATED {
    rl2,
    rl3,
    rl4,
    rl5,
    rl10,
    ...
}

EventTriggeredCellLoadReportingRequest ::= SEQUENCE {
    numberOfMeasurementReportingLevels      NumberOfMeasurementReportingLevels,
    ...
}

OverloadFlag ::= ENUMERATED {
    overload,
```

```
    ...
}

EventTriggeredCellLoadReportingResponse ::= SEQUENCE {
    cellLoadReportingResponse               CellLoadReportingResponse,
    overloadFlag                            OverloadFlag                        OPTIONAL,
    ...
}

--
-- IEs for HO Reporting application
--



HOReport::= SEQUENCE {
    hoType                  HoType,
    hoReportType            HoReportType,
    hosourceID              IRAT-Cell-ID,
    hoTargetID              IRAT-Cell-ID,
    candidateCellList       CandidateCellList,
    ...,
    candidatePCIList        CandidatePCIList    OPTIONAL
}

HoType ::= ENUMERATED {
    ltetoutran,
    ltetogeran,
    ...
}

HoReportType ::= ENUMERATED {
    unnecessaryhotoanotherrat,
    ...,
    earlyirathandover
}

CandidateCellList ::= SEQUENCE (SIZE(1..maxnoofcandidateCells)) 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 {
    cellsToActivateList     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,
    ...
}

NotificationCellList ::= SEQUENCE (SIZE(1.. maxnoofCellineNB)) OF NotificationCellList-Item

NotificationCellList-Item ::= SEQUENCE {
    cell-ID                 OCTET STRING,
    notifyFlag              NotifyFlag,
    ...
}

NotifyFlag ::= ENUMERATED {
    activated,
    deactivated,
    ...
}

FailureEventReport::= CHOICE {
    tooEarlyInterRATHOReportFromEUTRAN          TooEarlyInterRATHOReportReportFromEUTRAN,
    ...
}

TooEarlyInterRATHOReportReportFromEUTRAN ::= SEQUENCE {
    uERLFReportContainer    OCTET STRING, -- as defined in TS 36.331 [16] --
    mobilityInformation     MobilityInformation     OPTIONAL,
    ...
}

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 {
    eHRPDSectorCapacityClassValue               EHRPDSectorCapacityClassValue,
    eHRPDCapacityValue                          EHRPDCapacityValue,
    ...
}

EHRPDMultiSectorLoadReportingResponseItem ::= SEQUENCE {
    eHRPD-Sector-ID                         EHRPD-Sector-ID,
    eHRPDSectorLoadReportingResponse        EHRPDSectorLoadReportingResponse,
    ...
}


-- ************************************************************
--
-- Constants
--
-- ************************************************************

maxnoofIRATReportingCells                   INTEGER ::= 128
maxnoofcandidateCells                       INTEGER ::= 16
maxnoofCellineNB                            INTEGER ::= 256

