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S1 Application Protocol (S1AP)
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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".
- [52] 3GPP TS 38.401: "NG-RAN; Architecture description".

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 dedicated 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 SIAP ID* and *eNB UE SIAP 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 SIAP ID* IE and the eNB identifies the associated UE based on the *eNB UE SIAP 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
NTN	Non Terrestrial Networks
OTDOA	Observed Time Difference of Arrival
PDCP	Packet Data Convergence Protocol
PLMN	Public Land Mobile Network
ProSe	Proximity Services
PS	Packet Switched
PSCell	Primary SCell
PWS	Public Warning System
RACS	Radio Capability Signalling optimization
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 <i>Information Element Name</i> 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., <i>Information Element</i> 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 CONFIGURATION 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

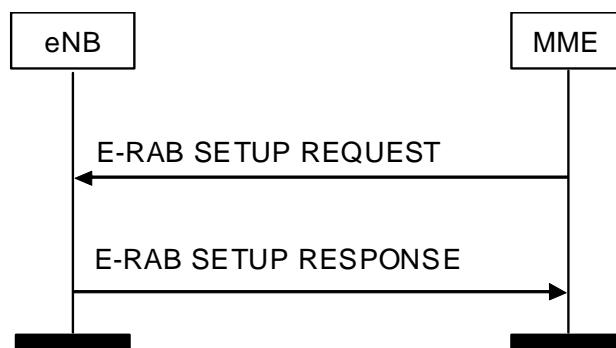


Figure 8.2.1.2-1: E-RAB Setup procedure. Successful operation.

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.

For each E-RAB for which the *Security Indication* IE is included in the *E-RAB To Be Setup Item IEs* IE of the E-RAB SETUP REQUEST message:

- if the *Integrity Protection Indication* IE is set to "required", then the eNB shall, if supported by the eNB and the UE, perform user plane integrity protection for the concerned E-RAB as specified in TS 33.401 [15], and otherwise it shall reject the establishment of the concerned E-RAB with an appropriate cause value.

- if the *Integrity Protection Indication* IE is set to "preferred", then the eNB should, if supported by the eNB and the UE, perform user plane integrity protection for the concerned E-RAB as specified in TS 33.401 [15].
- if the *Integrity Protection Indication* IE is set to "not needed", then the eNB shall not perform user plane integrity protection 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”.

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

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

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 IE*s (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 IE*s 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

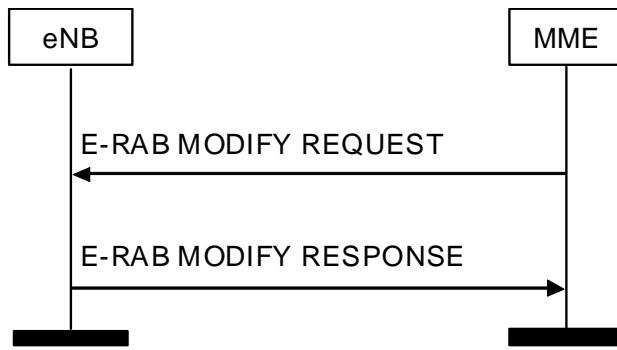


Figure 8.2.2.2-1: E-RAB Modify procedure. Successful operation.

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.

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

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

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

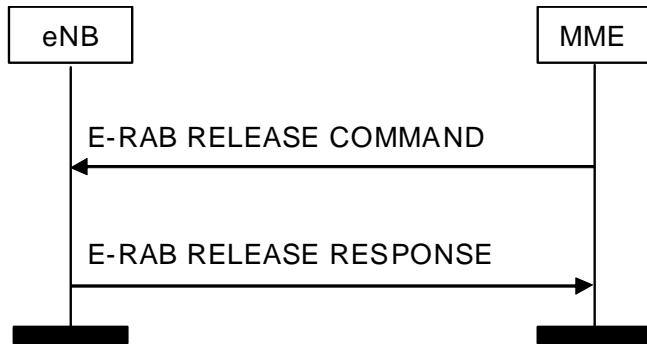


Figure 8.2.3.2.1-1: E-RAB Release procedure. Successful operation.

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

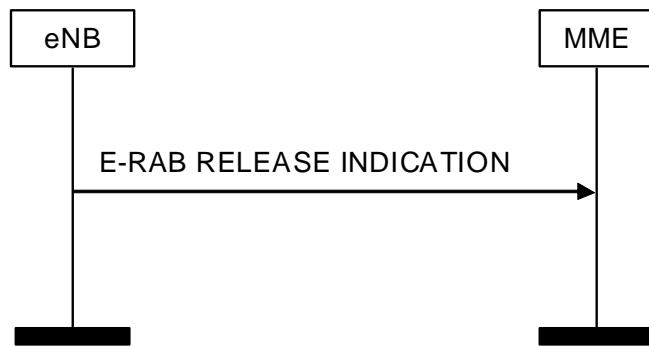


Figure 8.2.3.2.2-1: E-RAB Release INDICATION procedure. Successful operation.

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 IE*s (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 IE*s (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 IE*s 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

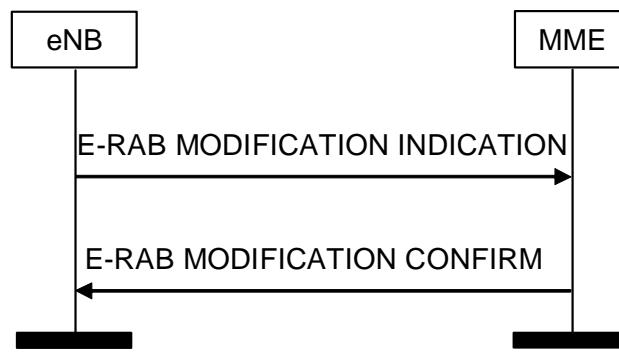


Figure 8.2.4.2-1: E-RAB Modification Indication procedure. Successful operation.

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

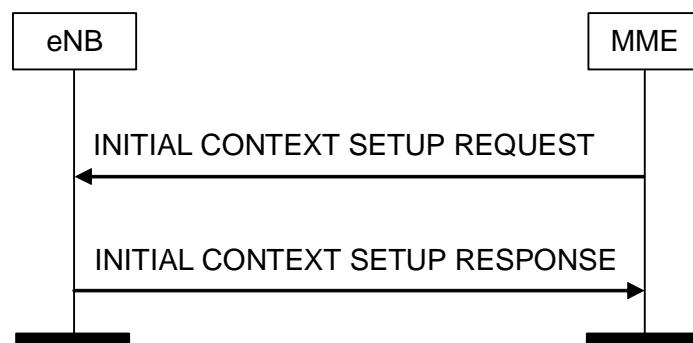


Figure 8.3.1.2-1: Initial Context Setup procedure. Successful operation.

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 *Security Indication* 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 Clot 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 *Security Indication* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall, if supported, act as defined in the E-RAB Setup procedure 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, and use it accordingly for the IAB-MT as specified in TS 38.401 [52].

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

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

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

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

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

If the *MME UE SIAP 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

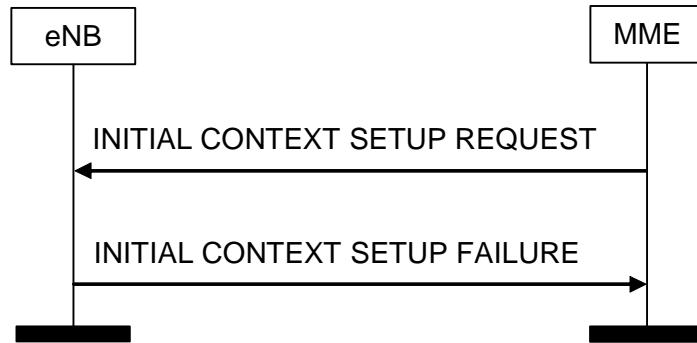


Figure 8.3.1.3-1: Initial Context Setup procedure. Unsuccessful operation.

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_{RELOCO}overall 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

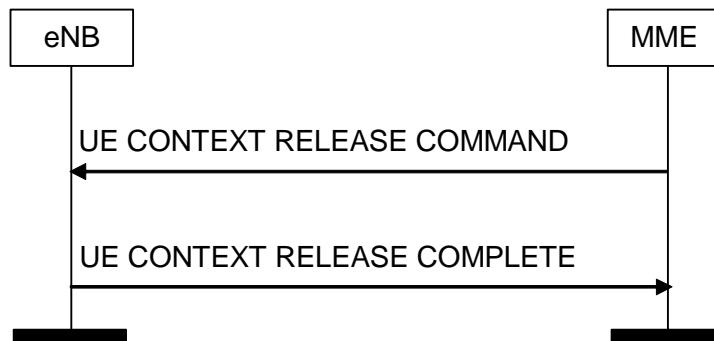


Figure 8.3.3.2-1: UE Context Release procedure. Successful operation.

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 SIAP ID pair* IE if available, otherwise the message shall contain the *MME UE SIAP 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

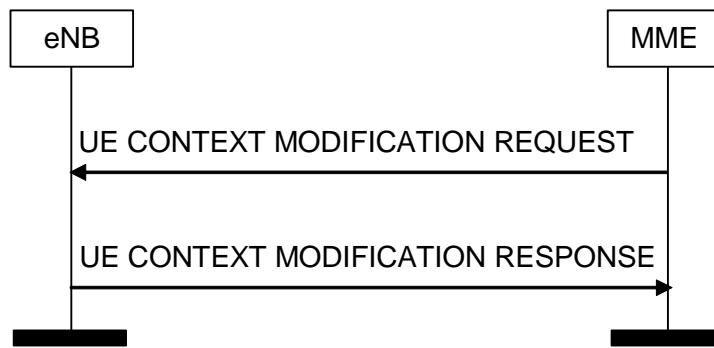


Figure 8.3.4.2-1: UE Context Modification procedure. Successful operation.

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, and use it as specified in TS 38.401 [52].

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

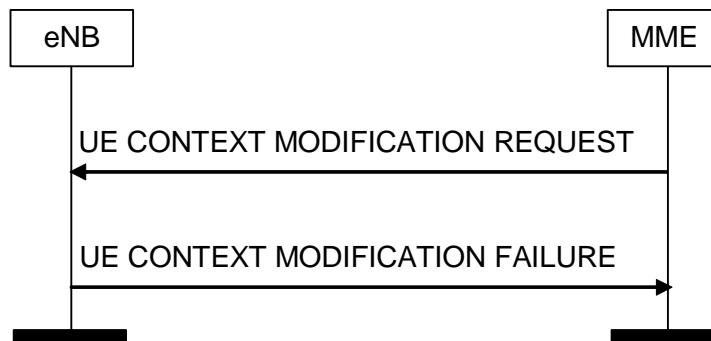


Figure 8.3.4.3-1: UE Context Modification procedure. Unsuccessful operation.

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

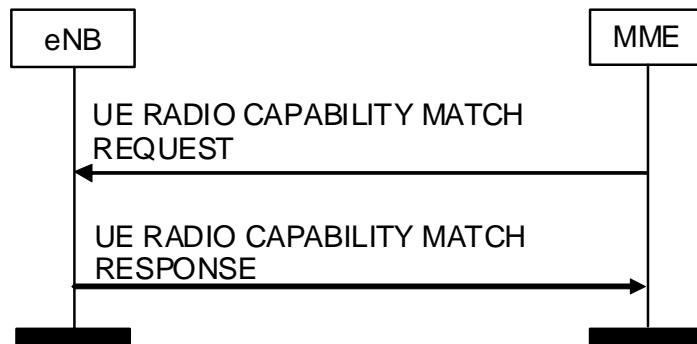


Figure 8.3.5.2-1: UE Radio Capability Match. Successful operation

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 SIAP ID* IE in the UE RADIO CAPABILITY MATCH REQUEST message; by receiving the *MME UE SIAP 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

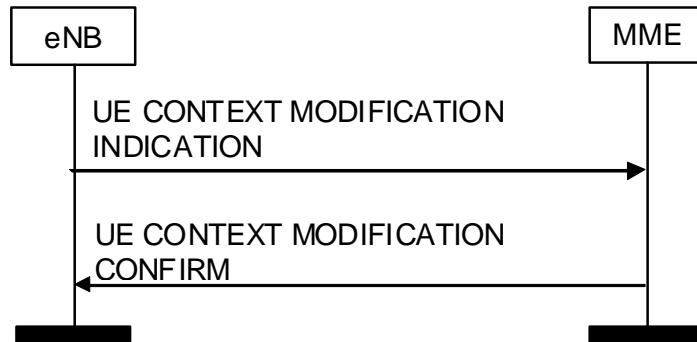


Figure 8.3.6.2-1: UE Context Modification Indication. Successful operation

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

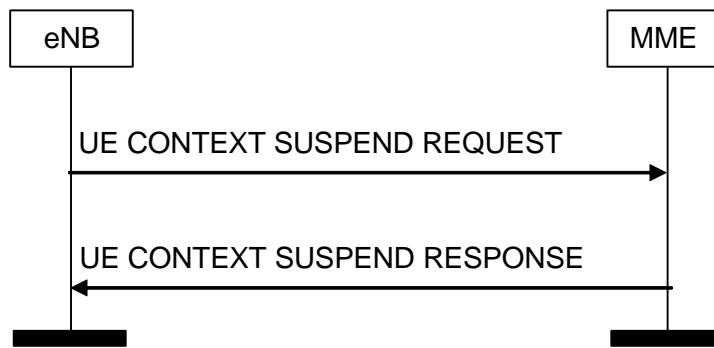


Figure 8.3.7.2-1: UE Context Suspend procedure. Successful operation.

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

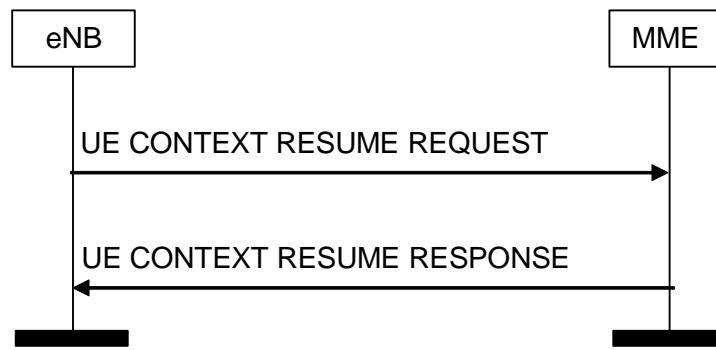


Figure 8.3.8.2-1: UE Context Resume procedure. Successful operation.

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

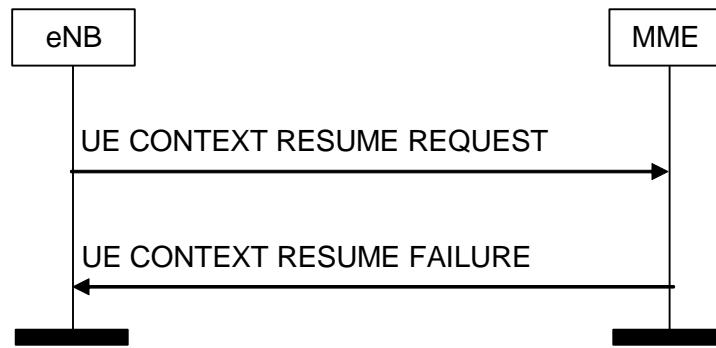


Figure 8.3.8.3-1: UE Context Resume procedure. Unsuccessful operation.

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].

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

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

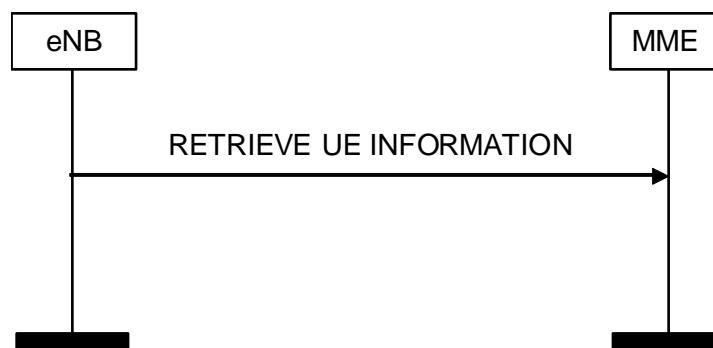


Figure 8.3.10.1: Retrieve UE Information Procedure. Successful operation.

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

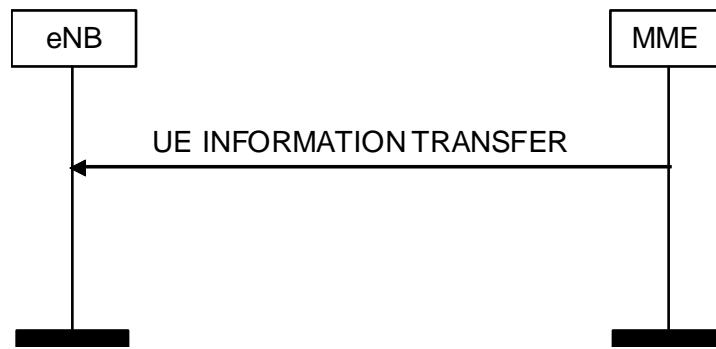


Figure 8.3.11.1: UE Information Transfer Procedure. Successful operation.

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].

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

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

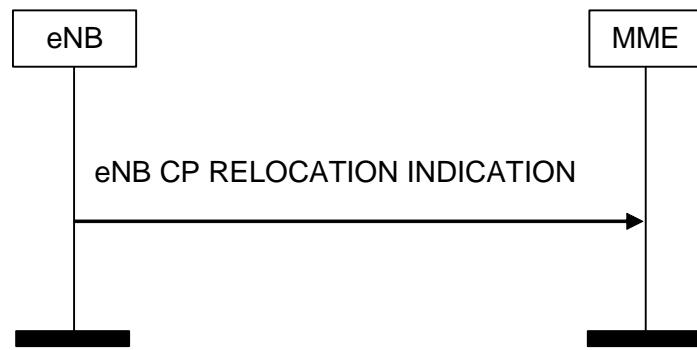


Figure 8.3.12.2-1: eNB CP Relocation Indication. Successful operation.

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

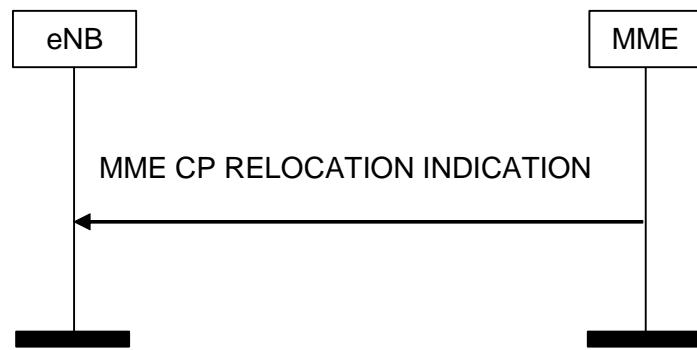


Figure 8.3.13.2-1: MME CP Relocation Indication. Successful operation.

