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S1 Application Protocol (S1AP)
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Foreword

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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 [2] and [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.
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- [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] 3GPP TS 32.421: "Trace concepts and requirements".
- [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'.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

Elementary Procedure: 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 stand alone procedures, which can be active in parallel. Examples on using several S1AP EPs together with each other and EPs from other interfaces can be found in reference [FFS].

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: according to definition in 23.401.

[Note (to be removed once captured in another TS): The eNB UE S1AP ID shall be allocated so as to uniquely identify the UE over the S1 interface within the eNB. When MME receives eNB UE S1AP ID it shall store it for the duration of the UE-associated logical S1-connection for this UE. Once known to MME this IE is included in all UE associated S1-AP signalling (UL as well as DL).]

MME UE S1AP ID: according to definition in 23.401.

[Note (to be removed once captured in another TS): The MME UE S1AP ID shall be allocated so as to uniquely identify the UE over the S1 interface within the MME. When eNB receives MME UE S1AP ID it shall store it for the duration of the UE-associated logical S1-connection for this UE. Once known to eNB this IE is included in all UE associated S1-AP signalling (UL as well as DL).]

SAE bearer: one or more Service Data Flows between a UE and EPC [*according to definition for EPS bearer 23.401*].

Note: The SAE bearer is either a default SAE bearer or a dedicated SAE bearer.

SAE bearer identity: the SAE bearer identity uniquely identifies an SAE bearer for one UE [*according to definition for EPS bearer identity in 23.401*].

Note: The SAE bearer identity remains unique for the UE even if the UE-associated logical S1-connection is released during periods of user inactivity.

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

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

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

3.2 Symbols

For the purposes of the present document, the following symbols apply:

<symbol> <Explanation>

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

<ACRONYM> <Explanation>

4 General

Editor's Note: Section captures procedure specification principles, forward/backward compatibility issue and specification notations.

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 section 10. For examples on how to use the *Criticality Diagnostics* IE, see Annex A.2.

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. SAE 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:

1. 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.
2. 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

Editor's Note: Description of S1AP functions.

S1AP protocol has the following functions:

- SAE Bearer management function: This overall functionality is responsible for setting up, modifying and releasing SAE bearers, which are triggered by the MME. The release of SAE bearers 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 SAE bearer(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 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
- NAS Signalling transport function between the UE and the MME is used:
 - to transfer NAS signalling related information and to establish the S1 UE context in the eNB.
 - to transfer NAS signalling related information when the S1 UE context in the eNB is already established.
- S1 UE context Release function: This functionality is responsible to manage the release of UE specific context in the eNB and the MME.
- 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.

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	
SAE Bearer Setup	SAE BEARER SETUP REQUEST	SAE BEARER SETUP RESPONSE	
SAE Bearer Modify	SAE BEARER MODIFY REQUEST	SAE BEARER MODIFY RESPONSE	
SAE Bearer Release	SAE BEARER RELEASE COMMAND	SAE BEARER RELEASE COMPLETE	
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 UPDATE CONFIGURATION ACKNOWLEDGE	ENB CONFIGURATION UPDATE FAILURE
MME Configuration Update	MME CONFIGURATION UPDATE	MME CONFIGURATION UPDATE ACKNOWLEDGE	MME CONFIGURATION UPDATE FAILURE

Table 2: Class 2 procedures

Elementary Procedure	Message
Handover Notification	HANDOVER NOTIFY
SAE Bearer Release Request	SAE BEARER RELEASE REQUEST
Paging	PAGING
Initial UE Message	INITIAL UE MESSAGE
Downlink NAS Transport	DOWNLINK NAS TRANSPORT
Uplink NAS Transport	UPLINK NAS TRANSPORT
NAS non delivery indication	NAS NON DELIVERY INDICATION
Error Indication	ERROR INDICATION
UE Context Release Request	UE CONTEXT RELEASE REQUEST
DownlinkS1 CDMA2000 Tunneling	DOWNLINK S1 CDMA2000 TUNNELING
Uplink S1 CDMA2000 Tunneling	UPLINK S1 CDMA2000 TUNNELING
UE Capability Info Indication	UE CAPABILITY INFO INDICATION
eNB Status Transfer	eNB STATUS TRANSFER
MME Status Transfer	MME STATUS TRANSFER
Deactivate Trace	DEACTIVATE TRACE
Trace Start	TRACE START
Trace Failure Indication	TRACE FAILURE INDICATION
Location Reporting Control	LOCATION REPORTING CONTROL
Location Reporting Failure Indication	LOCATION REPORTING FAILURE INDICATION
Location Report	LOCATION REPORT
Overload Start	OVERLOAD START
Overload Stop	OVERLOAD STOP

The following applies concerning interference between Elementary Procedures:

- The Reset procedure takes precedence over all other EPs.

8.2 SAE Bearer Management procedures

8.2.1 SAE Bearer Setup

8.2.1.1 General

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

8.2.1.2 Successful Operation

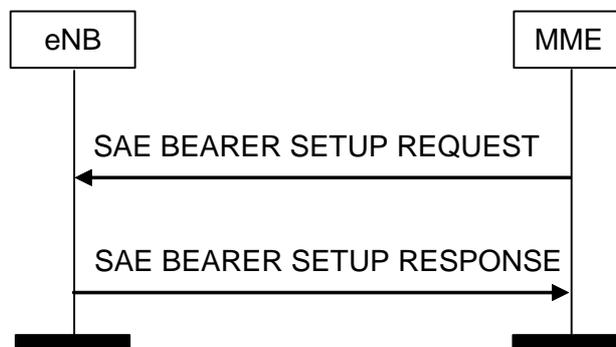


Figure 8.2.1.2-1: SAE Bearer Setup procedure. Successful operation.

The MME initiates the procedure by sending an SAE BEARER SETUP REQUEST message to the eNB. When sending the SAE BEARER SETUP REQUEST message the MME shall start the $T_{SAEBearerSetup}$ timer.

- The SAE BEARER SETUP REQUEST message shall contain the information required by the eNB to build the SAE bearer configuration consisting of at least one additional SAE bearer including for each SAE bearer to setup in the *SAE Bearer to be Setup List IE*.

Upon reception of the SAE BEARER SETUP REQUEST message, and if resources are available for the requested configuration, the eNB shall execute the requested SAE bearer configuration. For each SAE bearer and based on the *SAE Bearer level QoS parameters IE* the eNB shall establish an SAE Radio Bearer and allocate the required resources on Uu. The eNB shall pass the *NAS-PDU IE* and the value contained in the *SAE bearer identity IE* received for the SAE bearer for each established SAE Radio Bearer to the UE. The eNB shall allocate the required resources on S1 for the SAE bearers requested to be established.

The SAE BEARER SETUP REQUEST message may contain

- the *UE Aggregate Maximum Bit Rate IE*

If the *UE Aggregate Maximum Bit Rate IE* is included in the SAE BEARER 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; 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 SAE BEARER 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 report to the MME, in the SAE BEARER SETUP RESPONSE message, the result for all the requested SAE bearers.

A list of SAE bearers which are successfully established shall be included in the *SAE Bearer Setup List IE*.

A list of SAE bearers which failed to be established shall be included in the *SAE Bearer Failed to Setup List IE*. In case of the establishment of an SAE bearer the EPC must be prepared to receive user data before the SAE BEARER SETUP RESPONSE message has been received.

Upon reception of the SAE BEARER SETUP RESPONSE message the MME shall stop timer $T_{SAEBearerSetup}$.

Interactions with Handover Preparation procedure:

If a handover becomes necessary during SAE bearer setup, the eNB may interrupt the ongoing SAE bearer Setup procedure and initiate the Handover Preparation procedure as follows:

1. The eNB shall send the SAE BEARER SETUP RESPONSE message in which the eNB shall indicate, if necessary
 - all the SAE bearers fail with the cause "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 SAE BEARER SETUP REQUEST message containing a *SAE Bearer Level QoS Parameters IE* which contains a *QCI IE* indicating a GBR bearer (as defined in [13]), and which does not contain the *GBR QoS Information IE*, the eNB shall consider the establishment of the corresponding SAE bearer as failed.

If the eNB receives an SAE BEARER SETUP REQUEST message containing several *SAE Bearer ID IEs* (in the *SAE Bearer To Be Setup List IE*) set to the same value, the eNB shall consider the establishment of the corresponding SAE bearers as failed.

If the eNB receives an SAE BEARER SETUP REQUEST message containing a *SAE Bearer ID IE* (in the *SAE Bearer To Be Setup List IE*) set to the value that identifies an active SAE bearer (established before the SAE BEARER SETUP REQUEST message was received), the eNB shall consider the establishment of the new SAE bearer as failed.

Editor's Note: Further Assessment required.

8.2.2 SAE Bearer Modify

8.2.2.1 General

The purpose of the SAE Bearer Modify procedure is to enable modifications of already established SAE bearers for a given UE. The procedure uses UE-associated signalling.

8.2.2.2 Successful Operation

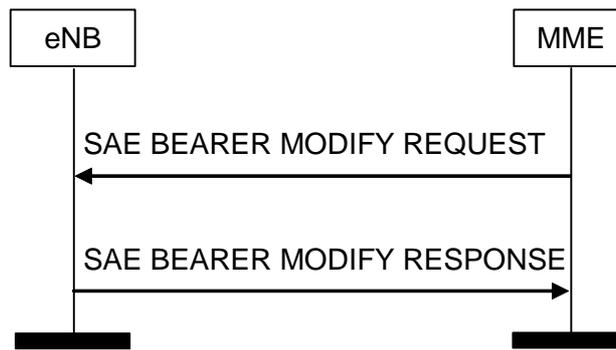


Figure 8.2.2.2-1: SAE Bearer Modify procedure. Successful operation.

The MME initiates the procedure by sending an SAE BEARER MODIFY REQUEST message to the eNB. When sending the SAE BEARER MODIFY REQUEST message the MME shall start the $T_{SAEBearerModify}$ timer.

The SAE BEARER MODIFY REQUEST message shall contain the information required by the eNB to modify one or several SAE bearers of the existing SAE Bearer configuration.

Information shall be present in the SAE BEARER MODIFY REQUEST message only when any previously set value for the SAE bearer configuration is requested to be modified.

Upon reception of the SAE BEARER MODIFY REQUEST message, and if resources are available for the requested target configuration, the eNB shall execute the modification of the requested SAE bearer configuration. For each SAE bearer that shall be modified and based on the new *SAE Bearer level QoS parameters* IE the eNB shall modify the SAE Radio Bearer configuration and change allocation of resources on Uu according to the new resource request. The eNB shall pass the *NAS-PDU* IE and the value contained in the *SAE bearer identity* IE received for the SAE bearer to the UE when modifying the SAE Radio Bearer configuration. eNB shall change allocation of resources on S1 according to the new resource request.

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

The SAE BEARER MODIFY REQUEST message may contain the

- the *UE Aggregate Maximum Bit Rate* IE.

If the *UE Aggregate Maximum Bit Rate* IE is included in the SAE BEARER 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; 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 SAE BEARER MODIFY REQUEST 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 SAE BEARER MODIFY RESPONSE message, the result for all the requested SAE bearers to be modified.

A list of SAE bearers which are successfully modified shall be included in the *SAE Bearer Modify List* IE.

A list of SAE Bearers which failed to be modified shall be included in the *SAE Bearer Failed to Modify List* IE.

In case of a modification of an SAE Bearer the EPC must be prepared to receive user data according to the modified SAE bearer profile prior to the SAE BEARER MODIFY RESPONSE message.

Upon reception of the SAE BEARER MODIFY RESPONSE the MME shall stop $T_{SAEBearerModify}$.

Interactions with Handover Preparation procedure:

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

1. The eNB shall send the SAE BEARER MODIFY RESPONSE message in which the eNB shall indicate, if necessary
 - all the SAE bearers fail with the cause "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 SAE BEARER MODIFY REQUEST message containing a *SAE Bearer Level QoS Parameters IE* which contains a *QCI IE* indicating a GBR bearer (as defined in [13]) for a SAE bearer previously configured as a non-GBR bearer (as defined in [13]), and which does not contain the *GBR QoS Information IE*, the eNB shall consider the modification of the corresponding SAE bearer as failed.

If the eNB receives an SAE BEARER MODIFY REQUEST message containing several *SAE Bearer ID IEs* (in the *SAE Bearer to be Modified List IE*) set to the same value, the eNB shall consider the modification of the corresponding SAE bearers as failed.

Editor's Note: Further Assessment required.

8.2.3 SAE Bearer Release

8.2.3.1 General

The purpose of the SAE Bearer Release procedure is to enable the release of already established SAE Bearers for a given UE. The procedure uses UE-associated signalling.

8.2.3.2 Successful Operation

8.2.3.2.1 SAE Bearer Release - MME initiated

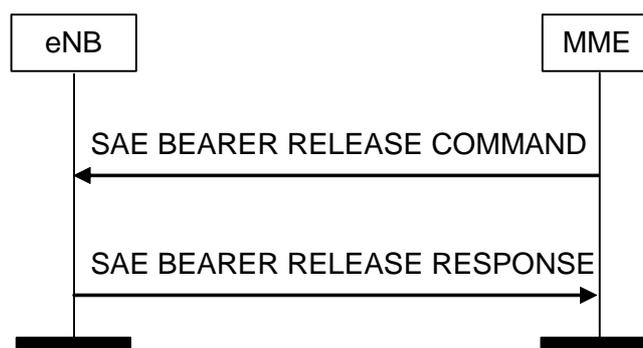


Figure 8.2.3.2.1-1: SAE Bearer Release procedure. Successful operation.

The MME initiates the procedure by sending an SAE BEARER RELEASE COMMAND message. When sending the SAE BEARER RELEASE COMMAND message, the MME shall start the $T_{SAEBEARERRELEASE}$ timer.

The SAE BEARER RELEASE COMMAND message shall contain the information required by the eNB to release at least one SAE bearer in the *SAE Bearer To Be Released List IE*.

Upon reception of the SAE BEARER RELEASE COMMAND message the eNB shall execute the release of the requested SAE Bearers. For each SAE bearer to be released the eNB shall release the corresponding SAE Radio Bearer and release the allocated resources on Uu. The eNB shall pass the value contained in the *SAE bearer identity IE* received for the SAE bearer to the radio interface protocol for each SAE Radio Bearer to be released. eNB shall release allocate resources on S1 for the SAE bearers requested to be released.

The SAE BEARER RELEASE COMMAND message may contain the

- the *UE Aggregate Maximum Bit Rate IE*

If the *UE Aggregate Maximum Bit Rate IE* is included in the SAE BEARER 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 SAE BEARER 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 SAE BEARER RELEASE RESPONSE message, the result for all the SAE bearers to be released.

A list of SAE bearers which are released successfully shall be included in the *SAE Bearer Release List IE*.

A list of SAE bearers which failed to be released shall be included in the *SAE Bearer Failed to Release List IE*.,

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

After sending an SAE BEARER RELEASE RESPONSE message containing an SAE Bearer identity within the *SAE Bearer Release List IE* , the eNB shall be prepared to receive an SAE BEARER SETUP REQUEST message requesting establishment of an SAE bearer with this SAE bearer identity.

8.2.3.2.2 SAE Bearer Release Request - eNB initiated



Figure 8.2.3.2.2-1: SAE Bearer Release Request procedure. Successful operation.

The eNB initiates the procedure by sending an SAE BEARER RELEASE REQUEST message towards the MME.

The SAE BEARER RELEASE REQUEST message shall contain at least one SAE bearers requested to be released, in the *SAE Bearer To Be Released List IE*.

Upon reception of the SAE BEARER RELEASE REQUEST message the MME should normally initiate the appropriate release procedure for the SAE bearers identified in the SAE BEARER RELEASE REQUEST message as defined in the **Interaction with SAE Bearer Release** paragraph below. It is up to the MME to decide how to react to the request.

Interaction with UE Context Release procedure:

If no SAE bearers will remain according to the SAE bearer RELEASE REQUEST message, the MME may initiate the UE Context Release Command procedure if it does not want to keep the UE-associated logical S1-connection.

Editor's Note: whether this is allowed at all (default bearer handling) needs to be checked, see open issue list.

Interaction with SAE bearer Release procedure (MME initiated):

If the EPC decides to release some or all indicated SAE bearers, the MME shall invoke the SAE BEARER RELEASE COMMAND procedure (release SAE bearer) to this effect.

8.2.3.3 Abnormal Conditions

If the eNB receives an SAE BEARER RELEASE COMMAND message containing several *SAE Bearer ID* IEs (in the *SAE Bearer To Be Released List IE*) set to the same value, the eNB shall consider the release of the corresponding SAE bearers as failed.

If the MME receives an SAE BEARER RELEASE REQUEST message containing several *SAE Bearer ID* IEs (in the *SAE Bearer To Be Released List IE*) set to the same value, the MME shall initiate the release of the corresponding SAE bearer.

Editor's Note: Further Assessment required.

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 SAE Bearer context, Security context, Handover Restriction List, UE capability information, NAS-PDU etc. The procedure uses UE-associated signalling.

8.3.1.2 Successful Operation

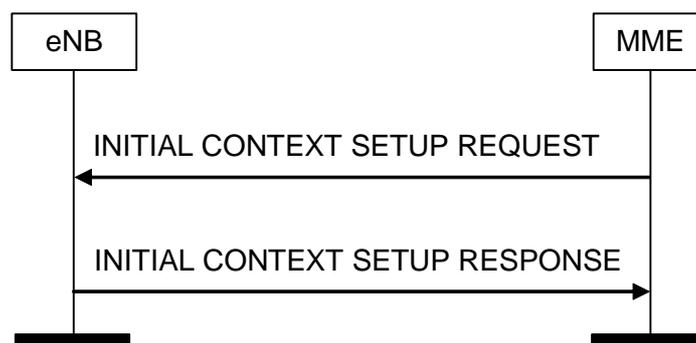


Figure 8.3.1.2-1: Initial Context Setup procedure. Successful operation.

In case of the establishment of an SAE Bearer the MME must be prepared to receive user data before the INITIAL CONTEXT SETUP RESPONSE message has been received.

When sending the INITIAL CONTEXT SETUP REQUEST message, the MME shall start the $T_{\text{InitialContextSetup}}$ timer.

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

The *SAE Bearer to be Setup List IE* may contain:

- the SAE Bearer level QoS parameters IE

The INITIAL CONTEXT SETUP REQUEST message may contain

- the *Handover Restriction List IE*, which may contain roaming, area or access restrictions
- the *NAS-PDU IE* (FFS)
- Security (FFS)
- the *UE Radio Capability IE*.

- the *Subscriber Profile ID for RAT/Frequency priority IE*

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

Upon receipt of the INITIAL CONTEXT SETUP REQUEST the eNB shall

- attempt to execute the requested SAE Bearer configuration.
- pass the value contained in the *SAE Bearer ID IE* to the radio interface protocol for each SAE Bearer requested to be established.
- not interpret or modify the information contained in the *NAS-PDU IE*. The content of the NAS-PDU is outside the scope of this specification.
- store the Handover restriction List in the UE context.
- store the received UE Radio Capabilities in the UE context.
- store the received Subscriber Profile ID for RAT/Frequency priority in the UE context and use it as defined in [14].

The eNB should use the information in *Handover Restriction List IE* to determine a target cell for handover. If the *Handover Restriction List IE* is not contained in the INITIAL CONTEXT SETUP REQUEST message, the target eNB shall consider that no access restriction applies to the UE.

If the *Trace activation IE* is included in the INITIAL CONTEXT SETUP REQUEST message then eNB should initiate the requested trace function as described in [10].

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

A list of SAE Bearers which are successfully established shall be included in the *SAE Bearer Setup List IE*

A list of SAE Bearers which failed to be established shall be included in the *SAE Bearer Failed to Setup List IE*.

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

Upon reception of the INITIAL CONTEXT SETUP RESPONSE message the MME shall stop timer $T_{InitialContextSetup}$.