END
```

Annex C (informative): Processing of Transparent Containers at the MME

The encoding of the *Source to Target Transparent Container* and *Target to Source Transparent Container* IEs in this specification is different from the one specified in TS 25.413 [19].

Irrespective of the mobility scenario (inter-RAT or intra-LTE), the MME always processes these IEs in the following way:

- The MME shall convey to the eNodeB the information received within
  - the GTPv1-C "UTRAN transparent field" of the "UTRAN Transparent Container" IE across the Gn-interface (see subclause 7.7.38 of TS 29.060 [35]), or
  - the 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	0223		changes to TS 36.413 agreed in RAN3#61	8.3.0
42	RP-080846	0325	1	changes to TS 36.413 agreed in RAN3#62	8.4.0
43	RP-090083	0327		Adding extension container in SEQUENCE type for forward compatibility	8.5.0
43	RP-090091	0331	1	Corrections on S1AP: eNB configuration update procedure	8.5.0
43	RP-090086	0332	1	Corrections on S1AP: Paging procedure	8.5.0
43	RP-090089	0333	1	Handling detection of two S1 connections towards one UE	8.5.0
43	RP-090089	0334	1	Interaction between UE Context Release Request and UE Context Release procedure	8.5.0
43	RP-090246	0337	2	IP address retrieval for ANRF	8.5.0
43	RP-090083	0340		Modification of RRC context indexing	8.5.0
43	RP-090086	0342	1	Completion of LTE cause values	8.5.0
43	RP-090090	0345	1	Correction of served GUMMEIs	8.5.0
43	RP-090086	0346	1	Correction of Initial Context Setup	8.5.0
43	RP-090086	0349	1	Clarification of path switch failure	8.5.0
43	RP-090091	0350	2	Correction of eNB Status Transfer	8.5.0
43	RP-090083	0356		Addition of the description of Timer TX2RELOCOverall	8.5.0
43	RP-090089	0357	1	New cause value “Interaction with other procedure”	8.5.0
43	RP-090087	0359	1	S1AP Review on Location Reporting procedures	8.5.0
43	RP-090089	0366	1	Definition on parameters related to a trace activation	8.5.0
43	RP-090090	0368	2	Adding EUTRAN CELL TRAFFIC TRACE message over S1 interfaces	8.5.0
43	RP-090091	0369	2	Adding MS Classmark 2 and MS Clssmark 3 IEs over S1 interface	8.5.0
43	RP-090086	0370	1	New Invalid E-RAB Id causes	8.5.0
43	RP-090091	0371	2	S1AP Review: S1 Handover Cancel procedure	8.5.0
43	RP-090158	0372	2	S1AP Review: Write-Replace Warning procedure	8.5.0
43	RP-090246	0374	1	Definition of Cell Type	8.5.0
43	RP-090085	0375	1	Abnormal condition related to UE Security Capabilities	8.5.0
43	RP-090245	0376		Removal of UE Security Capabilities IE from HANDOVER NOTIFY message	8.5.0
43	RP-090086	0378	1	Corrections for the procedure concurrency	8.5.0
43	RP-090091	0380	2	Clarification of eNB Name and MME Name IE’s	8.5.0
43	RP-090083	0392		Clarifications on access control at handover	8.5.0
43	RP-090087	0393	1	Paging response	8.5.0
43	RP-090077	0394		Correction on usage of UE History Information	8.5.0
43	RP-090086	0395	1	Delete the UDP port in the note for GTP-TEID	8.5.0
43	RP-090245	0396		S1AP CR on CDMA2000 RAT Type	8.5.0
43	RP-090246	0397	1	Editorial Updates TS 36.413	8.5.0
43	RP-090091	0398	3	NAS Security Parameters for to/from E-UTRAN/UTRAN handovers	8.5.0
43	RP-090085	0399	1	Updates for Next Hop Chaining Count	8.5.0
43	RP-090245	0401		Transparent Container content – informative annex	8.5.0
43	RP-090093	0404	1	Transparent container handling in case of SRVCC operation to GERAN	8.5.0
43	RP-090090	0405	2	Changes to S1AP to support paging optimization	8.5.0
43	RP-090245	0406	3	S1 handover Clean up	8.5.0
43	RP-090087	0407	1	Support blocking 3GPP2 handover	8.5.0
43	RP-090091	0410	2	Inclusion of eNB default paging DRX in S1 setup and configuration update	8.5.0
43	RP-090087	0412	1	Explicit resetting of overload state information on S1 Setup	8.5.0
43	RP-090090	0413	2	Clarify Security Context IE description	8.5.0
43	RP-090091	0414	2	Criticality corrections in 36.413	8.5.0
43	RP-090245	0415		Add abnormal conditions section to UE Context Release and fix tabular error	8.5.0
43	RP-090245	0419		Consistent references to S1AP	8.5.0
43	RP-090090	0424	2	Two new cause values in the Cause IE	8.5.0
43	RP-090089	0425		Alignment of QCI range	8.5.0
43	RP-090089	0426		Remove the Handover Type IE from the HANDOVER REQUEST ACKNOWLEDGE message	8.5.0
43	RP-090090	0427	1	Correction of the trace procedural text and trace related IEs	8.5.0
March 2009	-	-	-	Minor corrections before freezing of ASN.1	8.5.1
44	RP-090637	0504	2	Editorial Updates	8.6.0
44	RP-090637	0512		Correction of RAN#43 CR implementation	8.6.0
44	RP-090637	0510		Explicitly allow TRACE START to be the first UE-associated message received at the eNB	8.6.0
44	RP-090637	0507	1	Clarification of UE Capability Info Indication	8.6.0
44	RP-090637	0500	1	Mandatory UE History Information IE in HANDOVER REQUIRED For Inter-RAT HO from E-UTRAN to UMTS	8.6.0

44	RP-090637	0482	1	Clarify eNB may send Release msg rather than RRC Reject msg on receiving OVERLOAD Start msg	8.6.0
44	RP-090637	0480	1	Clarify reporting of duplicate E-RABs in E-RAB RESPONSE	8.6.0
44	RP-090637	0468		Correction of security parameters	8.6.0
44	RP-090637	0463	1	Emergency call Indicator during CS Fallback	8.6.0