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

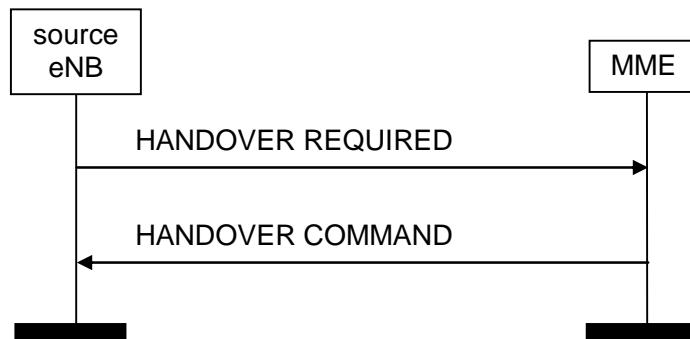


Figure 8.4.1.2-1: Handover preparation: successful operation

The source eNB initiates the handover preparation by sending the HANOVER REQUIRED message to the serving MME. When the source eNB sends the HANOVER 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 HANOVER 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 HANOVER 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 HANOVER COMMAND message.

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

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 HANOVER 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 HANOVER REQUIRED message and it is set to “DL forwarding proposed”, it indicates that the source eNB proposes forwarding of downlink data.

If the *Security Indication* IE is included within the *Source eNB to Target eNB Transparent Container* IE of the HANOVER REQUIRED message, it indicates the security policy stored in the source eNB for the concerned E-RAB, as specified in TS 33.401 [15].

If the *Security Result* IE is included within the *Target eNB to Source eNB Transparent Container* IE of the HANOVER COMMAND message, the source eNB shall take it into account as the status of integrity protection configured by the target eNB for the concerned E-RAB.

If the MME receives the *Direct Forwarding Path Availability* IE in the HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER REQUIRED message.

In case the SRVCC operation is performed, the *SRVCC HO Indication* IE in the HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER REQUIRED message.

In case the SRVCC operation is performed, the *SRVCC HO Indication* IE in the HANOVER 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 HANOVER 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 HANOVER COMMAND message;
- the target system is UTRAN, then the MME
 - shall encode the information in the *Target to Source Transparent Container* IE within the HANOVER 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 HANOVER COMMAND message.

In case the SRVCC operation is performed, the *SRVCC HO Indication* IE in the HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER COMMAND message.

If the HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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.

Interaction with Handover Cancel procedures:

If the *Security Result IE* is not included in the *Target eNB to Source eNB Transparent Container IE* of the HANOVER COMMAND message, and the *Security Indication IE* in the *Source eNB to Target eNB Transparent Container IE* indicated that some of the E-RABs required User Plane Integrity Protection, the source eNB shall initiate the Handover Cancel procedure. The source eNB may reattempt the handover but only for the E-RABs that do not require User Plane Integrity Protection.

8.4.1.3 Unsuccessful Operation

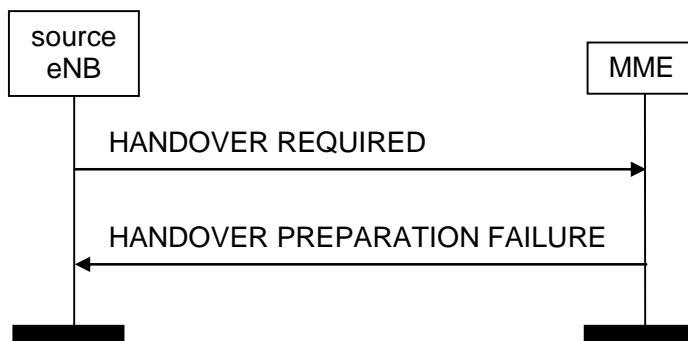


Figure 8.4.1.3-1: Handover preparation: unsuccessful operation

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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER COMMAND message or HANOVER 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

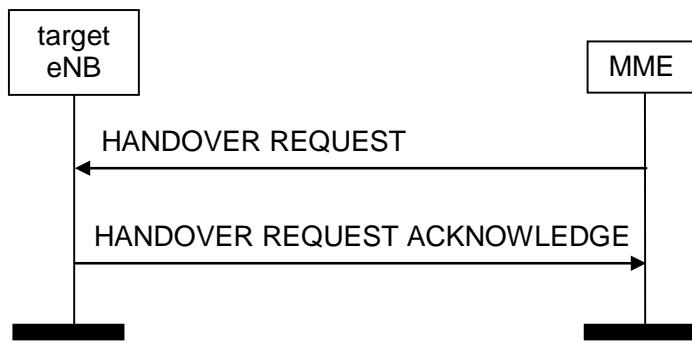


Figure 8.4.2.2-1: Handover resource allocation: successful operation

The MME initiates the procedure by sending the HANOVER REQUEST message to the target eNB. The HANOVER 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 HANOVER 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 HANOVER 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 HANOVER REQUEST message, the target eNB shall consider that no roaming and no access restriction apply to the UE.

Upon reception of the HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 *Trace Activation* IE includes the *Sensor Measurement Configuration* IE within the *MDT Configuration* IE, take it into account for MDT Configuration as described in TS 37.320 [31].

If the *CSG Id* IE is received in the HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER REQUEST ACKNOWLEDGE message indicating that it accepts the proposed forwarding of downlink data for this bearer.

If the HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 SIAP ID 2* IE shall only be contained in the HANOVER REQUEST message according to subclause 4.6.2 of TS 36.300 [14]. If the *MME UE SIAP 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 HANOVER 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 HANOVER REQUEST message the target eNB shall, if supported, use it to determine the characteristics of the UE for subsequent handling.

If the HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER REQUEST message, the eNB shall, if supported, store it and use it as defined in TS 36.300 [14].

If the HANOVER 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 HANOVER REQUEST message shall be considered as not to be handed over and ignored.

If the *IAB Authorized* IE is contained in the HANOVER REQUEST message, the target eNB shall, if supported, consider that the handover is for an IAB-node and use it as specified in TS 38.401 [52].

If the *NR V2X Services Authorized* IE is contained in the HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER 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 the *Security Indication IE* is contained in the HANOVER REQUEST message, the target eNB shall, if supported, act as defined in the E-RAB Setup procedure for the concerned E-RAB.

If the *Security Indication IE* is included in the *Source eNB to Target eNB Transparent Container IE* within the HANOVER REQUEST message, the target eNB shall, if supported, use it as specified in TS 33.401 [15] and include the *Security Result IE* in the *Target eNB to Source eNB Transparent Container IE* of the HANOVER REQUEST ACKNOWLEDGE message.

If the *UE Context Reference at Source eNB IE* is included in the *Source eNB to Target eNB Transparent Container IE* within the HANOVER REQUEST message, the target eNB may use it to identify an existing UE.

If for a given E-RAB flow the *Source Transport Layer Address IE* is included within the *Source eNB to Target eNB Transparent Container IE* in the HANOVER 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 *UE Radio Capability ID IE* is contained in the HANOVER REQUEST message, the target eNB may include the *RACS Indication IE* in the *Target eNB to Source eNB Transparent Container IE* within the HANOVER REQUEST ACKNOWLEDGE message, to indicate that it is able to acquire the UE radio capabilities through reception of the UE Radio Capability ID in future mobility actions as described in TS 23.401 [11].

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 HANOVER 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 *Source SN ID IE* is included in the *Source eNB to Target eNB Transparent Container IE* within the HANOVER 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 HANOVER REQUEST ACKNOWLEDGE message.

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

If the HANOVER REQUEST message contains within the *Source eNB to Target eNB Transparent Container IE* the *Time Based Handover Information IE*, the target eNB may use this information to allocate necessary resources for the incoming handover.

8.4.2.3 Unsuccessful Operation

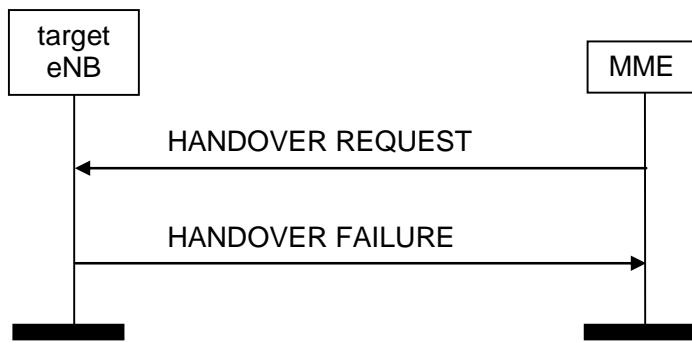


Figure 8.4.2.3-1: Handover resource allocation: unsuccessful operation

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 HANOVER 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 HANOVER 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 HANOVER 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 HANOVER NOTIFY message.

Interactions with Handover Success procedure:

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

For each E-RAB for which the *Security Indication* IE is included in the *E-RABs Switched in Downlink Item* IE of the PATH SWITCH REQUEST message, the MME shall, if supported, behave as specified in TS 33.401 [15] and may send back the *Security Indication* IE within the *E-RAB To Be Updated Item* IE of the PATH SWITCH REQUEST ACKNOWLEDGE message.

If the *Security Indication* IE is included within the *E-RAB To Be Updated Item* IE of the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall, if supported, behave as specified in TS 33.401 [15].

8.4.4.3 Unsuccessful Operation

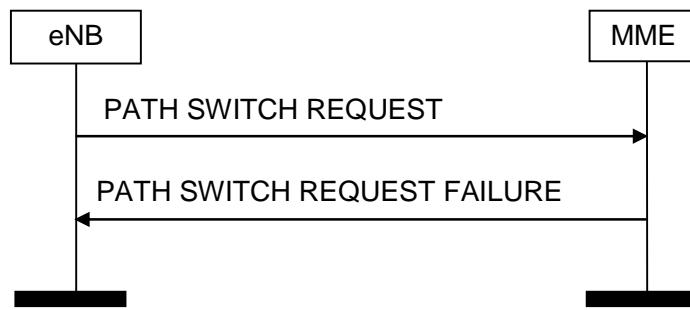


Figure 8.4.4.3-1: Path switch request: unsuccessful operation

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

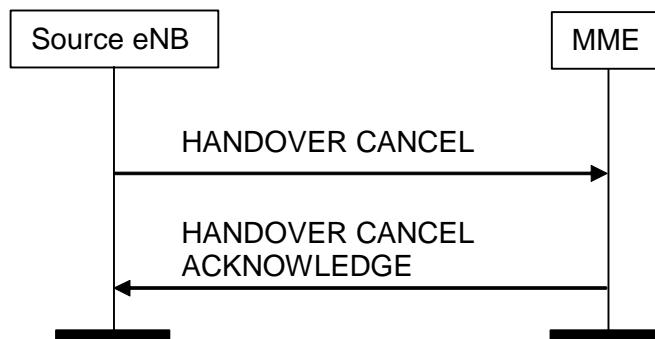


Figure 8.4.5.2-1: Handover Cancel procedure. Successful operation.

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

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

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

Transmission and reception of a HANOVER 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 HANOVER 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 HANOVER SUCCESS message to the source eNB.

8.4.8.3 Abnormal Conditions

If the HANOVER 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, or the COUNT for discarding of already forwarded downlink SDUs for respective E-RAB(s) during S1 handover with time-based trigger condition.

8.4.9.2 Successful Operation

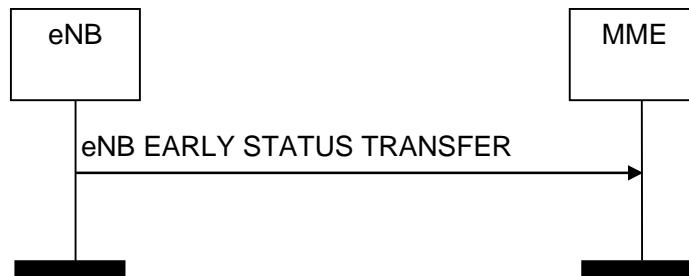


Figure 8.4.9.2-1: eNB Early Status Transfer procedure

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 or sending the eNB EARLY STATUS TRANSFER message to the MME after it initiated a handover preparation with time-based trigger condition.

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, or the COUNT for discarding of already forwarded downlink SDUs for respective E-RAB during S1 handover with time-based trigger condition.

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.

For each E-RAB in the *E-RABs Subject to DL Discarding List* IE received in the MME EARLY STATUS TRANSFER message, the target eNB does not transmit forwarded downlink SDUs to the UE whose COUNT is less than the one provided and discards them if transmission has not been attempted.

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

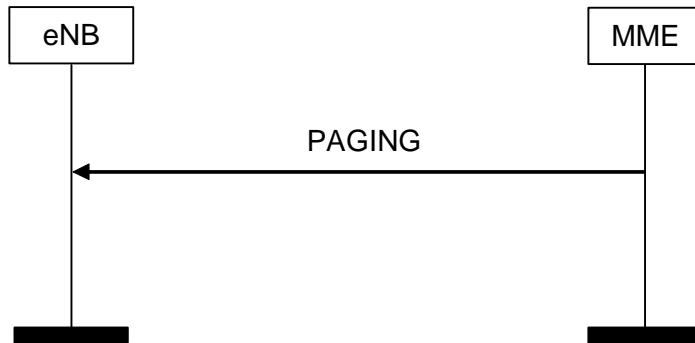


Figure 8.5.2-1: Paging procedure

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].

If the *Paging Cause* IE is included in the PAGING message, the eNB shall, if supported, transfer it to the UE according to TS 36.331 [21].

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, DOWLINK NAS TRANSPORT, UPLINK NAS TRANSPORT or REROUTE NAS REQUEST messages.

8.6.2 Successful Operations

8.6.2.1 Initial UE Message

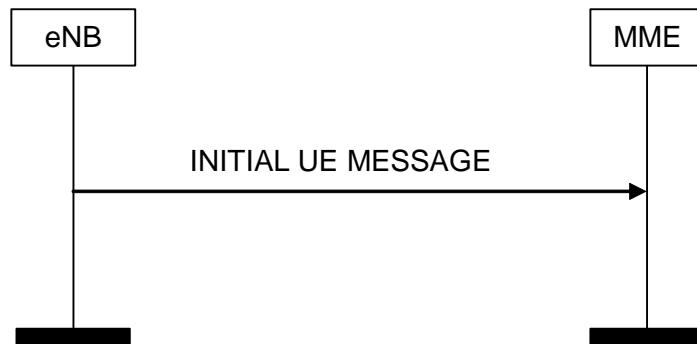


Figure 8.6.2.1-1: Initial UE Message procedure

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 specified 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 SIAP 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 SIAP 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 DOWLINK 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 DOWLINK 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 DOWLINK 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 DOWLINK 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 DOWLINK 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 DOWLINK 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 DOWLINK 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 DOWLINK 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 DOWLINK 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 DOWLINK 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 DOWLINK NAS TRANSPORT message, the eNB shall, if supported, use it as defined in TS 23.401 [11].

If the *Masked IMEISV* IE is included in the DOWLINK NAS TRANSPORT message, the eNB shall, if supported, use it to determine the characteristics of the UE for subsequent handling.

Interaction with the NAS Delivery Indication procedure:

If the *DL NAS PDU Delivery Acknowledgment Request* IE set to "requested" was included in the DOWLINK 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 DOWLINK 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

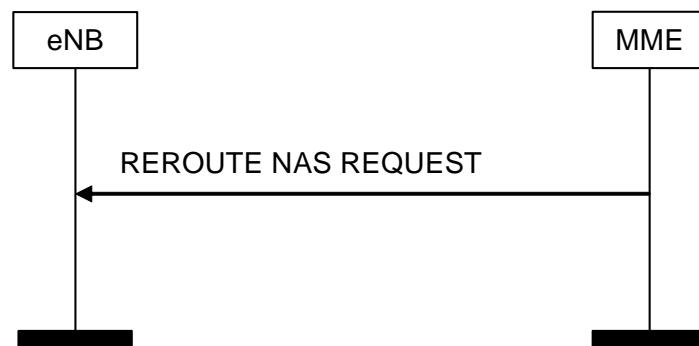


Figure 8.6.2.5-1: Reroute NAS Request Procedure

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

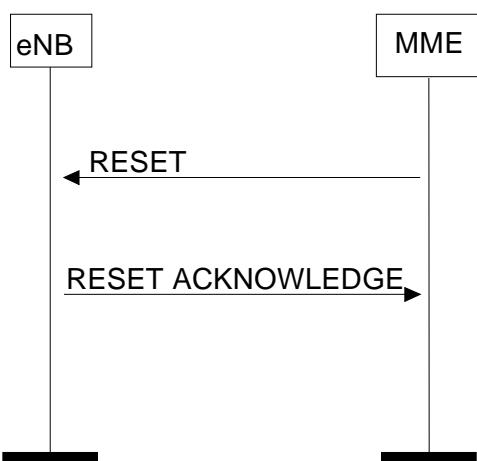


Figure 8.7.1.2.1-1: Reset procedure initiated from the MME. Successful operation.

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 SIAP ID IE* is included in the *UE-associated logical S1-connection Item IE* for a UE association, the eNB shall include the *eNB UE SIAP 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

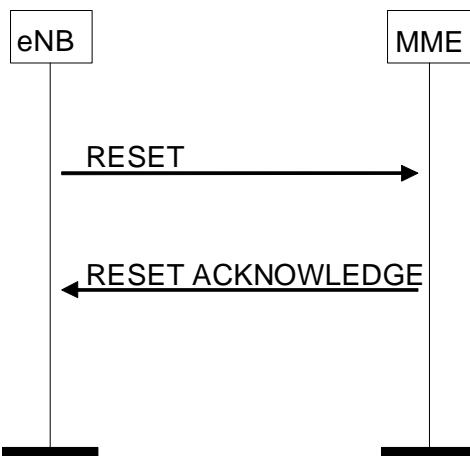


Figure 8.7.1.2.2-1: Reset procedure initiated from the E-UTRAN. Successful operation.