8.3.1.3 Unsuccessful Operation

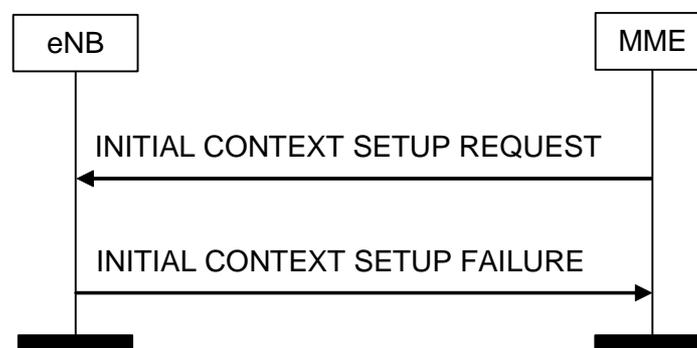


Figure 8.3.1.3-1: Initial Context Setup procedure. Unsuccessful operation.

If the eNB is not able to establish a UE context, 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 *SAE Bearer Level QoS Parameters* IE which contains a *QCI* IE indicating a GBR bearer (as defined in [13]), and which does not contain the *GBR QoS Information* IE, the eNB shall consider the establishment of the corresponding SAE bearer as failed.

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

Editor's Note: Further Assessment required.

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 EUTRAN generated reason (e.g. 'TX2_{RELOCOverall} Expiry'). The procedure uses UE-associated signalling.

8.3.2.2 Successful Operation



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

The eNB controlling a UE-associated logical S1-connection initiates the procedure by generating an 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" for the requested UE-associated logical S1-connection release.

8.3.3 UE Context Release (MME initiated)

8.3.3.1 General

The purpose of the UE Context Release procedure is to enable to MME to order the release of the UE-associated logical connection due to various reasons, for example completion of a transaction between the UE and the EPC or completion of successful handover or completion of handover cancellation. The MME initiated UE Context Release procedure may be initiated in response to the eNB initiated UE Context Release Request procedure. The procedure uses UE-associated signalling.

Editor's Note: The usage of this procedure to handle detection of two UE-associated logical connections towards one UE is FFS.

8.3.3.2 Successful Operation

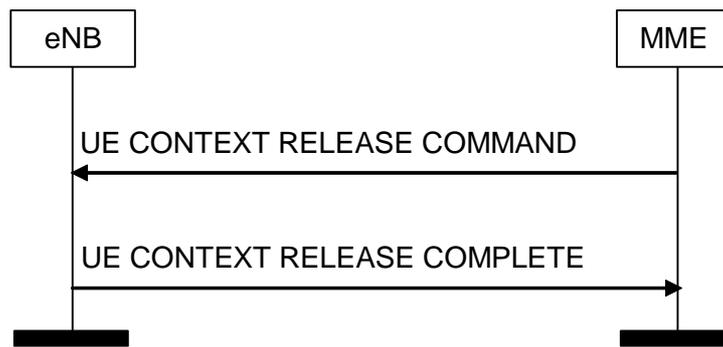


Figure 8.3.3.2-1: UE Context Release procedure. Successful operation.

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 SI AP ID pair* if available, otherwise the message shall contain MME UE SI AP ID.

The MME provides the *cause IE* set to "Load Balancing TAU Required" in the UE CONTEXT RELEASE COMMAND 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.

8.3.4 UE Context Modification

8.3.4.1 General

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

8.3.4.2 Successful Operation

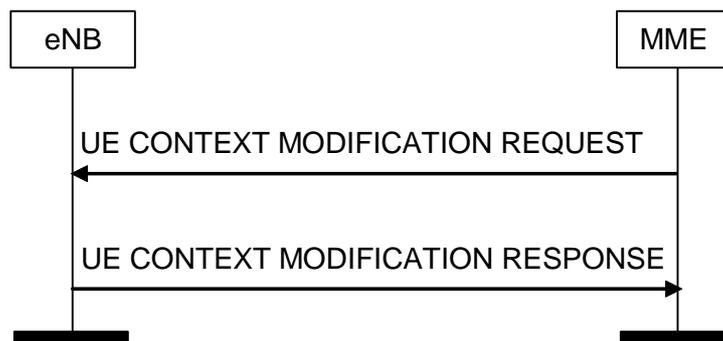


Figure 8.3.4.2-1: UE Context Modification procedure. Successful operation.

The UE CONTEXT MODIFICATION REQUEST message may contain

- the *security information IE* (includes the AS security key)
- the *Subscriber Profile ID for RAT/Frequency priority IE*

Upon receipt of the UE CONTEXT MODIFICATION REQUEST the eNB shall

- store the received *security information IE* and take it into use.
- store the *Subscriber Profile ID for RAT/Frequency priority IE* and use it as defined in [14].

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

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

8.3.4.3 Unsuccessful Operation

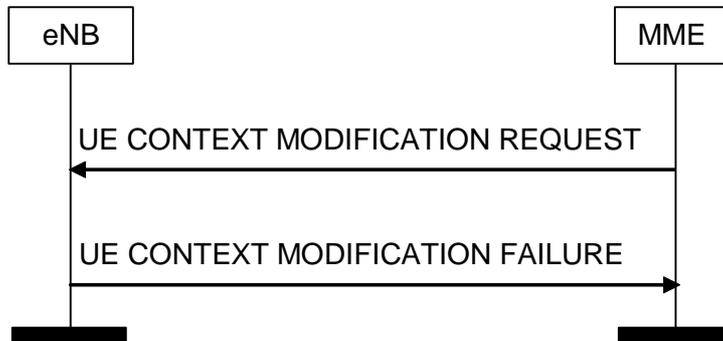


Figure 8.3.4.3-1: UE Context Modification procedure. Unsuccessful operation.

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

8.4 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.

Editor's Note: It is FFS whether the eNodeB is allowed to initiate this procedure in case there is an already prepared handover for this particular UE either on S1 or on any of its X2 interfaces.

8.4.1.2 Successful Operation

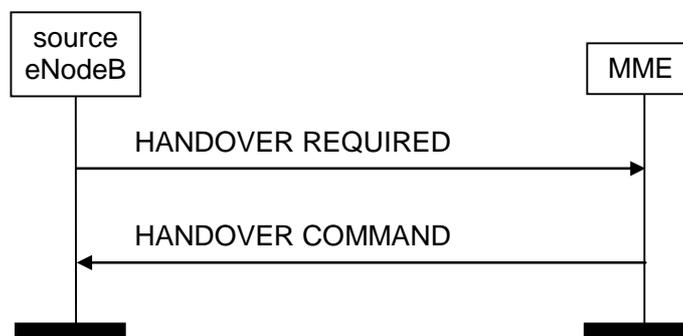


Figure 8.4.1.2-1: Handover preparation: successful operation

The source eNodeB initiates the handover preparation by sending the HANDOVER REQUIRED message to the serving MME.

Editor's note: How to handle and control data forwarding is FFS.

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 eNodeB.

If the *Target eNodeB to Source eNodeB Transparent Container IE* or the *Target RNC To Source RNC Transparent Container IE* or the *Target BSS to Source BSS 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.

If there are any SAE bearers that could not be admitted in the target, they shall be indicated in the *SAE Bearers to Release List IE*.

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

The source eNodeB may include the *Direct Forwarding Path Availability IE* in the HANOVER REQUIRED message if a direct data path is available.

If the HANOVER REQUIRED message does not contain the *Direct Forwarding Path Availability IE* then indirect forwarding may be applied, if available.

Interactions with SAE Bearer Management procedures:

If, after a HANOVER REQUIRED message is sent and before the Handover Preparation procedure is terminated, the source eNB receives a MME initiated SAE Bearer Management procedure on the same UE associated signaling connection, the source eNB shall either:

1. cancel the Handover Preparation procedure by executing the Handover Cancel procedure with an appropriate cause value 'Interaction with other procedure'. After successful completion of the Handover Cancel procedure, the source eNB shall continue the MME initiated SAE Bearer Management procedure

or

2. terminate the MME initiated SAE Bearer Management procedure by sending the appropriate response message with the cause value 'Handover Triggered' to the MME and then the source eNB shall continue with the handover procedure.

8.4.1.3 Unsuccessful Operation

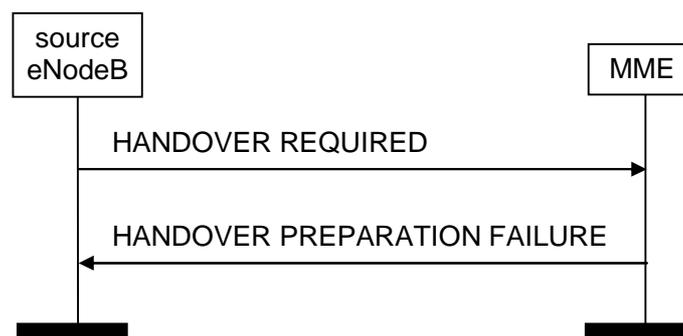


Figure 8.4.1.3-1: Handover preparation: unsuccessful operation

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

8.4.1.4 Abnormal Conditions

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 eNodeB for the handover of a UE.

8.4.2.2 Successful Operation

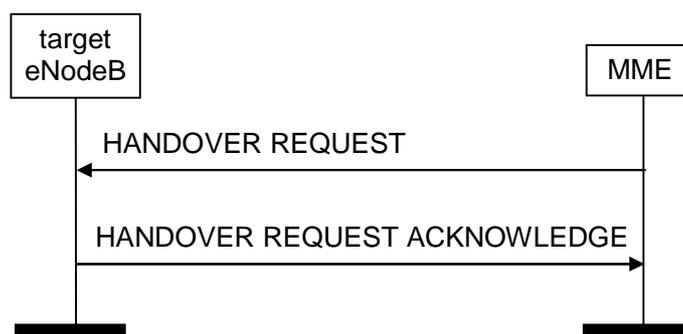


Figure 8.4.2.2-1: Handover resource allocation: successful operation

The MME initiates the procedure by sending the HANOVER REQUEST message to the target eNodeB. The HANOVER REQUEST message may contain the *Handover Restriction List* IE, which may contain roaming area or access restrictions.

If the *Handover Restriction List* IE is contained in the HANOVER REQUEST message, the target eNB shall store this information in the UE context.

The eNB should use the information in *Handover Restriction List* IE to determine a target cell for handover. If the *Handover Restriction List* IE is not contained in the HANOVER REQUEST message, the target eNB shall consider that no access restriction applies to the UE.

If the *Trace activation* IE is included in the HANOVER REQUEST message, the target eNB shall initiate the requested trace function as described in [10].

After all necessary resources for the admitted SAE Bearers have been allocated the target eNodeB generates the HANOVER REQUEST ACKNOWLEDGE message. The target eNodeB shall include in the *SAE Bearers Admitted List* IE the SAE Bearers for which resources have been prepared at the target cell. The SAE bearers that have not been admitted in the target cell shall be included in the *SAE Bearers Failed to Setup List* IE.

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 Tunnel endpoint* IE within the *SAE Bearers Admitted List IEs* IE of the HANOVER REQUEST ACKNOWLEDGE message indicating that it accepts the proposed forwarding of downlink data for this 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.

8.4.2.3 Unsuccessful Operation

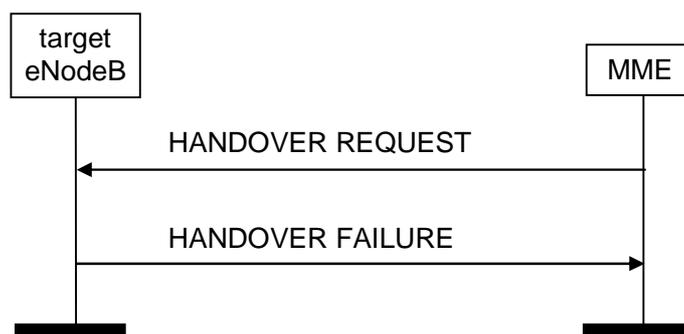


Figure 8.4.2.3-1: Handover resource allocation: unsuccessful operation

If the target eNodeB is not able to admit any of the SAE Bearers or a failure occurs during the Handover Preparation, it shall send the HANOVER REQUEST FAILURE message to the MME with an appropriate cause value.

8.4.2.4 Abnormal Conditions

If the eNB receives a HANOVER REQUEST message containing a *SAE Bearer Level QoS Parameters* IE which contains a *QCI* IE indicating a GBR bearer (as defined in [13]), and which does not contain the *GBR QoS Information* IE, the eNB shall not admit the corresponding SAE bearer.

If the eNB receives a HANOVER REQUEST message containing several *SAE Bearer ID* IEs (in the *SAE Bearers To Be Setup List* IE) set to the same value, the eNB shall not admit the corresponding SAE bearers.

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 eNodeB 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.

8.4.3.3 Abnormal Conditions

8.4.4 Path Switch Request

8.4.4.1 General

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

8.4.4.2 Successful Operation



Figure 8.4.4.2-1: Path switch request: successful operation

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

If the *SAE Bearer To Be Switched in Downlink List* IE in the PATH SWITCH REQUEST message does not include all SAE bearers previously included in the Ue Context, the MME shall consider the non included SAE bearers as implicitly released by the eNB.

After all necessary updates including the UP path switch have been successfully completed in the EPC for at least one of the SAE Bearers included in the PATH SWITCH REQUEST *SAE Bearer To Be Switched in Downlink List* IE, the MME shall send the PATH SWITCH REQUEST ACKNOWLEDGE message to the eNodeB and the procedure ends.

In case the EPC failed to perform the UP path switch for at least one, but not all, of the SAE bearers included in the PATH SWITCH REQUEST *SAE Bearer To Be Switched in Downlink List* IE, the MME shall include the SAE Bearers it failed to perform UP path switch in the PATH SWITCH REQUEST ACKNOWLEDGE *SAE Bearer Failed To Switch in Downlink List* IE.

The PATH SWITCH REQUEST ACKNOWLEDGE message may contain

- the *UE Aggregate Maximum Bit Rate* IE

If the *UE Aggregate Maximum Bit Rate* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE 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 *SAE Bearer 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 SAE bearer for which it wants to change the uplink tunnel termination point.

When the eNodeB receives the PATH SWITCH REQUEST ACKNOWLEDGE message and if this message includes the *SAE Bearer To Be Switched in Uplink List* IE, the eNodeB shall start delivering the uplink packets of the concerned SAE bearers to the new uplink tunnel endpoints as indicated in the message.

8.4.4.3 Unsuccessful Operation

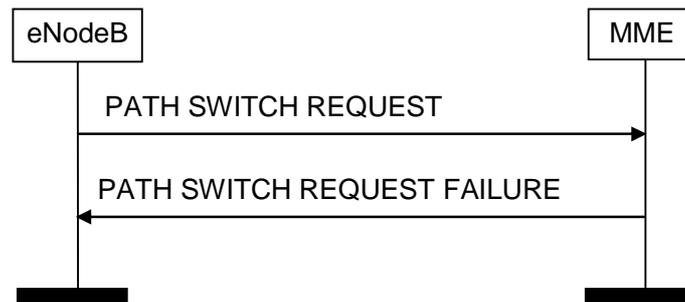


Figure 8.4.4.3-1: Path switch request: unsuccessful operation

If the EPC fails to switch the downlink GTP tunnel endpoint towards a new GTP tunnel endpoint for all SAE Bearer included in the *SAE Bearer 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 eNodeB with an appropriate cause value.

8.4.4.4 Abnormal Conditions

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

8.4.5 Handover Cancellation

8.4.5.1 General

The purpose of the Handover Cancel procedure is to enable a source eNB to cancel an ongoing handover. The Handover Cancel procedure may not be initiated by the source eNB during the Handover Preparation procedure after

- the source eNB has initiated the execution of the handover via the Uu interface

except if

- the UE has returned to the source eNB by transmitting an RRC message which indicates that the UE considers the source eNB as its serving eNB

The procedure uses UE-associated logical S1-connection.

8.4.5.2 Successful Operation

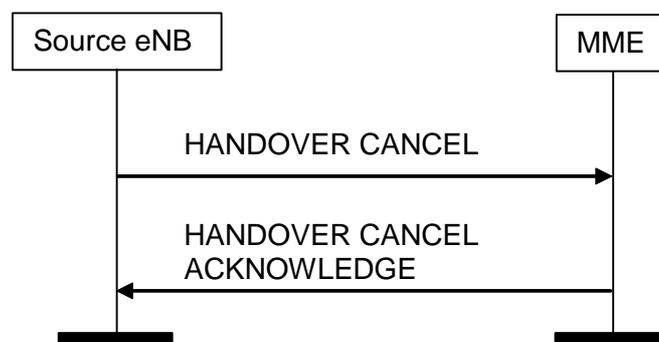


Figure 8.4.5.2-1: Handover Cancel procedure. Successful operation.

Editor's Note: Whether a HANDOVER CANCEL ACKNOWLEDGE message is needed is FFS.

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 by 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

Not applicable.

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 receiver status and the downlink PDCP-SN transmitter status from the source to the target eNodeB via the MME during an intra LTE S1 handover for each respective SAE bearer for which PDCP SN status preservation applies.

8.4.6.2 Successful Operation



Figure 8.4.6.2-1: eNB Status Transfer procedure

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

At that point of time, the source eNodeB either:

- discard the uplink packets received out of sequence for a bearer and include the bearer in the *SAE Bearers Subject to Status Transfer List IE* to indicate that PDCP SN status preservation applies for the bearer,
- send the uplink packets received out of sequence to the EPC for each bearer for which the PDCP SN status preservation doesn't apply.

8.4.6.3 Unsuccessful Operation

Not applicable.

8.4.6.4 Abnormal Conditions

Editor's Note: Further Assessment required.

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 receiver status and the downlink PDCP-SN transmitter status from the source to the target eNodeB via the MME during an S1 handover for each respective SAE bearer for which PDCP SN status preservation applies.

8.4.7.2 Successful Operation



Figure 8.4.7.2-1: MME Status Transfer procedure

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

For each bearer within the *SAE Bearers 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 STATUS TRANSFER message, the target eNodeB shall use it and not deliver any uplink packet which has a PDCP SN lower than the value contained in the *PDCP SN* IE of this IE.

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

8.4.7.3 Unsuccessful Operation

Not applicable.

8.4.7.4 Abnormal Conditions

If the target eNodeB receives this message for a UE for which no prepared handover exists at the target eNodeB, the target eNodeB 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

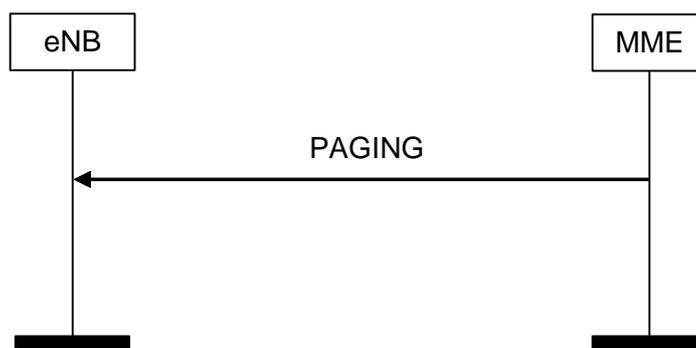


Figure 8.5.2-1: Paging procedure

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 *Paging Cause 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 for calculating the paging occasions for the UE.

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

8.5.3 Unsuccessful Operation

Not applicable.

8.5.4 Abnormal Conditions

Not applicable.

8.6 NAS transport

8.6.1 General

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

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

8.6.2 Successful Operations

8.6.2.1 Initial UE Message



Figure 8.6.2.1-1: Initial UE Message procedure

When the eNB has received from the radio interface a NAS message to be forwarded to an MME to which no UE-associated logical S1-connection for the UE exists, the eNB shall invoke the NAS Transport procedure and send the INITIAL UE MESSAGE to the MME including the NAS message as a *NAS-PDU* IE. The eNB shall allocate a unique eNB S1-AP UE Identity 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 ID part of 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.

8.6.2.2 DOWNLINK NAS TRANSPORT



Figure 8.6.2.2-1: DOWNLINK NAS Transport Procedure

If a NAS message shall be sent from the MME to the UE and a UE-associated logical S1-connection exists for the UE or if the MME have received the *eNB S1-AP UE Identity* 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 S1-AP UE Identity to be used for the UE and include that in the DOWNLINK NAS TRANSPORT message. By the reception of *MME S1-AP UE Identity* IE in eNB the UE-associated logical S1-connection is established.

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

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

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

The eNB should use the information in *Handover Restriction List* IE to determine a target cell for handover. 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 target eNB shall consider that no access restriction applies to 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 an 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 *NAS-PDU* IE contains an UE - MME message that is transferred without interpretation in the eNB.