44	RP-090638	0438	2	Correction on Path Switch Request procedure	8.6.0
44	RP-090644	0443	2	Removing 'outcome' element from the Triggering Message IE	8.6.0
44	RP-090644	0448	1	Missing S1AP functions	8.6.0
44	RP-090644	0451	1	Correction of abnormal conditions in UE Context Release	8.6.0
44	RP-090644	0452	1	Clarification of E-UTRAN Trace ID in Cell Traffice Trace message	8.6.0
44	RP-090644	0453		Removal of duplication description of MME UE S1AP ID and eNB UE S1AP ID	8.6.0
44	RP-090644	0455	1	Abnormal condition for Handover Cancellation	8.6.0
44	RP-090640	0458	3	NNSF for HeNB GW deployment scenario	8.6.0
44	RP-090640	0503	1	Transparent Container Coding	8.6.0
44	RP-090640	0471	2	Some Editorial Corrections on ASN.1	8.6.0
44	RP-090640	0492		Failure of the eNB Configuration Update procedure	8.6.0
44	RP-090640	0484		Rephrasing of abnormal conditions for S1 setup	8.6.0
44	RP-090640	0494		Cause value for inter-RAT Redirection	8.6.0
44	RP-090628	0464	2	NAS PDU in E-RAB Release Command	8.6.0
44	RP-090636	0491		Alignment of eNB configuration update procedure	8.6.0
44	RP-090636	0476	2	Add that a non-GBR must be received and admitted on S1-HO	8.6.0
44	RP-090636	0461	1	Clarification of Security Context to be used in HANDOVER REQUEST message	8.6.0
44	RP-090636	0459		Correction the text about the Handover Resource Allocation procedure	8.6.0
44	RP-090636	0502		Clarification for RAT list in S1 Setup Response and MME configuration Update	8.6.0
44	RP-090636	0501	1	Range bound for maximal number of PLMNs per MME and GUMMEIs	8.6.0
June 2009				Correction of an ASN.1 implementation error of CR0463r1 in RP-090637 (R3-091456)	8.6.1
45	RP-090767	0515	1	Corrections for 36.413	8.7.0
45	RP-090964	0522		SRVCC to GERAN/UTRAN	8.7.0
45	RP-090964	0531		Clean up the Terminology of home eNB in S1AP	8.7.0
45	RP-090964	0534		Specify how report dup E-RAB ID in Tabular and replace MME with EPC in 8.3.1.2	8.7.0
45	RP-090964	0536	1	Indirect path use by the MME	8.7.0
45	RP-090767	0537	1	Handling of not supported QCI values	8.7.0
45	RP-090964	0538	1	E-RABs subject to forwarding	8.7.0
45	RP-090767	0540	1	Mandatory NAS PDU in E-RAB Release Command	8.7.0
45	RP-090767	0542	1	Missing reference and specification for encoding the CDMA2000 Pilot List	8.7.0
45	RP-090767	0547	1	CR on *Repetition Period* IE	8.7.0
45	RP-090767	0551		Miscellaneous correction to 36.413v8.6.1	8.7.0
45	RP-090768	0553		ASN1 object identified correction	8.7.0
45	RP-090767	0554		Interaction between Initial Context Setup/UE Context Modification and Handover Preparation/Redirection procedures during CS Fallback	8.7.0
09/2009				Rel-9 version is created based on v.8.7.0	9.0.0
45	RP-090767	0521	3	Adding the RTD information in UPLINK CDMA2000 TUNNELING	9.0.0
45	RP-090787	0543	1	Handling of Emergency Calls in Limited Service Mode	9.0.0
45	RP-090787	0544	1	Emergency Calls Mobility Handling	9.0.0
45	RP-090776	0548	1	S1AP Kill procedure for cancellation of PWS warning messages	9.0.0
45	RP-090776	0549	1	S1AP Write-Replace Warning procedure for PWS/CMAS	9.0.0
46	RP-091191	0513	4	Support for paging optimization with CSG membership changes	9.1.0
46	RP-091191	0550	3	Inclusion of Access Mode and Subscription Status for UE prioritisation in LTE hybrid cells	9.1.0
46	RP-091194	0557		Handling of Multiple concurrent CMAS Warning Notifications	9.1.0
46	RP-091189	0563	2	CR for Transportation support for LPPa	9.1.0
46	RP-091195	0567	3	Introducing the "Data Forwarding Not Possible" indication to HANDOVER REQUEST	9.1.0
46	RP-091183	0569		ASN.1 correction for BroadcastCompleteAreaList	9.1.0
46	RP-091183	0571	1	Correction on abnormal handling of Subscriber Profile ID for RAT/Frequency priority IE	9.1.0
46	RP-091368	0580		Align IE's in Tabular for two messages with their ASN.1 for R9	9.1.0
46	RP-091183	0589	2	Rejection Criteria for Overload	9.1.0
46	RP-091369	0592	2	Introduction of inbound LTE mobility	9.1.0
46	RP-091194	0605	1	Repetition Period for CMAS	9.1.0
46	RP-091183	0607		Correction of E-RAB Modify	9.1.0
46	RP-091183	0616	1	Clarification on handover restriction	9.1.0

46	RP-091183	0618	2	Correction of Transport Layer Address	9.1.0
46	RP-091183	0621	1	Missing reference and unclear handling of the CDMA2000 Sector ID	9.1.0
47	RP-100214	0623	1	Correction of RTD range	9.2.0
47	RP-100214	0625	1	Correction of path switch failure	9.2.0
47	RP-100213	0626		Fix for Mobile terminated calls rejection in eNodeB	9.2.0
47	RP-100229	0627		Introduction of PLMN-related abnormal conditions during HO in network sharing scenarios	9.2.0
47	RP-100222	0628		Correction of CSG Cell and Hybrid Cell Definition	9.2.0
47	RP-100214	0629	3	NCC Initialization in eNB at the Initial Connection Setup	9.2.0
47	RP-100228	0631		Inter RAT Mobility Load Balance on S1	9.2.0
47	RP-100213	0634		Crrection in DOWNLIN S1 CDMA2000 TUNNELING Procedure	9.2.0
47	RP-100222	0639	3	CSG expiry Handling	9.2.0
47	RP-100229	0641	1	CMAS and ETWS action if Number of Broadcasts Requested IE set to 0	9.2.0
47	RP-100229	0645	1	Description of Transparent Container Encoding	9.2.0
47	RP-100230	0647	2	Rapporteur's update for S1AP protocol	9.2.0
47	RP-100213	0649		Removing the restriction for Primary Notification	9.2.0