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 SIAP ID IE* and/or the *eNB UE SIAP 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 IE*s 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 IE*s, received in the RESET message, may be omitted in the RESET ACKNOWLEDGE message.
- If the *MME UE SIAP ID IE* is included in the *UE-associated logical S1-connection Item IE* for a UE association, the MME shall include the *MME UE SIAP ID IE* in the corresponding *UE-associated logical S1-connection Item IE* in the RESET ACKNOWLEDGE message.
- If the *eNB UE SIAP ID IE* is included in a *UE-associated logical S1-connection Item IE* for a UE association, the MME shall include the *eNB UE SIAP 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 SIAP ID* IE nor the *eNB UE SIAP 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 SIAP ID* IE nor the *eNB UE SIAP 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 SIAP ID IE* and the *eNB UE SIAP ID IE* shall be included in the ERROR INDICATION message. If one or both of *MME UE SIAP ID IE* and the *eNB UE SIAP 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

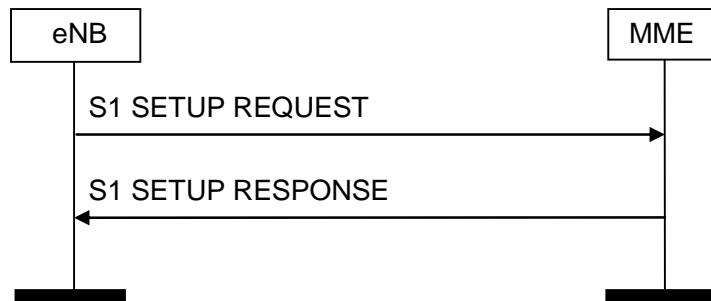


Figure 8.7.3.2-1: S1 Setup procedure: Successful Operation.

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. If the *IAB Supported* IE is included in the S1 SETUP RESPONSE message, the eNB shall, if supported, store this information and use it for further MME selection for the IAB-MT.

8.7.3.3 Unsuccessful Operation

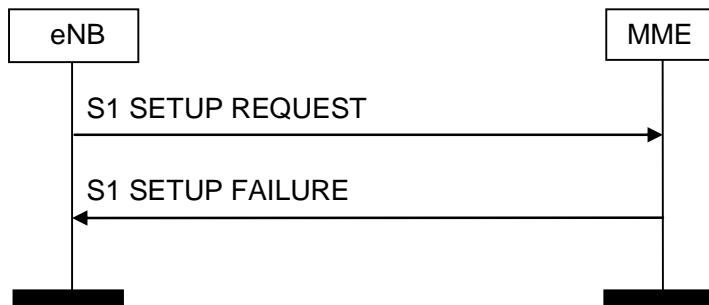


Figure 8.7.3.3-1: S1 Setup procedure: Unsuccessful Operation.

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

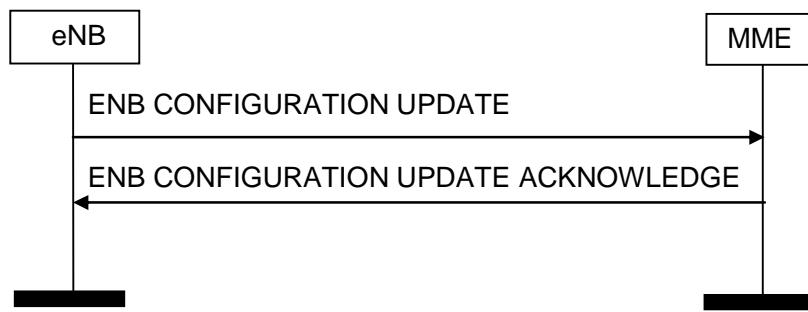


Figure 8.7.4.2-1: ENB Configuration Update procedure: Successful Operation.

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

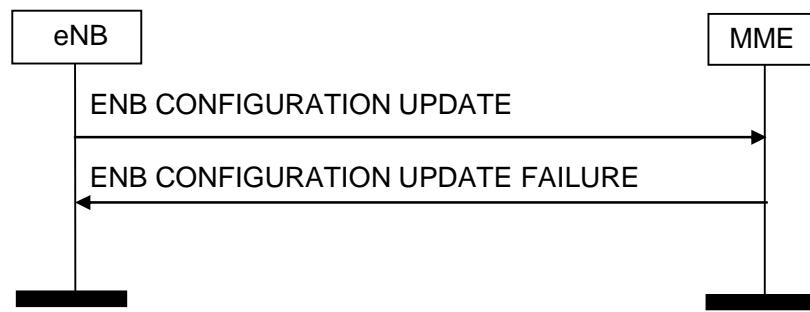


Figure 8.7.4.3-1: ENB Configuration Update procedure: Unsuccessful Operation.

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 ACKNOWLEDGE 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

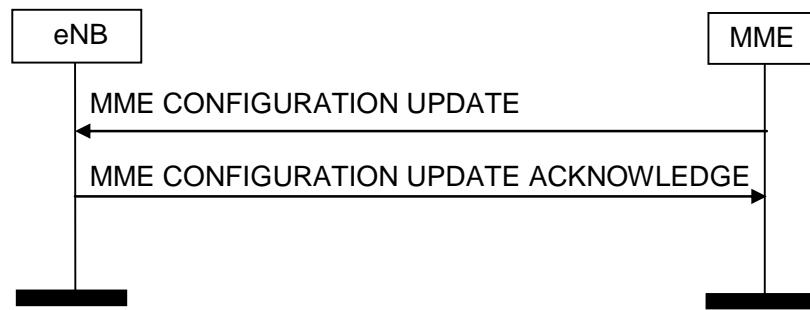


Figure 8.7.5.2-1: MME Configuration Update procedure: Successful Operation.

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

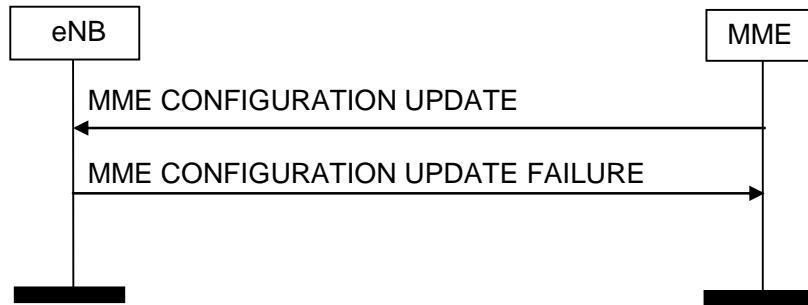


Figure 8.7.5.3-1: MME Configuration Update: Unsuccessful Operation.

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 ACKNOWLEDGE 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 it 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

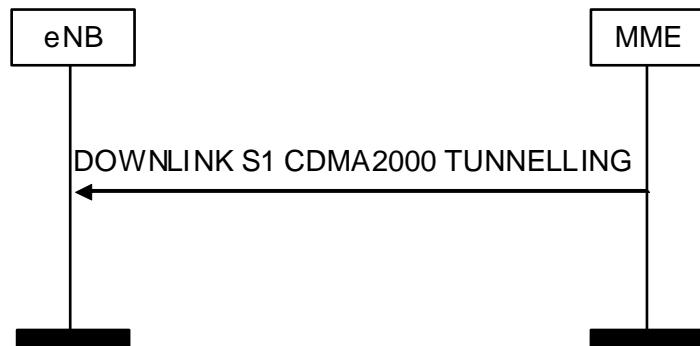


Figure 8.8.2.1-1: Downlink S1 CDMA2000 Tunnelling Procedure

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 tunneled 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

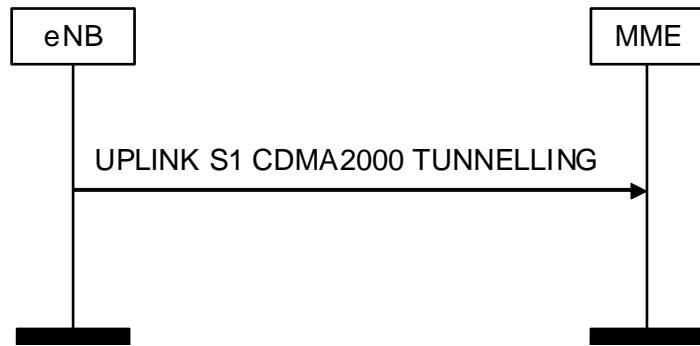


Figure 8.8.2.2-1: Uplink S1 CDMA2000 Tunnelling Procedure

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

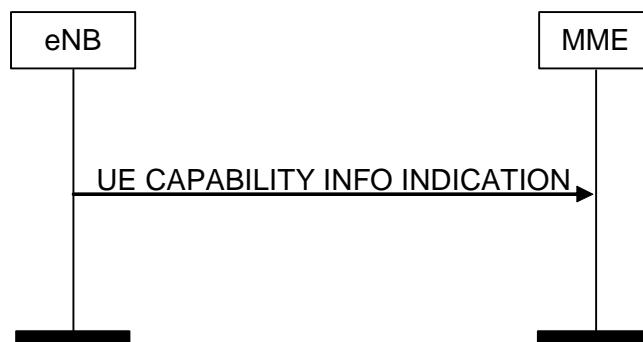


Figure 8.9.2-1: UE Capability Info Indication procedure. Successful operation.

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 this 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.

If the *Trace Activation* IE includes the *Sensor Measurement Configuration* IE within the *MDT Configuration* IE, take it into account for MDT Configuration as described in TS 37.320 [31].

Interactions with other procedures:

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

8.10.2 Trace Failure Indication

8.10.2.1 General

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

8.10.2.2 Successful Operation



Figure 8.10.2.2-1: Trace Failure Indication procedure.

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

8.10.3 Deactivate Trace

8.10.3.1 General

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

8.10.3.2 Successful Operation



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

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

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

Interactions with other procedures:

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

8.10.4 Cell Traffic Trace

8.10.4.1 General

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

8.10.4.2 Successful Operation



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

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

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

8.11 Location Reporting Procedures

8.11.1 Location Reporting Control

8.11.1.1 General

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

8.11.1.2 Successful Operation



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

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

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

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

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

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

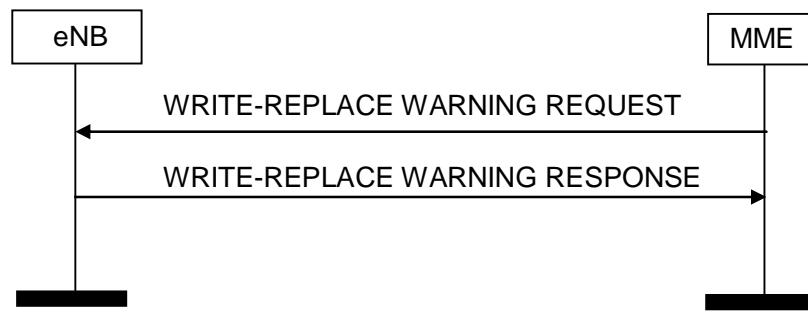


Figure 8.12.1.2-1: Write-Replace Warning procedure. Successful operation.

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

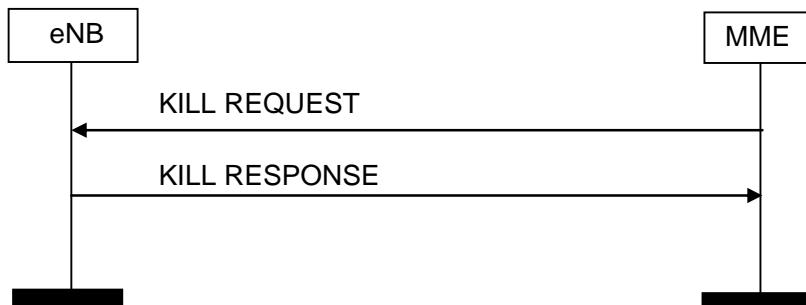


Figure 8.12.2.2-1: Kill procedure. Successful operation.

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 *Inter-system SON Information IE* containing the *Inter-system SON Information Reply 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

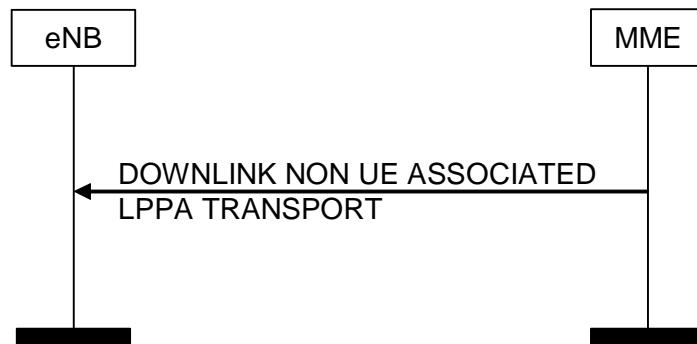


Figure 8.17.2.3-1: DOWNLINK NON UE ASSOCIATED LPPA Transport Procedure

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

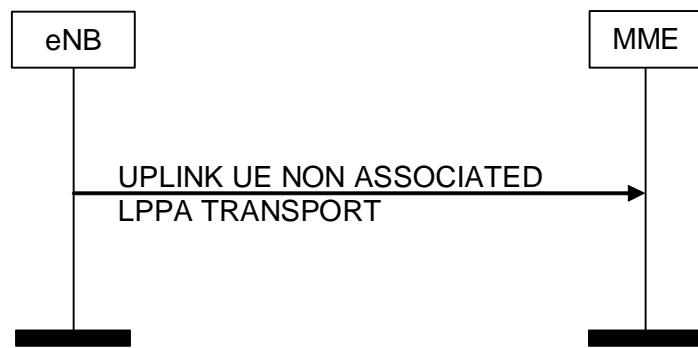


Figure 8.17.2.4-1: UPLINK NON UE ASSOCIATED LPPA TRANSPORT Procedure

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

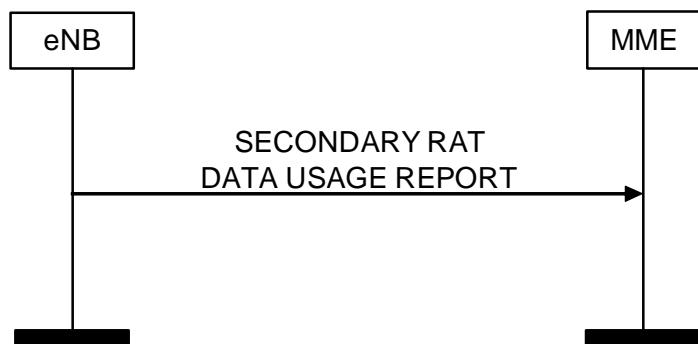


Figure 8.18.2.1-1: Secondary RAT Data Usage Report Procedure

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

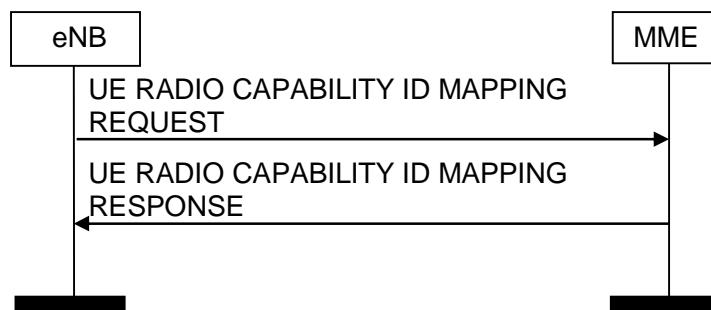


Figure 8.19.2-1: UE Radio Capability ID mapping Request procedure. Successful operation.

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
>>Security Indication	O		9.2.1.163		YES	reject

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

9.1.3.2 E-RAB SETUP RESPONSE

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

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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.

9.1.3.3 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-			EACH	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
		<i>RABs></i>			-	
>>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 <i>E-RAB ID</i> shall only be present once in <i>E-RAB Modify List IE</i> and <i>E-RAB Failed to Modify List IE</i> .	YES	ignore
Criticality Diagnostics	O		9.2.1.21		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.

9.1.3.5 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 <i>E-RAB To Be Released List IE</i> .	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 .. <maxnoof			EACH	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
		<i>E-RABs></i>			-	
>>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 <i>E-RAB ID</i> shall only be present once in <i>E-RAB Release List IE</i> and <i>E-RAB Failed to Release List IE</i> .	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 <i>E-RAB ID</i> shall only be present once in <i>E-RAB Released List IE</i> .	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		1 ..			EACH	reject

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Modified Item IEs		<maxnoof E-RABs>				
>>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 .. <maxnoof E-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 .. <maxnoof E-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	O		E-RAB List	A value for E-RAB	YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
List			9.2.1.36	<i>ID</i> shall only be present once in the E-RAB MODIFICATION CONFIRM message.		
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 .. <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		-	
>>NAS-PDU	O		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
>>Security Indication	O		9.2.1.163		YES	reject
UE Security Capabilities	M		9.2.1.40		YES	reject
Security Key	M		9.2.1.41	The KeNB is provided after the key-generation in the MME, see TS 33.401 [15].	YES	reject
Trace Activation	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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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-ifCSFBhigh priority		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 CloT 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
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 <i>CS Fallback Indicator</i> 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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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 <i>CS Fallback Indicator</i> 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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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 .. <maxnoof E-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 .. <maxnoof E-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
Masked IMEISV	O		9.2.3.38		YES	ignore

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
Masked IMEISV	O		9.2.3.38		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	In NTN, this IE is used to indicate the single broadcast TAC. This IE shall be ignored if the <i>LTE NTN TAI Information</i> IE is present.	YES	ignore
UL CP Security Information	M		9.2.3.50		YES	reject
LTE NTN TAI Information	O		9.2.3.56		YES	ignore

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 HANOVER 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 <i>Handover Type</i> IE is set to the "Value" LTEtoGERAN and the SRVCC HO Indication IE is present.

9.1.5.2 HANOVER 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-iftoUTRAN GERAN		9.2.3.30	The eNB shall use this IE as specified in TS 33.401 [15].	YES	reject
E-RABs Subject to Forwarding List		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	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.	-	

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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 HANOVER 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 HANOVER 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 .. <maxnoof E-RABs>			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	To deliver UL PDUs.	-	
>>E-RAB Level QoS Parameters	M		9.2.1.15	Includes necessary QoS parameters.	-	

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
>>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
>>Security Indication	O		9.2.1.163		YES	reject
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-iffromUTR ANGERA N		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 CloT 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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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 HANOVER 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 .. <maxnoof E-RABs>			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	To deliver DL PDUs.	-	
>>DL Transport Layer Address	O		9.2.2.1		-	
>>DL GTP-TEID	O		9.2.2.2	To deliver forwarded DL PDCP SDUs.	-	
>>UL Transport Layer Address	O		9.2.2.1		-	
>>UL GTP-TEID	O		9.2.2.2	To deliver forwarded UL PDCP SDUs.	-	
E-RABs Failed to Setup List	O		E-RAB List 9.2.1.36	A value for E-RAB ID shall only be present once in E-RABs Admitted List IE 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 HANOVER 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 HANOVER 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	In NTN, this IE is used to indicate the single broadcast TAC. This IE shall be ignored if the <i>LTE NTN TAI Information</i> IE is present.	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
LTE NTN TAI Information	O		9.2.3.56		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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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 .. <maxnoof E-RABs>			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	To deliver DL PDUs.	-	
>>Security Indication	O		9.2.1.163		YES	ignore
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	In NTN, this IE is used to indicate the single broadcast TAC. This IE shall be ignored if the <i>LTE NTN TAI Information</i> IE is present.	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
LTE NTN TAI Information	O		9.2.3.56		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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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 .. <maxnoof E-RABs>			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2		-	
E-RAB To Be Released List	O		E-RAB List 9.2.1.36	A value for <i>E-RAB ID</i> shall only be present once in <i>E-RAB To Be Switched in Uplink List</i> IE and <i>E-RAB to Be Released List</i> 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 CloT 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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
UE Security Capabilities	O		9.2.1.40		YES	ignore
E-RAB To Be Updated List		0..1			YES	ignore
>E-RAB To Be Updated Item		1 .. <maxnoof E-RABs>			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>Security Indication	O		9.2.1.163		-	

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, and during S1 handover with time-based trigger condition.