8.6.2.4 NAS NON DELIVERY INDICATION



Figure 8.6.2.4-1: NAS NON DELIVERY INDICATION Procedure

When the eNB decides to not start the delivery of a NAS message that has been received over an 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 the *Cause* IE e.g. handover triggered'.

8.6.3 Unsuccessful Operation

Not applicable

8.6.4 Abnormal Conditions

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

8.7 Management procedures

Editor's Note: Placeholder for a procedure description of common procedures as defined in TS 36.300

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 doesn't affect the application level configuration data exchanged during 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

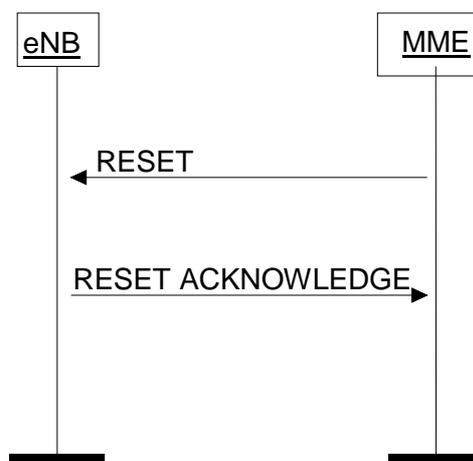


Figure 8.7.1.2.1-1: Reset procedure initiated from the MME. Successful operation.

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 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 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 in the RESET ACKNOWLEDGE message include, for each UE association to reset, the *UE-associated logical S1-connection Item* IE in the *UE-associated logical S1-connection list* IE. The *UE-associated logical S1-connection Item* IEs shall be in the same order as received in the RESET message and shall include also unknown UE-associated logical S1-connections. Empty *UE-associated logical S1-connection Item* IEs, received in the RESET message, may be omitted in the RESET ACKNOWLEDGE message.
- If the *MME UE S1AP ID* IE is included in the *UE-associated logical S1-connection Item* IE for a UE association, the eNB shall include the *MME UE S1AP ID* IE in the corresponding *UE-associated logical S1-connection Item* IE in the RESET ACKNOWLEDGE message.

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

Interactions with other procedures:

If the RESET message is received, any other ongoing procedure (except 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

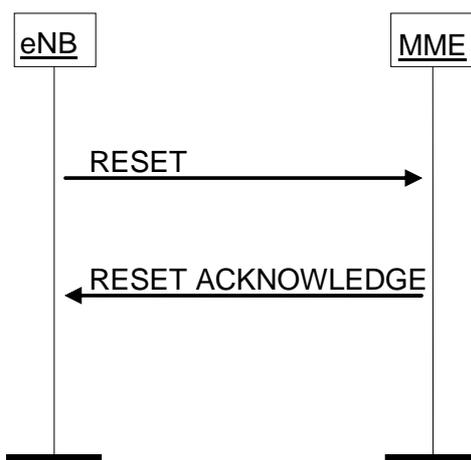


Figure 8.7.1.2.2-1: Reset procedure initiated from the E-UTRAN. Successful operation.

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 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 can be used for new UE-associated logical S1-connections over the S1 interface, the MME shall respond with the RESET ACKNOWLEDGE message.

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

- The MME shall use the *MME UE S1AP ID IE* and/or the *eNB UE S1AP ID IE* to explicitly identify the UE association(s) to be reset.
- The MME shall in the RESET ACKNOWLEDGE message include, for each UE association to 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 S1AP ID IE* is included in the *UE-associated logical S1-connection Item IE* for a UE association, the MME shall include the *MME UE S1AP ID IE* in the corresponding *UE-associated logical S1-connection Item IE* in the RESET ACKNOWLEDGE message.
- If the *eNB UE S1AP ID IE* is included in a *UE-associated logical S1-connection Item IE* for a UE association, the MME shall include the *eNB UE S1AP ID IE* in the corresponding *UE-associated logical S1-connection Item IE* in the RESET ACKNOWLEDGE message.

Interactions with other procedures:

If the RESET message is received, any other ongoing procedure (except 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 Reset procedure is ongoing in 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 RESET ACKNOWLEDGE message as described in 8.7.1.2.1.

If Reset procedure is ongoing in 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 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 to report detected errors in one incoming message, provided they cannot be reported by an appropriate failure message.

If the error situation arises due to reception of a message utilising UE associated signalling, then the Error Indication procedure uses UE associated signalling. Otherwise the procedure uses non-UE associated signalling.

8.7.2.2 Successful Operation



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



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

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

The ERROR INDICATION message shall contain at least either the *Cause* IE or the *Criticality Diagnostics* IE.

In case the Error Indication procedure is triggered by utilising UE associated signalling the *MME UE S1AP ID* IE and the *eNB UE S1AP* IE shall be included in the ERROR INDICATION message. If one or both of *MME UE S1AP ID* IE and the *eNB UE S1AP* IE are not correct, the cause shall be set to appropriate value e.g. "Unknown MME UE S1AP ID", "Unknown eNB UE S1AP" or "Unknown 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 eNodeB and MME to interoperate correctly on the S1 interface. This procedure shall be the first S1AP procedure triggered after the TNL association has become operational. This procedure erases any existing application level configuration data in the two nodes and replaces it by the one received. This procedure also re-initialises the E-UTRAN S1AP UE-related contexts (if any) and erases all related signalling connections in the two nodes like a Reset procedure would do.

8.7.3.2 Successful Operation

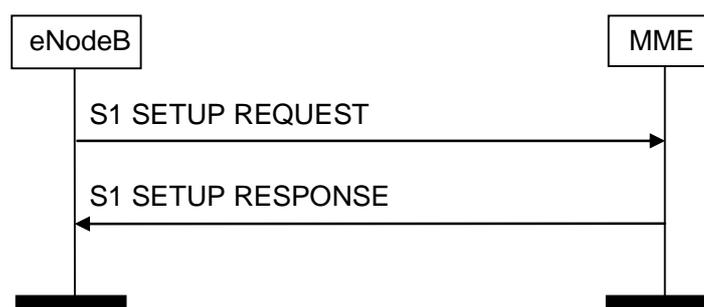


Figure 8.7.3.2-1: S1 Setup procedure: Successful Operation.

The eNodeB initiates the procedure by sending a S1 SETUP REQUEST message including the appropriate data to the MME. The MME responds with S1 SETUP RESPONSE 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 S1 interface is operational and other S1 messages can be exchanged.

8.7.3.3 Unsuccessful Operation

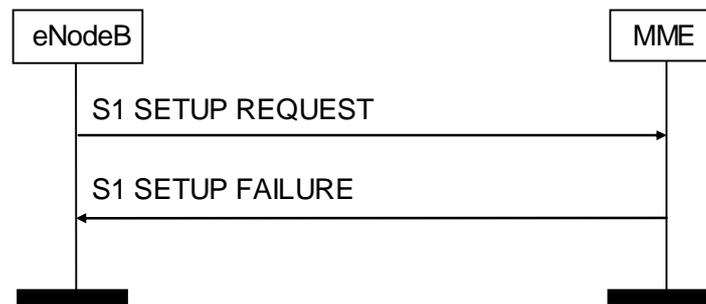


Figure 8.7.3.3-1: S1 Setup procedure: Unsuccessful Operation.

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

If the S1 SETUP FAILURE messages include the *Time To Wait* IE the eNodeB 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 the MME is not able to identify at least one of the PLMN provided by the eNB, then the MME shall reject the eNB S1 Setup Request procedure with the appropriate cause value e.g "Unknown PLMN".

8.7.4 eNB Configuration Update

8.7.4.1 General

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

8.7.4.2 Successful Operation

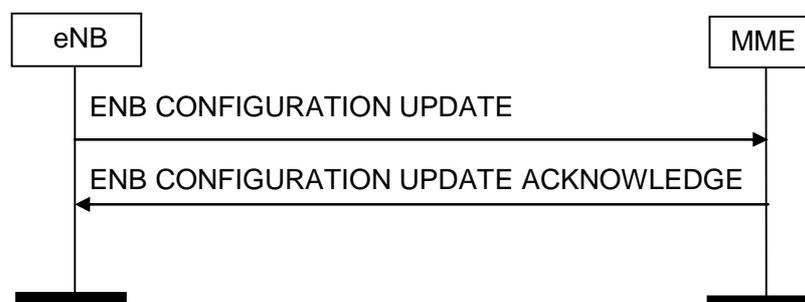


Figure 8.7.4.2-1: NB Configuration Update procedure: Successful Operation.

The eNB initiates the procedure by sending an ENB CONFIGURATION UPDATE message including the appropriate updated configuration data to the MME. The MME responds with ENB CONFIGURATION UPDATE ACKNOWLEDGE 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 are not to be updated shall be included in the *Supported TAs* IE. The MME shall overwrite the whole list of the TAs.

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

8.7.4.3 Unsuccessful Operation

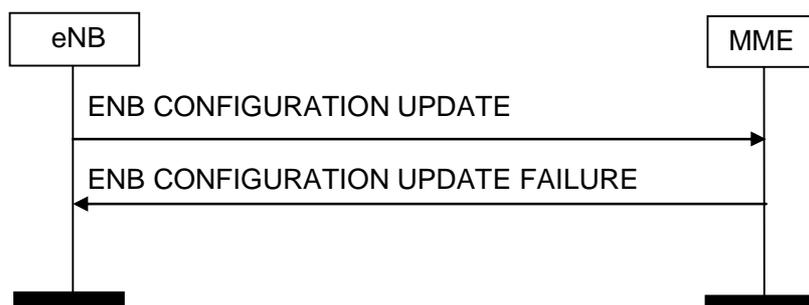


Figure 8.7.4.3-1: NB Configuration Update procedure: Unsuccessful Operation.

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

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

8.7.4.4 Abnormal Conditions

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 doesn't affect existing UE-related contexts, if any.

8.7.5.2 Successful Operation

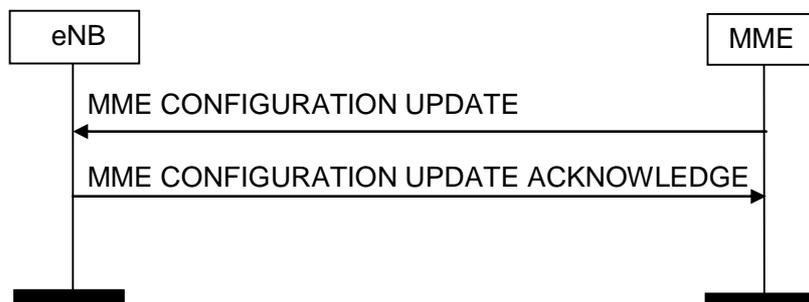


Figure 8.7.5.2-1: MME Configuration Update procedure: Successful Operation.

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 MME CONFIGURATION UPDATE ACKNOWLEDGE 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/are not changed and shall continue to operate the S1 with the existing related configuration data.

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

8.7.5.3 Unsuccessful Operation

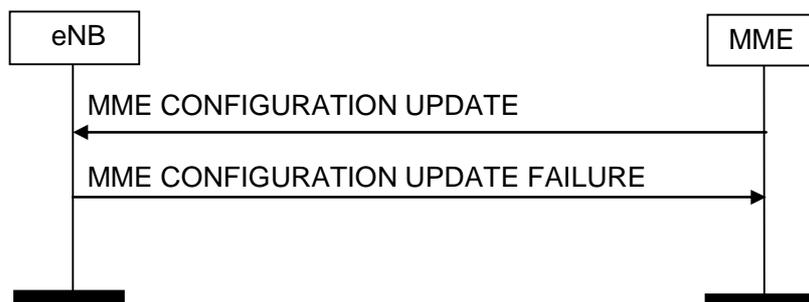


Figure 8.7.5.3-1: MME Configuration Update: Unsuccessful Operation.

If the eNB can not 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

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 START message is set to

- "reject all RRC connection requests for non-emergency mobile originated data transfer ", or
- "reject all new RRC connection requests for signalling ",or
- "only permit RRC connection establishments for emergency sessions".

the eNB shall reject/permit the indicated signalling traffic.

8.7.6.3 Unsuccessful Operation

Not applicable.

8.7.7 Overload Stop

8.7.7.1 General

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

The procedure uses non-UE associated signalling.

8.7.7.2 Successful Operation



Figure 8.7.7.2.-1: Overload Stop procedure

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

8.7.7.3 Unsuccessful Operation

Not applicable.

8.8 S1 CDMA2000 Tunneling Procedures

8.8.1 General

The purpose of S1 CDMA2000 Tunneling procedures is to carry CDMA2000 signalling between UE and CDMA2000 RAT over the S1 Interface. This includes signalling for pre-registration of UE with CDMA2000 HRPD network, signalling for handover preparation for handover from E-UTRAN to CDMA2000 HRPD/1xRTT. 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 eNodeB and MME in the tunneling procedure. These procedures use an established UE-associated logical S1-connection.

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

8.8.2 Successful Operations

8.8.2.1 Downlink S1 CDMA2000 Tunneling

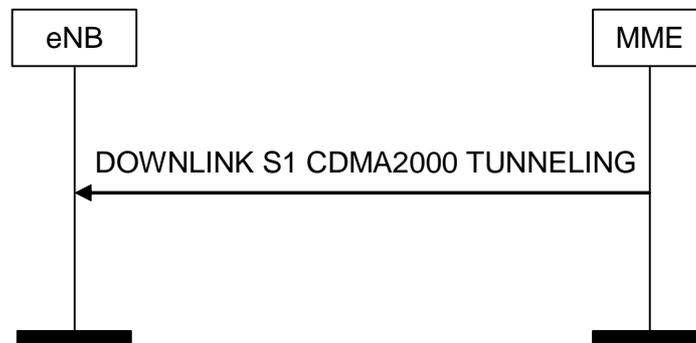


Figure 8.8.2.1-1: Downlink S1 CDMA2000 Tunneling Procedure

If a CDMA2000 message shall be sent from the MME to the UE and a UE-associated logical S1-connection exists for the UE the MME should send a DOWNLINK S1 CDMA2000 TUNNELING message to the eNB including the CDMA2000 message in the *CDMA2000-PDU* IE. The eNB forwards the received *CDMA2000-PDU* IE and *CDMA2000 RAT Type* IE to the UE.

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

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

Editor's Note: The DL data forwarding behaviour of the eNB for handover to CDMA2000 HRPD/1xRTT should be aligned to the DL data forwarding behaviour of eNB for 3GPP inter-RAT handover.

8.8.2.2 Uplink S1 CDMA2000 Tunneling

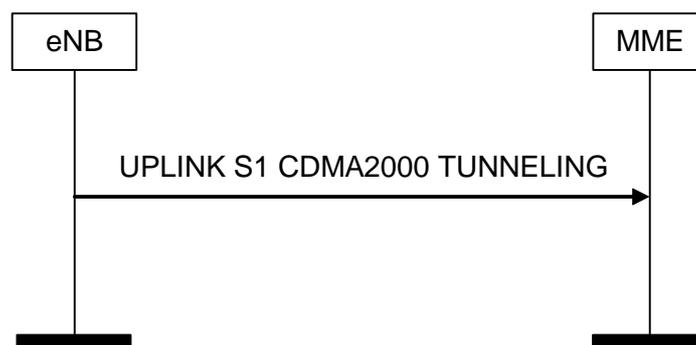


Figure 8.8.2.2-1: Uplink S1 CDMA2000 Tunneling Procedure

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

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

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

Interactions with SAE Bearer Management procedures:

If, after an UPLINK S1 CDMA2000 TUNNELING message with *CDMA2000 HO Required Indication* IE set to 'true' is sent but before the DOWNLINK S1 CDMA2000 TUNNELING message with *CDMA2000 HO Status* IE is received, the source eNB receives a MME initiated SAE Bearer Management procedure on the same UE associated signaling connection, the source eNB shall terminate the MME initiated SAE Bearer Management procedure by sending the appropriate response message with the cause value 'Handover Triggered' to the MME.

8.8.3 Unsuccessful Operation

Not applicable

8.8.4 Abnormal Conditions

Editor's Note: Further Assessment required.

8.9 UE Capability Info Indication

8.9.1 General

The purpose of the UE Capability Info Indication procedure is used to enable the eNB to provide this information and relevant updates of this information within the eNB that took place without MME notice within the E-UTRAN to the MME.

8.9.2 Successful Operation

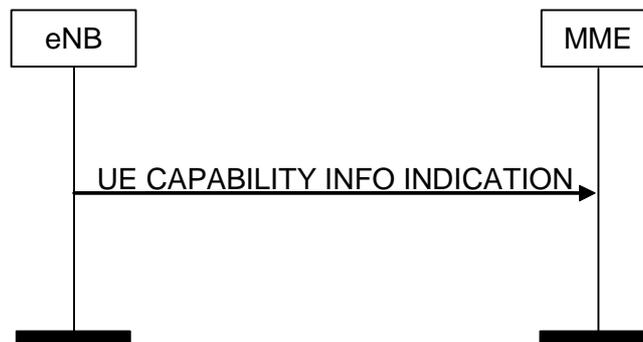


Figure 8.9.2-1: UE Capability Info Indication procedure. Successful operation.

The eNB controlling a UE-associated logical S1-connection initiates the procedure by generating an UE CAPABILITY INFO INDICATION message towards the affected MME node including UE capability information. The UE capability information provided to the MME should overwrite respective UE capability related information stored in the MME.

8.10 Trace Procedures

8.10.1 Trace Start

8.10.1.1 General

The Trace Start procedure is initiated by a MME in order to start a trace recording for a UE in LTE_ACTIVE. The procedure uses UE-associated signalling.

8.10.1.2 Successful Operation



Figure 8.10.1.2-1: Trace Start procedure.

On receipt of a TRACE START message the eNB shall initiate the requested trace function as described in [10].

8.10.2 Trace Failure Indication

8.10.2.1 General

The Trace Start Failure Indication procedure is initiated by an eNB in order to inform the MME that a Trace Start procedure or a Deactivate Trace procedure has failed. The procedure uses UE-associated signalling.

8.10.2.2 Successful Operation



Figure 8.10.2.2-1: Trace Failure Indication procedure.

Upon reception of the TRACE FAILRE INDICATION message the MME shall based on the failure reason indicated by the *Cause* IE take appropriate action.

8.10.3 Deactivate Trace

8.10.3.1 General

The purpose of the Deactivate Trace procedure is to inform 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.

The eNB shall stop the trace session for the indicated trace reference in the *Trace Reference IE*.

8.11 Location Reporting Procedures

8.11.1 Location Reporting Control

8.11.1.1 General

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

8.11.1.2 Successful Operation



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

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

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

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

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

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

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. 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 FAILRE INDICATION message the MME shall based on the failure reason indicated by the *Cause* IE take appropriate action.

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.

8.11.3.3 Abnormal Conditions

Not applicable.

9 Elements for S1AP Communication

9.1 Message Functional Definition and Content

Editor's Note: Description of functional definition and content.

Editor's note: Tabular format tables content (e.g. semantic description, criticality assignment, etc.) will be updated in forthcoming meetings.

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 SAE Bearer Management Messages

9.1.3.1 SAE BEARER SETUP REQUEST

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

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
SAE Bearer to be Setup List	M				YES	reject
>SAE Bearer To Be Setup Item IEs		1 to <maxnoof SAEbearers>			EACH	reject
>> SAE Bearer ID	M		9.2.1.2		-	
>> SAE Bearer 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	note: EPC TEID, UDP port	-	
NAS-PDU	M		9.2.3.5		YES	ignore

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE bearer allowed towards one UE, the maximum value is 256.

9.1.3.2 SAE BEARER SETUP RESPONSE

This message is sent by the eNB and is used to report the outcome of the request from the SAE BEARER 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	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
SAE Bearer Setup List	O				YES	ignore
>SAE Bearer Setup Item IEs		1 to <maxnoof SAEbearers>			EACH	ignore
>> SAE Bearer ID	M				-	
>> Transport Layer Address	M		9.2.2.1		-	
>> GTP-TEID	M		9.2.2.2	note: eNB TEID, UDP port	-	
SAE Bearer Failed to Setup List	O		SAE Bearer List 9.2.1.36	a value for <i>SAE bearer identity</i> shall only be present once in <i>SAE Bearer Failed to Setup List</i> IE	YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE bearer allowed towards one UE, the maximum value is 256.