47	RP-100214	0651	1	CDMA2000 1xRTT RAND format	9.2.0
47	RP-100213	0659	1	Handling of the CDMA2000 RAT and Sector ID	9.2.0
47	RP-100214	0661	2	Handling of CSG ID check failure in LTE hybrid cells	9.2.0
47	RP-100225	0664	1	Transfer Encoding of LPPa PDUs over S1	9.2.0
47	RP-100214	0666	1	Correction of connection establishment	9.2.0
47	RP-100214	0667	1	Correction of S1 Release	9.2.0
47	RP-100228	0678		Creation of annex for SON Transfer and Cell Load Reporting RIM application.	9.2.0
47	RP-100230	0679		Support of time and frequency synchronization using network listening	9.2.0
04/2010				ToC updated	9.2.1
04/2010				Corrupted headers and ASN.1 fixed	9.2.2
48	RP-100592	0682	1	E-UTRAN Trace ID Abnormal Conditions	9.3.0
48	RP-100599	0683	2	Clarification on DTM and PS Handover	9.3.0
48	RP-100599	0687		Correction on UE Security Capability handling in UE Context Modification procedure	9.3.0
48	RP-100599	0693		Clarification on processing Extended Repetition Period IE	9.3.0
48	RP-100599	0694	1	List more apt cause in Interactions with E-RAB Management procedures section	9.3.0
48	RP-100596	0695	1	Missing ETWS action if Repetition period set to 0	9.3.0
48	RP-100599	0701	2	Correction of shall to shall if supported	9.3.0
48	RP-100599	0710		Correction of no DTM support	9.3.0
48	RP-100599	0711	2	Correction of forbidden inter-RAT	9.3.0
48	RP-100599	0716	1	Rapporteur's update for S1AP protocol	9.3.0
48	RP-100599	0717	1	S1AP Transparent containers compatible maximum message size	9.3.0
49	RP-100908	0726	1	Explicit PLMN coding in Trace IEs	9.4.0
49	RP-100908	0731	3	Cause value for UE context release during CSFB	9.4.0
49	RP-100906	0738	1	CS Fallback Indication and Handover Restriction List	9.4.0
49	RP-100908	0741	1	Correction of Repetition Period	9.4.0
49	RP-100908	0742	1	Notification of Location Reporting Failure	9.4.0
49	RP-100908	0743	1	Correction of UE AMBR	9.4.0
49	RP-100908	0745		Simultaneous Rekeying and CSFB	9.4.0
49	RP-100908	0751		Delete references to 23.041 in Tabular	9.4.0
50	RP-101271	0753		Handling of CDMA2000 HO Required Indication	9.5.0
50	RP-101270	0755		Correction of E-RAB Data Forwarding in HANDOVER COMMAND and DOWNLINK S1 CDMA2000 TUNNELING	9.5.0
50	RP-101271	0756		Clarification on Handover Restriction List	9.5.0
50	RP-101271	0761	4	Multiple PLMNs Selection in eNodeB for CS fallback	9.5.0
50	RP-101271	0780	2	Clarification on SRVCC procedure in case of PS handover failure	9.5.0
50	RP-101271	0783	1	Correction of GBR and MBR	9.5.0
50	RP-101271	0799		Clarification on the overload action only accepting emergency and MT sessions	9.5.0
12/2010				Rel-10 version created based on v 9.5.0	10.0.0
50	RP-101272	0752	2	Prioritised handling of MPS session in S1-AP PAGING message	10.0.0
50	RP-101272	0754	2	Alignment of tabular with ASN.1 for S1 Setup message	10.0.0
50	RP-101272	0764	2	Enhancement of the IP address exchange mechanism for ANR purposes	10.0.0
50	RP-101304	0768	1	Inter-RAT cell load reporting for multiple cells	10.0.0
50	RP-101304	0769	2	Event-triggered inter-RAT cell load reporting	10.0.0
50	RP-101272	0776	3	Introduction of a new overload action IE to permit high priority access	10.0.0
50	RP-101304	0791	2	Inter-RAT MRO for Detection of too early inter-RAT handover with no RLF	10.0.0
50	RP-101281	0794	2	Adding List of GUMMEIs to Overload related messages	10.0.0
50	RP-101272	0797	1	Incorrect causes in the Error Indication msg	10.0.0
50	RP-101279	0798	4	X2 handover support	10.0.0

50	RP-101272	0800	1	Clarification on the overload action only accepting emergency and MT sessions	10.0.0
01/2011				Editorial change: highlighting removed	10.0.1
SP-49	SP-100629			Clarification on the use of References (TS 21.801 CR#0030)	10.1.0
51	RP-110231	0801		Correct the criticality for two new IEs to support X2 HO for HeNB	10.1.0
51	RP-110239	0802		Clean-up for Rel-10 enhancements of SON Transfer application	10.1.0
51	RP-110226	0803		Clarification containers for CS only SRVCC towards UTRAN without PS HO support	10.1.0
51	RP-110225	0804		Correction to the editor notes	10.1.0
51	RP-110225	0805		Correction on CSG Subcription List	10.1.0
51	RP-110222	0808		Correction of CSFB related Cause Values	10.1.0
51	RP-110236	0809	2	Relay Node indication to MME	10.1.0
51	RP-110236	0810		GUMMEI List in Overload Start and Overload Stop message	10.1.0
51	RP-110222	0812		ASN.1 Correction for the Broadcast Cancelled Area List IE	10.1.0
51	RP-110227	0813	2	LIPA Impact In RAN3	10.1.0
51	RP-110227	0814		S1 Release for LIPA Bearer	10.1.0
51	RP-110230	0815	2	Support for MDT	10.1.0
51	RP-110236	0820	1	Advertising support to RNs at the MME	10.1.0
51	RP-110225	0823	1	Introduction of SPID into DOWNLINK NAS TRANSPORT message	10.1.0
51	RP-110226	0824	2	NNSF Abbreviation and other Editorials	10.1.0
51	RP-110226	0827	2	Clarification on TEID value range for S1AP	10.1.0
51	RP-110222	0833	2	Correction of Write Replace Warning abnormal condition	10.1.0
51	RP-110226	0839		Correction of the name for Time Synchronization Info IE	10.1.0
51	RP-110226	0840	1	Typo correction in Message Type IE table	10.1.0
51	RP-110231	0848	1	Correction of Source MME GUMMEI IE criticality in PATH SWITCH REQUEST message	10.1.0