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, and during S1 handover with time-based trigger condition.

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 .. <maxnoof TAIs>			EACH	ignore
>>TAI	M		9.2.3.16		-	
CSG Id List		0..1			GLOBAL	ignore
>CSG Id		1 .. <maxnoof CSGIds>	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
Paging Cause	O		ENUMERATED (voice, ...)		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. In NTN, this IE is used to indicate the single broadcast TAC. This IE shall be ignored if the <i>LTE NTN TAI Information</i> IE is present.	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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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 36.331 [16]. 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
LTE NTN TAI Information	O		9.2.3.56		YES	ignore

9.1.7.2 DOWNLINK NAS TRANSPORT

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

Direction: MME → 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	O		9.2.1.127		YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Capabilities						
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
Masked IMEISV	O		9.2.3.38		YES	ignore

9.1.7.3 UPLINK NAS TRANSPORT

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
NAS-PDU	M		9.2.3.5		YES	reject
E-UTRAN CGI	M		9.2.1.38		YES	ignore
TAI	M		9.2.3.16	In NTN, this IE is used to indicate the single broadcast TAC. This IE shall be ignored if the <i>LTE NTN TAI Information</i> IE is present.	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
LTE NTN TAI Information	O		9.2.3.56		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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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 DOWLINK 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		1 .. <maxnoofI			EACH	reject

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
logical S1-connection Item		<i>n</i> dividualS1ConnectionsToReset>				
>>>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..<maxno ofTACs>		Supported TAs in the eNB.	GLOBAL	reject
>TAC	M		9.2.3.7	Broadcast TAC.	-	
>Broadcast PLMNs		1..<maxno ofBPLMNs >		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 .. <maxnoof CSGIds>	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.. maxnoof Connecteden-gNBs>			GLOBAL	ignore
>en-gNB ID	M		BIT STRING (SIZE(22..32))	The MME derives the Global en-gNB ID based on the <i>en-gNB ID</i> IE and the first PLMN Identity in the Supported TAs list for the en-gNB.		
>Supported TAs		1..<maxno ofTACs>		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..<maxno ofBPLMNs >		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..<maxno ofRATs>		The LTE related pool configuration is included on the first place in the list.	GLOBAL	reject
>Served PLMNs		1..<maxno ofPLMNsPerMME>			-	
>>PLMN Identity	M		9.2.3.8		-	
>Served GroupIDs		1..<maxno ofGroupIDs>			-	
>>MME Group ID	M		OCTET STRING (SIZE(2))		-	
>Served MMECs		1..<maxno ofMMECs>			-	
>>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..<maxno ofDCNs>			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 served 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..<maxno ofTACs>		Supported TAs in the eNB.	GLOBAL	reject
>TAC	M		9.2.3.7	Broadcast TAC.	-	
> Broadcast PLMNs		1..<maxno ofBPLMNs >		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 .. <maxnoof CSGId>	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.. maxnoof Connecteden-gNBs>			GLOBAL	ignore
>en-gNB ID	M		BIT STRING (SIZE(22..32))	The MME derives the Global en-gNB ID based on the <i>en-gNB ID</i> IE and the first PLMN Identity in the Supported TAs list of the added en-gNB.		
> Supported TAs		1..<maxno ofTACs>		Supported TAs in the en-gNB.	-	
>>Configured TAC	M		TAC 9.2.3.7		-	
>> Broadcast PLMNs		1..<maxno ofBPLMNs >		Broadcast PLMNs.	-	
>>>PLMN Identity	M		9.2.3.8			
Connected en-gNB To Be Removed List		<0.. maxnoof Connecteden-gNBs>			GLOBAL	ignore
>en-gNB ID	M		BIT STRING (SIZE(22..32))	The MME derives the Global en-gNB ID based on the <i>en-gNB ID</i> IE and the first PLMN Identity in the Supported TAs list of the en-gNB to be removed.		
> Supported TAs		1..<maxno		Supported TAs in	-	

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
		<i>ofTACs></i>		the en-gNB.	-	
>>Configured TAC	M		TAC 9.2.3.7		-	
>>Broadcast PLMNs		1..<maxno ofBPLMNs >		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..<maxno ofRATs>		The LTE related pool configuration is included on the first place in the list.	GLOBAL	reject
>Served PLMNs		1..<maxno ofPLMNsPerMME>			-	

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
>>PLMN Identity	M		9.2.3.8		-	
> Served GroupIDs		1..<maxno ofGroupID s>			-	
>>MME GroupID	M		OCTET STRING (SIZE(2))		-	
> Served MMECs		1..<maxno ofMMECs >			-	
>>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..<maxno ofDCNs>			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 served 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		<i>0..1</i>			YES	ignore
>GUMMEI List Item		<i>1..<maxno ofMMECs></i>			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		<i>0..1</i>			YES	ignore
>GUMMEI List Item		<i>1..<maxnoofMMECs></i>			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 DLINK 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		<i>0..1</i>			YES	ignore
>E-RABs Subject to Forwarding Item IEs		<i>1 .. <maxnoof E-RABs></i>			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		-	

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
>>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	YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
				Value '1' indicates "Capable" and value '0' indicates "not Capable". Unused bits are reserved for future use.		
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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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	In NTN, this IE is used to indicate the single broadcast TAC. This IE shall be ignored if the <i>LTE NTN TAI Information</i> IE is present.	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
LTE NTN TAI	O		9.2.3.56		YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Information						

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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..<maxno ofCellsfor Restart>			EACH	reject
>E-CGI	M		9.2.1.38		-	-
Global eNB ID	M		9.2.1.37		YES	reject
TAI List for Restart		1 .. <maxnoof RestartTAIs>			EACH	reject
>TAI	M		9.2.3.16		-	-
Emergency Area ID List for Restart		0 .. <maxnoof RestartEmergencyAreaIDs>			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.
maxnoofRestartTAs	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 <i>Inter-system SON Configuration Transfer</i> 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 <i>Inter-system SON Configuration Transfer IE</i> 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 DLINK 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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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			
> <i>Radio Network Layer</i>				
>>Radio Network Layer Cause	M		ENUMERATED (Unspecified, TX2RELOCoverall 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, TS1RELOCoverall Expiry, TS1RELOCprep 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	

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
			<p>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, UP integrity protection not possible, Release due to discontinuous coverage)</p>	
>Transport Layer				
>>Transport Layer Cause	M		ENUMERATED (Transport Resource)	

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
			Unavailable, Unspecified, ...)	
>NAS				
>>NAS Cause	M		ENUMERATED (Normal Release, Authentication failure, Detach, Unspecified, ..., CSG Subscription Expiry, UE not in PLMN serving area)	
>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 (Falsey 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 HANOVER COMMAND message from MME contained <i>E-RABs to Release List IE</i> 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.

Radio Network Layer cause	Meaning
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.
UP integrity protection not possible	The E-RAB cannot be accepted according to the required user plane integrity protection policy.

Radio Network Layer cause	Meaning
Release due to discontinuous coverage	The release is due to discontinuous coverage (only applicable to IoT NTN).

Transport Layer cause	Meaning
Transport Resource Unavailable	The required transport resources are not available.
Unspecified	Sent when none of the specified 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 specified 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.
UE not in PLMN serving area	The release is due to the UE not being within the serving area of its current PLMN (for IoT NTN).

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 (Falsey Constructed Message)	The received message contained IEs or IE groups in wrong order or with too many occurrences.
Unspecified	Sent when none of the specified 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 specified 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* IE, *EstablishmentCause-NB* IE or *ResumeCause* IE as 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 <i>Trace Collection Entity URI</i> 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	YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
				configurations are included in the IE in this version of the specification.		
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 <i>Extended RNC-ID</i> IE is included in the <i>Target ID</i> IE, the <i>RNC-ID</i> IE shall be ignored.	-	-
>>Extended RNC-ID	O		9.2.1.14	The <i>Extended RNC-ID</i> 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		-	-
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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 <i>HandoverPreparation Information</i> 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
>>Security Indication	O		9.2.1.163		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	Includes the <i>VisitedCellInfoList</i> IE contained in the <i>UEInformationResponse</i> message (TS 36.331 [16])	YES	ignore
IMS voice EPS fallback from 5G	O		ENUMERATED (true, ...)		YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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
UE Context Reference at Source eNB	O		eNB UE S1AP ID 9.2.3.4	This IE is used for NTN operation.	YES	ignore
Source SN ID	O		Global RAN Node ID 9.2.1.131		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
Time Based Handover Information	O			This IE only applies to IoT NTN.	YES	ignore
>Handover Window Start	M		INTEGER (0..1048575)	Corresponds to information provided in the <i>t1-Threshold</i> contained in the <i>ReportConfigEUTRA</i> IE as defined in TS 36.331 [16]	-	
>Handover Window Duration	M		INTEGER (1..6000)	Corresponds to information provided in the <i>duration</i> contained in the <i>condEventT1</i> contained in the <i>ReportConfigEUTRA</i> IE as defined in TS 36.331 [16]	-	

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 E-UTRA <i>HandoverCommand</i> message as defined in subclause 10.2.2 of TS 36.331 [16].	-	

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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	-	
RACS Indication	O		9.2.1.162		YES	ignore
E-RABs Security Result List		0..1			YES	ignore
>E-RABs Security Result Item		1 .. <maxnoof E-RABs>			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>Security Result	M		9.2.1.164		-	
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 <i>Extended RNC-ID</i> 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 uplink 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 <i>Extended E-RAB Maximum Bit Rate Downlink</i> IE is included, the <i>E-RAB Maximum Bit Rate Downlink</i> 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 <i>Extended E-RAB Maximum Bit Rate Uplink</i> IE is included, the <i>E-RAB Maximum Bit Rate Uplink</i> 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 <i>Extended E-RAB Guaranteed Bit Rate Downlink</i> IE is included, the <i>E-RAB Guaranteed Bit Rate Downlink</i> 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 <i>Extended E-RAB Guaranteed Bit Rate Uplink</i> IE is included, the <i>E-RAB Guaranteed Bit Rate Uplink</i> 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	O		Extended Bit Rate	Desc.: This IE indicates the

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Guaranteed Bit Rate Uplink			9.2.1.126	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 <i>Extended UE Aggregate Maximum Bit Rate Downlink</i> IE is included, the <i>UE Aggregate Maximum Bit Rate Downlink</i> 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 <i>UE Aggregate Maximum Bit Rate Downlink</i> IE and the <i>UE Aggregate Maximum Bit Rate Uplink</i> IE equal to value zero shall be considered as a logical error by the eNB. If the <i>Extended UE Aggregate Maximum Bit Rate Uplink</i> IE is included, the <i>UE Aggregate Maximum Bit Rate Uplink</i> 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		

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
				PLMNs.		
>PLMN Identity	M		9.2.3.8			
Forbidden TAs		0..<maxno ofEPLMNs PlusOne>		Intra LTE roaming restrictions.		
>PLMN Identity	M		9.2.3.8	The PLMN of forbidden TACs.		
>Forbidden TACs		1..<maxno ofForbTA Cs>				
>>TAC	M		9.2.3.7	The TAC of the forbidden TAI.		
Forbidden LAs		0..<maxno ofEPLMNs PlusOne>		Inter-3GPP RAT roaming restrictions.		
>PLMN Identity	M		9.2.3.8			
>Forbidden LACs		1..<maxno ofForbLA Cs>				
>>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 (NRrestrictedin EPSasSecondaryRAT, ...)	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..<maxno ofEPLMNs PlusOne>		Includes any of the Serving PLMN or any PLMN of the Equivalent PLMNs listed in the <i>Mobility Restriction List</i> 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 (NRrestrictedin 5GS, ...)	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	YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
				from where the UE formerly handed over to EPS and which is preferred in case of subsequent mobility to 5GS.		
RAT Restrictions		0..<maxno ofEPLMNs PlusOne>		This IE contains RAT restriction related information as specified in TS 23.401 [11].	YES	ignore
>PLMN Identity	M		9.2.3.8		-	
>RAT Restriction Information	M		BIT STRING { LEO (0), MEO (1), GEO (2), OTHERSAT (3), NR-LEO (4), NR-MEO (5), NR-GEO (6), NR- OTHERSAT (7) } (SIZE(8, ...))	Each position in the bitmap represents a RAT. If a bit is set to "1", the respective RAT is restricted for the UE. If a bit is set to "0", the respective RAT is not restricted for the UE.	-	

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
				the CDMA2000 system.

9.2.1.25 CDMA2000 Sector ID

This information element, along with the *RAT Type* IE is used for routing the tunneled 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, <i>Next Hop Chaining Count</i> IE = "2" as defined in TS 33.501 [48]. For other inter-RAT Handover into LTE the <i>Next Hop Chaining Count</i> IE takes the value defined for NCC at initial setup, i.e., <i>Next Hop Chaining Count</i> 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 <i>Next-Hop NH</i> 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

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
				36.331 [16], or the <i>UERadioAccessCapabilityInformation-NB</i> 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	-	-

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
				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 ($N + \text{First Missing SDU Number}$) 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	YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
				DL SDU not having an SN yet in case of 18 bit long PDCP-SN.		
>>Receive Status Of UL PDCP SDUs for PDCP SN Length 18	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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
				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 <i>Pilot List</i> IE from the A21-1x air interface signalling message in 3GPP 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 <i>Cell Identity</i> IE contained in the <i>E-UTRAN CGI</i> IE (see subclause 9.2.1.38) of each cell served by the eNB.
>Home eNB ID				
>>Home eNB ID	M		BIT STRING (SIZE(28))	Equal to the <i>Cell Identity</i> IE contained in the <i>E-UTRAN CGI</i> IE (see subclause 9.2.1.38) of the cell served by the eNB.
>Short Macro eNB ID				
>> Short Macro eNB ID	M		BIT STRING (SIZE(18))	Equal to the 18 leftmost bits of the <i>Cell Identity</i> 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 <i>Cell Identity</i> 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. The Security Capabilities received from NAS signaling shall not be modified or truncated when forwarded to eNBs and the eNBs store and send the complete bitmaps without modification or truncation as specified in TS 36.300 [14].

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, “fourth to seventh bit” are mapped from bit 4 to bit 1 of octet 3 in the <i>UE Security Capability</i> IE defined in TS 24.301 [24], 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, “fourth to seventh bit” are mapped from bit 4 to bit 1 of octet 4 in the <i>UE Security Capability</i> IE defined in TS 24.301 [24], “seventh bit” – EIA7 (support of user plane integrity protection), 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
Last Visited PSCell List		0..<maxno ofPSCells PerPrimaryCellinUEHistoryInfo >		List of cells configured as PSCells. Most recent PSCell related information is added to the top of the list.	YES	ignore
>Last Visited PSCell Information	M		9.2.1.161	The PSCell related information.	YES	ignore

Range bound	Explanation
maxnoofPSCellsPerPrimaryCellinUEHistoryInfo	Maximum number of last visited PSCell information records that can be reported in the IE. Value is 8.

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.
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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>		

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
>>>E-CGI	M		9.2.1.38	
>TAI Broadcast				
>>TAI Broadcast		1 .. <maxnoofTAIf orWarning>		
>>>TAI	M		9.2.3.16	
>>>Completed Cell in TAI List		1 .. <maxnoofCelli nTAI>		
>>>>E-CGI	M			
>Emergency Area ID				
>>Emergency Area ID Broadcast		1 .. <maxnoofEme rgencyAreaID>		
>>>Emergency Area ID	M		9.2.1.47	
>>>Completed Cell in Emergency Area ID List		1 .. <maxnoofCelli nEAI>		
>>>>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 <i>Source eNB to Target</i>

IE/Group Name	Presence	Range	IE type and reference	Semantics description
				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 <i>Target eNB to Source eNB Transparent Container IE</i> , or the <i>Target RNC to Source RNC Transparent Container IE</i> as defined in TS 25.413 [19] or the Target BSS to Source BSS Transparent Container Contents of the <i>Target BSS to Source BSS Transparent Container IE</i> as defined in TS 48.018 [18] or the <i>Layer 3 Information field</i> of the <i>Layer 3 Information IE</i> as defined in TS 48.008 [23], or the <i>Target NG-RAN Node to Source NG-RAN Node Transparent Container IE</i> 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)	<p>Desc.: This IE should be understood as “priority of allocation and retention” (see TS 23.401 [11]).</p> <p>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.</p>
>Pre-emption Capability	M		ENUMERATED(shall not trigger pre-emption, may trigger pre-emption)	<p>Desc.: This IE indicates the pre-emption capability of the request on other E-RABs</p> <p>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.</p>
>Pre-emption Vulnerability	M		ENUMERATED(not pre-emptable, pre-emptable)	<p>Desc.: This IE indicates the vulnerability of the E-RAB to preemption of other E-RABs.</p> <p>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.</p>

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 <i>Classmark Information Type 2 IE</i> 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 <i>Classmark Information Type 3 IE</i> 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 overflowed.