9.1.3.3 SAE BEARER MODIFY REQUEST

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

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
SAE Bearer to be Modified List	M				YES	reject
>SAE Bearer To Be Modified Item IEs		1 to <maxnoof SAEbearers>			EACH	reject
>> SAE Bearer ID	M		9.2.1.2		-	
>> SAE Bearer Level QoS Parameters	M		9.2.1.15	Includes necessary QoS parameters	-	
NAS-PDU	M		9.2.3.5		YES	ignore

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE bearer allowed towards one UE, the maximum value is 256.

9.1.3.4 SAE BEARER MODIFY RESPONSE

This message is sent by the eNB and is used to report the outcome of the request from the SAE BEARER 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	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
SAE Bearer Modify List	O				YES	ignore
>SAE Bearer Modify Item IEs		1 to <maxnoof SAEbearers>			EACH	ignore
>> SAE BearerID	M		9.2.1.2		-	
SAE Bearer Failed to Modify List	O		SAE Bearer List 9.2.1.36	a value for SAE bearer identity shall only be present once in SAE Bearer Modify List IE + SAE Bearer Failed to Modify List	YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE bearer allowed towards one UE, the maximum value is 256.

9.1.3.5 SAE BEARER 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 SAE bearers..

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
SAE Bearer To Be Released List	M		SAE Bearer List 9.2.1.36	a value for SAE bearer identity shall only be present once in SAE Bearer To Be Released List IE	YES	ignore

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE bearer allowed towards one UE, the maximum value is 256.

9.1.3.6 SAE BEARER RELEASE RESPONSE

This message is sent by the eNB and is used to report the outcome of the request from the SAE BEARER 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	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
SAE Bearer Release List	O				YES	ignore
>SAE Bearer Release Item IEs		1 to <maxnoof SAEbearers>			EACH	ignore
>> SAE bearer ID	M		9.2.1.2		-	
SAE Bearer Failed to Release List	O		SAE Bearer List 9.2.1.36	a value for <i>SAE bearer identity</i> shall only be present once in <i>SAE Bearer Release List IE + SAE Bearer Failed to Release List IE</i>	YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE bearer allowed towards one UE, the maximum value is 256.

9.1.3.7 SAE BEARER RELEASE REQUEST

This message is sent by the eNB and is used to request the MME to release one or several SAE Bearers 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
SAE Bearer To Be Released List	M		SAE Bearer List 9.2.1.36	a value for <i>SAE bearer identity</i> shall only be present once in <i>SAE Bearer To Be Released List IE</i>	YES	ignore

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE bearer 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 a 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
SAE Bearer to Be Setup List	M				YES	reject
> SAE Bearer to Be Setup Item IEs		1 to <maxnoofSAEbearers>			EACH	reject
>>SAE Bearer ID	M		9.2.1.2		-	
>>SAE Bearer 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		-	
Security	M		FFS	FFS	YES	reject
Trace Activation	O		9.2.1.4		YES	ignore
Handover Restriction List	O		9.2.1.22		YES	ignore
NAS-PDU	O		9.2.3.5	FFS	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

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE bearer allowed towards one UE, the maximum value is 256.

9.1.4.2 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	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
SAE Bearer Setup List	O				YES	ignore
> SAE Bearer Setup Item IEs		1 to <maxnoofSAEbearers>			EACH	ignore
>>SAE Bearer Identity	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP TEID	M		9.2.2.2		-	
SAE Bearer Failed to Setup List	O		SAE Bearer List 9.2.1.36		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE bearer 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	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Cause	M		9.2.1.3		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.4.5 UE CONTEXT RELEASE REQUEST

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

Direction: eNB → MME

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

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 S1 AP IDs	M				YES	reject
>UE S1 AP ID pair	M		9.2.3.18			
>MME UE S1AP ID	M		9.2.3.3			
Cause	M		9.2.1.3		YES	ignore

9.1.4.7 UE CONTEXT RELEASE COMPLETE

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

Direction: eNB → MME

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

9.1.4.8 UE CONTEXT MODIFICATION REQUEST

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Security Information	O		9.2.1.26		YES	reject
Subscriber Profile ID for RAT/Frequency priority	O		9.2.1.39		YES	ignore

9.1.4.9 UE CONTEXT MODIFICATION RESPONSE

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
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	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Cause	M		9.1.2.3		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.5 Handover Signalling Messages

9.1.5.1 HANDOVER REQUIRED

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

Direction: eNodeB → 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	<IntraLTE, LTEtoUTRAN, LTEtoGERAN>	9.2.1.13		YES	reject
Cause	M		9.2.1.3		YES	ignore
Target ID	M		9.2.1.6		YES	reject
Selected TAI	M		TAI 9.2.3.16	Contains the TAC of the target cell and the PLMN selected for that target cell	YES	reject
Direct Forwarding Path Availability	O		9.2.3.15		YES	ignore
Intra-LTE HO Information ListRequest	C- ifIntraLTE				YES	reject
> Source eNodeB to Target eNodeB Transparent Container	M		9.2.1.7	It includes the UE RAN context		
LTE to UTRAN HO Information ListRequest	C- ifLTEtoUTRAN				YES	reject
> Source RNC To Target RNC Transparent Container	M		9.2.1.9	FFS if this is mandatory and needed		
LTE to GERAN HO Information ListRequest	C- ifLTEtoGERAN				YES	reject
> Source BSS To Target BSS Transparent Container	M		9.2.1.11	FFS if this is mandatory and needed		

Condition	Explanation
ifIntraLTE	This IE shall be present if the <i>Handover Type</i> IE is set to the 'Value' IntraLTE.
ifLTEtoUTRAN	This IE shall be present if the <i>Handover Type</i> IE is set to the 'Value' LTEtoUTRAN.
ifLTEtoGERAN	This IE shall be present if the <i>Handover Type</i> IE is set to the 'Value' LTEtoGERAN.

9.1.5.2 HANDOVER COMMAND

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

Direction: MME → eNodeB.

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	<IntraLTE, LTEtoUTRAN, LTEtoGERAN>	9.2.1.13		YES	reject
SAE Bearers Subject to Forwarding List	O				YES	ignore
>SAE Bearers Subject to Forwarding Item IEs		1 to <maxnoof SAEbearers>			EACH	ignore
>> SAE Bearer ID	M		9.2.1.2		-	
>> DL Transport Layer Address	M		9.2.2.1		-	
>> DL GTP TEID	M		9.2.2.2	To deliver forwarded DL PDCP SDUs	-	
SAE Bearers to Release List	O				YES	ignore
>SAE Bearers to Release Item IEs		1 to <maxnoof SAEbearers>			EACH	ignore
>> SAE Bearer ID	M		9.2.1.2		-	
Intra-LTE HO Information ListResponse	C- ifIntraLTE				YES	reject
> Target eNodeB to Source eNodeB Transparent Container	M		9.2.1.8			
LTE to UTRAN HO Information ListResponse	C- ifLTEtoUTRAN				YES	reject
> Target RNC to Source RNC Transparent Container	M		9.2.1.10	FFS if this is mandatory and needed		
LTE to GERAN HO Information ListResponse	C- ifLTEtoGERAN				YES	reject
> Target BSS to Source BSS Transparent Container	M		9.2.1.12	FFS if this is mandatory and needed		
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Editor's Note: How to handle and control data forwarding is FFS. This means that the existence of, and the definition of the SAE Bearers Subject to Forwarding List IE is FFS.

Condition	Explanation
ifIntraLTE	This IE shall be present if the <i>Handover Type</i> IE is set to the 'Value' IntraLTE.
ifLTEtoUTRAN	This IE shall be present if the <i>Handover Type</i> IE is set to the 'Value' LTEtoUTRAN.
ifLTEtoGERAN	This IE shall be present if the <i>Handover Type</i> IE is set to the 'Value' LTEtoGERAN.

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE Bearers for one UE. Value is 256.

9.1.5.3 HANDOVER PREPARATION FAILURE

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

Direction: MME → eNodeB.

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
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.5.4 HANDOVER REQUEST

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

Direction: MME → eNodeB.

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	<IntraLTE, UTRANtoLTE, GERANtoLTE>	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
SAE Bearers To Be Setup List	M				YES	reject
>SAE Bearers To Be Setup Item IEs		1 to <maxnoof SAEbearers>			EACH	reject
>> SAE Bearer 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	-	
>> SAE Bearer Level QoS Parameters	M		9.2.1.15	Includes necessary QoS parameters	-	
Source eNodeB to Target eNodeB Transparent Container	M		9.2.1.7			
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

Editor's Note: The details of required IEs to indicate security parameters in the message (e.g., encryption and integrity protection information) are FFS.

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE Bearers for one UE. Value is 256.

9.1.5.5 HANDOVER REQUEST ACKNOWLEDGE

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

Direction: eNodeB → 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	allocated at the target eNodeB	YES	reject
Handover Type	M	<IntraLTE, UTRANtoLTE, GERANtoLTE>	9.2.1.13		YES	reject
SAE Bearers Admitted List	O				YES	ignore
>SAE Bearers Admitted Item IEs		1 to <maxnoof SAEbearers>			EACH	ignore
>> SAE Bearer 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.	-	
SAE Bearers Failed to Setup List	O		SAE Bearer List 9.2.1.36		YES	ignore
Intra-LTE HO Information ListResponse	C- ifIntraLTE				YES	reject
> Target eNodeB to Source eNodeB Transparent Container	M		9.2.1.8	It includes HO Command info for the UE		
UTRAN to LTE HO Information ListResponse	C- if UTRANtoLTE				YES	reject
> Target RNC to Source RNC Transparent Container	M		9.2.1.10	FFS if this is mandatory and needed		
GERAN to LTE HO Information ListResponse	C- if GERANtoLTE				YES	reject
> Target BSS to Source BSS Transparent Container	M		9.2.1.12	FFS if this is mandatory and needed		
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Condition	Explanation
ifIntraLTE	This IE shall be present if the <i>Handover Type</i> IE is set to the 'Value' IntraLTE.
ifUTRANtoLTE	This IE shall be present if the <i>Handover Type</i> IE is set to the 'Value' UTRANtoLTE.
ifGERANtoLTE	This IE shall be present if the <i>Handover Type</i> IE is set to the 'Value' GERANtoLTE.

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE Bearers for one UE. Value is 256.

9.1.5.6 HANDOVER FAILURE

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

Direction: eNodeB → 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
Cause	M		9.2.1.3		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.5.7 HANDOVER NOTIFY

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

Direction: eNodeB → 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

9.1.5.8 PATH SWITCH REQUEST

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

Direction: eNodeB → 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
SAE Bearer To Be Switched in Downlink List	M				YES	reject
>SAE Bearers Switched in Downlink Item IEs		1 to <maxnoof SAEbearers>			EACH	reject
>> SAE Bearer ID	M		9.2.1.2		-	
>> Transport layer address	M		9.2.2.1		-	
>> GTP TEID	M		9.2.2.2	To deliver DL PDUs	-	
Source MME UE S1AP ID	M		9.2.3.3		YES	reject
E-UTRAN CGI	M		9.2.1.38		YES	ignore

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE Bearers for one UE. Value is 256.

9.1.5.9 PATH SWITCH REQUEST ACKNOWLEDGE

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

Direction: MME → eNodeB.

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
SAE Bearer To Be Switched in Uplink List	O				YES	ignore
> SAE Bearers Switched in Uplink Item IEs		1 to <maxnoof SAEbearers>			EACH	ignore
>> SAE Bearer ID	M		9.2.1.2		-	
>> Transport layer address	M		9.2.2.1		-	
>> GTP TEID	M		9.2.2.2		-	
SAE Bearer Failed to Switch in Downlink List	O				YES	ignore
> SAE Bearer Failed to Switch in Downlink Item IEs		1 to <maxnoof SAEbearers>			EACH	ignore
>> SAE Bearer ID	M		9.2.1.2		-	
>> cause	M		9.2.1.3		-	
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE Bearers for one UE. Value is 256.

9.1.5.10 PATH SWITCH REQUEST FAILURE

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

Direction: MME → eNodeB.

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
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.5.11 HANDOVER CANCEL

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

Direction: eNodeB → 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 eNodeB to confirm that the ongoing handover was cancelled.

Direction: MME → eNodeB.

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
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.5.13 eNB STATUS TRANSFER

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

Direction: eNodeB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.11		YES	ignore
MME S1-AP UE Identity	M		9.2.3.3		YES	reject
eNB S1-AP UE Identity	M		9.2.3.4		YES	reject
eNB Status Transfer Transparent Container	M		9.2.1.31		YES	reject

Editor's note: it is FFS if the procedure may be triggered more than once time during the handover preparation.

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 → eNodeB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.15		YES	ignore
MME S1-AP UE Identity	M		INTEGER (0..4095)	eNB UE X2AP ID allocated at the old eNodeB	YES	reject
eNB S1-AP UE Identity	M		INTEGER (0..4095)	eNB UE X2AP ID allocated at the new eNodeB	YES	reject
eNB Status Transfer Transparent Container	M		9.2.1.31		YES	reject

9.1.6 PAGING

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
UE Identity Index value	M		9.2.3.10		YES	ignore
UE Paging ID	M		9.2.3.13		YES	ignore
Paging DRX	O		9.2.1.16		YES	ignore
Paging Cause	M		9.2.1.17		YES	ignore
List of TAIs					YES	ignore
>TAI List Item		1 to < maxnoofTAI >			EACH	ignore
>>TAI	M		9.2.3.16		-	

Range bound	Explanation
maxnoofTAI	Maximum no. of TAI Identity for one UE. Value is FFS.

9.1.7 NAS Transport Messages

9.1.7.1 INITIAL UE MESSAGE

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	reject
NAS-PDU	M		9.2.3.5		YES	reject
TAI	M		9.2.3.16	Indicating the Tracking Area from which the UE has sent the NAS message.	YES	reject
E-UTRAN CGI	M		9.2.1.38	Indicating the E-UTRAN CGI from which the UE has sent the NAS message.	YES	ignore
S-TMSI	O		9.2.3.6		YES	reject

9.1.7.2 DOWNLINK NAS TRANSPORT

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

Direction: MME → eNB

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

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

9.1.7.4 NAS NON DELIVERY INDICATION

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

Direction: eNB → MME

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

9.1.8 Management messages

9.1.8.1 RESET

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

Direction: MME → eNB and eNB → MME

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

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

9.1.8.2 RESET ACKNOWLEDGE

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

Direction: eNB → MME and MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
UE-associated logical S1-connection list	O				YES	ignore
> UE-associated logical S1-connection Item		1 to < maxnoofIndividualS1ConnectionsToReset >			EACH	ignore

>>MME UE S1AP ID	O		9.2.3.3		-	-
>>eNB UE S1AP ID	O		9.2.3.4		-	-
Criticality Diagnostics	O		9.2.1.21		YES	ignore

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

9.1.8.3 ERROR INDICATION

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

Direction: MME → eNB and eNB → MME

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

9.1.8.4 S1 SETUP REQUEST

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Global eNB ID	M		9.2.1.x		YES	reject
eNB Name	M		OCTET STRING	FSS if IE is optional	YES	ignore
Supported TAs		1..<maxnoofTACs >		Supported TAs in the eNB	GLOBAL	reject
>TAC	M		9.2.3.7	Broadcast TAC	-	
>Broadcast PLMNs		1..<maxnoofBPLMNs>		Broadcast PLMNs	-	
>>PLMN Identity	M		9.2.3.8		-	

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

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

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	M		OCTET STRING	FSS if IE is optional	YES	ignore
Served PLMNs		1..<maxnoofPLMNsPerMME>			GLOBAL	reject
>PLMN Identity	M		9.2.3.8		-	
Served GUMMEIs		1..<maxnoofGUMMEIs>			GLOBAL	reject
>GUMMEI	M		9.2.3.9		-	-
Relative MME Capacity	M		9.2.3.17		YES	reject
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofPLMNsPerMME	Maximum no. of PLMNs per MME. Value is FFS.
maxnoofGUMMEIs	Maximum no. of GUMMEI per MME. Value is FFS.

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		OCTET STRING		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		OCTET STRING	FSS if IE is optional	YES	ignore
Supported TAs		0..<maxnoofTACs>		Supported TAs in the eNB	GLOBAL	reject
>TAC	M		9.2.3.7	Broadcasted TAC	-	
>Broadcast PLMNs		1..<maxnoofBPLMNs>		Broadcast PLMNs	-	
>>PLMN Identity	M		9.2.3.8		-	

Range bound	Explanation
maxnoofTACs	Maximum no. of TACs. Value is FFS.
maxnoofBPLMNs	Maximum no. of Broadcasted PLMNs. Value is FFS.

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		OCTET STRING		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		OCTET STRING	FSS if IE is optional	YES	ignore
Served PLMNs		0..<maxnoofPLMNsPerMME>			GLOBAL	reject
>PLMN Identity	M		9.2.3.8		-	
Served GUMMEIs		0..<maxnoofGUMMEIs>			GLOBAL	reject
>GUMMEI	O		9.2.3.9		-	
Relative MME Capacity	O		9.2.3.17		YES	reject

Range bound	Explanation
maxnoofPLMNsPer MME	Maximum no. of PLMNs per MME. Value is FFS.
maxnoofGUMMEIs	Maximum no. of GUMMEI per MME. Value is FFS.

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		OCTET STRING		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

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

9.1.9 S1 CDMA2000 Tunneling Messages

9.1.9.1 DOWNLINK S1 CDMA2000 TUNNELING

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
SAE Bearers Subject to Forwarding List	O				YES	ignore
>SAE Bearers Subject to Forwarding Item IEs		1 to <maxnoof SAEbearers>			EACH	ignore
>> SAE Bearer ID	M		9.2.1.2		-	
>> DL Transport Layer Address	M		9.2.2.1		-	
>> DL GTP TEID	M		9.2.2.2	This IE indicates the tunnel endpoint for forwarding of DL data.	-	
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
maxnoofSAEbearers	Maximum no. of SAE Bearers for one UE. Value is 256.

9.1.9.2 UPLINK S1 CDMA2000 TUNNELING

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

Direction: eNB → MME

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

9.1.10 UE CAPABILITY INFO INDICATION

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

Direction: eNB → MME

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

9.1.11 Trace Messages

9.1.11.1 TRACE START

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

Direction: MME → eNB

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

9.1.11.2 TRACE FAILURE INDICATION

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Trace Reference	M		OCTET STRING (8)		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
Trace Reference	M		OCTET STRING (8)		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	O		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
Request Type	M		9.2.1.34		YES	ignore

9.2 Information Element Definitions

Editor's Note: Information element definitions.

9.2.0 General

Subclause 9.2 presents the S1AP IE definitions in tabular format. The corresponding ASN.1 definition is presented in subclause 9.3. In case there is contradiction between the tabular format in subclause 9.2 and the ASN.1 definition, the ASN.1 shall take precedence, except for the definition of conditions for the presence of conditional elements, where the tabular format shall take precedence.

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

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

9.2.1 Radio Network Layer Related IEs

9.2.1.1 Message Type

The *Message Type* IE uniquely identifies the message being sent. It is mandatory for all messages.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Message Type				Assumed max no of messages is 256.
>Procedure Code	M		(Handover Preparation, Handover Resource Allocation, Handover Notification, Patch Switch Request, Handover Cancel, SAE Bearer Setup, SAE Bearer Modify, SAE Bearer Release, SAE Bearer Release Request, Initial Context Setup, Paging, Downlink NAS transport, Initial UE Message, Uplink NAS transport, Reset, Error Indication, NAS Non Delivery Indication, S1 Setup, UE Context Release Request, UE Context Release, Downlink S1 CDMA2000 Tunneling, Uplink S1 CDMA2000 Tunneling; UE Context Modification, UE Capability Info Indication, eNB Status Transfer, MME Status Transfer, Deactivate Trace, Trace Start, Trace Failure Indication, eNB Configuraton Update, MME Configuration Update, Location Reporting Control, Location Reporting Failure Indication, Location Report, Overload Start, Overload Stop, ...)	
>Type of Message	M		CHOICE (Initiating Message, Successful Outcome, Unsuccessful Outcome, ...)	

9.2.1.2 SAE Bearer ID

This element uniquely identifies a radio access bearer for a particular UE, which makes the SAE Bearer ID unique over one S1 connection. The SAE Bearer ID shall remain the same for the duration of the SAE Bearer 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
SAE Bearer ID	M		INTEGER (0..15, ...)	