51	RP-110226	0852	1	Correction of Duplicated Warning Messages	10.1.0
51	RP-110234	0854	1	Introduction of MTC Overload Support	10.1.0
51	RP-110231	0857	3	Correction of Mobility to Open HeNBs	10.1.0
51	RP-110226	0860		S1AP Procedure Text General Clean-up	10.1.0
51	RP-110225	0863		Correction to the Semantics Description of TAC	10.1.0
51	RP-110226	0864		Introduction of a Stepwise Load Reduction Indication for the Overload procedure in Stage 3	10.1.0
52	RP-110695	0865	1	MDT correction for TAI	10.2.0
52	RP-110688	0870	1	Usage of the transparent containers for SRVCC	10.2.0
52	RP-110688	0871	1	Removal of DTM capability for UTRAN PS HO	10.2.0
52	RP-110687	0874	1	UE context release correction	10.2.0
52	RP-110700	0878		Correction to the semantic description of *Cell Load Reporting Cause* IE	10.2.0
52	RP-110682	0885	1	Correction of Target ID	10.2.0
52	RP-110689	0886	2	Review of Initial Context Setup	10.2.0
52	RP-110689	0887		Correction of SPID	10.2.0
52	RP-110689	0889	1	Overload Consistency Handling	10.2.0
52	RP-110689	0892	2	Clarification of “Redirection towards 1xRTT” cause code	10.2.0
52	RP-110695	0900	3	Support for MDT user consent	10.2.0
52	RP-110684	0903		Correction of References	10.2.0
52	RP-110686	0904	2	General clean-up before Rel-10 ASN.1 closure	10.2.0
52	RP-110698	0905	1	Clarification of MME,HeNB GW and Relay Node functions	10.2.0
52	RP-110687	0910	3	Error Handling for LIPA	10.2.0
52	RP-110695	0911	2	MDT amendments	10.2.0
52	RP-110695	0912	1	Correction of trace function and trace session	10.2.0
52	RP-110714	0913	2	Remove the UE context in the source HeNB-GW after HeNB-HeNB X2 HO	10.2.0
53	RP-111197	0914		Correction on the Order of Transparent Containers	10.3.0
53	RP-111196	0919	1	Correction of an ASN.1 typo regarding ManagementBasedMDTAllowed	10.3.0
53	RP-111197	0923	1	Data Forwarding correction	10.3.0
53	RP-111195	0924	2	Definition of value of bit in Measurements to Activate	10.3.0
53	RP-111195	0927	1	Correction of RIM function decsription	10.3.0
53	RP-111196	0928	-	Missing procedure code for “Kill”	10.3.0
53	RP-111196	0930	1	Correction of Emergency Call	10.3.0
53	RP-111198	0933	2	Container Issue	10.3.0
53	RP-111196	0935	1	Correction of SRVCC	10.3.0
53	RP-111197	0940	-	Clarification on PLMN Identity	10.3.0
54	RP-111648	0941		Definition of Maximum no. of candidate cells	10.4.0
54	RP-111651	0943		Correction of Emergency Call	10.4.0
54	RP-111651	0944		Correction of the annex on the processing of transparent containers at MME	10.4.0
54	RP-111648	0945	1	GW Context Release Indication correction	10.4.0
54	RP-111649	0954	3	Alignment on privacy requirements for MDT	10.4.0
55	RP-120233	0956	1	Corrections for SON Transfer RIM application	10.5.0

55	RP-120234	0969	2	Correct of reset	10.5.0
55	RP-120234	0978	2	Octet String for E-CGI	10.5.0
56	RP-120744	0980	-	Correction on ETWS and CMAS	10.6.0
06/2012				Rel-11 version created based on v 10.6.0	11.0.0
56	RP-120751	0981	-	Introduction of the Security Algorithm (ZUC)	11.0.0
56	RP-120752	0998	2	Correction on Emergency ARP Value	11.0.0
56	RP-120752	1007	1	Improved granularity for the time UE stayed in cell	11.0.0
56	RP-120747	1010	-	SON Transfer application for IRAT Network Energy Savings	11.0.0
57	RP-121140	1011	2	UE Radio Capability Match Indicator for Voice Continuity	11.1.0
57	RP-121140	1018		Correction of GUMMEI	11.1.0
57	RP-121138	1034	1	Corrections for IRAT Network Energy Savings	11.1.0
57	RP-121135	1041	2	Addition of HO cause value to the UE history information in S1AP	11.1.0
57	RP-121138	1044	1	Energy Saving UE Measurement (“Probing”)	11.1.0
58	RP-121730	1048	3	Introduction of new MDT measurements	11.2.0
58	RP-121736	1049		Verification of HeNB	11.2.0
58	RP-121732	1052	2	Membership verification during Path Switch Request procedure (Option A)	11.2.0
58	RP-121737	1056	1	Rapporteur editorial corrections	11.2.0
58	RP-121737	1057		Rapporteur correction of constants’ names	11.2.0
58	RP-121730	1061	2	Multi-PLMN MDT	11.2.0
58	RP-121736	1062		Correction of Capability Match Request	11.2.0
58	RP-121731	1068	2	Introduce support for Inter-RAT MRO	11.2.0
58	RP-121739	1074	2	New Information for BBF access	11.2.0
58	RP-121736	1075	1	Establishment of UE-associated logical S1-connection in eNB	11.2.0
02/2013				History table update	11.2.1
59	RP-130211	1095	-	Correction of GUMMEI Type Criticality	11.3.0
59	RP-130211	1097	2	ASN.1 review for S1AP	11.3.0
59	RP-130211	1100	1	Clarification of Warning Area List IE	11.3.0
59	RP-130212	1106	2	Invalidation of ETWS with security feature	11.3.0
59	RP-130211	1108	3	Correction of Classmark Encoding	11.3.0
59	RP-130210	1109	1	S1AP modification for PDCP SN extension	11.3.0
60	RP-130641	1110	1	Correction for the MDT Location Information IE	11.4.0
60	RP-130643	1111		Correction of the presence of the X2 TNL Configuration Info IE inside the SON Configuration Transfer IE tabular definition	11.4.0
60	RP-130643	1116	1	Correction of Kill	11.4.0
61	RP-131182	1127	1	Correction on LPPa Signalling Transport Function to support UTDOA	11.5.0
61	RP-131183	1140	2	Correction of terminology concerning the mobility restriction function	11.5.0