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 <i>Extended Repetition Period</i> 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 .. <maxnoof CellIDforMDT>				-
>>E-CGI	M		9.2.1.38		-	-
>TA based						-
>>TA List for MDT		1 .. <maxnoof TAforMDT>				-
>>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 .. <maxnoof TAforMDT>			-	-
>>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-	This IE shall be ignored if the Measurements to	-	-

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
			triggered, ..., A2event-triggered periodic)	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)	Corresponds to the <i>thresholdRSRP</i> in the <i>ThresholdEUTRA</i> IE as defined in TS 36.331 [16].	-	-
>>>>RSRQ						-
>>>>Threshold RSRQ	M		INTEGER (0..34)	Corresponds to the <i>thresholdRSRQ</i> in the <i>ThresholdEUTRA</i> IE as 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)	Corresponds to the <i>ReportInterval</i> IE as 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	YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
				"do not activate". The eNB shall ignore the first bit unless the <i>Measurements to Activate IE</i> has the first bit or the sixth bit set to "1".		
>>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
>>Sensor Measurement Configuration	O		9.2.1.166		YES	ignore
> <i>Logged MDT</i>						-
>>Logging interval	M		ENUMERATED (ms1280, ms2560, ms5120, ms10240, ms20480, ms30720, ms40960 and ms61440)	Corresponds to the <i>LoggingInterval IE</i> as defined in TS 36.331 [16].	-	-
>>Logging duration	M		ENUMERATED (m10, m20, m40, m60, m90 and m120)	Corresponds to the <i>LoggingDuration IE</i> as defined in TS 36.331 [16].	-	-
>>Bluetooth Measurement Configuration	O		9.2.1.137		YES	ignore
>>WLAN Measurement Configuration	O		9.2.1.138		YES	ignore
>>CHOICE Report Type	O				YES	ignore
>>>Periodical			NULL			
>>>Event Triggered						
>>>>Event Trigger Logged MDT Configuration	M		9.2.1.165			
>>Sensor Measurement Configuration	O		9.2.1.166		YES	ignore
> <i>Logged MBSFN MDT</i>					YES	ignore
>>Logging interval	M		ENUMERATED (ms1280, ms2560, ms5120, ms10240, ms20480, ms30720, ms40960 and ms61440)	Corresponds to the <i>LoggingInterval IE</i> as defined in TS 36.331 [16].	-	-
>>Logging duration	M		ENUMERATED (m10, m20,	Corresponds to the	-	-

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
			m40, m60, m90 and m120)	<i>LoggingDuration</i> IE as is defined in TS 36.331 [16].		
>>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 <i>Measurements to Activate</i> IE has the first bit set to "1" and the <i>M1 Reporting Trigger</i> IE is set to "A2event-triggered" or to "A2event-triggered periodic".
ifperiodicMDT	This IE shall be present if the <i>M1 Reporting Trigger</i> IE is set to "periodic", or to "A2event-triggered periodic".
ifM3	This IE shall be present if the <i>Measurements to Activate</i> IE has the third bit set to "1".
ifM4	This IE shall be present if the <i>Measurements to Activate</i> IE has the fourth bit set to "1".
ifM5	This IE shall be present if the <i>Measurements to Activate</i> IE has the fifth bit set to "1".
ifM6	This IE shall be present if the <i>Measurements to Activate</i> IE has the seventh bit set to "1".
ifM7	This IE shall be present if the <i>Measurements to Activate</i> 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	Criticality	Assigned Criticality
M4 Collection Period	M		ENUMERATED (ms1024, ms2048, ms5120, ms10240, min1, ...)		-	
M4 Links to log	M		ENUMERATED(uplink, downlink, both-uplink-and-downlink, ...)		-	
M4 Report Amount	O		ENUMERATED (1, 2, 4, 8, 16, 32, 64, infinity,...)		Yes	ignore

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	Criticality	Assigned Criticality
M5 Collection Period	M		ENUMERATED (ms1024, ms2048, ms5120, ms10240, min1, ...)		-	
M5 Links to log	M		ENUMERATED(uplink, downlink, both-uplink-and-downlink, ...)		-	
M5 Report Amount	O		ENUMERATED (1, 2, 4, 8, 16, 32, 64, infinity,...)		Yes	ignore

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	In NTN, this IE is used to indicate the single broadcast TAC. This IE shall be ignored if the <i>LTE NTN TAI Information</i> IE is present.	-	-
>PSCell Information	O		9.2.1.141		YES	ignore

>LTE NTN TAI Information	O		9.2.3.56		YES	ignore
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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..<maxnoofMBSFNAreaMDT>		
>MBSFN-Areald	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 <i>Expected Activity Period</i> IE and the <i>Expected Idle Period</i> IE, if present, is derived from subscription information. If "statistics" is indicated, the information contained in the <i>Expected Activity Period</i> IE and the <i>Expected Idle Period</i> IE, if present, is derived from statistical information.

9.2.1.98 UE Radio Capability for Paging

This IE contains paging specific UE Radio Capability information.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
UE Radio Capability for Paging	M		OCTET STRING	Includes either the <i>UERadioPagingInformation</i> message as defined in 10.2.2 of TS 36.331 [16], or the <i>UERadioPagingInformation-NB</i> 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	Criticality	Assigned Criticality
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, ...)		-	
M6 Report Amount	O		ENUMERATED (1, 2, 4, 8, 16, 32, 64, infinity,...)		Yes	ignore

Condition	Explanation
ifUL	This IE shall be present if the <i>M6 Links to log</i> 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	Criticality	Assigned Criticality
M7 Collection Period	M		INTEGER (1..60, ...)	Unit: minutes	-	
M7 Links to log	M		ENUMERATED(uplink, downlink, both-uplink-and-downlink, ...)		-	
M7 Report Amount	O		ENUMERATED (1, 2, 4, 8, 16, 32, 64, infinity,...)		Yes	ignore

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	O		9.2.1.104	

Recommended Cells				
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 .. <maxnoofRecommendedCells>		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 .. <maxnoofRecommendedeNBs>		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 <i>UEPagingCoverageInformation</i> message as defined in 10.2.2 of TS 36.331 [16], or the <i>UEPagingCoverageInformation-NB</i> 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 CloT Support Indicator

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE User Plane CloT 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,	Unit: [2.56 seconds]

			s7, s8, s9, s10, s11, s12, s13, s14, s15, s16, ...)	
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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, ..., NB-IoT-LEO, NB-IoT-MEO, NB-IoT-GEO, NB-IoT-OTHERSAT, EUTRAN-LEO, EUTRAN-MEO, EUTRAN-GEO, EUTRAN-OTHERSAT)	

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	Indicates whether	-	-

			(authorized, not authorized, ...)	the UE is authorized as Pedestrian UE		
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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	Relativie 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			-	-

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
>>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 <i>Usage Count UL IE</i> and <i>Usage Count DL IE</i> .	-	-
>>>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 <i>Usage Count UL IE</i> and <i>Usage Count DL IE</i> .	-	-
>>>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
maxnofE-RABs	Maximum no. of E-RABs for one UE. Value is 256.
maxnof 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]. The Security Capabilities received from NAS signaling shall not be modified or truncated when forwarded to eNBs and the eNBs store and send the complete bitmaps without modification or truncation as specified in TS 36.300 [14].

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, “fourth to seventh bit” are mapped from bit 4 to bit 1 of octet 3 in the <i>UE Additional Security Capability IE</i> defined in TS 24.301 [24], “eighth to fifteenth bit” are mapped from bit 8 to bit 1 of octet 4 in the <i>UE Additional Security Capability IE</i> defined in TS 24.301 [24] 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, “fourth to seventh bit” are mapped from bit 4 to bit 1 of octet 5 in the <i>UE Additional Security Capability IE</i> defined in TS 24.301 [24], “eighth to fifteenth bit” are mapped from bit 8 to bit 1 of octet 6 in the <i>UE Additional Security Capability IE</i> defined in TS 24.301 [24] other bits reserved for future use. Value ‘1’ indicates support and value ‘0’ indicates no support of the algorithm. Algorithms are defined in TS

IE/Group Name	Presence	Range	IE type and reference	Semantics description
				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	Assigned Criticality
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 .. <maxnoof CellIDforQMC>				-
>>E-CGI	M		9.2.1.38		-	-
>TA based						-
>>TA List for QMC		1 .. <maxnoof TAforQMC>				-
>>TAC	M		9.2.3.7	The TAI is derived using the current serving PLMN.	-	-
>TAI based					-	-
>>TAI List for QMC		1 .. <maxnoof TAforQMC>			-	-
>>TAI	M		9.2.3.16		-	-
>PLMN area based						-
>>PLMN List for QMC		1 .. <maxnoof PLMNforQMC>				-
>>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	Indicates whether	-	-

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
			(restricted, not-restricted...)	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 <i>NR Cell Identity</i> IE contained in the <i>NR CGI</i> 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 <i>Bluetooth Measurement Configuration</i> 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 <i>WLAN Measurement Configuration</i> IE is set to "Setup".
>WLAN Measurement Configuration Name Item		1 .. <maxnoofWLANNName>		
>>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
maxnoofWLANNName	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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
				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 <i>Time of Day Start</i> 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(stati onary, 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(batt ery 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	Semantics description

			reference	
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	Indicates whether the UE is

			(authorized, not authorized, ...)	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..<maxnoofP C5QoSFlows>		
>>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	M		INTEGER	The period of time	-	-

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Duration			(1..100)	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.. <maxnooff frequencies>		List of inter-system measurements configured	YES	reject
>>>FreqBandIndicatorNR	M		INTEGER (1..1024)	The frequency band in which the <i>ssbFrequency</i> 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, ..., kHz480, kHz960)	Corresponds to <i>subcarrierSpacingSSB</i> IE contained in the <i>MeasObjectNR</i> IE as defined in TS 36.331 [16]. The value kHz60 is not used in this release.		
>>>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. Corresponds to the <i>MaxRS-IndexCellQualNR</i> IE as defined in TS 36.331 [16]		
>>>SMTC	O		OCTET STRING	Includes the MTC-SSB-NR IE as defined in TS 36.331 [16].		
>>>threshRS-Index-r15	O		OCTET STRING	Includes the threshRS-Index contained in the <i>MeasObjectNR</i> IE as defined in TS 36.331 [16], List of thresholds for consolidation of L1 measurements per		

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
				RS index		
>>>SSB-ToMeasure	O		OCTET STRING	Includes the <i>SSB-ToMeasure</i> IE as defined in TS 36.331 [16].		
>>>SS-RSSI-Measurements	O		OCTET STRING	Includes the <i>SS-RSSI-Measurement</i> IE as defined in TS 36.331 [16].		
>>>quantityConfigNR-R-R15	O		OCTET STRING	Includes the <i>quantityConfigNR</i> contained in the <i>QuantityConfig</i> IE as defined in TS 36.331 [16].		
>>>excludedCellsToAddModList	O		OCTET STRING	Includes the <i>excludedCellsToAddModList</i> contained in the <i>MeasObjectNR</i> IE as defined in TS 36.331 [16]. It applies only to SSB resources.		

Range bound	Explanation
maxnooffrequencies	Maximum no. of frequencies. Value is 64.
maxNARFCN	Maximum value of NR carrier frequency, corresponds to the <i>maxNARFCN</i> as defined in TS 38.331 [50]. Value is 3279165
maxRS-IndexCellQual	Maximum number of RS indices averaged to derive cell quality for RRM, corresponds to the <i>maxRS-IndexCellQual-r15</i> as 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 <i>Source Node ID</i>	M			
> <i>Source NG-RAN Node ID</i>				
>>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 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 <i>UERadioAccessCapabilityInformation</i> 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		<u>ENUMERATED (DAPS HO required, ...)</u>	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, and for the S1 handover with time-based trigger condition 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		The contents of this IE shall be ignored if the <i>E-RABs Subject to DL Discarding List</i> IE is present.	-	-
>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		

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
				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.		
E-RABs Subject To DL Discarding List		0..1			YES	ignore
>E-RABs Subject To DL Discarding Item		1 .. <maxnoof E-RABs>			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	-
>>CHOICE DL Discarding	M				-	
>>>12 bit PDCP-SN						
>>>DISCARD DL COUNT Value for PDCP SN Length 12	M		COUNT Value 9.2.1.32	PDCP-SN and Hyper frame number for which the receiving eNB should discard forwarded DL SDUs associated with lower values in case of 12 bit long PDCP-SN.	-	
>>>15 bit PDCP-SN						
>>>DISCARD DL COUNT Value for PDCP SN Length 15	M		COUNT Value Extended 9.2.1.90	PDCP-SN and Hyper frame number for which the receiving eNB should discard forwarded DL SDUs associated with lower values in case of 15 bit long PDCP-SN.	-	
>>>18 bit PDCP-SN						
>>>DISCARD 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 for which the receiving eNB should discard forwarded DL SDUs associated with lower values in case of 18 bit	-	

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
				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 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 <i>UERadioPagingInformation</i> message as defined in TS 38.331 [50].

9.2.1.161 Last Visited PSCell Information

The Last Visited PSCell Information may contain cell specific information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PSCell ID	O		PSCell Information 9.2.1.141	This IE is present when the SCG resources are configured for the UE.
Time Stay	M		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. Or the duration of the time when no SCG resources are configured for the UE.

9.2.1.162 RACS Indication

This IE indicates that the target eNB is able to retrieve the UE radio capabilities based on information received from the target MME as described in TS 23.401 [11].

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

9.2.1.163 Security Indication

This IE contains the user plane integrity protection indication which indicates the requirements on UP integrity protection for corresponding E-RABs.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Integrity Protection Indication	M		ENUMERATED (required, preferred, not needed, ...)	Indicates whether UP integrity protection shall apply, should apply or shall not apply for the concerned E-RAB.

9.2.1.164 Security Result

This IE indicates whether integrity protection is performed or not.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Integrity Protection Result	M		ENUMERATED (performed, not performed, ...)	Indicates whether UP integrity protection is performed or not for the concerned E-RAB.

9.2.1.165 Event Trigger Logged MDT Configuration

This IE defines the event trigger logged MDT configuration.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE <i>Event trigger type</i>	M			
> <i>Out-of-coverage</i>				
>>Out-of-Coverage Configuration	M		ENUMERATED (true, ...)	
> <i>L1 Event</i>				
>>CHOICE <i>L1 Event Threshold</i>	M			
>>> <i>RSRP</i>				
>>>Threshold RSRP	M		INTEGER (0..97)	Corresponds to the <i>thresholdRSRP</i> in the <i>ThresholdEUTRA</i> IE as defined in TS 36.331 [16].
>>> <i>RSRQ</i>				
>>>Threshold RSRQ	M		INTEGER (0..34)	Corresponds to the <i>thresholdRSRQ</i> in the <i>ThresholdEUTRA</i> IE as defined in TS 36.331 [16].
>>Hysteresis	M		INTEGER (0..30)	This parameter is used within the entry and leave condition of an event triggered reporting condition.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
>>Time to Trigger	M		ENUMERATED (ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120)	Time during which specific criteria for the event needs to be met in order to trigger a measurement report.

9.2.1.166 Sensor Measurement Configuration

This IE defines the parameters for Sensor measurement collection.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sensor Measurement Configuration	M		ENUMERATED (Setup, ...)	
Sensor Measurement Configuration Name List		0..1		
>Sensor Measurement Configuration Name Item		1..<maxnoofSensorName>		
>>CHOICE Sensor Name	M			
>>>Uncompensated Barometric				
>>>Uncompensated Barometric Configuration	M		ENUMERATED (true, ...)	

Range bound	Explanation
maxnoofSensorName	Maximum no. of Sensor local name used for Sensor measurement collection. Value is 3

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))	<ul style="list-style-type: none"> - 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 <p>-The PLMN identity consists of 3 digits from MCC followed by either</p> <ul style="list-style-type: none"> -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))	<ul style="list-style-type: none"> - 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 <p>-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.</p>

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 media or delay tolerant access from CP ClotT)	

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 <i>Extended RNC-ID</i> IE is included in the <i>Target ID</i> IE, the <i>RNC-ID</i> IE shall be ignored.	-	
>>Extended RNC-ID	O		9.2.1.14	The <i>Extended RNC-ID</i> 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-ifActivateMuting		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 <i>SON Information</i> IE contains the <i>SON Information Request</i> IE set to "X2TNL Configuration Info"
ifActivateMuting	This IE shall be present if the <i>SON Information</i> IE contains the <i>SON Information Request</i> 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 <i>SON Information</i> 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	M		9.2.1.37a	

IE/Group Name	Presence	Range	IE type and reference	Semantics description
ID				
>>>Selected TAI	M		TAI 9.2.3.16	The MME may ignore this IE if any of the following IEs are present in the <i>EN-DC SON Configuration Transfer IE</i> : 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 <i>SON Information IE</i> 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 <i>SON Information IE</i> contains the <i>SON Information Request IE</i> 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)	In the current version of the specification only "X2 TNL Configuration	-	

			Muting, Deactivate Muting)	"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 .. <maxnoof eNBX2TL As>				
>Transport Layer Address	M		9.2.2.1	Transport Layer Addresses for X2 SCTP end-point.		
eNB X2 Extended Transport Layer Addresses		0 .. <maxnoof eNBX2Ext TLAs>			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 .. <maxnoof eNBX2GT PTLAs>			-	-
>>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 .. <maxnoof eNBX2TL As>			YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
>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 <i>NAS security parameters from E-UTRA</i> 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 <i>NAS security parameters to E-UTRA</i> 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	Includes the <i>rlf-Report-r9</i> contained in <i>UEInformationResponse</i> message as defined in TS 36.331 [16].
UE RLF Report Container for extended bands	O		OCTET STRING	Includes the <i>rlf-Report-v9e0</i> contained in the <i>UEInformationResponse</i> message (TS 36.331 [16])
NB-IoT RLF Report Container	O		OCTET STRING	Includes the <i>rlf-Report-NB-r16</i> contained in <i>UEInformationResponse-NB</i> 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

Aggressor Cell List		0..1		detected for synchronisation. 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, ...)	

9.2.3.56 LTE NTN TAI Information

This IE contains the serving PLMN, the broadcast TAC(s) and the TAC information derived from the actual UE location if available.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Serving PLMN	M		PLMN Identity 9.2.3.8	Indicates the UE's serving PLMN.
TAC List in LTE NTN		1..<maxnoofTACsinNTN>		Includes all TAC(s) broadcast in the cell, for the UE's serving PLMN.
>TAC	M		9.2.3.7	
UE location derived TAC in LTE NTN	O		TAC 9.2.3.7	This IE contains TAC information derived from the actual UE location, if available.

Range bound	Explanation
maxnoofTACsinNTN	Maximum no. of TACs in NTN. Value is 12.

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

9.3.0 General

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

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

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

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

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

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

9.3.1 Usage of private message mechanism for non-standard use

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

- for special operator- (and/or vendor) specific features considered not to be part of the basic functionality, i.e., the functionality required for a complete and high-quality specification in order to guarantee multivendor interoperability;
- by vendors for research purposes, e.g., to implement and evaluate new algorithms/features before such features are proposed for standardisation.