9.2.1.3 Cause

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

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE Cause Group	M			
>Radio Network Layer				
>>Radio Network Layer Cause	M		ENUMERATED (Unspecified, Handover triggered, TX2 _{RELOCoverall} Expiry, Successful Handover, Release due to E-UTRAN Generated Reason, Handover Cancelled, Partial Handover, Handover Failure In Target EPC/eNB Or Target System, Handover Target not allowed, TS1 _{RELOCoverall} Expiry, TS1 _{RELOCprep} Expiry, Cell not available,, Unknown Target ID, No Radio Resources Available in Target Cell, Unknown MME UE S1AP ID, Unknown eNB UE S1AP ID, Unknown 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, ...)	
>Transport Layer				
>>Transport Layer Cause	M		ENUMERATED (Transport Resource Unavailable, Unspecified, ...)	
> NAS				
>> NAS Cause	M		ENUMERATED (Normal Release, Authentication failure, Detach, Unspecified, ...)	
>Protocol				
>>Protocol Cause	M		ENUMERATED (Transfer Syntax Error, Abstract Syntax Error (Reject), Abstract Syntax Error (Ignore and Notify), Message not Compatible with Receiver State, Semantic Error, Abstract Syntax Error (Falsely Constructed Message), Unspecified,...)	
>Misc				
>>Miscellaneous Cause	M		ENUMERATED (Control Processing Overload, Not enough User Plane Processing Resources, Hardware Failure, O&M Intervention, Unspecified, 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
Handover triggered	The action is due to a handover that has been triggered.
TX2RELOCOverall Expiry	The timer guarding the handover that takes place over X2 has abnormally expired.
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>SAE Bearers to Release List</i> IE and the source eNB estimated service continuity for the UE would be better by not proceeding with handover towards this particular target eNB.
Handover Failure In Target EPC/eNB Or Target System	The handover failed due to a failure in target EPC/eNB or target system.
Handover Target not allowed	Handover to the indicated target cell is not allowed for the UE in question.
TS1 _{RELOCoverall} Expiry	The reason for the action is expiry of timer TS1 _{RELOCoverall} .
TS1 _{RELOCprep} Expiry	Handover Preparation procedure is cancelled when timer TS1 _{RELOCprep} expires.
Cell not available	The concerned cell is not available.
Unknown Target ID	Handover rejected because the target ID is not known to the EPC.
No radio resources available in target cell	Load on target cell is too high.
Unknown MME UE S1AP ID	The action failed because the MME UE S1AP ID is unknown.
Unknown eNB UE S1AP ID	The action failed because the eNB UE S1AP ID is unknown.
Unknown pair of UE S1AP ID	The action failed because the pair of UE S1AP IDs is unknown.
Handover Desirable for Radio Reasons	The reason for requesting handover is radio related.
Time Critical Handover	handover is requested for time critical reason i.e. this cause value is reserved to represent all critical cases where the connection is likely to be dropped if handover is not performed.
Resource Optimisation Handover	The reason for requesting handover is to improve the load distribution with the neighbour cells.
Reduce Load in Serving Cell	Load on serving cell needs to be reduced.

User Inactivity	The action is requested due to user inactivity on one or several non real time RABs e.g. 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.

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

NAS cause	Meaning
Normal Release	The release is normal
Authentication Failure	The action is due to authentication failure.
Detach	The action is due to detach.
Unspecified	Sent when none of the above cause values applies but still the cause is NAS related

Protocol cause	Meaning
Transfer Syntax Error	The received message included a transfer syntax error.
Abstract Syntax Error (Reject)	The received message included an abstract syntax error and the concerning criticality indicated "reject".
Abstract Syntax Error (Ignore And Notify)	The received message included an abstract syntax error and the concerning criticality indicated "ignore and notify".
Message Not Compatible With Receiver State	The received message was not compatible with the receiver state.
Semantic Error	The received message included a semantic error.
Abstract Syntax Error (Falsely Constructed Message)	The received message contained IEs or IE groups in wrong order or with too many occurrences.
Unspecified	Sent when none of the above cause values applies but still the cause is Protocol related
Miscellaneous cause	Meaning
Control Processing Overload	Control processing overload
Not Enough User Plane Processing Resources Available	No enough resources are available related to user plane processing.
Hardware Failure	Action related to hardware failure
O&M Intervention	The action is due to O&M intervention.
Unspecified Failure	Sent when none of the above cause values applies and the cause is not related to any of the categories Radio Network Layer, Transport Network Layer, NAS or Protocol.
Unknown PLMN	The MME doesn't identify at least one of the PLMN provided by the eNB

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
Trace Reference	M		OCTET STRING (8)			
Interfaces To Trace		1 to <maxInterfaces>				
>Interface	M		ENUMERATED (s1, x2 Uu, ...)			
>Trace depth	M		ENUMERATED (minimum, medium, maximum, vendorMinimum, vendorMedium, vendorMaximum,...)	Defined in [10]		

9.2.1.5 Source ID

Void.

9.2.1.6 Target ID

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Choice Target ID					-	
> Target eNB-ID			9.2.1.37			
> 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		OCTET STRING (SIZE (3))	- digits 0 to 9, encoded 0000 to 1001, - 1111 used as filler digit, two digits per octet, - bits 4 to 1 of octet n encoding digit 2n-1 - bits 8 to 5 of octet n encoding digit 2n -The PLMN identity consists of 3 digits from MCC followed by either -a filler digit plus 2 digits from MNC (in case of 2 digit MNC) or -3 digits from MNC (in case of a 3 digit MNC).	-	
>> LAC	M		OCTET STRING (2)	0000 and FFFE not allowed.	-	
>>CI	M		OCTET STRING (2)		-	
>>RAC	O		9.2.3.2			

9.2.1.7 Source eNB to Target eNB Transparent Container

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

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		-	-
Target Cell ID	M		E-UTRAN CGI 9.2.1.38		-	-
Subscriber Profile ID for RAT/Frequency priority	O		9.2.1.35		-	-
SAE Bearers Information List	O					
> SAE Bearers Information Item		1 to <maxnoof SAEbearers >			EACH	ignore
>> SAE Bearer ID	M		9.2.1.2		-	-
>> DL Forwarding	O		9.2.3.14		-	-

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE Bearers 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. This IE is used for the intra SAE/LTE handover case.

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		-	-

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 and vice versa.

This IE defined in TS 25.413. Content FFS.

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 and vice versa.

This IE is defined in TS 25.413. Content FFS.

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 and vice versa.

This IE is defined in TS 48.018. Content FFS.

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 and vice versa.

This IE is defined in TS 48.018. Content FFS.

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, GERANtoTLE)	

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..6553 5)	The <i>Extended RNC-ID</i> IE shall be used if the RNC identity has a value larger than 4095. Note: Application of the <i>Extended RNC-ID</i> IE to very large networks is FFS.

9.2.1.15 SAE Bearer Level QoS Parameters

This IE defines the QoS to be applied to a SAE bearer.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SAE Bearer Level QoS Parameters				
>QCI	M		INTEGER (1..256)	QoS Class Identifier defined in [11]. Logical range and coding specified in [13]
>Allocation and Retention Priority	M		INTEGER (0..15)	Desc.: This IE should be understood as 'priority of allocation and retention' (see [11]). Usage: Value 15 means 'no priority'. Values between 1 and 14 are ordered in decreasing order of priority, i.e. 1 is the highest and 14 the lowest. Value 0 shall be treated as a logical error if received.
>GBR QoS Information	O		9.2.1.18	This IE applies to GBR bearers only and shall be ignored otherwise.

9.2.1.16 Paging DRX

This IE indicates the Paging DRX as defined in [xx].

Editor's Note: The definition is FFS and should be aligned to RRC 36.331 referenced as [xx].

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Paging DRX	M		INTEGER (0..4095)			

9.2.1.17 Paging Cause

This element indicates the cause for paging a UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Paging Cause	M		ENUMERATED (Terminating Conversational Call, Terminating Streaming Call, Terminating Interactive Call, Terminating Background Call, Terminating Low Priority Signalling, ..., Terminating High Priority Signalling)			

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
SAE Bearer Maximum Bit Rate Downlink	M		SAE Bearer Bit Rate 9.2.1.19	Desc.: This IE indicates the maximum downlink SAE Bearer Bit Rate (i.e. from the EPC to E-UTRAN) for this bearer.
SAE Bearer Maximum Bit Rate Uplink	M		SAE Bearer Bit Rate 9.2.1.19	Desc: This IE indicates the maximum uplink SAE Bearer Bit Rate (i.e. from the E-UTRAN to the EPC) for this bearer.
SAE Bearer Guaranteed Bit Rate Downlink	M		SAE Bearer Bit Rate 9.2.1.19	Desc.: This IE indicates the downlink guaranteed SAE Bearer Bit Rate (provided that there is data to deliver) from the EPC to the E-UTRAN for this bearer.
SAE Bearer Guaranteed Bit Rate Uplink	M		SAE Bearer Bit Rate 9.2.1.19	Desc.: This IE indicates the uplink guaranteed SAE Bearer Bit Rate (provided that there is data to deliver) from the E-UTRAN to the EPC for this bearer

9.2.1.19 Bit Rate

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

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

9.2.1.20 UE Aggregate Maximum Bit Rate

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Aggregate Maximum Bit Rate				Desc.: Applicable for non-GBR SAE Bearers
>UE Aggregate Maximum Bit Rate Downlink	M		9.2.1.19	Desc.: to be added
>UE Aggregate Maximum Bit Rate Uplink	M		9.2.1.19	Desc.: to be added

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 Annex A.2 – FFS).

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, outcome)	The Triggering Message is used only if the Criticality Diagnostics is part of Error Indication procedure.
Procedure Criticality	O		ENUMERATED(reject, ignore, notify)	This Procedure Criticality is used for reporting the Criticality of the Triggering message (Procedure).
Information Element Criticality Diagnostics		0 to <maxnoof errors>		
>IE Criticality	M		ENUMERATED(reject, ignore, notify)	The IE Criticality is used for reporting the criticality of the triggering IE. The value 'ignore' shall not be used.
>IE ID	M		INTEGER (0..65535)	The IE ID of the not understood or missing IE
>Type of Error	M		ENUMERATED(not understood, missing, ...)	

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

9.2.1.22 Handover Restriction List

This IE defines area roaming or access restrictions for handover. If the eNB receives the Handover Restriction List, it shall overwrite previously received restriction information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Serving PLMN	M		9.2.3.8	
Equivalent PLMNs		0..<maxnoofEPLMNs>		Allowed PLMNs in addition to Serving PLMN. This list corresponds to the list of 'equivalent PLMNs' as defined in [TS 24.008].
>PLMN Identity	M		9.2.3.8	
Forbidden TAs		0..<maxnoofEPLMNsPlusOne>		intra LTE roaming restrictions
>PLMN Identity	M		9.2.3.8	The PLMN of forbidden TACs
>Forbidden TACs		1..<maxnoofForbTACs>		
>>TAC	M		9.2.3.7	The TAC of the forbidden TAI
Forbidden LAs		0..<maxnoofEPLMNsPlusOne>		inter-3GPP RAT roaming restrictions
>PLMN Identity	M		9.2.3.8	
>Forbidden LACs		1..<maxnoofForbLACs>		
>>LAC	M		OCTET STRING(2)	
Forbidden inter RATs	O		ENUMERATED(ALL, GERAN, UTRAN, ...)	inter-3GPP RAT access restrictions

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

9.2.1.23 CDMA2000-PDU

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

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

9.2.1.24 CDMA2000 RAT Type

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

Note: In the downlink, this information element is forwarded to the UE to help it route the tunnelled downlink CDMA2000 message to the appropriate CDMA upper layer.

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

9.2.1.25 CDMA2000 Sector ID

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CDMA2000 Sector ID	M		OCTET STRING	This IE is set to CDMA2000 Reference Cell ID corresponding to the HRPD/1xRTT sector under the HRPD AN/1xBS to which the eNB has initiated the UE to handover to. The CDMA2000 Reference Cell ID is statically configured in the eNB.

9.2.1.26 Security Information

The purpose of the *Security Information* IE is to indicate the AS security key.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
AS security key	M		BIT STRING (128)	

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	FFS: reference to TS 36.331

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 [8] 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 **SI** handover case.

This IE is transparent to the EPC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
SAE Bearers Subject to Status Transfer List	M				–	–
>SAE Bearers Subject to Status Transfer Item		1 to <maxnoof SAEbearers>			EACH	ignore
>> SAE Bearer ID	M		9.2.1.2		–	–
>> UL COUNT value	M		9.2.1.32	PDCP-SN and HFN of first missing UL PDCP SDU	–	–
>> DL COUNT value	M		9.2.1.32	PDCP-SN and HFN that the target eNB should assign for the next DL SDU not having an SN yet	–	–

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE Bearers for one UE. Value is 256.

9.2.1.32 COUNT value

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

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

9.2.1.33 CDMA2000 1xRTT RAND

This information element is a random number generated by the eNB and tunnelled to the 1xCS IWS [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 handover from E-UTRAN to CDMA2000 1xRTT RAT.

9.2.1.34 Request Type

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

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

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 [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 tunneled 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.

9.2.1.36 SAE Bearer List

This IE contains a list of SAE Bearer identities 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
SAE Bearer List Item		1 to <maxnoof SAEbearers>			EACH	ignore
>SAE bearer ID	M		9.2.1.2		–	–
>Cause	M		9.2.1.3		–	–

Range bound	Explanation
maxnoofSAEbearers	Maximum no. of SAE bearer allowed towards one UE, the maximum value is 256.

9.2.1.37 Global eNB ID

This element is used to globally identify an eNB (see [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			BIT STRING (20)	Equal to the 20 leftmost bits of the <i>Cell Identity</i> IE contained in the <i>E-UTRAN CGI</i> IE (see section 9.2.1.38) of each cell served by the eNB
>Home eNB ID			BIT STRING (28)	Equal to the <i>Cell Identity</i> IE contained in the <i>E-UTRAN CGI</i> IE (see section 9.2.1.38) of the cell served by the eNB

9.2.1.38 E-UTRAN CGI

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.8	
Cell Identity	M		BIT STRING (28)	The leftmost bits of the Cell Identity correspond to the eNB ID (defined in section 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 [14].

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

9.2.2 Transport Network Layer Related IEs

9.2.2.1 Transport Layer Address

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

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

9.2.2.2 GTP-TEID

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
GTP TEID	M		OCTET STRING (4)	

9.2.3 NAS Related IEs

9.2.3.1 LAI

This element is used to uniquely identify a Location Area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
LAI				
>PLMN identity	M		OCTET STRING (SIZE (3))	- digits 0 to 9, encoded 0000 to 1001, - 1111 used as filler digit, two digits per octet, - bits 4 to 1 of octet n encoding digit 2n-1 - bits 8 to 5 of octet n encoding digit 2n -The PLMN identity consists of 3 digits from MCC followed by either -a filler digit plus 2 digits from MNC (in case of 2 digit MNC) or -3 digits from MNC (in case of a 3 digit MNC).
>LAC	M		OCTET STRING (2)	0000 and FFFE not allowed.

9.2.3.2 RAC

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

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

9.2.3.3 MME UE S1AP ID

The MME UE S1AP ID uniquely identify 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 identify 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. Typically it contains call control, session management, supplementary services, short message service and mobility management messages.

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

9.2.3.6 S-TMSI

Temporary Mobile Subscriber Identity, 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 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	

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 Selected 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		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 Selected 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).
>MME Group ID	M		OCTET STRING (2)	FFS
>MME code	M		9.2.3.12	

9.2.3.10 UE Identity Index value

The *UE Identity Index value* IE is used at paging.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE identity Index Value	M		OCTET STRING	IMSI mod L as defined in FFS.

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.</p> <p>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 element represents the MME Code to uniquely identify a MME within an MME pool area.

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

9.2.3.13 UE Paging Identity

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice UE Paging Identity				
>IMSI	M		9.2.3.11	
>S-TMSI	M		9.2.3.6	

9.2.3.14 DL Forwarding

This element indicates that the SAE bearer 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. EPC behaviour on receipt of this IE is specified in [x2].

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 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 11].

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

9.2.3.18 UE S1 AP ID pair

This IE contains a pair of UE S1 AP identities.

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

9.2.3.19 Overload Response

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

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

9.2.3.20 Overload Action

The *Overload Action* IE indicates which signalling traffic needs to be rejected/permited by the eNB in an MME overload situation as defined in [11],

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Overload Action	M		ENUMERATED (Reject RRC connection requests for non-emergency MO DT, Reject all connection requests for Signalling, Permit Emergency Sessions only, ...)	

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

9.3.0 General

S1AP ASN.1 definition conforms with [4] and [5].

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 (Note that in the following IE means an IE in the object set with an explicit id. If one IE needed to appear more than once in one object set, then the different occurrences have different IE ids):

- IEs shall be ordered (in an IE container) in the order they appear in object set definitions..
- Object set definitions specify how many times IEs may appear. An IE shall appear exactly once if the presence field in an object has value "mandatory". An IE may appear at most once if the presence field in an object has value "optional" or "conditional". If in a tabular format there is multiplicity specified for an IE (i.e. an IE list) then in the corresponding ASN.1 definition the list definition is separated into two parts. The first part defines an IE container list 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.

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

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

9.3.1 Usage of private message mechanism for non-standard use

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

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

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

9.3.2 Elementary Procedure Definitions

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

SLAP-PDU-Descriptions {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (20) modules (3) slap (1) version1 (1) slap-PDU-Descriptions (0)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    ProcedureCode
FROM SlAP-CommonDataTypes

    DeactivateTrace,
    DownlinkNASTransport,
    DownlinkSlcdma2000tunneling,
    ENBStatusTransfer,
    ENBConfigurationUpdate,
    ENBConfigurationUpdateAcknowledge,
    ENBConfigurationUpdateFailure,
    ErrorIndication,
    HandoverCancel,
    HandoverCancelAcknowledge,
    HandoverCommand,
    HandoverFailure,
    HandoverNotify,
    HandoverPreparationFailure,
    HandoverRequest,
    HandoverRequestAcknowledge,
    HandoverRequired,
    InitialContextSetupFailure,
    InitialContextSetupRequest,
    InitialContextSetupResponse,
    InitialUEMessage,
    LocationReportingControl,
    LocationReportingFailureIndication,
    LocationReport,
    MMEConfigurationUpdate,
    MMEConfigurationUpdateAcknowledge,
```

MMEConfigurationUpdateFailure,
MMEStatusTransfer,
NASNonDeliveryIndication,
OverloadStart,
OverloadStop,
Paging,
PathSwitchRequest,
PathSwitchRequestAcknowledge,
PathSwitchRequestFailure,
Reset,
ResetAcknowledge,
S1SetupFailure,
S1SetupRequest,
S1SetupResponse,
SAEBearerModifyRequest,
SAEBearerModifyResponse,
SAEBearerReleaseCommand,
SAEBearerReleaseResponse,
SAEBearerReleaseRequest,
SAEBearerSetupRequest,
SAEBearerSetupResponse,
TraceFailureIndication,
TraceStart,
UECapabilityInfoIndication,
UEContextModificationFailure,
UEContextModificationRequest,
UEContextModificationResponse,
UEContextReleaseCommand,
UEContextReleaseComplete,
UEContextReleaseRequest,
UplinkNASTransport,
UplinkS1cdma2000tunneling

FROM S1AP-PDU-Contents

id-DeactivateTrace,
id-downlinkNASTransport,
id-DownlinkS1cdma2000tunneling,
id-eNBStatusTransfer,
id-ErrorIndication,
id-HandoverCancel,
id-HandoverNotification,
id-HandoverPreparation,
id-HandoverResourceAllocation,
id-InitialContextSetup,
id-initialUEMessage,
id-ENBConfigurationUpdate,
id-LocationReportingControl,
id-LocationReportingFailureIndication,
id-LocationReport,
id-MMEConfigurationUpdate,
id-MMEStatusTransfer,
id-NASNonDeliveryIndication,
id-OverloadStart,

```

    id-OverloadStop,
    id-Paging,
    id-PathSwitchRequest,
    id-Reset,
    id-S1Setup,
    id-SAEBearerModify,
    id-SAEBearerRelease,
    id-SAEBearerReleaseRequest,
    id-SAEBearerSetup,
    id-TraceFailureIndication,
    id-TraceStart,
    id-UECapabilityInfoIndication,
    id-UEContextModification,
    id-UEContextRelease,
    id-UEContextReleaseRequest,
    id-uplinkNASTransport,
    id-UplinkS1cdma2000tunneling
FROM S1AP-Constants;