62	RP-131902	1147	3	Correction of Handover Restriction List	11.6.0
62	RP-131902	1150	1	Correction for Load Balancing Related cause value CR for 36413	11.6.0
62	RP-131901	1153	4	Correction on CSFB high priority indication	11.6.0
62	RP-131902	1164	1	Correction of UE Radio Capability Match	11.6.0
62	RP-131909	1128	4	Introduction of Collocated L-GW for SIPTO@LN	12.0.0
62	RP-131910	1143	3	Kill All Warning Messages	12.0.0
62	RP-131979	1166	1	Update of reference to 3GPP2 specification	12.0.0
62	RP-131909	1171	1	Introduction of SIPTO@LN Stand-Alone in S1AP	12.0.0
63	RP-140296	1151	6	Introduce support for load reporting between LTE and eHRPD	12.1.0
63	RP-140297	1163	3	Reporting of User Location Information at E-RAB release	12.1.0
63	RP-140297	1180	1	New CSFB high priority indication for eMPS and emergency call	12.1.0
63	RP-140298	1181	1	Introduction of Restart Indication for PWS	12.1.0
63	RP-140295	1196	2	Correction of contradictions for kill-all functionality	12.1.0
64	RP-140906	1179	3	Provide IMEISV to eNB to identify UE characteristics	12.2.0
64	RP-140897	1185	4	Enhance TNL Address Discovery procedure for X2 GW	12.2.0
64	RP-140894	1191	4	Correction of SRVCC to GERAN	12.2.0
64	RP-140902	1200	1	Correction on Kill-all Warning Messages Indicator	12.2.0
64	RP-140903	1208	1	Correction of OCTET STRING for eHRPD Sector ID	12.2.0
64	RP-140905	1215	1	Correction of MME STATUS TRANSFER	12.2.0
64	RP-140905	1220	-	Correction on Inter-RAT Cell ID in SON Transfer	12.2.0
65	RP-141520	1216	2	Introduction of the UE history reported from the UE	12.3.0
65	RP-141522	1219	5	Introduction of MBMS MDT	12.3.0
65	RP-141518	1231	2	Introduction of an indication of the expected UE behaviour	12.3.0
65	RP-141513	1243	2	Correction of Transparent Container encoding for PS Handover to GERAN	12.3.0
65	RP-141514	1246	2	Correction of Transparent Containers usage in annex C	12.3.0
65	RP-141521	1255	1	Paging enhancements for Low Complexity UE	12.3.0
66	RP-142082	1198	9	Addition of RLF reporting over S1	12.4.0
66	RP-142089	1214	8	Introduction of Dual Connectivity	12.4.0
66	RP-142093	1238	2	Rapporteur Review	12.4.0
66	RP-142088	1257	8	Enabling Radio Interface based Synchronisation via S1 Signalling	12.4.0
66	RP-142095	1274	2	HO Report Enhancements to reduce IRAT configuration	12.4.0

67	RP-150353	1230	6	ProSe UE Authorization in S1AP	12.5.0
67	RP-150356	1276	1	Corrections of SON configuration transfer	12.5.0
67	RP-150356	1281	2	Rapporteur Review-ASN.1 consistency check	12.5.0
67	RP-150352	1285	2	Correction of reloading PWS Alerts	12.5.0
68	RP-150943	1289	2	Add indication in the E-RAB MODIFICATION CONFIRM for E-RAB(s) that shall be released	12.6.0
68	RP-150943	1293		Adding Criticality Diagnostics in E-RAB Modification Confirm message	12.6.0
68	RP-150944	1305	3	Masked IMEISV IE correction	12.6.0
68	RP-150943	1310	1	Correction of Muting procedure	12.6.0
68	RP-150944	1311	2	Correction of PWS Broadcast Completed Area List	12.6.0
68	RP-150944	1312	1	Updating SRVCC Operation Possible in EUTRAN	12.6.0
06/2015				Rel-13 version created based on v 12.6.0	13.0.0
68	RP-150945	1303	2	eNB behaviour for IRAT handovers in AAS	13.0.0
70	RP-152100	1315	6	ProSe UE Relaying Support in S1AP	13.1.0
70	RP-152099	1345	2	Extension of PDCP SN	13.1.0
70	RP-152102	1348	4	Adding CSG support to DC	13.1.0
70	RP-152096	1362	4	Introduction of Dedicated Core Network (DCN) feature	13.1.0
70	RP-152102	1368	1	Support of SIPTO and LIPA for DC	13.1.0
70	RP-152103	1369	3	Introduction of feMDT	13.1.0
70	RP-152102	1372	-	Tunnel Information of BBAI in Dual Connectivity	13.1.0
70	RP-152108	1373	2	Introduction of PWS Failure Indication message	13.1.0
71	RP-160442	1377	2	Introduction of Paging Optimisation and Paging for Coverage Enhancement capable UEs	13.2.0
71	RP-160447	1387	1	Addition of new RRC establishment cause to S1AP for VoLTE	13.2.0
71	RP-160443	1388	2	Introduction of eDRX parameters in the paging message	13.2.0
71	RP-160449	1398		Rapporteur Review on 36.413	13.2.0
71	RP-160449	1401	2	UE context retention at SCTP recovery	13.2.0
71	RP-160448	1403	1	Providing UE Usage Type in Dedicated Core Network Reroute NAS Request procedure	13.2.0
71	RP-160451	1408	2	Correction on CSG support in DC enhancement	13.2.0
71	RP-160442	1411	2	Introduction of new UE Identity in the paging message	13.2.0
72	RP-161042	1383	11	Introduction of the UE Context Resume function	13.3.0
72	RP-161042	1393	7	Introduction of common impacts of NB-IoT solutions	13.3.0
72	RP-161042	1410	5	Introduction Control Plane CIoT EPS Optimization	13.3.0
72	RP-161043	1415	3	Indication of Bearer Type over S1 for cIOT	13.3.0
72	RP-161042	1420	4	Indication of RAT Type	13.3.0
72	RP-160959	1426	1	Additional eDRX cycle value	13.3.0
72	RP-161047	1428	2	Handling of GUMMEI in overload procedures	13.3.0
72	RP-161047	1429	2	On Paging Time Window unit	13.3.0
73	RP-161549	1435	1	Correction on CSG support in Dual Connectivity	13.4.0
73	RP-161550	1438	1	Introduction of CE mode B support indicator	13.4.0
73	RP-161551	1439	1	Correction on NB-IoT inter node RRC containers	13.4.0
73	RP-161551	1440	1	Introduction of NB-IoT UE Identity Index Value in Paging	13.4.0