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

9.3.2 Elementary Procedure Definitions

```
-- ASN1START
-- ****
-- Elementary Procedure definitions
-- ****

S1AP-PDU-Descriptions {
    itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
    eps-Access (21) modules (3) slap (1) version1 (1) slap-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
    criticality     S1AP-ELEMENTARY-PROCEDURE.&criticality
    value           S1AP-ELEMENTARY-PROCEDURE.&InitiatingMessage
}

SuccessfulOutcome ::= SEQUENCE {
    procedureCode   S1AP-ELEMENTARY-PROCEDURE.&procedureCode
    criticality     S1AP-ELEMENTARY-PROCEDURE.&criticality
    value           S1AP-ELEMENTARY-PROCEDURE.&SuccessfulOutcome
}

UnsuccessfulOutcome ::= SEQUENCE {
    procedureCode   S1AP-ELEMENTARY-PROCEDURE.&procedureCode
    criticality     S1AP-ELEMENTARY-PROCEDURE.&criticality
    value           S1AP-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome
}

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

S1AP-ELEMENTARY-PROCEDURES S1AP-ELEMENTARY-PROCEDURE ::= {
    S1AP-ELEMENTARY-PROCEDURES-CLASS-1
    |
    S1AP-ELEMENTARY-PROCEDURES-CLASS-2,
    ...
}

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
  mMMEConfigurationTransfer
  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
}

uplinkNATransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkNATransport
    PROCEDURE CODE          id-uplinkNATransport
    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

-- ASN1STOP
```

9.3.3 PDU Definitions

```
-- ASN1START
-- ****
-- PDU definitions for S1AP.
--
-- ****

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

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS

    UEAggregateMaximumBitrate,
    BearerType,
    Cause,
    CellAccessMode,
    Cdma2000HORRequiredIndication,
    Cdma2000HOSstatus,
    Cdma2000OneXSRVCCInfo,
    Cdma2000OneXRAND,
    Cdma2000PDU,
    Cdma2000RATType,
    Cdma2000SectorID,
    EUTRANRoundTripDelayEstimationInfo,
    CNDomain,
    ConcurrentWarningMessageIndicator,
    CriticalityDiagnostics,
    CSFBFallbackIndicator,
    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,
GUMMEILList,
Correlation-ID,
GWContextReleaseIndication,
PrivacyIndicator,
VoiceSupportMatchIndicator,
TunnelInformation,
KillAllWarningMessages,
TransportInformation,
LHN-ID,
UserLocationInformation,
AdditionalCSFallbackIndicator,
ECGILListForRestart,
TAIListForRestart,
EmergencyAreaIDListForRestart,
ExpectedUEBehaviour,
Paging-eDRXInformation,
Extended-UEIdentityIndexValue,
MME-Group-ID,
Additional-GUTI,
PWSfailedECGILList,
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,
PagingCause,
SecurityIndication,
SecurityResult,
LTE-NTN-TAI-Information
```

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-uAggregateMaximumBitrate,
id-BearerType,
id-Cause,
id-CellAccessMode,
id-CellIdentifierAndCELevelForCECapableUEs,
id-cdma2000HOResquiredIndication,
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-NASSecurityParametersstoE-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-RABFailedtoSetupItemHReqAck,
id-E-RABFailedToSetupListBearerSRes,
id-E-RABFailedToSetupListCtxtSRes,
id-E-RABFailedToSetupListHReqAck,
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-RABSetupItemBearerSRes,
id-E-RABSetupItemCtxtSRes,
id-E-RABSetupListBearerSRes,
id-E-RABSetupListCtxtSRes,
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-RABToBeSetupItemBearerSUEq,
id-E-RABToBeSetupItemCtxtSUEq,
id-E-RABToBeSetupItemHReq,
id-E-RABToBeSetupListBearerSUEq,
id-E-RABToBeSetupListCtxtSUEq,
id-E-RABToBeSetupListHReq,
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,
maxnooftErrors,
maxnooftE-RABs,
maxnooftIndividualS1ConnectionsToReset,
maxnooftEmergencyAreaID,
maxnooftCellID,
maxnooftAIforWarning,
maxnooftCellinTAI,
maxnooftCellinEAI,
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,

```

id-PagingCause,
id-SecurityIndication,
id-SecurityResult,
id-LTE-NTN-TAI-Information,
id-E-RABToBeUpdatedList,
id-E-RABToBeUpdatedItem

FROM S1AP-Constants;

-- ****
-- Common Container Lists
-- ****

E-RAB-IE-ContainerList      { S1AP-PROTOCOL-IES : IEsSetParam } ::= ProtocolIE-ContainerList { 1, maxnofE-RABs, { IEsSetParam } }
E-RAB-IE-ContainerPairList   { S1AP-PROTOCOL-IES-PAIR : IEsSetParam } ::= ProtocolIE-ContainerPairList { 1, maxnofE-RABs, { IEsSetParam } }
ProtocolError-IE-ContainerList { S1AP-PROTOCOL-IES : IEsSetParam } ::= ProtocolIE-ContainerList { 1, maxnofE-RABs, { IEsSetParam } }

-- ****
-- HANDOVER PREPARATION ELEMENTARY PROCEDURE
-- ****

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
    dL-gTP-TEID                   GTP-TEID
    uL-TransportLayerAddress       TransportLayerAddress
    uL-GTP-TEID                   GTP-TEID
    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 },
    ...
}

-- *****
-- HANOVER 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-uAggregateMaximumBitrate 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 optional   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-RABToBeSetupListHORreq ::= E-RAB-IE-ContainerList { {E-RABToBeSetupItemHORreqIEs} }

E-RABToBeSetupItemHORreqIEs SLAP-PROTOCOL-IES ::= {
  { ID id-E-RABToBeSetupItemHORreq CRITICALITY reject TYPE E-RABToBeSetupItemHORreq PRESENCE mandatory },
  ...
}

E-RABToBeSetupItemHORreq ::= SEQUENCE {
  e-RAB-ID,
  transportLayerAddress,
  gTP-TEID,
  e-RABLevelQoSParameters,
  iE-Extensions
  E-RAB-ID,
  TransportLayerAddress,
  GTP-TEID,
  E-RABLevelQoSParameters,
  ProtocolExtensionContainer { {E-RABToBeSetupItemHORreq-ExtIEs} } OPTIONAL,
  ...
}

E-RABToBeSetupItemHORreq-ExtIEs SLAP-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 }|
  { ID id-SecurityIndication CRITICALITY reject EXTENSION SecurityIndication 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-RABFailedToSetupListHReqAck CRITICALITY ignore   TYPE E-RABFailedtoSetupListHReqAck    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-RABFailedtoSetupListHReqAck ::= E-RAB-IE-ContainerList { {E-RABFailedtoSetupItemHReqAckIEs} }

E-RABFailedtoSetupItemHReqAckIEs S1AP-PROTOCOL-IES ::= {
  { ID id-E-RABFailedtoSetupItemHReqAck   CRITICALITY ignore   TYPE E-RABFailedToSetupItemHReqAck          PRESENCE mandatory} ,
  ...
}

E-RABFailedToSetupItemHReqAck ::= SEQUENCE {
  e-RAB-ID                   E-RAB-ID,
  cause                     Cause,
  iE-Extensions               ProtocolExtensionContainer { { E-RABFailedToSetupItemHReqAckExtIEs} } OPTIONAL,
  ...
}

E-RABFailedToSetupItemHReqAckExtIEs 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  },
    ...
}

-- ****
-- HANOVER 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-NotifySourceeNB         CRITICALITY ignore   TYPE NotifySourceeNB    PRESENCE optional } |
    { ID id-LTE-NTN-TAI-Information CRITICALITY ignore   TYPE LTE-NTN-TAI-Information  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 } |
    { ID id-LTE-NTN-TAI-Information CRITICALITY ignore   TYPE LTE-NTN-TAI-Information  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 ::= {
    { ID id-SecurityIndication   CRITICALITY ignore   EXTENSION SecurityIndication  PRESENCE optional },
    ...
}

```

```

-- ****
-- 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 }|
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 }|
{ ID id-UESecurityCapabilities   CRITICALITY ignore   TYPE UESecurityCapabilities       PRESENCE optional }|
{ ID id-E-RABToBeUpdatedList     CRITICALITY ignore   TYPE E-RABToBeUpdatedList        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 ::= {

  ...
}

E-RABToBeUpdatedList ::= E-RAB-IE-ContainerList { {E-RABToBeUpdatedItemIEs} }

E-RABToBeUpdatedItemIEs S1AP-PROTOCOL-IES ::= {
  { ID id-E-RABToBeUpdatedItem      CRITICALITY ignore    TYPE E-RABToBeUpdatedItem      PRESENCE mandatory },
  ...
}

E-RABToBeUpdatedItem ::= SEQUENCE {
  e-RAB-ID                           E-RAB-ID,
  securityIndication                 SecurityIndication     OPTIONAL,
  iE-Extensions                      ProtocolExtensionContainer { { E-RABToBeUpdatedItem-ExtIEs} }   OPTIONAL,
  ...
}

E-RABToBeUpdatedItem-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 },
  ...
}

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

-- ****
-- HANOVER 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-RABLevelQoSParameters,
    transportLayerAddress,
    gTP-TEID,
    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 } |
    { ID id-SecurityIndication     CRITICALITY reject   EXTENSION SecurityIndication     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 } |
    { ID id-UserLocationInformation  CRITICALITY ignore TYPE UserLocationInformation 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-uAggregateMaximumBitrate 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 } |
}

```

```

{ ID id-UserLocationInformation          CRITICALITY ignore  TYPE UserLocationInformation      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-uAggregateMaximumBitrate 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-RABToBeSetupListCtxtSReq  CRITICALITY reject   TYPE E-RABToBeSetupListCtxtSReq  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-RABToBeSetupListCtxtSReq ::= SEQUENCE (SIZE(1.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { {E-RABToBeSetupItemCtxtSReqIEs} }

E-RABToBeSetupItemCtxtSReqIEs S1AP-PROTOCOL-IES ::= {
{ ID id-E-RABToBeSetupItemCtxtSReq CRITICALITY reject TYPE E-RABToBeSetupItemCtxtSReq PRESENCE mandatory },
...
}

E-RABToBeSetupItemCtxtSReq ::= 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-RABToBeSetupItemCtxtSReqExtIEs} } OPTIONAL,
...
}

E-RABToBeSetupItemCtxtSReqExtIEs 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 }|
{ ID id-SecurityIndication CRITICALITY reject EXTENSION SecurityIndication 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-RABSetupListCtxtSRes  CRITICALITY ignore   TYPE E-RABSetupListCtxtSRes    PRESENCE mandatory }|
    { ID id-E-RABFailedToSetupListCtxtSRes  CRITICALITY ignore   TYPE E-RABList           PRESENCE optional }|
    { ID id-CriticalityDiagnostics  CRITICALITY ignore   TYPE CriticalityDiagnostics  PRESENCE optional },
    ...
}

E-RABSetupListCtxtSRes ::= SEQUENCE (SIZE(1.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { {E-RABSetupItemCtxtSResIEs} }

E-RABSetupItemCtxtSResIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABSetupItemCtxtSRes  CRITICALITY ignore   TYPE E-RABSetupItemCtxtSRes    PRESENCE mandatory },
    ...
}

E-RABSetupItemCtxtSRes ::= SEQUENCE {
    e-RAB-ID                  E-RAB-ID,
    transportLayerAddress      TransportLayerAddress,
    gTP-TEID                  GTP-TEID,
    iE-Extensions              ProtocolExtensionContainer { {E-RABSetupItemCtxtSResExtIEs} } OPTIONAL,
    ...
}

E-RABSetupItemCtxtSResExtIEs 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}|
    { ID id-PagingCause               CRITICALITY ignore   TYPE PagingCause               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
iE-Extensions
...
}

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}|  

...  

optional}|  

{ ID id-AdditionalRRMPriorityIndex CRITICALITY ignore  TYPE AdditionalRRMPriorityIndex PRESENCE optional}|  

{ ID id-UERadioCapabilityID      CRITICALITY reject   TYPE UERadioCapabilityID  PRESENCE optional}|  

{ ID id-Masked-IMEISV            CRITICALITY ignore    TYPE Masked-IMEISV        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}|  

{ ID id-LTE-NTN-TAI-Information CRITICALITY ignore TYPE LTE-NTN-TAI-Information 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 }|  

    { ID id-LTE-NTN-TAI-Information CRITICALITY ignore TYPE LTE-NTN-TAI-Information 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 SLAP-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 SLAP-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-eBname           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 SLAP-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 SLAP-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-cdma2000HOResquiredIndication CRITICALITY ignore  TYPE Cdma2000HOResquiredIndication  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 } |
    { ID id-LTE-NTN-TAI-Information CRITICALITY ignore   TYPE LTE-NTN-TAI-Information PRESENCE optional },
    ...
}

-- ****
-- OVERLOAD ELEMENTARY PROCEDURES
-- ****

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 SlAP-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 SlAP-PRIVATE-IES ::= {
  ...
}

-- *****
-- KILL PROCEDURE
--
-- *****
-- Kill Request
--
-- *****

KillRequest ::= SEQUENCE {
  protocolIEs        ProtocolIE-Container    { {KillRequestIEs} } ,
  ...
}

KillRequestIEs SlAP-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
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 SLAP-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 SLAP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
-- 
-- UE Context Resume Response
-- 
-- *****

UEContextResumeResponse ::= SEQUENCE {
  protocolsIEs ProtocolIE-Container { { UEContextResumeResponseIEs} },
  ...
}

UEContextResumeResponseIEs SLAP-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 SLAP-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},
  { ID id-Masked-IMEISV           CRITICALITY ignore   TYPE Masked-IMEISV           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}|  

    { ID id-Masked-IMEISV        CRITICALITY ignore   TYPE Masked-IMEISV        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}|  

{ ID id-LTE-NTN-TAI-Information    CRITICALITY ignore   TYPE LTE-NTN-TAI-Information  PRESENCE optional},  

...
}  

-- *****
--  

-- 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
-- ASN1STOP

```

9.3.4 Information Element Definitions

```
-- ASN1START
-- ****
-- Information Element Definitions
-- ****

S1AP-IEs {
    itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
    eps-Access (21) modules (3) slap (1) version1 (1) slap-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-CNTtypeRestrictions,
id-DownlinkPacketLossRate,
id-UplinkPacketLossRate,
id-BluetoothMeasurementConfiguration,
id-WLANMeasurementConfiguration,
id-LastNG-RANPLMNIIdentity,
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-lastVisitedPSCellList,
id-RACSIIndication,
id-SecurityIndication,
id-E-RABSecurityResultItem,
id-E-RABSecurityResultList,
id-RAT-Restrictions,
id-UEContextReferenceatSourceeNB,
id-LTE-NTN-TAI-Information,
id-SourceNodeTransportLayerAddress,
id-SourceSNID,
id-Direct-Forwarding-Path-Availability,
id-LoggedMDTTrigger,
id-SensorMeasurementConfiguration,
id-M4ReportAmount,
id-M5ReportAmount,
id-M6ReportAmount,
id-M7ReportAmount,
id-TimeBasedHandoverInformation,
id-Bearers-SubjectToDLDiscarding-Item,

```
id-Bearers-SubjectToDLDiscardingList,  
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,  
maxnoofWLANNName,  
maxnoofConnectedengNBs,  
maxnoofPC5QoSFlows,  
maxnooffrequencies,  
maxNARFCN,  
maxRS-IndexCellQual,  
maxnoofPSCellsPerPrimaryCellinUEHistoryInfo,  
maxnoofTACsInNTN,  
maxnoofSensorName
```

```

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 SLAP-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 SLAP-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 SLAP-PROTOCOL-EXTENSION ::= {
...
}

Bearers-SubjectToDLDiscardingList ::= SEQUENCE (SIZE(1.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { { Bearers-SubjectToDLDiscarding-ItemIEs } }

Bearers-SubjectToDLDiscarding-ItemIEs SLAP-PROTOCOL-IES ::= {
{ ID id-Bearers-SubjectToDLDiscarding-Item   CRITICALITY ignore   TYPE Bearers-SubjectToDLDiscarding-Item   PRESENCE mandatory},
...
}

Bearers-SubjectToDLDiscarding-Item ::= SEQUENCE {
e-RAB-ID                E-RAB-ID,
dL-Discarding            DLDiscarding,
iE-Extensions            ProtocolExtensionContainer { {Bearers-SubjectToDLDiscarding-ItemExtIEs} } OPTIONAL,
...
}

Bearers-SubjectToDLDiscarding-ItemExtIEs SLAP-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))

BPLMN ::= 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,
    number_of_broadcasts  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-slap-id,
unknown-enb-ue-slap-id,
unknown-pair-ue-slap-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,
up-integrity-protection-not-possible,
release-due-to-discontinuous-coverage
}

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

CauseNas ::= ENUMERATED {
  normal-release,
  authentication-failure,
  detach,
  unspecified,
}

```

```

    ...
    csg-subscription-expiry,
    uE-not-in-PLMN-serving-area
}

CellAccessMode ::= ENUMERATED {
    hybrid,
    ...
}

CellIdentifierAndCELevelForCECapableUEs ::= SEQUENCE {
    global-Cell-ID      EUTRAN-CGI,
    cELevel             CELevel,
    iE-Extensions       ProtocolExtensionContainer { { CellIdentifierAndCELevelForCECapableUEs-ExtIEs} } OPTIONAL,
    ...
}

CellIdentifierAndCELevelForCECapableUEs-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

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,
    numberBroadcasts NumberBroadcasts,
    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 SLAP-PROTOCOL-EXTENSION ::= {
    ...
}

CellIdListforMDT ::= SEQUENCE (SIZE(1..maxnoofCellIDforMDT)) OF EUTRAN-CGI

CellBasedQMC ::= SEQUENCE {
    cellIdListforQMC      CellIdListforQMC,
    iE-Extensions          ProtocolExtensionContainer { {CellBasedQMC-ExtIEs} } OPTIONAL,
    ...
}

CellBasedQMC-ExtIEs SLAP-PROTOCOL-EXTENSION ::= {
    ...
}

CellIdListforQMC ::= SEQUENCE (SIZE(1..maxnoofCellIDforQMC)) OF EUTRAN-CGI

Cdma2000PDU ::= OCTET STRING

Cdma2000RATTtype ::= ENUMERATED {
    hRPD,
    onexRTT,
    ...
}

Cdma2000SectorID ::= OCTET STRING

Cdma2000HOStatus ::= ENUMERATED {
    hOSuccess,
    hOFailure,
    ...
}

Cdma2000HORRequiredIndication ::= ENUMERATED {
    true,
    ...
}

Cdma2000OneXSRVCCInfo ::= SEQUENCE {
    cdma2000OneXMEID      Cdma2000OneXMEID,
    cdma2000OneXMSI        Cdma2000OneXMSI,
    cdma2000OneXPilot      Cdma2000OneXPilot,
    iE-Extensions          ProtocolExtensionContainer { {Cdma2000OneXSRVCCInfo-ExtIEs} } OPTIONAL,
    ...
}

```

```

Cdma2000OneXSRVCCInfo-ExtIEs SlAP-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 SlAP-PROTOCOL-EXTENSION ::= {
    ...
}

CGI ::= SEQUENCE {
    pLMNidentity     PLMNidentity,
    lAC               LAC,
    cI                CI,
    rAC               RAC           OPTIONAL,
    iE-Extensions     ProtocolExtensionContainer { { CGI-ExtIEs} }   OPTIONAL,
    ...
}

CGI-ExtIEs SlAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

CNDomain ::= ENUMERATED {
    ps,
    cs
}

CNTypeRestrictions ::= SEQUENCE (SIZE(1.. maxnoofEPLMNPsPlusOne)) OF CNTypeRestrictions-Item

CNTypeRestrictions-Item ::= SEQUENCE {
    pLMN-Identity     PLMNidentity,
    cNType            CNType,
    iE-Extensions     ProtocolExtensionContainer { { CNTypeRestrictions-Item-ExtIEs} } OPTIONAL,
    ...
}

```