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

S1AP-ELEMENTARY-PROCEDURE ::= CLASS {
    &InitiatingMessage
    &SuccessfulOutcome          OPTIONAL,
    &UnsuccessfulOutcome        OPTIONAL,
    &procedureCode              ProcedureCode  UNIQUE,
    &criticality                 Criticality   DEFAULT ignore
}
WITH SYNTAX {
    INITIATING MESSAGE      &InitiatingMessage
    [SUCCESSFUL OUTCOME     &SuccessfulOutcome]
    [UNSUCCESSFUL OUTCOME   &UnsuccessfulOutcome]
    PROCEDURE CODE          &procedureCode
    [CRITICALITY            &criticality]
}

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

S1AP-PDU ::= CHOICE {
    initiatingMessage      InitiatingMessage,
    successfulOutcome       SuccessfulOutcome,
    unsuccessfulOutcome     UnsuccessfulOutcome,
    ...
}

```

```

InitiatingMessage ::= SEQUENCE {
  procedureCode  S1AP-ELEMENTARY-PROCEDURE.&procedureCode    ({S1AP-ELEMENTARY-PROCEDURES}),
  criticality    S1AP-ELEMENTARY-PROCEDURE.&criticality      ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
  value         S1AP-ELEMENTARY-PROCEDURE.&InitiatingMessage ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

SuccessfulOutcome ::= SEQUENCE {
  procedureCode  S1AP-ELEMENTARY-PROCEDURE.&procedureCode    ({S1AP-ELEMENTARY-PROCEDURES}),
  criticality    S1AP-ELEMENTARY-PROCEDURE.&criticality      ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
  value         S1AP-ELEMENTARY-PROCEDURE.&SuccessfulOutcome ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

UnsuccessfulOutcome ::= SEQUENCE {
  procedureCode  S1AP-ELEMENTARY-PROCEDURE.&procedureCode    ({S1AP-ELEMENTARY-PROCEDURES}),
  criticality    S1AP-ELEMENTARY-PROCEDURE.&criticality      ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
  value         S1AP-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

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

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

S1AP-ELEMENTARY-PROCEDURES-CLASS-1 S1AP-ELEMENTARY-PROCEDURE ::= {
  handoverPreparation |
  handoverResourceAllocation |
  pathSwitchRequest |
  sAEbearerSetup |
  sAEbearerModify |
  sAEbearerRelease |
  initialContextSetup |
  handoverCancel |
  reset |
  s1Setup |
  uEContextModification |
  uEContextRelease |
  eNBConfigurationUpdate |
  mMEConfigurationUpdate |
  ...
}

S1AP-ELEMENTARY-PROCEDURES-CLASS-2 S1AP-ELEMENTARY-PROCEDURE ::= {
  handoverNotification |
  sAEbearerReleaseRequest |
  paging |
  downlinkNASTransport |
}

```

```

    initialUEMessage
    uplinkNASTransport
    errorIndication
    nASNonDeliveryIndication
    uEContextReleaseRequest
    downlinkS1cdma2000tunneling
    uplinkS1cdma2000tunneling
    uECapabilityInfoIndication
    eNBStatusTransfer
    mMESStatusTransfer
    deactivateTrace
    traceStart
    traceFailureIndication
    locationReportingControl
    locationReportingFailureIndication
    locationReport
    overloadStart
    overloadStop
    ...
}

-- *****
--
-- 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
}

SAEBearerSetup S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  SAEBearerSetupRequest
    SUCCESSFUL OUTCOME  SAEBearerSetupResponse
    PROCEDURE CODE      id-SAEBearerSetup
    CRITICALITY         reject
}

SAEBearerModify S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  SAEBearerModifyRequest
    SUCCESSFUL OUTCOME  SAEBearerModifyResponse
    PROCEDURE CODE      id-SAEBearerModify
    CRITICALITY         reject
}

SAEBearerRelease S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  SAEBearerReleaseCommand
    SUCCESSFUL OUTCOME  SAEBearerReleaseResponse
    PROCEDURE CODE      id-SAEBearerRelease
    CRITICALITY         reject
}

SAEBearerReleaseRequest S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  SAEBearerReleaseRequest
    PROCEDURE CODE      id-SAEBearerReleaseRequest
    CRITICALITY         ignore
}

initialContextSetup S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  InitialContextSetupRequest
    SUCCESSFUL OUTCOME  InitialContextSetupResponse
    UNSUCCESSFUL OUTCOME InitialContextSetupFailure
    PROCEDURE CODE      id-InitialContextSetup
    CRITICALITY         reject
}

UEContextReleaseRequest S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  UEContextReleaseRequest
    PROCEDURE CODE      id-UEContextReleaseRequest
    CRITICALITY         ignore
}

paging S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  Paging
    PROCEDURE CODE      id-Paging
    CRITICALITY         ignore
}

downlinkNASTransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  DownlinkNASTransport
    PROCEDURE CODE      id-downlinkNASTransport
    CRITICALITY         ignore
}
```

```
}

initialUEMessage S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      InitialUEMessage
    PROCEDURE CODE          id-initialUEMessage
    CRITICALITY              ignore
}

uplinkNASTransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkNASTransport
    PROCEDURE CODE          id-uplinkNASTransport
    CRITICALITY              ignore
}

NASNonDeliveryIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      NASNonDeliveryIndication
    PROCEDURE CODE          id-NASNonDeliveryIndication
    CRITICALITY              ignore
}

handoverCancel S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      HandoverCancel
    SUCCESSFUL OUTCOME      HandoverCancelAcknowledge
    PROCEDURE CODE          id-HandoverCancel
    CRITICALITY              reject
}

reset S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      Reset
    SUCCESSFUL OUTCOME      ResetAcknowledge
    PROCEDURE CODE          id-Reset
    CRITICALITY              reject
}

errorIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ErrorIndication
    PROCEDURE CODE          id-ErrorIndication
    CRITICALITY              ignore
}

s1Setup S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      S1SetupRequest
    SUCCESSFUL OUTCOME      S1SetupResponse
    UNSUCCESSFUL OUTCOME    S1SetupFailure
    PROCEDURE CODE          id-S1Setup
    CRITICALITY              reject
}

enBConfigurationUpdate S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENBConfigurationUpdate
    SUCCESSFUL OUTCOME      ENBConfigurationUpdateAcknowledge
    UNSUCCESSFUL OUTCOME    ENBConfigurationUpdateFailure
    PROCEDURE CODE          id-ENBConfigurationUpdate
    CRITICALITY              reject
}
```

```
mMEConfigurationUpdate S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MMEConfigurationUpdate
    SUCCESSFUL OUTCOME      MMEConfigurationUpdateAcknowledge
    UNSUCCESSFUL OUTCOME    MMEConfigurationUpdateFailure
    PROCEDURE CODE          id-MMEConfigurationUpdate
    CRITICALITY              reject
}

downlinkS1cdma2000tunneling S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DownlinkS1cdma2000tunneling
    PROCEDURE CODE          id-DownlinkS1cdma2000tunneling
    CRITICALITY              ignore
}

uplinkS1cdma2000tunneling S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkS1cdma2000tunneling
    PROCEDURE CODE          id-UplinkS1cdma2000tunneling
    CRITICALITY              ignore
}

UEContextModification S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UEContextModificationRequest
    SUCCESSFUL OUTCOME      UEContextModificationResponse
    UNSUCCESSFUL OUTCOME    UEContextModificationFailure

    PROCEDURE CODE          id-UEContextModification
    CRITICALITY              reject
}

UECapabilityInfoIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UECapabilityInfoIndication
    PROCEDURE CODE          id-UECapabilityInfoIndication
    CRITICALITY              ignore
}

UEContextRelease S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UEContextReleaseCommand
    SUCCESSFUL OUTCOME      UEContextReleaseComplete
    PROCEDURE CODE          id-UEContextRelease
    CRITICALITY              reject
}

eNBStatusTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      eNBStatusTransfer
    PROCEDURE CODE          id-eNBStatusTransfer
    CRITICALITY              ignore
}

mMEStatusTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      mMEStatusTransfer
    PROCEDURE CODE          id-mMEStatusTransfer
    CRITICALITY              ignore
}
```

```
deactivateTrace S1AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE    DeactivateTrace
  PROCEDURE CODE        id-DeactivateTrace
  CRITICALITY           ignore
}

traceStart S1AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE    TraceStart
  PROCEDURE CODE        id-TraceStart
  CRITICALITY           ignore
}

traceFailureIndication S1AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE    TraceFailureIndication
  PROCEDURE CODE        id-TraceFailureIndication
  CRITICALITY           ignore
}

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
}

END
```

9.3.3 PDU Definitions

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

S1AP-PDU-Contents {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (20) modules (3) slap (1) version1 (1) slap-PDU-Contents (1) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS

    UEAggregateMaximumBitrate,
    Cause,
    Cdma2000HORequiredIndication,
    Cdma2000HOStatus,
    Cdma2000OneXSRVCCInfo,
    Cdma2000OneXRAND,
    Cdma2000PDU,
    Cdma2000RATType,
    Cdma2000SectorID,
    CriticalityDiagnostics,
    Direct-Forwarding-Path-Availability,
    Global-ENB-ID,
    EUTRAN-CGI,
    ENBname,
    ENB-StatusTransfer-TransparentContainer,
    ENB-UE-S1AP-ID,
    GTP-TEID,
    GUMMEI,
    HandoverRestrictionList,
    HandoverType,
    MMENAME,
    MME-UE-S1AP-ID,
    NAS-PDU,
    OverloadResponse,
    PagingCause,
    PagingDRX,
    PLMNidentity,
    RelativeMMECapacity,
    RequestType,
```

SAE-Bearer-ID,
 SAE-BearerLevelQoSParameters,
 SAEBearerList,
 SecurityInfo,
 SecurityInformation,
 ServedGUMMEIs,
 ServedPLMNs,
 SourceBSS-ToTargetBSS-TransparentContainer,
 SourceeNodeB-ToTargeteNodeB-TransparentContainer,
 SourceRNC-ToTargetRNC-TransparentContainer,
 SubscriberProfileIDforRFP,
 SupportedTAs,
 TAI,
 TargetBSS-ToSourceBSS-TransparentContainer,
 TargeteNodeB-ToSourceeNodeB-TransparentContainer,
 TargetID,
 TargetRNC-ToSourceRNC-TransparentContainer,
 TimeToWait,
 TraceActivation,
 TraceReference,
 TransportLayerAddress,
 UEIdentityIndexValue,
 UEPagingID,
 UERadioCapability,
 UE-S1AP-IDs,
 UE-associatedLogicalS1-ConnectionItem,
 S-TMSI

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-uAggregateMaximumBitrate,
 id-Cause,
 id-cdma2000HORequiredIndication,
 id-cdma2000HOStatus,
 id-cdma2000OneXSRVCCInfo,
 id-cdma2000OneXRAND,
 id-cdma2000PDU,
 id-cdma2000RATType,
 id-cdma2000SectorID,
 id-CriticalityDiagnostics,

id-Direct-Forwarding-Path-Availability,
id-Global-ENB-ID,
id-EUTRAN-CGI,
id-eNBname,
id-eNB-StatusTransfer-TransparentContainer,
id-eNB-UE-S1AP-ID,
id-GERANToLTEHOInformationRes,
id-GUMMEI-ID,
id-HandoverRestrictionList,
id-HandoverType,
id-InitialContextSetup,
id-Intra-LTEHOInformationReq,
id-Intra-LTEHOInformationRes,
id-LTEtoGERANHOInformationReq,
id-LTEtoGERANHOInformationRes,
id-LTEtoUTRANHOInformationReq,
id-LTEtoUTRANHOInformationRes,
id-MMEname,
id-MME-UE-S1AP-ID,
id-NAS-PDU,
id-OverloadResponse,
id-pagingCause,
id-pagingDRX,
id-RelativeMMECapacity,
id-RequestType,
id-SAEBearerAdmittedItem,
id-SAEBearerAdmittedList,
id-SAEBearerDataForwardingItem,
id-SAEBearerFailedToModifyList,
id-SAEBearerFailedToReleaseList,
id-SAEBearerFailedtoSetupItemHOReqAck,
id-SAEBearerFailedToSetupListBearerSures,
id-SAEBearerFailedToSetupListCtxtSures,
id-SAEBearerFailedToSetupListHOReqAck, id-SAEBearerFailedToSwitchDLList,
id-SAEBearerModify,
id-SAEBearerModifyItemBearerModRes,
id-SAEBearerModifyListBearerModRes,
id-SAEBearerRelease,
id-SAEBearerReleaseItemBearerRelComp,
id-SAEBearerReleaseItemHOCmd,
id-SAEBearerReleaseListBearerRelComp,
id-SAEBearerReleaseRequest,
id-SAEBearerSetup,
id-SAEBearerSetupItemBearerSures,
id-SAEBearerSetupItemCtxtSures,
id-SAEBearerSetupListBearerSures,
id-SAEBearerSetupListCtxtSures,
id-SAEBearerSubjecttoDataForwardingList,
id-SAEBearerToBeModifiedItemBearerModReq,
id-SAEBearerToBeModifiedListBearerModReq,
id-SAEBearerToBeReleasedList,
id-SAEBearerToBeSetupItemBearerSReq,
id-SAEBearerToBeSetupItemCtxtSReq,
id-SAEBearerToBeSetupItemHOReq,

```

id-SAEBearerToBeSetupListBearerSReq,
id-SAEBearerToBeSetupListCtxtSReq,
id-SAEBearerToBeSetupListHReq,
id-SAEBearerToBeSwitchedDLItem,
id-SAEBearerToBeSwitchedDLList,
id-SAEBearerToBeSwitchedULList,
id-SAEBearerToBeSwitchedULItem,
id-SAEBearerToReleaseListHOCmd,
id-SecurityInfo,
id-Security-Information,
id-ServedGUMMEIs,
id-ServedPLMNs,
id-SourceeNodeB-ToTargeteNodeB-TransparentContainer,
id-SourceMME-UE-S1AP-ID,
id-SubscriberProfileIDforRFP,
id-SupportedTAs,
id-S-TMSI,
id-TAI,
id-TAIItem,
id-TAIList,
id-TargetID,
id-TimeToWait,
id-TraceActivation,
id-TraceReference,
id-UEIdentityIndexValue,
id-UEPagingID,
id-UERadioCapability,
id-UTRANToLTEHOInformationRes,
id-UE-associatedLogicalS1-ConnectionListResAck,
id-UE-associatedLogicalS1-ConnectionItem,
id-UE-S1AP-IDs,
id-ResetType,
maxnoofTAI,
maxNrOfErrors,
maxNrOfSAEBs,
maxNrOfIndividualS1ConnectionsToReset

```

FROM S1AP-Constants;

```

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

```

```

SAEB-IE-ContainerList          { S1AP-PROTOCOL-IES      : IEsSetParam } ::= ProtocolIE-ContainerList    { 1, maxNrOfSAEBs, {IEsSetParam}
}
SAEB-IE-ContainerPairList     { S1AP-PROTOCOL-IES-PAIR : IEsSetParam } ::= ProtocolIE-ContainerPairList { 1, maxNrOfSAEBs, {IEsSetParam}
}
ProtocolError-IE-ContainerList { S1AP-PROTOCOL-IES      : IEsSetParam } ::= ProtocolIE-ContainerList    { 1, maxNrOfSAEBs, {IEsSetParam}
}

```

```

-- *****

```

```

--
-- HANOVER PREPARATION ELEMNTARY PROCEDURE
--
-- *****
-- *****
-- Handover Required
--
-- *****

HandoverRequired ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container          { { HandoverRequiredIEs } },
    ...
}

HandoverRequiredIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID          PRESENCE mandatory } |
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID          PRESENCE mandatory } |
    { ID id-HandoverType            CRITICALITY reject  TYPE HandoverType            PRESENCE mandatory } |
    { ID id-Cause                    CRITICALITY ignore TYPE Cause                    PRESENCE mandatory } |
    { ID id-TargetID                 CRITICALITY reject TYPE TargetID                 PRESENCE mandatory } |
    { ID id-TAI                      CRITICALITY reject TYPE TAI                      PRESENCE mandatory } |
    { ID id-Direct-Forwarding-Path-Availability CRITICALITY ignore TYPE Direct-Forwarding-Path-Availability PRESENCE optional } |
    { ID id-Intra-LTEHOInformationReq CRITICALITY reject TYPE Intra-LTEHOInformationReq PRESENCE conditional
    -- This IE shall be present if Handover Type IE is set to value 'IntraLTE' -- } |
    { ID id-LTEtoUTRANHOInformationReq CRITICALITY reject TYPE LTEtoUTRANHOInformationReq PRESENCE conditional
    -- This IE shall be present if the Handover Type IE is set to value 'LTEtoUTRAN' -- } |
    { ID id-LTEtoGERANHOInformationReq CRITICALITY reject TYPE LTEtoGERANHOInformationReq PRESENCE conditional
    -- This IE shall be present if the Handover Type IE is set to value 'LTEtoGERAN' -- } |
    ...
}

Intra-LTEHOInformationReq ::= SEQUENCE {
    sourceeNodeB-ToTargeteNodeB-TransparentContainer          SourceeNodeB-ToTargeteNodeB-TransparentContainer,
    iE-Extensions          ProtocolExtensionContainer { { Intra-LTEHOInformationReq-ExtIEs } }          OPTIONAL,
    ...
}

Intra-LTEHOInformationReq-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

LTEtoUTRANHOInformationReq ::= SEQUENCE {
    sourceRNC-ToTargetRNC-TransparentContainer          SourceRNC-ToTargetRNC-TransparentContainer,
    iE-Extensions          ProtocolExtensionContainer { { LTEtoUTRANHOInformationReq-ExtIEs } }          OPTIONAL,
    ...
}

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

```

```

LTEToGERANHOInformationReq ::= SEQUENCE {
    sourceBSS-ToTargetBSS-TransparentContainer      SourceBSS-ToTargetBSS-TransparentContainer,
    IE-Extensions                                  ProtocolExtensionContainer { {LTEToGERANHOInformationReq-ExtIEs} } OPTIONAL,
    ...
}

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

-- *****
--
-- 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-SAEBearerSubjecttoDataForwardingList
    PRESENCE optional } |
    { ID id-SAEBeareertoReleaseListHOCmd
    CRITICALITY ignore  TYPE SAEBeareertoReleaseListHOCmd          PRESENCE optional } |
    { ID id-Intra-LTEHOInformationRes
    CRITICALITY reject  TYPE Intra-LTEHOInformationRes          PRESENCE conditional
    -- This IE shall be present if Handover Type IE is set to value 'IntraLTE' -- } |
    { ID id-LTEToUTRANHOInformationRes
    CRITICALITY reject  TYPE LTEToUTRANHOInformationRes          PRESENCE conditional
    -- This IE shall be present if the Handover Type IE is set to value 'LTEToUTRAN' -- } |
    { ID id-LTEToGERANHOInformationRes
    CRITICALITY reject  TYPE LTEToGERANHOInformationRes          PRESENCE conditional
    -- This IE shall be present if the Handover Type IE is set to value 'LTEToGERAN' -- } |
    { ID id-CriticalityDiagnostics    CRITICALITY ignore  TYPE CriticalityDiagnostics    PRESENCE optional },
    ...
}

SAEBearerSubjecttoDataForwardingList ::= SAE-IE-ContainerList { {SAEBearerDataForwardingItemIEs} }

SAEBearerDataForwardingItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SAEBearerDataForwardingItem
    CRITICALITY ignore  TYPE SAEBearerDataForwardingItem          PRESENCE mandatory },
    ...
}

SAEBearerDataForwardingItem ::= SEQUENCE {
    SAE-Bearer-ID          SAE-Bearer-ID,
    dL-transportLayerAddress      TransportLayerAddress,
    dL-gTP-TEID              GTP-TEID,
    IE-Extensions            ProtocolExtensionContainer { { SAEBearerDataForwardingItem-ExtIEs} } OPTIONAL,
    ...
}