73	RP-161550	1458	1	Correction to enable update of SRVCC capability for emergency call	13.4.0
09/2016				Rel-14 version created based on v 13.4.0	14.0.0
73	RP-161552	1418	5	Vehicular Authorization Signaling over S1	14.0.0
74	RP-162337	1470	-	Clarification on V2X Services Authorized IE	14.1.0
74	RP-162340	1481	1	Correction to UE Context Resume Request	14.1.0

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-03	75	RP-170544	1480	5	B	Introduction of eDECOR in RAN	14.2.0
2017-03	75	RP-170540	1490	1	B	Overload control for CP CIoT EPS optimization	14.2.0
2017-03	75	RP-170539	1495	-	C	Handling of NB-IOT UE capabilities	14.2.0
2017-03	75	RP-170540	1499	1	B	Reliable DL NAS delivery based on hop-by-hop acknowledgements	14.2.0
2017-03	75	RP-170541	1500	-	B	Support of Redirection for VoLTE	14.2.0
2017-03	75	RP-170538	1501	-	B	Support of V2X over S1	14.2.0
2017-03	75	RP-170542	1502	-	B	Introduction of New types of eNB ID	14.2.0
2017-03	75	RP-170539	1505	-	B	Introduction of coverage level for location service	14.2.0
2017-03	75	RP-170539	1506		B	Introduction of Coverage Enhancement Authorization	14.2.0
2017-03	75	RP-170319	1507	1	B	Introduction of S1 UE information retrieve procedure	14.2.0
2017-06	76	RP-171329	1504	3	A	Correction on the presence of Extended UE Identity Index Value	14.3.0
2017-06	76	RP-171329	1509	2	A	Correction on Overload action for exception reporting	14.3.0
2017-06	76	RP-171323	1510		F	Impact on paging from NB-IoT enhancements	14.3.0
2017-06	76	RP-171329	1515		A	Correction of missing security information in Suspend and Resume messages	14.3.0
2017-06	76	RP-171323	1517	2	F	Correction on UE-AMBR for NB-IoT UE using CP solution	14.3.0
2017-06	76	RP-171329	1520		A	Correction to Path Switch Request for RRC Resume Cause	14.3.0
2017-06	76	RP-171323	1521	3	B	Support of RLF for CP CIoT Optimisation	14.3.0
2017-09	77	RP-171974	1523	-	F	Correction of the mismatched code points of overload action	14.4.0
2017-09	77	RP-171975	1530	1	F	Remove the description of Inter RAT Redirection value for MMTEL	14.4.0
2017-09	77	RP-171974	1534	-	F	S1AP Cause for E-UTRAN Pre-emption operations	14.4.0
2017-12	78	RP-172672	1524	6	B	Baseline CR to TS 36.413 covering agreements of RAN3 #98	15.0.0
2017-12	78	RP-172674	1543	2	B	Introduction of QoE Measurement Collection for LTE	15.0.0
2018-03	79	RP-180468	1558	-	F	Add NR UE Security Capabilities to DL NAS Transport message	15.1.0
2018-03	79	RP-180468	1559	1	F	Clarification and correction on S1 for EN-DC	15.1.0
2018-03	79	RP-180473	1562	-	A	Correct ASN.1 error for NAS DELIVERY INDICATION	15.1.0
2018-03	79	RP-180472	1563	2	B	Support for unlicensed access as secondary RAT in S1AP	15.1.0
2018-03	79	RP-180473	1567	1	A	Stage-3 impacts to support "voice centric" UE in CE mode B	15.1.0
2018-03	79	RP-180473	1569	-	A	Enhanced Coverage Restricted Indication for Paging	15.1.0
2018-03	79	RP-180472	1571	2	F	MDT correction	15.1.0
2018-03	79	RP-180468	1575	-	F	Add missing range for secondary RAT data volume	15.1.0
2018-06	80	RP-181241	1547	6	B	Support of Enhanced VoLTE Performance	15.2.0
2018-06	80	RP-181241	1572	3	C	Introduction of QMC for MTSI in EUTRAN	15.2.0
2018-06	80	RP-181241	1574	3	B	Triggering UE capability info retrieval using DL NAS TRANSPORT	15.2.0
2018-06	80	RP-181237	1576	4	B	Introduction of SA NR (36.413 Baseline CR covering RAN3 agreements)	15.2.0
2018-06	80	RP-181242	1578	4	B	Introduction of early data transmission	15.2.0
2018-06	80	RP-181241	1580	2	B	Introduction of LTE-M (eMTC) traffic Differentiation	15.2.0
2018-06	80	RP-181243	1587	3	B	Baseline CR: Introduction of the Aerial Usage Indication	15.2.0
2018-06	80	RP-181244	1590	-	A	Clarification on Connection Establishment Indication procedure scenarios	15.2.0
2018-06	80	RP-181241	1594	1	F	Correction of applicability of Secondary RAT Data Usage report for LAA, LWA and LWIP	15.2.0
2018-09	81	RP-181920	1600	2	F	Correction of Secondary RAT Data Usage Report	15.3.0
2018-09	81	RP-181922	1601	2	F	NR Corrections (36.413 Baseline CR covering RAN3-101 agreements)	15.3.0
2018-09	81	RP-181923	1608	1	F	Introduction of Warning Area Coordinates in S1AP: WRITE-REPLACE WARNING REQUEST	15.3.0
2018-09	81	RP-181923	1611	-	F	Correction on target NG-RAN Node ID	15.3.0
2018-09	81	RP-181921	1612	1	F	Access Restriction Data for NR in EPC	15.3.0
2018-09	81	RP-181926	1616	1	A	Pending Data Indication	15.3.0
2018-09	81	RP-181924	1617	1	B	CR to S1AP to introduce Bluetooth and WLAN measurement in MDT	15.3.0
2018-09	81	RP-182115	1619	3	B	Introduction of Subscription based UE differentiation	15.3.0
2018-12	RP-82	RP-182446	1630	1	F	Correction on Handover Type	15.4.0
2018-12	RP-82	RP-182451	1641	1	A	Pending Data Indication	15.4.0
2019-03	RP-83	RP-190556	1644	2	F	Extending GUMMEI Type	15.5.0
2019-03	RP-83	RP-190556	1647	2	F	Correction of EPC interworking	15.5.0
2019-03	RP-83	RP-190555	1649	2	F	Transfer of the PSCell information to Core Network	15.5.0
2019-03	RP-83	RP-190559	1651	-	F	Correction on Initial UE Message to include EDT for MTC	15.5.0
2019-03	RP-83	RP-190556	1652	-	F	Change of Interfaces to Trace IE in S1AP	15.5.0
2019-03	RP-83	RP-190558	1659	1		Addition of procedural text for Warning Area Coordinates IE	15.5.0