```

CNTtypeRestrictions-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CNTtype ::= ENUMERATED {
    fiveGCForbidden,
    ...,
    epc-Forbiddnen
}

ConcurrentWarningMessageIndicator ::= ENUMERATED {
    true
}

ConnectedengNBLList ::= SEQUENCE (SIZE(1..maxnoofConnectedengNBs)) OF ConnectedengNBIitem

ConnectedengNBIitem ::= SEQUENCE {
    en-gNB-ID      En-gNB-ID,
    supportedTAs   SupportedTAs,
    iE-Extensions   ProtocolExtensionContainer { {ConnectedengNBIitem-ExtIEs} } OPTIONAL,
    ...
}

ConnectedengNBIitem-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 SLAP-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 SLAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- D

DAPSRequestInfo ::= SEQUENCE {
    dAPSIndicator        ENUMERATED {dAPS-HO-required, ...},
    iE-Extensions         ProtocolExtensionContainer {{DAPSRequestInfo-ExtIES}} OPTIONAL,
    ...
}

DAPSRequestInfo-ExtIES SLAP-PROTOCOL-EXTENSION ::= {
    ...
}

DAPSResponseInfoList ::= SEQUENCE (SIZE(1.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { { DAPSResponseInfoListIES } }

DAPSResponseInfoListIES SLAP-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,
...
}

DLDiscarding ::= CHOICE {
  discardDLCOUNTValuePDCP-SNlength12  COUNTvalue,
  discardDLCOUNTValuePDCP-SNlength15  COUNTValueExtended,
  discardDLCOUNTValuePDCP-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..maxnoofCellsInNB)) 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 ::= {
    { ID id-Bearers-SubjectToDLDiscardingList     CRITICALITY ignore EXTENSION Bearers-SubjectToDLDiscardingList PRESENCE optional},
    ...
}

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 ::= {
    ...
}

GUMMEILList ::= 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          OPTIONAL,
iE-Extensions
...
}

E-RABInformationListItem-ExtIEs  S1AP-PROTOCOL-EXTENSION ::= {
  { ID id-DAPSRequestInfo           CRITICALITY ignore  EXTENSION DAPSRequestInfo
  { ID id-SourceTransportLayerAddress   CRITICALITY ignore  EXTENSION TransportLayerAddress
  { ID id-SecurityIndication         CRITICALITY ignore  EXTENSION SecurityIndication
  { ID id-SourceNodeTransportLayerAddress  CRITICALITY ignore  EXTENSION TransportLayerAddress
  ...
}

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
  iE-Extensions           ProtocolExtensionContainer { {E-RABQoSParameters-ExtIEs} } OPTIONAL,
  ...
}

E-RABSecurityResultList ::= SEQUENCE (SIZE (1.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { { E-RABSecurityResultListIEs } }

E-RABSecurityResultListIEs  S1AP-PROTOCOL-IES ::= {
  { ID id-E-RABSecurityResultItem    CRITICALITY ignore  TYPE E-RABSecurityResultItem    PRESENCE mandatory  },
  ...
}

E-RABSecurityResultItem ::= SEQUENCE {
  e-RAB-ID                E-RAB-ID,
  securityResult           SecurityResult,
  iE-Extensions           ProtocolExtensionContainer { { E-RABSecurityResultItem-ExtIEs} } OPTIONAL,
  ...
}

```

```

E-RABSecurityResultItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

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)

EventL1LoggedMDTConfig ::= SEQUENCE {
    l1Threshold            MeasurementThresholdL1LoggedMDT,
    hysteresis             Hysteresis,
    timeToTrigger          TimeToTrigger,
}

```

```

iE-Extensions          ProtocolExtensionContainer { { EventL1LoggedMDTConfig-ExtIEs} } OPTIONAL,
...
}

EventL1LoggedMDTConfig-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
  ...
}

EventTrigger ::= CHOICE {
  outOfCoverage      ENUMERATED {true, ...},
  eventL1LoggedMDTConfig,
  choice-Extensions  ProtocolIE-SingleContainer { { EventTrigger-ExtIEs} }
}

EventTrigger-ExtIEs S1AP-PROTOCOL-IES ::= {
  ...
}

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 (1000000000..400000000000, ...)

ExtendedRNC-ID          ::= INTEGER (4096..65535)

ExtendedRepetitionPeriod ::= INTEGER (4096..131071)

Extended-UEIdentityIndexValue ::= BIT STRING (SIZE (14))

-- F

FiveGSTAC ::= OCTET STRING (SIZE (3))

FiveGSTAI ::= SEQUENCE {
    pLMNidentity,
    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 SLAP-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 SLAP-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,
    mMME-Group-ID      MME-Group-ID,
    mMME-Code          MME-Code,
    iE-Extensions       ProtocolExtensionContainer { {GUMMEI-ExtIEs} } OPTIONAL,
    ...
}

GUMMEI-ExtIEs SLAP-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-CNTTypeRestrictions      CRITICALITY ignore EXTENSION CNTTypeRestrictions  PRESENCE optional}| 
{ ID id-NRrestrictionin5GS      CRITICALITY ignore EXTENSION NRrestrictionin5GS      PRESENCE optional}| 
{ ID id-LastNG-RANPLMNIentity  CRITICALITY ignore EXTENSION PLMNidentity      PRESENCE optional}| 
{ ID id-RAT-Restrictions       CRITICALITY ignore EXTENSION RAT-Restrictions  PRESENCE optional},
...
}

HandoverType ::= ENUMERATED {
    intralte,
    l3tetoutran,
    l3tetogeran,
    utrantolte,
    gerantolte,
    ...,
    eps-to-5gs,
    fivegs-to-eps
}

HFN ::= INTEGER (0..1048575)

HFNModified ::= INTEGER (0..131071)

HFNforPDCP-SNlength18 ::= INTEGER (0..16383)

Hysteresis ::= INTEGER (0..30)

-- 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}| 
    { ID id-SensorMeasurementConfiguration CRITICALITY ignore EXTENSION SensorMeasurementConfiguration 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,...))

IntegrityProtectionIndication ::= ENUMERATED {
    required,
    preferred,
    not-needed,
    ...
}

IntegrityProtectionResult ::= ENUMERATED {
    performed,
    not-performed,
    ...
}

```

```

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),
    sSSBfrequencies                  INTEGER (0..maxNARFCN),
    subcarrierSpacingSSB              ENUMERATED {kHz15, kHz30, kHz60, kHz120, kHz240, ..., kHz480, kHz960},
    maxRSIndexCellQual                INTEGER (1..maxRS-IndexCellQual)   OPTIONAL,
    sMTC                               OCTET STRING                           OPTIONAL,
    threshRS-Index-r15                 OCTET STRING                           OPTIONAL,
    sSBToMeasure                       OCTET STRING                           OPTIONAL,
    sRSSIMeasurement                   OCTET STRING                           OPTIONAL,
    quantityConfigNR-R15               OCTET STRING                           OPTIONAL,
    excludedCellsToAddModList         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
{ ID id-lastVisitedPSCellList
...
}

LastVisitedPSCellList ::= SEQUENCE (SIZE(1.. maxnoofPSCellsPerPrimaryCellinUEHistoryInfo)) OF LastVisitedPSCellInformation

LastVisitedPSCellInformation ::= SEQUENCE {
    pSCellID                               PSCellInformation      OPTIONAL,
    timeStay        INTEGER (0..40950),
    iE-Extensions   ProtocolExtensionContainer { { LastVisitedPSCellInformation-ExtIEs} }   OPTIONAL,
...
}

LastVisitedPSCellInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
...
}

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}|
    { ID id-LoggedMDTTrigger                      CRITICALITY ignore EXTENSION LoggedMDTTrigger          PRESENCE optional}|
    { ID id-SensorMeasurementConfiguration        CRITICALITY ignore EXTENSION SensorMeasurementConfiguration PRESENCE optional},
}

LoggingInterval ::= ENUMERATED {ms1280, ms2560, ms5120, ms10240, ms20480, ms30720, ms40960, ms61440}

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 ::= {
}

LoggedMDTTrigger ::= CHOICE{
    periodical      NULL,
    eventTrigger    EventTrigger,
}
...

LTE-M-Indication ::= ENUMERATED {lte-m, ... }

LTE-NTN-TAI-Information ::= SEQUENCE {
    servingPLMN                  PLMNIdentity,
    tACList-In-LTE-NTN            TACList-In-LTE-NTN,
    uE-Location-Derived-TAC      TAC                  OPTIONAL,
    iE-Extensions                 ProtocolExtensionContainer { { LTE-NTN-TAI-Information-ExtIEs } } OPTIONAL,
}
...

LTE-NTN-TAI-Information-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
}

-- M

M3Configuration ::= SEQUENCE {
    m3period       M3period,
    iE-Extensions   ProtocolExtensionContainer { { M3Configuration-ExtIEs } } OPTIONAL,
}
...

M3Configuration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
}

```

```

}

M3period ::= ENUMERATED {ms100, ms1000, ms10000, ...,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 ::= {
{ ID id-M4ReportAmount      CRITICALITY ignore  EXTENSION M4ReportAmountMDT      PRESENCE optional },
    ...
}

M4ReportAmountMDT ::= ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity, ...}

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 ::= {
{ ID id-M5ReportAmount      CRITICALITY ignore  EXTENSION M5ReportAmountMDT      PRESENCE optional },
    ...
}

M5ReportAmountMDT ::= ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity, ...}

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 ::= {
{ ID id-M6ReportAmount      CRITICALITY ignore  EXTENSION M6ReportAmountMDT      PRESENCE optional },
    ...
}

M6ReportAmountMDT ::= ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity, ...}

```

```

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 ::= {
{ ID id-M7ReportAmount      CRITICALITY ignore EXTENSION M7ReportAmountMDT      PRESENCE optional },
...
}

M7ReportAmountMDT ::= ENUMERATED { r1, r2, r4, r8, r16, r32, r64, infinity, ... }

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,
    ...
}

MeasurementThresholdL1LoggedMDT ::= CHOICE {
    threshold-RSRP           Threshold-RSRP,
    threshold-RSRQ           Threshold-RSRQ,
    choice-Extensions        ProtocolIE-SingleContainer { { MeasurementThresholdL1LoggedMDT-ExtIEs} }
}

MeasurementThresholdL1LoggedMDT-ExtIEs S1AP-PROTOCOL-IES ::= {
    ...
}

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
NASSecurityParametersstoE-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 {
  nRestrictedinEPSasSecondaryRAT,
  ...
}

NRrestrictionin5GS ::= ENUMERATED {
  nRestrictedin5GS,
  ...
}

```

```

NRUESecurityCapabilities ::= SEQUENCE {
    nRenryptionAlgorithms      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         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             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, ...}

PagingCause ::= ENUMERATED {voice, ...}

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 SLAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- Q

QCI                   ::= INTEGER (0..255)

-- R

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

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-Restrictions ::= SEQUENCE (SIZE(1..maxnoofEPLMNsPlusOne)) OF RAT-RestrictionsItem

RAT-RestrictionsItem ::= SEQUENCE {
    pLMNidentity          PLMNidentity,
    rAT-RestrictionInformation   BIT STRING (SIZE(8, ...)),
    iE-Extensions           ProtocolExtensionContainer { { RAT-RestrictionsItem-ExtIES} } OPTIONAL,
    ...
}

RAT-RestrictionsItem-ExtIES     S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

RAT-Type ::= ENUMERATED {
    nbiot,
    ...,
    nbiot-leo,
    nbiot-meo,
    nbiot-geo,
    nbiot-othersat,
    eutran-leo,
    eutran-meo,
    eutran-geo,
    eutran-othersat
}

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 SLAP-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-for-extended-bands
    iE-Extensions
    ...
}

RLFReportInformation-ExtIEs SLAP-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 SLAP-PROTOCOL-EXTENSION ::= {
    ...
}

SecondaryRATType ::= ENUMERATED {
    nR,
    ...
    unlicensed
}

SecondaryRATDataUsageRequest ::= ENUMERATED {
    requested,
    ...
}

SecondaryRATDataUsageReportList ::= SEQUENCE (SIZE(1.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { {SecondaryRATDataUsageReportItemIEs} }

SecondaryRATDataUsageReportItemIEs SLAP-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 ::= {
  ...
}

SecurityIndication ::= SEQUENCE {
  integrityProtectionIndication      IntegrityProtectionIndication,
  iE-Extensions                      ProtocolExtensionContainer { { SecurityIndication-ExtIEs } } OPTIONAL,
  ...
}

SecurityIndication-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
  ...
}

SecurityResult ::= SEQUENCE {
  integrityProtectionResult          IntegrityProtectionResult,
  iE-Extensions                     ProtocolExtensionContainer { { SecurityResult-ExtIEs } } OPTIONAL,
  ...
}

SecurityResult-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
  ...
}

SensorMeasConfig ::= ENUMERATED {setup,...}

SensorMeasConfigNameItem ::= SEQUENCE {
  sensorNameConfig      SensorNameConfig,
  iE-Extensions         ProtocolExtensionContainer { { SensorMeasConfigNameItem-ExtIEs } } OPTIONAL,
  ...
}

SensorMeasConfigNameItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
  ...
}

SensorMeasConfigNameList ::= SEQUENCE (SIZE(1..maxnoofSensorName)) OF SensorMeasConfigNameItem

SensorMeasurementConfiguration ::= SEQUENCE {
  sensorMeasConfig           SensorMeasConfig,
  sensorMeasConfigNameList   SensorMeasConfigNameList
  iE-Extensions              ProtocolExtensionContainer { { SensorMeasurementConfiguration-ExtIEs } } OPTIONAL,
  ...
}

SensorMeasurementConfiguration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
  ...
}

SensorNameConfig ::= CHOICE {
  uncompensatedBarometricConfig    ENUMERATED {true, ...},
  ...
}

```

```

choice-Extensions      ProtocolIE-SingleContainer { {SensorNameConfig-ExtIEs} }

}

SensorNameConfig-ExtIEs S1AP-PROTOCOL-IES ::= {
  ...
}

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 OPTIONAL,
 iE-Extensions {{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-UEContextReferenceatSourceeNB  CRITICALITY ignore EXTENSION ENB-UE-S1AP-ID          PRESENCE optional}|{ID id-SourceSNID                  CRITICALITY ignore EXTENSION Global-RAN-NODE-ID        PRESENCE optional}|{ID id-Direct-Forwarding-Path-Availability  CRITICALITY ignore EXTENSION Direct-Forwarding-Path-Availability  PRESENCE optional}|{ID id-TimeBasedHandoverInformation  CRITICALITY ignore EXTENSION TimeBasedHandoverInformation  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 SLAP-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 SLAP-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 SLAP-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 BPLMN,
    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 {
    mMME      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))

```

```

TACList-In-LTE-NTN ::= SEQUENCE (SIZE(1..maxnoofTACsInNTN)) OF TAC

TAIBasedMDT ::= SEQUENCE {
    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,
    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,
    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,
    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      TAIIListforQMC,
  iE-Extensions     ProtocolExtensionContainer { {TAIBasedQMC-ExtIEs} } OPTIONAL,
  ...
}

TAIBasedQMC-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
  ...
}

TAIIListforQMC ::= 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 SLAP-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 SLAP-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 SLAP-PROTOCOL-EXTENSION ::= {
    { ID id-DAPSResponseInfoList           CRITICALITY ignore EXTENSION DAPSResponseInfoList
    { ID id-RACSI indication             CRITICALITY ignore EXTENSION RACSI indication
    { ID id-E-RABSecurityResultList       CRITICALITY ignore EXTENSION E-RABSecurityResultList
    { ID id-Direct-Forwarding-Path-Availability   CRITICALITY ignore EXTENSION Direct-Forwarding-Path-Availability
    ...
}

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

```

PRESENCE optional } |
 PRESENCE optional } |
 PRESENCE optional } |
 PRESENCE optional }

```
-- 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)

TimeBasedHandoverInformation ::= SEQUENCE {
    hOWindowStart          HandoverWindowStart,
    hOWindowDuration       HandoverWindowDuration,
    iE-Extensions          ProtocolExtensionContainer { {TimeBasedHandoverInformation-ExtIEs} } OPTIONAL,
    ...
}

TimeBasedHandoverInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

HandoverWindowStart ::= INTEGER (0.. 1048575)

HandoverWindowDuration ::= INTEGER (1..6000)

TimeToTrigger ::= ENUMERATED {ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120}

TimeToWait ::= ENUMERATED {vls, 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..maxnofCellsinUEHistoryInfo)) OF LastVisitedCell-Item

UE-HistoryInformationFromTheUE ::= OCTET STRING

UEPagingID ::= CHOICE {
    s-TMSI      S-TMSI,
    iMSI        IMSI,
    ...
}

UERadioCapability ::= OCTET STRING

UERadioCapabilityForPaging ::= OCTET STRING

UERadioCapabilityID ::= OCTET STRING

UE-RLF-Report-Container ::= OCTET STRING

UE-RLF-Report-Container-for-extended-bands ::= OCTET STRING

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 SIAP-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 SIAP-PROTOCOL-EXTENSION ::= {
    { ID id-PSCellInformation      CRITICALITY ignore EXTENSION PSCellInformation      PRESENCE optional}| 
    { ID id-LTE-NTN-TAI-Information CRITICALITY ignore EXTENSION LTE-NTN-TAI-Information 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 SIAP-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 SIAP-PROTOCOL-EXTENSION ::= {
  ...
}

WLANMeasConfigNameList ::= SEQUENCE (SIZE(1..maxnoofWLANNname)) OF WLANNname

```

```

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,
    gPTPLAa              ENBX2GPTPLAs            OPTIONAL,
    iE-Extensions         ProtocolExtensionContainer { { ENBX2ExtTLA-ExtIEs } } OPTIONAL,
    ...
}

ENBX2ExtTLA-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ENBX2GPTPLAs ::= SEQUENCE (SIZE(1.. maxnoofeNBX2GPTPLAs)) OF TransportLayerAddress

ENBIndirectX2TransportLayerAddresses ::= SEQUENCE (SIZE(1..maxnoofeNBX2TLAs)) OF TransportLayerAddress

-- Y
-- Z

END
-- ASN1STOP

```


9.3.5 Common Definitions

```
-- ASN1START
-- ****
-- Common definitions
--
-- ****

S1AP-CommonDataTypes {
    itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
    eps-Access (21) modules (3) slap (1) version1 (1) slap-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, unsuccessful-outcome }