```

```

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

SAEBearerToReleaseListHOCmd ::= SAEB-IE-ContainerList { {SAEBearerReleaseItemHOCmdIEs} }

SAEBearerReleaseItemHOCmdIEs S1AP-PROTOCOL-IES ::= {
  { ID id-SAEBearerReleaseItemHOCmd          CRITICALITY ignore  TYPE SAEBearerReleaseItemHOCmd          PRESENCE mandatory },
  ...
}

SAEBearerReleaseItemHOCmd ::= SEQUENCE {
  sAE-Bearer-ID          SAE-Bearer-ID,
  iE-Extensions          ProtocolExtensionContainer { { SAEBearerReleaseItemHOCmd-ExtIEs } }      OPTIONAL,
  ...
}

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

Intra-LTEHOInformationRes ::= SEQUENCE {
  targeteNodeB-ToSourceeNodeB-TransparentContainer          TargeteNodeB-ToSourceeNodeB-TransparentContainer,
  iE-Extensions          ProtocolExtensionContainer { {Intra-LTEHOInformationRes-ExtIEs} }      OPTIONAL,
  ...
}

Intra-LTEHOInformationRes-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
  ...
}

LTEToUTRANHOInformationRes ::= SEQUENCE {
  targetRNC-ToSourceRNC-TransparentContainer          TargetRNC-ToSourceRNC-TransparentContainer,
  iE-Extensions          ProtocolExtensionContainer { {LTEToUTRANHOInformationRes-ExtIEs} }      OPTIONAL,
  ...
}

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

LTEToGERANHOInformationRes ::= SEQUENCE {
  targetBSS-ToSourceBSS-TransparentContainer          TargetBSS-ToSourceBSS-TransparentContainer,
  iE-Extensions          ProtocolExtensionContainer { {LTEToGERANHOInformationRes-ExtIEs} }      OPTIONAL,
  ...
}

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

-- *****
--
-- Handover Preparation Failure

```

```

--
-- *****
HandoverPreparationFailure ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { { HandoverPreparationFailureIEs } },
    ...
}

HandoverPreparationFailureIEs 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-CriticalityDiagnostics  CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional  },
    ...
}

-- *****
--
-- HANDOVER RESOURCE ALLOCATION ELEMENTARY PROCEDURE
--
-- *****
--
-- *****
--
-- Handover Request
--
-- *****

HandoverRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { { HandoverRequestIEs } },
    ...
}

HandoverRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID          PRESENCE mandatory } |
    { ID id-HandoverType           CRITICALITY reject  TYPE HandoverType           PRESENCE mandatory } |
    { ID id-Cause                   CRITICALITY ignore  TYPE Cause                   PRESENCE mandatory } |
    { ID id-uEAggregateMaximumBitrate CRITICALITY reject  TYPE UEAggregateMaximumBitrate PRESENCE mandatory } |
    { ID id-SABearerToBeSetupListHReq CRITICALITY reject  TYPE SABearerToBeSetupListHReq PRESENCE mandatory } |
    { ID id-SourceeNodeB-ToTargeteNodeB-TransparentContainer CRITICALITY reject  TYPE SourceeNodeB-ToTargeteNodeB-TransparentContainer 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 },
    ...
}

SABearerToBeSetupListHReq ::= SAEB-IE-ContainerList { { SABearerToBeSetupItemHReqIEs } }

SABearerToBeSetupItemHReqIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SABearerToBeSetupItemHReq CRITICALITY reject  TYPE SABearerToBeSetupItemHReq PRESENCE mandatory },
    ...
}

```

```

SAEBearerToBeSetupItemHOReq ::= SEQUENCE {
    sAE-Bearer-ID                SAE-Bearer-ID,
    transportLayerAddress        TransportLayerAddress,
    gTP-TEID                     GTP-TEID,
    sAE-BearerlevelQoSParameters SAE-BearerLevelQoSParameters,
    iE-Extensions                ProtocolExtensionContainer { {SAEBearerToBeSetupItemHOReq-ExtIEs} } OPTIONAL,
    ...
}

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

-- *****
--
-- Handover Request Acknowledge
--
-- *****

HandoverRequestAcknowledge ::= SEQUENCE {
    protocolIEs        ProtocolIE-Container    { {HandoverRequestAcknowledgeIEs} },
    ...
}

HandoverRequestAcknowledgeIEs 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-SAEBearerAdmittedList          CRITICALITY ignore TYPE SAEBearerAdmittedList          PRESENCE mandatory } |
    { ID id-SAEBearerFailedToSetupListHOReqAck CRITICALITY ignore TYPE SAEBearerFailedtoSetupListHOReqAck PRESENCE mandatory } |
optional
} |
    { ID id-Intra-LTEHOInformationRes      CRITICALITY reject TYPE Intra-LTEHOInformationRes      PRESENCE conditional
    -- This IE shall be present if Handover Type IE is set to value 'IntraLTE' -- } |
    { ID id-UTRANToLTEHOInformationRes     CRITICALITY reject TYPE UTRANToLTEHOInformationRes     PRESENCE conditional
    -- This IE shall be present if the Handover Type IE is set to value 'UTRANToLTE' -- } |
    { ID id-GERANToLTEHOInformationRes     CRITICALITY reject TYPE GERANToLTEHOInformationRes     PRESENCE conditional
    -- This IE shall be present if the Handover Type IE is set to value 'GERANToLTE' -- } |
    { ID id-CriticalityDiagnostics         CRITICALITY ignore TYPE CriticalityDiagnostics         PRESENCE optional },
    ...
}

SAEBearerAdmittedList ::= SAEB-IE-ContainerList { {SAEBearerAdmittedItemIEs} }

SAEBearerAdmittedItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SAEBearerAdmittedItem          CRITICALITY ignore TYPE SAEBearerAdmittedItem          PRESENCE mandatory },
    ...
}

SAEBearerAdmittedItem ::= SEQUENCE {
    sAE-Bearer-ID                SAE-Bearer-ID,
    transportLayerAddress        TransportLayerAddress,
    gTP-TEID                     GTP-TEID,
    dL-transportLayerAddress      TransportLayerAddress OPTIONAL,
}

```

```

    dL-gTP-TEID                GTP-TEID    OPTIONAL,
    iE-Extensions              ProtocolExtensionContainer { {SAEBearerAdmittedItem-ExtIEs} }    OPTIONAL,
    ...
}

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

SAEBearerFailedtoSetupListHOREqAck ::= SAEB-IE-ContainerList { {SAEBearerFailedtoSetupItemHOREqAckIEs} }

SAEBearerFailedtoSetupItemHOREqAckIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SAEBearerFailedtoSetupItemHOREqAck          CRITICALITY ignore  TYPE SAEBearerFailedToSetupItemHOREqAck          PRESENCE mandatory },
    ...
}

SAEBearerFailedToSetupItemHOREqAck ::= SEQUENCE {
    sAE-Bearer-ID                SAE-Bearer-ID,
    cause                        Cause,
    iE-Extensions              ProtocolExtensionContainer { { SAEBearerFailedToSetupItemHOREqAckExtIEs } }    OPTIONAL,
    ...
}

SAEBearerFailedToSetupItemHOREqAckExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

UTRANToLTEHOInformationRes ::= SEQUENCE {
    targetRNC-ToSourceRNC-TransparentContainer          TargetRNC-ToSourceRNC-TransparentContainer,
    iE-Extensions              ProtocolExtensionContainer { {UTRANToLTEHOInformationRes-ExtIEs} }    OPTIONAL,
    ...
}

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

GERANToLTEHOInformationRes ::= SEQUENCE {
    targetBSS-ToSourceBSS-TransparentContainer          TargetBSS-ToSourceBSS-TransparentContainer,
    iE-Extensions              ProtocolExtensionContainer { {GERANToLTEHOInformationRes-ExtIEs} }    OPTIONAL,
    ...
}

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

-- *****
--
-- Handover Failure
--
-- *****

```

```

HandoverFailure ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { { HandoverFailureIEs } },
    ...
}

HandoverFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID          PRESENCE mandatory } |
    { ID id-Cause                    CRITICALITY ignore  TYPE Cause                    PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics    CRITICALITY ignore  TYPE CriticalityDiagnostics    PRESENCE optional  },
    ...
}

-- *****
--
-- HANDOVER NOTIFICATION ELEMENTARY PROCEDURE
--
-- *****
--
-- *****
--
-- Handover Notify
--
-- *****

HandoverNotify ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { { HandoverNotifyIEs } },
    ...
}

HandoverNotifyIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID          PRESENCE mandatory } |
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID          PRESENCE mandatory } |
    { ID id-EUTRAN-CGI              CRITICALITY ignore  TYPE EUTRAN-CGI              PRESENCE mandatory },
    ...
}

-- *****
--
-- 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-SABearerToBeSwitchedDLList CRITICALITY reject TYPE SABearerToBeSwitchedDLList 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},
    ...
}

SABearerToBeSwitchedDLList ::= SAEB-IE-ContainerList { {SABearerToBeSwitchedDLItemIEs} }

SABearerToBeSwitchedDLItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SABearerToBeSwitchedDLItem CRITICALITY reject TYPE SABearerToBeSwitchedDLItem PRESENCE mandatory },
    ...
}

SABearerToBeSwitchedDLItem ::= SEQUENCE {
    sAE-Bearer-ID          SAE-Bearer-ID,
    transportLayerAddress  TransportLayerAddress,
    gTP-TEID               GTP-TEID,
    iE-Extensions          ProtocolExtensionContainer { { SABearerToBeSwitchedDLItem-ExtIEs } } OPTIONAL,
    ...
}

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

-- *****
--
-- Path Switch Request Acknowledge
--
-- *****

PathSwitchRequestAcknowledge ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container { { PathSwitchRequestAcknowledgeIEs } },
    ...
}

PathSwitchRequestAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY 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-SABearerToBeSwitchedULList CRITICALITY ignore TYPE SABearerToBeSwitchedULList PRESENCE optional }|
    { ID id-SABearerFailedToSwitchDLList CRITICALITY ignore TYPE SABearerList PRESENCE optional }|
    { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional },
    ...
}

SABearerToBeSwitchedULList ::= SAEB-IE-ContainerList { {SABearerToBeSwitchedULItemIEs} }

SABearerToBeSwitchedULItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SABearerToBeSwitchedULItem CRITICALITY ignore TYPE SABearerToBeSwitchedULItem PRESENCE mandatory },
    ...
}

```

```

SAEBearerToBeSwitchedULItem ::= SEQUENCE {
    sAE-Bearer-ID          SAE-Bearer-ID,
    transportLayerAddress TransportLayerAddress,
    gTP-TEID              GTP-TEID,
    iE-Extensions        ProtocolExtensionContainer { { SAEBearerToBeSwitchedULItem-ExtIEs } } OPTIONAL,
    ...
}

SAEBearerToBeSwitchedULItem-ExtIEs SIAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- Path Switch Request Failure
--
-- *****

PathSwitchRequestFailure ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { { PathSwitchRequestFailureIEs } },
    ...
}

PathSwitchRequestFailureIEs SIAP-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-CriticalityDiagnostics  CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional },
    ...
}

-- *****
--
-- HANDOVER CANCEL ELEMENTARY PROCEDURE
--
-- *****

-- *****
--
-- Handover Cancel
--
-- *****

HandoverCancel ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { { HandoverCancelIEs } },
    ...
}

HandoverCancelIEs SIAP-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 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-CriticalityDiagnostics  CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional },
    ...
}

-- *****
--
-- SAE BEARER SETUP ELEMENTARY PROCEDURE
--
-- *****

-- *****
--
-- SAE Bearer Setup Request
--
-- *****

SAEBearerSetupRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { {SAEBearerSetupRequestIEs} },
    ...
}

SAEBearerSetupRequestIEs 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-SAEBearerToBeSetupListBearerSReq CRITICALITY reject  TYPE SAEBearerToBeSetupListBearerSReq PRESENCE mandatory } |
    { ID id-NAS-PDU                  CRITICALITY ignore  TYPE NAS-PDU                  PRESENCE mandatory },
    ...
}

SAEBearerToBeSetupListBearerSReq ::= SEQUENCE (SIZE(1.. maxNrOfSAEBs)) OF ProtocolIE-SingleContainer { {SAEBearerToBeSetupItemBearerSReqIEs} }

SAEBearerToBeSetupItemBearerSReqIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SAEBearerToBeSetupItemBearerSReq CRITICALITY reject  TYPE SAEBearerToBeSetupItemBearerSReq PRESENCE mandatory },
    ...
}

SAEBearerToBeSetupItemBearerSReq ::= SEQUENCE {

```

```

    sAE-Bearer-ID                SAE-Bearer-ID,
    sAE-BearerLevelQoSParameters SAE-BearerLevelQoSParameters,
    transportLayerAddress        TransportLayerAddress,
    gTP-TEID                      GTP-TEID,
    iE-Extensions                ProtocolExtensionContainer { {SAEBearerToBeSetupItemBearerSUReqExtIEs} } OPTIONAL,
    ...
}

SAEBearerToBeSetupItemBearerSUReqExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- SAE Bearer Setup Response
--
-- *****

SAEBearerSetupResponse ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { {SAEBearerSetupResponseIEs} },
    ...
}

SAEBearerSetupResponseIEs 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-SAEBearerSetupListBearerSURES          CRITICALITY ignore TYPE SAEBearerSetupListBearerSURES          PRESENCE optional }|
    { ID id-SAEBearerFailedToSetupListBearerSURES          CRITICALITY ignore TYPE SAEBearerList          PRESENCE optional }|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore TYPE CriticalityDiagnostics          PRESENCE optional },
    ...
}

SAEBearerSetupListBearerSURES ::= SEQUENCE (SIZE(1.. maxNrOfSAEBs)) OF ProtocolIE-SingleContainer { {SAEBearerSetupItemBearerSURESIEs} }

SAEBearerSetupItemBearerSURESIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SAEBearerSetupItemBearerSURES          CRITICALITY ignore TYPE SAEBearerSetupItemBearerSURES          PRESENCE mandatory },
    ...
}

SAEBearerSetupItemBearerSURES ::= SEQUENCE {
    sAE-Bearer-ID                SAE-Bearer-ID,
    transportLayerAddress        TransportLayerAddress,
    gTP-TEID                      GTP-TEID,
    iE-Extensions                ProtocolExtensionContainer { {SAEBearerSetupItemBearerSURESExtIEs} } OPTIONAL,
    ...
}

SAEBearerSetupItemBearerSURESExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```

-- *****
--
-- SAE BEARER MODIFY ELEMENTARY PROCEDURE
--
-- *****

-- *****
--
-- SAE Bearer Modify Request
--
-- *****

SAEBearerModifyRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container          { {SAEBearerModifyRequestIEs} },
    ...
}

SAEBearerModifyRequestIEs 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-SAEBearerToBeModifiedListBearerModReq CRITICALITY reject  TYPE SAEBearerToBeModifiedListBearerModReq PRESENCE mandatory } |
    { ID id-NAS-PDU                  CRITICALITY ignore  TYPE NAS-PDU                  PRESENCE mandatory },
    ...
}

SAEBearerToBeModifiedListBearerModReq ::= SEQUENCE (SIZE(1.. maxNrOfSAEBs)) OF ProtocolIE-SingleContainer {
    {SAEBearerToBeModifiedItemBearerModReqIEs} }

SAEBearerToBeModifiedItemBearerModReqIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SAEBearerToBeModifiedItemBearerModReq CRITICALITY reject  TYPE SAEBearerToBeModifiedItemBearerModReq PRESENCE mandatory },
    ...
}

SAEBearerToBeModifiedItemBearerModReq ::= SEQUENCE {
    sAE-Bearer-ID          SAE-Bearer-ID,
    sAE-BearerLevelQoSParameters          SAE-BearerLevelQoSParameters,
    iE-Extensions          ProtocolExtensionContainer { {SAEBearerToBeModifyItemBearerModReqExtIEs} } OPTIONAL,
    ...
}

SAEBearerToBeModifyItemBearerModReqExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```

-- *****
--
-- SAE Bearer Modify Response
--
-- *****

SAEBearerModifyResponse ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container          { {SAEBearerModifyResponseIEs} },
    ...
}

SAEBearerModifyResponseIEs 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-SAEBearerModifyListBearerModRes  CRITICALITY ignore  TYPE SAEBearerModifyListBearerModRes  PRESENCE optional }|
    { ID id-SAEBearerFailedToModifyList      CRITICALITY ignore  TYPE SAEBearerList          PRESENCE optional }|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics          PRESENCE optional },
    ...
}

SAEBearerModifyListBearerModRes ::= SEQUENCE (SIZE(1.. maxNrOfSAEBs)) OF ProtocolIE-SingleContainer { {SAEBearerModifyItemBearerModResIEs} }

SAEBearerModifyItemBearerModResIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SAEBearerModifyItemBearerModRes  CRITICALITY ignore  TYPE SAEBearerModifyItemBearerModRes  PRESENCE mandatory },
    ...
}

SAEBearerModifyItemBearerModRes ::= SEQUENCE {
    sAE-Bearer-ID          SAE-Bearer-ID,
    iE-Extensions          ProtocolExtensionContainer { {SAEBearerModifyItemBearerModResExtIEs} } OPTIONAL,
    ...
}

SAEBearerModifyItemBearerModResExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```

-- *****
--
-- SAE BEARER RELEASE ELEMENTARY PROCEDURE
--
-- *****
--
-- *****
--
-- SAE Bearer Release Command
--
-- *****

SAEBearerReleaseCommand ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { {SAEBearerReleaseCommandIEs} },
    ...
}

SAEBearerReleaseCommandIEs SlAP-PROTOCOL-IES ::= {
    { ID id-MME-UE-SlAP-ID          CRITICALITY reject  TYPE MME-UE-SlAP-ID          PRESENCE mandatory }|
    { ID id-eNB-UE-SlAP-ID          CRITICALITY reject  TYPE ENB-UE-SlAP-ID          PRESENCE mandatory }|
    { ID id-uEAggregateMaximumBitrate  CRITICALITY reject  TYPE UEAggregateMaximumBitrate  PRESENCE optional }|
    { ID id-SAEBearerToBeReleasedList  CRITICALITY ignore  TYPE SAEBearerList            PRESENCE mandatory } ,
    ...
}

-- *****
--
-- SAE Bearer Release Response
--
-- *****

SAEBearerReleaseResponse ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { { SAEBearerReleaseResponseIEs } },
    ...
}

SAEBearerReleaseResponseIEs SlAP-PROTOCOL-IES ::= {
    { ID id-MME-UE-SlAP-ID          CRITICALITY reject  TYPE MME-UE-SlAP-ID          PRESENCE mandatory }|
    { ID id-eNB-UE-SlAP-ID          CRITICALITY reject  TYPE ENB-UE-SlAP-ID          PRESENCE mandatory }|
    { ID id-SAEBearerReleaseListBearerRelComp  CRITICALITY ignore  TYPE SAEBearerReleaseListBearerRelComp  PRESENCE optional }|
    { ID id-SAEBearerFailedToReleaseList  CRITICALITY ignore  TYPE SAEBearerList            PRESENCE optional }|
    { ID id-CriticalityDiagnostics  CRITICALITY ignore  TYPE CriticalityDiagnostics  PRESENCE optional } ,
    ...
}

SAEBearerReleaseListBearerRelComp ::= SEQUENCE (SIZE(1.. maxNrOfSAEBs)) OF ProtocolIE-SingleContainer { {SAEBearerReleaseItemBearerRelCompIEs} }

SAEBearerReleaseItemBearerRelCompIEs SlAP-PROTOCOL-IES ::= {
    { ID id-SAEBearerReleaseItemBearerRelComp  CRITICALITY ignore  TYPE SAEBearerReleaseItemBearerRelComp  PRESENCE mandatory },
    ...
}

```

```

SAEBearerReleaseItemBearerRelComp ::= SEQUENCE {
    sAE-Bearer-ID          SAE-Bearer-ID,
    iE-Extensions          ProtocolExtensionContainer { {SAEBearerReleaseItemBearerRelCompExtIEs} } OPTIONAL,
    ...
}

SAEBearerReleaseItemBearerRelCompExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- SAE BEARER RELEASE REQUEST ELEMENTARY PROCEDURE
--
-- *****
--
-- *****
--
-- SAE Bearer Release Request
--
-- *****

SAEBearerReleaseRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { {SAEBearerReleaseRequestIEs} },
    ...
}

SAEBearerReleaseRequestIEs 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-SAEBearerToBeReleasedList CRITICALITY ignore TYPE SAEBearerList          PRESENCE mandatory },
    ...
}
-- *****
--
-- INITIAL CONTEXT SETUP ELEMENTARY PROCEDURE
--
-- *****
--
-- *****
--
-- Initial Context Setup Request
--
-- *****

InitialContextSetupRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { {InitialContextSetupRequestIEs} },
    ...
}

InitialContextSetupRequestIEs S1AP-PROTOCOL-IES ::= {