2019-03	RP-83	RP-190561	1662	-	F	Introduction of TNL Address discovery for EN-DC (using new container)	15.5.0
2019-07	RP-84	RP-191397	1664	1	F	Correction of Core Network Type Restrictions	15.6.0
2019-07	RP-84	RP-191397	1665	1	F	5G to 4G Handover with non eligible PDU sessions	15.6.0
2019-07	RP-84	RP-191394	1680	1	F	Adding PSCell to the User Location Information	15.6.0
2019-07	RP-84	RP-191400	1686		A	NB-IoT Correction: inconsistent between tabular and ASN.1	15.6.0

2019-09	RP-85	RP-192166	1688	1	F	CR for addressing Race condition between X2 and S1	15.7.0
2019-09	RP-85	RP-192169	1694	1	F	S1AP Introduction of New Indicator for EPS Fallback	15.7.0
2019-09	RP-85	RP-192167	1700	2	F	Update of TNL Address discovery for EN-DC (using new container)	15.7.0
2019-09	RP-85	RP-192167	1703	2	F	Enabling additional PSCell reporting and time since EN-DC was deconfigured	15.7.0
2019-09	RP-85	RP-192166	1707	2	F	Correction to EN-DC TNL address discovery	15.7.0
2019-10						Editorial Correction to ASN1: Adding a missing comma after "id-IMSvoiceEPSfallbackfrom5G"	15.7.1
2019-12	RP-86	RP-192916	1734	2	F	Addition of Handover Restriction List to PATH SWITCH REQUEST ACKNOWLEDGE message	15.8.0
2019-12	RP-86	RP-192916	1737		F	CR for Clarification on purpose of path switch request	15.8.0
2019-12	RP-86	RP-192913	1643	8	B	Temporary Identifier usage at interworking	16.0.0
2019-12	RP-86	RP-192913	1669	5	B	Introduction of Additional RRM Policy Index (ARPI)	16.0.0
2019-12	RP-86	RP-192913	1670	5	F	ERROR INDICATION Message in S1AP	16.0.0
2019-12	RP-86	RP-192913	1690	3	F	Introduction of inter UE QoS in CP relocation scenario	16.0.0
2020-03	RP-87-e	RP-200422	1730	2	B	Introduction of NR-U	16.1.0
2020-03	RP-87-e	RP-200419	1738	1	B	SA to EN DC handover and direct forwarding with shared SgNB/gNB	16.1.0
2020-03	RP-87-e	RP-200425	1745	1	F	PSCell information report for EN-DC	16.1.0
2020-03	RP-87-e	RP-200423	1746	1	B	Signalling UE capability identity (The CR is not implemented. The CR was marked agreed by mistake while the WI is not yet complete)	16.1.0
2020-07	RP-88-e	RP-201077	1661	13	B	BL CR to 36.413: Support for IAB	16.2.0
2020-07	RP-88-e	RP-201086	1682	13	B	Introduction of MT Early Data Transmission	16.2.0
2020-07	RP-88-e	RP-201079	1691	9	B	Support of Ethernet Type Bearer	16.2.0
2020-07	RP-88-e	RP-201074	1709	10	B	Support of NR V2X over S1	16.2.0
2020-07	RP-88-e	RP-201082	1710	10	B	Addition of SON features	16.2.0
2020-07	RP-88-e	RP-201088	1741	4	B	Support of RLF in NB-IoT	16.2.0
2020-07	RP-88-e	RP-201078	1746	5	B	Signalling UE capability identity	16.2.0
2020-07	RP-88-e	RP-201082	1747	4	B	MDT support for EN-DC	16.2.0
2020-07	RP-88-e	RP-201089	1760	5	B	Baseline CR for introducing Rel-16 LTE further mobility enhancements	16.2.0
2020-07	RP-88-e	RP-201086	1762	3	B	Support of WUS Group	16.2.0
2020-07	RP-88-e	RP-201088	1765	3	B	Support NB-IoT UE Specific DRX	16.2.0
2020-07	RP-88-e	RP-201092	1767	2	A	Correction of connected en-gNBs	16.2.0
2020-07	RP-88-e	RP-201091	1769	2	A	Corrected handling of Selected TAI for TNL discovery for EN-DC	16.2.0
2020-07	RP-88-e	RP-201092	1774	3	A	Correction the NCC for 5G to 4G handover	16.2.0
2020-09	RP-89-e	RP-201951	1786		F	Correction of LTE-M Indication	16.3.0
2020-09	RP-89-e	RP-201948	1787	-	F	Correction the NR Sidelink AMBR in ASN.1 definition	16.3.0
2020-09	RP-89-e	RP-201954	1792	1	A	No N26 interface cause value	16.3.0
2020-09	RP-89-e	RP-201948	1793	-	D	Rapporteur cleanup of S1AP	16.3.0
2020-12	RP-90-e	RP-202312	1796	1	F	Introducing UE radio capability ID in Connection Establishment Indication	16.4.0
2020-12	RP-90-e	RP-202312	1799		F	Enabling URI configuration within Trace Activation over S1	16.4.0
2021-03	RP-91-e	RP-210238	1801	1	F	Correction of IMS Voice Emergency Indicator	16.5.0
2021-03	RP-91-e	RP-210237	1802	2	F	Correction on RAT Type Handling	16.5.0
2021-06	RP-92-e	RP-211333	1816	1	F	Cause value on S1AP for insufficient UE capabilities CR 36.413	16.6.0
2021-06	RP-92-e	RP-211332	1819	1	F	Correction of IMS voice EPS fallback from 5G	16.6.0
2021-09	RP-93-e	RP-211874	1817	3	F	Correcting assigned criticality for IEs in transparent handover containers	16.7.0
2021-12	RP-94-e	RP-212862	1824	2	F	S1AP Cause value for exceeding the bearer pre-emption rate limitation	16.8.0
2021-12	RP-94-e	RP-212868	1840	1	F	(S1AP CR) support the UE Radio Capability for Paging in RACS context	16.8.0
2022-03	RP-95-e	RP-220278	1838	1	F	Dynamic ACL over S1 CR 36.413	16.9.0
2022-03	RP-95-e	RP-220283	1866	1	F	Clarification of the usage of an IE in case of DAPS HO	16.9.0
2022-03	RP-95-e	RP-220243	1868	2	F	Direct data forwarding for mobility between DC and SA	16.9.0
2022-03	RP-95-e	RP-220284	1870	1	A	Misalignment on M8 and M9 measurement configurations	16.9.0
2022-03	RP-95-e	RP-220280	1871		F	Correction of maxNARFCN in ASN.1	16.9.0
2022-06	RP-96	RP-221150	1879	1	F	Dynamic ACL over S1 CR 36.413	16.10.0
2022-06	RP-96	RP-221157	1889	1	F	Data forwarding address allocation for handover to EN-DC	16.10.0
2022-06	RP-96	RP-221157	1890	1	F	Direct data forwarding for mobility from MR-DC to eNB	16.10.0

History

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