END
-- ASN1STOP
```

9.3.6 Constant Definitions

```
-- ASN1START
-- ****
-- Constant definitions
--
-- ****

S1AP-Constants {
    itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
    eps-Access (21) modules (3) slap (1) version1 (1) slap-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
maxnoofWLANNName                     INTEGER ::= 4
maxnoofConnectedengNBs               INTEGER ::= 256
maxnoofPC5QoSFlows                   INTEGER ::= 2048
maxnooffrequencies                   INTEGER ::= 64
maxNARFCN                            INTEGER ::= 3279165
maxRS-IndexCellQual                  INTEGER ::= 16
maxnoofPSCellsPerPrimaryCellInUEHistoryInfo INTEGER ::= 8
maxnoofTACsInNTN                      INTEGER ::= 12
maxnoofSensorName                     INTEGER ::= 3

```

```

-- ****
-- 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-RABSubjectoDataForwardingList	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-uAggregateMaximumBitrate	ProtocolIE-ID ::= 66
id-TAI	ProtocolIE-ID ::= 67
id-E-RABReleaseListBearerRelComp	ProtocolIE-ID ::= 69
id-cdma2000PDU	ProtocolIE-ID ::= 70
id-cdma2000RATTtype	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-cdma2000HOResquiredIndication	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-MSCClassmark2	ProtocolIE-ID ::= 132
id-MSCClassmark3	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-MobileInformation	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-CNTTypeRestrictions	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-RANPLMIdentity	ProtocolIE-ID ::= 290
id-ConnectedengNBList	ProtocolIE-ID ::= 291
id-ConnectedengNBTToAddList	ProtocolIE-ID ::= 292
id-ConnectedengNBTToRemoveList	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-lastVisitedPSCellList	ProtocolIE-ID ::= 329
id-RACSI indication	ProtocolIE-ID ::= 330
id-PagingCause	ProtocolIE-ID ::= 331
id-SecurityIndication	ProtocolIE-ID ::= 332
id-SecurityResult	ProtocolIE-ID ::= 333
id-E-RABSecurityResultItem	ProtocolIE-ID ::= 334
id-E-RABSecurityResultList	ProtocolIE-ID ::= 335
id-RAT-Restrictions	ProtocolIE-ID ::= 336
id-UEContextReferenceatSourceeNB	ProtocolIE-ID ::= 337
id-LTE-NTN-TAI-Information	ProtocolIE-ID ::= 339
id-SourceNodeTransportLayerAddress	ProtocolIE-ID ::= 340
id-E-RABToBeUpdatedList	ProtocolIE-ID ::= 341
id-E-RABToBeUpdatedItem	ProtocolIE-ID ::= 342
id-SourceSNID	ProtocolIE-ID ::= 343

```

id-LoggedMDTTrigger          ProtocolIE-ID ::= 344
id-SensorMeasurementConfiguration ProtocolIE-ID ::= 345
id-M4ReportAmount           ProtocolIE-ID ::= 346
id-M5ReportAmount           ProtocolIE-ID ::= 347
id-M6ReportAmount           ProtocolIE-ID ::= 348
id-M7ReportAmount           ProtocolIE-ID ::= 349
id-TimeBasedHandoverInformation ProtocolIE-ID ::= 350
id-Bearers-SubjectToDLDiscarding-Item ProtocolIE-ID ::= 351
id-Bearers-SubjectToDLDiscardingList  ProtocolIE-ID ::= 352

```

```

END
-- ASN1STOP

```

9.3.7 Container Definitions

```

-- ASN1START
-- ****
-- 
-- Container definitions
-- 
-- ****
S1AP-Containers {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) slap (1) version1 (1) slap-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

```

-- ASN1STOP

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

$TS1_{RELOC_{prep}}$

- Specifies the maximum time for the Handover Preparation procedure in the source eNB.

$TS1_{RELOC_{overall}}$

- Specifies the maximum time for the protection of the overall handover procedure in the source eNB.

$TX2_{RELOC_{overall}}$

- 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:

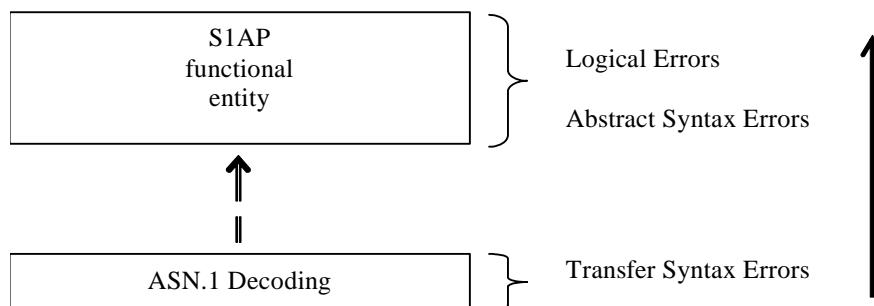


Figure 10.1-1: Protocol Errors in S1AP.

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.
6. receives IEs or IE groups for a functionality that is not supported.

Cases 1, 2 and 6 (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 and 6 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 comprehension of different IEs or IE groups within a standard version or between standard versions is not mandated. Any IE or IE group that is not supported shall be considered not comprehended, even if another IE or IE group for that EP from that standard version is comprehended, and action based on criticality shall be applied.

The comprehension of different EPs within a standard version or between different standard versions is not mandated. Any EP that is not supported shall 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	<i>Old BSS to New BSS information elements</i> field of the Old BSS to New BSS information	48.008	<i>Layer 3 Information field</i> 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 <i>Source to Target Transparent Container IE</i>); <i>Old BSS to New BSS information elements</i> field of the Old BSS to New BSS information (in the <i>Source to Target Transparent Container Secondary IE</i>)	48.018 48.008	<i>Layer 3 Information field</i> of the Layer 3 Information (in the <i>Target to Source Transparent Container IE</i>); Target BSS to Source BSS Transparent Container Contents of the Target BSS to Source BSS Transparent Container (in the <i>Target to Source Transparent Container Secondary IE</i>)	48.008 48.018
Inter-system handover to NG-RAN	Source NG-RAN Node to Target NG-RAN Node Transparent Container	38.413	<i>Target NG-RAN Node to Source NG-RAN Node Transparent Container</i>	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 <i>Reporting Cell Identifier</i> 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 <i>RAT Discriminator</i> field shall be set to 'E-UTRAN'.
>Failure Event Reporting			NULL	The <i>Reporting Cell Identifier</i> 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 <i>RAT Discriminator</i> 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 <i>Application Container IE</i> is syntactically incorrect.
Inconsistent Reporting Cell Identifier	<ul style="list-style-type: none"> - In case the reporting RAT is GERAN: the Reporting Cell Identifier in the <i>Application Container IE</i> does not match with the <i>Destination Cell Identifier IE</i> value (in the case of a RAN-INFORMATION-REQUEST PDU) or with the <i>Source Cell Identifier IE</i> value (in the case of a RAN-INFORMATION PDU) of the RIM header. - In case the reporting RAT is UTRAN or E-UTRAN: the cell identified by Reporting Cell Identifier in the <i>Application Container IE</i> is unknown in the RNC (UTRAN case) or in the eNodeB (E-UTRAN case) identified by the <i>Destination Cell Identifier IE</i> 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 <i>Application Container IE</i> is syntactically incorrect.
Inconsistent Reporting Cell Identifier	<ul style="list-style-type: none"> - In case the reporting RAT is E-UTRAN: The Reporting Cell Identifier in the <i>Application Container IE</i> is unknown in the eNB identified by the <i>Destination Cell Identifier IE</i> value of the RIM header of a RAN-INFORMATION-REQUEST PDU or the reporting cell identifier in the <i>Application Container IE</i> does not match with the <i>Source Cell Identifier IE</i> 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 <i>Application Container IE</i> is syntactically incorrect.
Inconsistent Reporting Cell Identifier	<ul style="list-style-type: none"> - In case the reporting RAT is E-UTRAN: The Reporting Cell Identifier in the <i>Application Container IE</i> does not match with the <i>Source Cell Identifier IE</i> value of the RIM header of a RAN-INFORMATION-REQUEST PDU or the reporting cell identifier in the <i>Application Container IE</i> does not match with the <i>Destination Cell Identifier IE</i> 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 <i>Application Container IE</i> is syntactically incorrect.
Inconsistent Reporting Cell Identifier	<ul style="list-style-type: none"> - In case the reporting RAT is E-UTRAN: The Reporting Cell Identifier in the <i>Application Container IE</i> does not match with the <i>Source Cell Identifier IE</i> value of the RIM header of a RAN-INFORMATION-REQUEST PDU or the reporting cell identifier in the <i>Application Container IE</i> does not match with the <i>Destination Cell Identifier IE</i> 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 <i>Cell Load Information Group IE</i> as defined in TS 25.413. The receiver shall ignore the value of the <i>Source Cell Identifier IE</i> within the <i>Cell Load Information Group IE</i> .
>GERAN				
>>GERAN Response	M		OCTET STRING	Contains the <i>Cell Load Information Group IE</i> as defined in TS 48.008. The receiver shall ignore the value of the <i>Cell Identifier IE</i> within the <i>Cell Load Information Group IE</i> .
>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 <i>Composite Available Capacity Group IE</i> 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 .. <maxnoofIRAT ReportingCells>		One of the IRAT Cell IDs contained in this list shall be carried in the <i>Reporting Cell Identifier</i> field in the RAN-INFORMATION-REQUEST Application Container for SON Transfer (TS 48.018).
>IRAT Cell ID	M		B.1.8	

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

B.1.8 IRAT Cell ID

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE Reporting RAT	M			
>E-UTRAN				
>>Cell Identifier	M		OCTET STRING	Contains the E-UTRAN CGI IE as defined in 9.2.1.38.
>UTRAN				
>>Cell Identifier	M		OCTET STRING	Contains the <i>Source Cell Identifier</i> IE as defined in TS 25.413.
>GERAN				
>>Cell Identifier	M		OCTET STRING	Contains the <i>Cell Identifier</i> IE as defined in TS 48.018.
>eHRPD				
>>eHRPD Sector ID	M		B.1.18	

B.1.9 Multi-Cell Load Reporting Response

This IE contains response information for inter-RAT multi-cell load reporting.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Reporting Cell List		1 .. <maxnoofIRAT ReportingCells >		
>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 <i>Cell Load Information Group</i> IE as defined in TS 25.413.
>>GERAN				
>>>GERAN Response	M		OCTET STRING	Contains the <i>Cell Load Information Group</i> 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 <i>Application Container IE</i> is syntactically incorrect.
Inconsistent Reporting Cell Identifier	- In case the reporting RAT is GERAN or eHRPD: the <i>Reporting Cell Identifier</i> in the <i>Application Container IE</i> does not match with the <i>Destination Cell Identifier IE</i> value (in the case of a RAN-INFORMATION-REQUEST PDU) or with the <i>Source Cell Identifier IE</i> 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 <i>Reporting Cell Identifier</i> in the <i>Application Container IE</i> is unknown in the RNC (UTRAN case) or in the eNodeB (E-UTRAN case) identified by the <i>Destination Cell Identifier IE</i> 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 <i>Reporting Cell Identifier</i> 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 <i>Candidate Cell List</i> 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 .. <maxnoofCelli neNB>		One of the cell IDs contained in this list shall be carried in the <i>Reporting Cell Identifier</i> field in the RAN-INFORMATION-REQUEST Application Container for SON Transfer (TS 48.018 [18]).
>Cell Identifier	M		OCTET STRING	Contains the <i>E-UTRAN CGI</i> 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 .. <maxnoofCelli neNB>		
>Cell Identifier	M		OCTET STRING	Contains the <i>E-UTRAN CGI</i> IE as defined in 9.2.1.38.

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

B.1.16 Cell State Indication

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Notification Cell List		1 .. <maxnoofCelli neNB>		One of the cell IDs contained in this list shall be carried in the <i>Reporting Cell Identifier</i> field in the RAN-INFORMATION-REQUEST Application Container for SON Transfer (TS 48.018 [18]).
>Cell Identifier	M		OCTET STRING	Contains the <i>E-UTRAN CGI</i> 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 <i>Reporting Cell Identifier</i> 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	Includes the <i>rlf-Report</i> contained in the <i>UEInformationResponse</i> message as defined in 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

```
-- ASN1START
-- ****
-- 
-- 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                      HReport,
    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                      HReportingCause,
    eutranCellActivation              CellActivationCause,
    energySavingsIndication         CellStateIndicationCause,
    failureEventReporting            FailureEventReportingCause
}

CellLoadReportingCause ::= ENUMERATED {
    application-container-syntax-error,
    inconsistent-reporting-cell-identifier,
    unspecified,
    ...
}

HReportingCause ::= 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 {
    r12,
    r13,
    r14,
    r15,
    r110,
    ...
}

```

```

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..maxnofcandidateCells)) OF IRAT-Cell-ID

CandidatePCIList ::= SEQUENCE (SIZE(1..maxnofcandidateCells)) 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.. maxnofCelllineNB)) OF CellsToActivateList-Item

CellsToActivateList-Item ::= SEQUENCE {
    cell-ID             OCTET STRING,
    ...
}

CellActivationResponse ::= SEQUENCE {
    activatedCellsList   ActivatedCellsList,
    ...
}

ActivatedCellsList ::= SEQUENCE (SIZE(0.. maxnofCelllineNB)) OF ActivatedCellsList-Item

```

```

ActivatedCellsList-Item ::= SEQUENCE {
    cell-ID          OCTET STRING,
    ...
}

-- IEs for Energy Savings Indication application
--

CellStateIndication ::= SEQUENCE {
    notificationCellList      NotificationCellList,
    ...
}

NotificationCellList ::= SEQUENCE (SIZE(1.. maxnoofCelllineNB)) 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,
    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      EHRPDCCompositeAvailableCapacity,
    uL-EHRPD-CompositeAvailableCapacity      EHRPDCCompositeAvailableCapacity,
    ...
}

EHRPDCCompositeAvailableCapacity ::= SEQUENCE {
    eHRPDSectorCapacityClassValue            EHRPDSectorCapacityClassValue,
    eHRPDCapacityValue                     EHRPDCapacityValue,
    ...
}

EHRPDMultiSectorLoadReportingResponseItem ::= SEQUENCE {
    eHRPD-Sector-ID                      EHRPD-Sector-ID,
    eHRPDSectorLoadReportingResponse      EHRPDSectorLoadReportingResponse,
    ...
}

-- ****
-- Constants
--
-- ****

maxnoofIRATReportingCells           INTEGER ::= 128
maxnofcandidateCells                INTEGER ::= 16
maxnoofCelllineNB                   INTEGER ::= 256

```

END
-- ASN1STOP

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 HANOVER 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 HANOVER 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

TSG #	TSG Doc.	CR	Rev	Subject/Comment	New
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 Traffic 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

TSG #	TSG Doc.	CR	Rev	Subject/Comment	New
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		Correction 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 HANOVER COMMAND and DOWLINK 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

TSG #	TSG Doc.	CR	Rev	Subject/Comment	New
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 Subscription 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 decription	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

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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

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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 CloT 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 CloT 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

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Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
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 CloT 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	15.7.0

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Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
						deconfigured	
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
2022-03	RP-95-e	RP-220221	1800	9	B	BLCR to 36.413_Addition of SON features enhancement	17.0.0
2022-03	RP-95-e	RP-220237	1804	5	F	Correction for Chapter 10	17.0.0
2022-03	RP-95-e	RP-220237	1811	5	B	Detection of RACS support at target during N2/S1 handover [RACS_S1_NG]	17.0.0
2022-03	RP-95-e	RP-220237	1835	5	C	Support for mapping complete security capabilities from NAS [UE_Sec_Caps]	17.0.0
2022-03	RP-95-e	RP-220219	1851	3	B	Introduction of MultiSIM support over S1	17.0.0
2022-03	RP-95-e	RP-220241	1852	6	B	Introduction of User Plane Integrity Protection in EPS	17.0.0
2022-03	RP-95-e	RP-220216	1853	4	B	Support of NTN RAT identification and NTN RAT restrictions	17.0.0
2022-03	RP-95-e	RP-220237	1862	2	D	S1AP Rapporteur Corrections	17.0.0
2022-03	RP-95-e	RP-220239	1864	1	D	Inclusive language review for TS 36.413	17.0.0
2022-06	RP-96	RP-221150	1880	1	A	Dynamic ACL over S1 CR 36.413	17.1.0
2022-06	RP-96	RP-221146	1881	3	F	Removing the unnecessary LTE-M satellite indication	17.1.0
2022-06	RP-96	RP-221146	1882		F	Correction to NTN tabular mistake	17.1.0
2022-06	RP-96	RP-221144	1884		F	Correction of the Security Indication IE in Source eNB to Target eNB	17.1.0

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Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
						Transparent Container	
2022-06	RP-96	RP-221144	1886	1	F	UIP EPC Correction on S1AP	17.1.0
2022-06	RP-96	RP-221144	1887	2	F	Correction of EPS Integrity Protection	17.1.0
2022-06	RP-96	RP-221157	1892		A	Direct data forwarding for mobility from MR-DC to eNB	17.1.0
2022-06	RP-96	RP-221146	1893	1	F	Adding serving PLMN information in ULI for IoT NTN	17.1.0
2022-06	RP-96	RP-221157	1894		A	Data forwarding address allocation for handover to EN-DC	17.1.0
2022-09	RP-97-e	RP-222198	1898	1	A	Addition of Masked IMEISV for UEs using CP CloT EPS optimisation	17.2.0
2022-09	RP-97-e	RP-222168	1899	1	B	Correction of LTE MDT on event trigger logging [LTE-Event-MDT]	17.2.0
2022-09	RP-97-e	RP-222172	1901		B	Correction of LTE MDT on Sensor information[LTE-Height-MDT]	17.2.0
2022-12	RP-98-e	RP-222894	1903	1	F	Additional ULI provision with PScell information	17.3.0
2023-03	RAN#99	RP-230596	1907	1	A	Clarification on IAB Authorized IE in UE Context Modification procedure	17.4.0
2023-03	RAN#99	RP-230592	1908	-	F	Correction of references to RRC protocol elements in S1AP	17.4.0
2023-06	RAN#100	RP-231083	1909	4	B	Correction for SubcarrierSpacingSSB [NR_ext_to_71GHz-Core]	17.5.0
2023-06	RAN#100	RP-231072	1912		A	Clarify the usage of IAB Supported IE	17.5.0
2023-12	RAN#102	RP-233845	1876	6	B	Introducing Report Amount for M4, M5, M6, M7 measurements for E-UTRAN [ReportAmount_MDT_E-UTRAN]	18.0.0
2023-12	RAN#102	RP-233846	1895	16	B	IoT NTN enhance	18.0.0
2024-03	RAN#103	RP-240642	1924	3	A	Mobility Restrictions with NR NTN - S1AP Impacts	18.1.0
2024-03	RAN#103	RP-240643	1927	3	A	IAB-node authorization	18.1.0
2024-03	RAN#103	RP-240619	1930	-	F	Correction of E-RABs Subject To DL Discarding for IoT NTN	18.1.0
2024-03	RAN#103	RP-240619	1931	1	F	Correction on Time-based HO over S1	18.1.0

History

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