```

```

{ ID id-MME-UE-SlAP-ID          CRITICALITY reject  TYPE MME-UE-SlAP-ID          PRESENCE mandatory }|
{ ID id-eNB-UE-SlAP-ID          CRITICALITY reject  TYPE ENB-UE-SlAP-ID          PRESENCE mandatory }|
{ ID id-uEAggregateMaximumBitrate  CRITICALITY reject  TYPE UEAggregateMaximumBitrate  PRESENCE mandatory }|
{ ID id-SABearerToBeSetupListCtxtSReq  CRITICALITY reject  TYPE SABearerToBeSetupListCtxtSReq  PRESENCE mandatory }|
{ ID id-Security-Information      CRITICALITY reject  TYPE SecurityInformation      PRESENCE mandatory }|
{ ID id-TraceActivation          CRITICALITY ignore  TYPE TraceActivation          PRESENCE optional }|
{ ID id-HandoverRestrictionList    CRITICALITY ignore  TYPE HandoverRestrictionList    PRESENCE optional }|
{ ID id-NAS-PDU                  CRITICALITY ignore  TYPE NAS-PDU                  PRESENCE optional }|
{ ID id-UERadioCapability          CRITICALITY ignore  TYPE UERadioCapability          PRESENCE optional }|
{ ID id-SubscriberProfileIDforRFP    CRITICALITY ignore  TYPE SubscriberProfileIDforRFP    PRESENCE optional },
...
}

SABearerToBeSetupListCtxtSReq ::= SEQUENCE (SIZE(1.. maxNrOfSAEBs)) OF ProtocolIE-SingleContainer { {SABearerToBeSetupItemCtxtSReqIEs} }

SABearerToBeSetupItemCtxtSReqIEs  SlAP-PROTOCOL-IES ::= {
  { ID id-SABearerToBeSetupItemCtxtSReq  CRITICALITY reject  TYPE SABearerToBeSetupItemCtxtSReq  PRESENCE mandatory },
  ...
}

SABearerToBeSetupItemCtxtSReq ::= SEQUENCE {
  sAE-Bearer-ID          SAE-Bearer-ID,
  sAE-BearerLevelQoSParameters          SAE-BearerLevelQoSParameters,
  transportLayerAddress          TransportLayerAddress,
  gTP-TEID          GTP-TEID,
  iE-Extensions          ProtocolExtensionContainer { {SABearerToBeSetupItemCtxtSReqExtIEs} } OPTIONAL,
  ...
}

SABearerToBeSetupItemCtxtSReqExtIEs SlAP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- Initial Context Setup Response
--
-- *****

InitialContextSetupResponse ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container          { {InitialContextSetupResponseIEs} },
  ...
}

InitialContextSetupResponseIEs SlAP-PROTOCOL-IES ::= {
  { ID id-MME-UE-SlAP-ID          CRITICALITY reject  TYPE MME-UE-SlAP-ID          PRESENCE mandatory }|
  { ID id-eNB-UE-SlAP-ID          CRITICALITY reject  TYPE ENB-UE-SlAP-ID          PRESENCE mandatory }|
  { ID id-SABearerSetupListCtxtSRes          CRITICALITY ignore  TYPE SABearerSetupListCtxtSRes          PRESENCE optional }|
  { ID id-SABearerFailedToSetupListCtxtSRes          CRITICALITY ignore  TYPE SABearerList          PRESENCE optional }|
}

```

```

    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional  },
    ...
}

SAEBearerSetupListCtxtSURES ::= SEQUENCE (SIZE(1.. maxNrOfSAEBs)) OF ProtocolIE-SingleContainer { {SAEBearerSetupItemCtxtSURESIES} }

SAEBearerSetupItemCtxtSURESIES S1AP-PROTOCOL-IES ::= {
  { ID id-SAEBearerSetupItemCtxtSURES  CRITICALITY ignore      TYPE SAEBearerSetupItemCtxtSURES  PRESENCE mandatory },
  ...
}

SAEBearerSetupItemCtxtSURES ::= SEQUENCE {
  sAE-Bearer-ID          SAE-Bearer-ID,
  transportLayerAddress  TransportLayerAddress,
  gTP-TEID               GTP-TEID,
  iE-Extensions          ProtocolExtensionContainer { {SAEBearerSetupItemCtxtSURESExtIES} } OPTIONAL,
  ...
}

SAEBearerSetupItemCtxtSURESExtIES S1AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- Initial Context Setup Failure
--
-- *****

InitialContextSetupFailure ::= SEQUENCE {
  protocolIES          ProtocolIE-Container      { {InitialContextSetupFailureIES} },
  ...
}

InitialContextSetupFailureIES 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-CriticalityDiagnostics  CRITICALITY ignore  TYPE CriticalityDiagnostics  PRESENCE optional  },
  ...
}

-- *****
--
-- 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-pagingCause                CRITICALITY ignore TYPE PagingCause    PRESENCE mandatory } |
  { ID id-TAIList                    CRITICALITY ignore TYPE TAIList        PRESENCE mandatory },
  ...
}

TAIList ::= SEQUENCE (SIZE(1.. maxnoofTAI)) OF ProtocolIE-SingleContainer {{TAIItemIEs}}

TAIItemIEs S1AP-PROTOCOL-IES ::= {
  { ID id-TAIItem CRITICALITY ignore TYPE TAIItem PRESENCE mandatory },
  ...
}

TAIItem ::= SEQUENCE {
  tAI TAI,
  iE-Extensions ProtocolExtensionContainer { {TAIItemExtIEs} } OPTIONAL,
  ...
}

TAIItemExtIEs S1AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- UE CONTEXT RELEASE ELEMENTARY PROCEDURE
--
-- *****

-- *****
--
-- UE CONTEXT RELEASE REQUEST
--
-- *****

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

UEContextReleaseRequest-IEs S1AP-PROTOCOL-IES ::= {
  { ID id-MME-UE-S1AP-ID CRITICALITY reject TYPE MME-UE-S1AP-ID PRESENCE mandatory } |
  { ID id-eNB-UE-S1AP-ID CRITICALITY reject TYPE eNB-UE-S1AP-ID PRESENCE mandatory } |
  { ID id-Cause CRITICALITY ignore TYPE Cause PRESENCE mandatory } ,
  ...
}

-- *****

```

```

--
-- 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 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-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional  },
    ...
}

-- *****
--
-- UE Context Modification
--
-- *****

-- *****
--
-- 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-SecurityInfo            CRITICALITY reject  TYPE SecurityInfo          PRESENCE optional } |
    { ID id-SubscriberProfileIDforRFP CRITICALITY ignore TYPE SubscriberProfileIDforRFP PRESENCE optional },
    ...
}
-- *****
--
-- UE Context Modification Response
--
-- *****

UEContextModificationResponse ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { { UEContextModificationResponseIEs } },
    ...
}

UEContextModificationResponseIEs 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-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 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-CriticalityDiagnostics  CRITICALITY ignore  TYPE CriticalityDiagnostics  PRESENCE optional },
    ...
}

-- *****
--
-- 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-SlAP-ID          CRITICALITY reject  TYPE ENB-UE-SlAP-ID          PRESENCE mandatory} |
    { ID id-NAS-PDU                 CRITICALITY reject  TYPE NAS-PDU                 PRESENCE mandatory} |
    { ID id-HandoverRestrictionList CRITICALITY ignore  TYPE HandoverRestrictionList PRESENCE optional },
    ...
}

-- *****
--
-- INITIAL UE MESSAGE
--
-- *****

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

InitialUEMessage-IEs SlAP-PROTOCOL-IES ::= {
    { ID id-eNB-UE-SlAP-ID          CRITICALITY reject  TYPE ENB-UE-SlAP-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-S-TMSI                  CRITICALITY reject  TYPE S-TMSI                  PRESENCE optional},
    ...
}

-- *****
--
-- UPLINK NAS TRANSPORT
--
-- *****

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

UplinkNASTransport-IEs SlAP-PROTOCOL-IES ::= {
    { ID id-MME-UE-SlAP-ID          CRITICALITY reject  TYPE MME-UE-SlAP-ID          PRESENCE mandatory} |
    { ID id-eNB-UE-SlAP-ID          CRITICALITY reject  TYPE ENB-UE-SlAP-ID          PRESENCE mandatory} |
    { ID id-NAS-PDU                 CRITICALITY reject  TYPE NAS-PDU                 PRESENCE mandatory} ,
    ...
}

-- *****
--
-- NAS NON DELIVERY INDICATION
--
-- *****

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

```

```

}

NASNonDeliveryIndication-IEs S1AP-PROTOCOL-IES ::= {
  { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID          PRESENCE mandatory } |
  { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID          PRESENCE mandatory } |
  { ID id-NAS-PDU                  CRITICALITY ignore  TYPE NAS-PDU                  PRESENCE mandatory } |
  { ID id-Cause                    CRITICALITY ignore  TYPE Cause                    PRESENCE mandatory } ,
  ...
}

-- *****
--
-- RESET ELEMENTARY PROCEDURE
--
-- *****

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

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

ResetIEs S1AP-PROTOCOL-IES ::= {
  { ID id-Cause          CRITICALITY ignore  TYPE Cause          PRESENCE mandatory } |
  { ID id-ResetType      CRITICALITY reject  TYPE ResetType      PRESENCE mandatory } ,
  ...
}

ResetType ::= CHOICE {
  s1-Interface          ResetAll,
  partOfS1-Interface    UE-associatedLogicalS1-ConnectionListRes,
  ...
}

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

UE-associatedLogicalS1-ConnectionListRes ::= SEQUENCE (SIZE(1.. maxNrOfIndividualS1ConnectionsToReset)) OF ProtocolIE-SingleContainer { { UE-associatedLogicalS1-ConnectionItemRes } }

UE-associatedLogicalS1-ConnectionItemRes S1AP-PROTOCOL-IES ::= {
  { ID id-UE-associatedLogicalS1-ConnectionItem CRITICALITY reject  TYPE UE-associatedLogicalS1-ConnectionItem PRESENCE mandatory } ,
  ...
}

```

```

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

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

ResetAcknowledgeIEs SlAP-PROTOCOL-IES ::= {
    { ID id-UE-associatedLogicalS1-ConnectionListResAck          CRITICALITY ignore TYPE UE-associatedLogicalS1-ConnectionListResAck          PRESENCE optional } |
    { ID id-CriticalityDiagnostics          CRITICALITY ignore TYPE CriticalityDiagnostics          PRESENCE optional },
    ...
}

UE-associatedLogicalS1-ConnectionListResAck ::= SEQUENCE (SIZE(1.. maxNrOfIndividualS1ConnectionsToReset)) OF ProtocolIE-SingleContainer { { UE-associatedLogicalS1-ConnectionItemResAck } }

UE-associatedLogicalS1-ConnectionItemResAck SlAP-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 SlAP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY ignore TYPE MME-UE-S1AP-ID          PRESENCE optional } |
    { ID id-eNB-UE-S1AP-ID          CRITICALITY ignore TYPE ENB-UE-S1AP-ID          PRESENCE optional } |
    { ID id-Cause          CRITICALITY ignore TYPE Cause          PRESENCE optional } |
    { ID id-CriticalityDiagnostics          CRITICALITY ignore TYPE CriticalityDiagnostics          PRESENCE optional },
    ...
}

-- *****
--

```

```

-- S1 SETUP ELEMENTARY PROCEDURE
--
-- *****
-- *****
--
-- S1 Setup Request
--
-- *****

S1SetupRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container          { {S1SetupRequestIEs} },
    ...
}

S1SetupRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Global-ENB-ID          CRITICALITY reject TYPE Global-ENB-ID          PRESENCE mandatory }|
    { ID id-eNBname                CRITICALITY ignore TYPE eNBname                PRESENCE mandatory }|
    { ID id-SupportedTAS           CRITICALITY reject TYPE SupportedTAS           PRESENCE mandatory },
    ...
}

-- *****
--
-- S1 Setup Response
--
-- *****

S1SetupResponse ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container          { {S1SetupResponseIEs} },
    ...
}

S1SetupResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MMename                CRITICALITY ignore TYPE MMename                PRESENCE mandatory }|
    { ID id-ServedPLMNs           CRITICALITY reject TYPE ServedPLMNs           PRESENCE mandatory }|
    { ID id-ServedGUMMEIs         CRITICALITY reject TYPE ServedGUMMEIs         PRESENCE mandatory }|
    { ID id-RelativeMMECapacity    CRITICALITY reject TYPE RelativeMMECapacity    PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional },
    ...
}

-- *****
--
-- S1 Setup Failure
--
-- *****

S1SetupFailure ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container          { {S1SetupFailureIEs} },
    ...
}

```

```

S1SetupFailureIEs S1AP-PROTOCOL-IES ::= {
  { ID id-Cause          CRITICALITY ignore  TYPE Cause          PRESENCE mandatory }|
  { ID id-TimeToWait     CRITICALITY ignore  TYPE TimeToWait       PRESENCE optional }|
  { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional },
  ...
}

-- *****
--
-- ENB CONFIGURATION UPDATE ELEMENTARY PROCEDURE
--
-- *****

-- *****
--
-- eNB Configuration Update
--
-- *****

ENBConfigurationUpdate ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container      { {ENBConfigurationUpdateIEs} },
  ...
}

ENBConfigurationUpdateIEs S1AP-PROTOCOL-IES ::= {
  { ID id-eNBname        CRITICALITY ignore  TYPE eNBname          PRESENCE optional }|
  { ID id-SupportedTAs   CRITICALITY reject  TYPE SupportedTAs     PRESENCE optional },
  ...
}

-- *****
--
-- eNB Configuration Update Acknowledge
--
-- *****

ENBConfigurationUpdateAcknowledge ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container      { {ENBConfigurationUpdateAcknowledgeIEs} },
  ...
}

ENBConfigurationUpdateAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
  { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional },
  ...
}

-- *****
--
-- eNB Configuration Update Failure
--
-- *****

ENBConfigurationUpdateFailure ::= SEQUENCE {

```

```

    protocolIEs          ProtocolIE-Container    { {ENBConfigurationUpdateFailureIEs} },
    ...
}

ENBConfigurationUpdateFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Cause          CRITICALITY ignore  TYPE Cause          PRESENCE mandatory }|
    { ID id-TimeToWait     CRITICALITY ignore  TYPE TimeToWait        PRESENCE optional }|
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional },
    ...
}

-- *****
--
-- MME Configuration UPDATE ELEMENTARY PROCEDURE
--
-- *****
--
-- *****
--
-- MME Configuration Update
--
-- *****

MMEConfigurationUpdate ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { {MMEConfigurationUpdateIEs} },
    ...
}

MMEConfigurationUpdateIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MMENAME       CRITICALITY ignore  TYPE MMENAME          PRESENCE optional }|
    { ID id-ServedPLMNs   CRITICALITY reject  TYPE ServedPLMNs      PRESENCE optional }|
    { ID id-ServedGUMMEIs CRITICALITY reject  TYPE ServedGUMMEIs    PRESENCE optional }|
    { ID id-RelativeMMECapacity CRITICALITY reject  TYPE RelativeMMECapacity PRESENCE optional},
    ...
}

-- *****
--
-- MME Configuration Update Acknowledge
--
-- *****

MMEConfigurationUpdateAcknowledge ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { {MMEConfigurationUpdateAcknowledgeIEs} },
    ...
}

MMEConfigurationUpdateAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional },
    ...
}

```

```

-- *****
--
-- MME Configuration Update Failure
--
-- *****

MMEConfigurationUpdateFailure ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { {MMEConfigurationUpdateFailureIEs} },
    ...
}

MMEConfigurationUpdateFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Cause          CRITICALITY ignore TYPE Cause          PRESENCE mandatory } |
    { ID id-TimeToWait     CRITICALITY ignore TYPE TimeToWait     PRESENCE optional } |
    { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional },
    ...
}

-- *****
--
-- DOWNLINK S1 CDMA2000 TUNNELING ELEMENTARY PROCEDURE
--
-- *****

-- *****
--
-- Downlink S1 CDMA2000 Tunneling
--
-- *****

DownlinkS1cdma2000tunneling ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { {DownlinkS1cdma2000tunnelingIEs} },
    ...
}

DownlinkS1cdma2000tunnelingIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject TYPE MME-UE-S1AP-ID          PRESENCE mandatory } |
    { ID id-eNB-UE-S1AP-ID         CRITICALITY reject TYPE ENB-UE-S1AP-ID         PRESENCE mandatory } |
    { ID id-SABearerSubjecttoDataForwardingList CRITICALITY ignore TYPE SABearerSubjecttoDataForwardingList PRESENCE optional } |
    { ID id-cdma2000HOSTatus        CRITICALITY ignore TYPE Cdma2000HOSTatus        PRESENCE optional } |
    { ID id-cdma2000RATType         CRITICALITY reject TYPE Cdma2000RATType         PRESENCE mandatory } |
    { ID id-cdma2000PDU             CRITICALITY reject TYPE Cdma2000PDU             PRESENCE mandatory },
    ...
}

-- *****
--
-- UPLINK S1 CDMA2000 TUNNELING ELEMENTARY PROCEDURE
--
-- *****

```

```

-- Uplink S1 CDMA2000 Tunneling
--
-- *****
UplinkS1cdma2000tunneling ::= SEQUENCE {
  protocolIES          ProtocolIE-Container    { {UplinkS1cdma2000tunnelingIEs} },
  ...
}

UplinkS1cdma2000tunnelingIEs S1AP-PROTOCOL-IES ::= {
  { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID          PRESENCE mandatory } |
  { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID          PRESENCE mandatory } |
  { ID id-cdma2000RATType          CRITICALITY reject  TYPE Cdma2000RATType        PRESENCE mandatory } |
  { ID id-cdma2000SectorID         CRITICALITY reject  TYPE Cdma2000SectorID       PRESENCE mandatory } |
  { ID id-cdma2000HORequiredIndication CRITICALITY ignore  TYPE Cdma2000HORequiredIndication PRESENCE optional } |
  { ID id-cdma2000OneXSRVCCInfo    CRITICALITY ignore  TYPE Cdma2000OneXSRVCCInfo  PRESENCE optional } |
  { ID id-cdma2000OneXRAND         CRITICALITY ignore  TYPE Cdma2000OneXRAND       PRESENCE optional } |
  { ID id-cdma2000PDU              CRITICALITY reject  TYPE Cdma2000PDU            PRESENCE mandatory } ,
  ...
}

-- *****
--
-- UE CAPABILITY INFO INDICATION PROCEDURE
--
-- *****
--
-- *****
--
-- UE Capability Info Indication
--
-- *****
UECapabilityInfoIndication ::= SEQUENCE {
  protocolIES          ProtocolIE-Container    { { UECapabilityInfoIndicationIEs } },
  ...
}

UECapabilityInfoIndicationIEs S1AP-PROTOCOL-IES ::= {
  { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID          PRESENCE mandatory } |
  { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID          PRESENCE mandatory } |
  { ID id-UERadioCapability       CRITICALITY ignore  TYPE UERadioCapability       PRESENCE mandatory } ,
  ...
}

-- *****
--
-- eNB STATUS TRANSFER
--
-- *****
--
-- *****
--
-- eNB Status Transfer

```

```

--
-- *****
ENBStatusTransfer ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container          { {ENBStatusTransferIEs} },
    ...
}

ENBStatusTransferIEs SlAP-PROTOCOL-IES ::= {
    { ID id-MME-UE-SlAP-ID          CRITICALITY reject  TYPE MME-UE-SlAP-ID          PRESENCE mandatory} |
    { ID id-eNB-UE-SlAP-ID          CRITICALITY reject  TYPE ENB-UE-SlAP-ID          PRESENCE mandatory} |
    { ID id-eNB-StatusTransfer-TransparentContainer CRITICALITY reject  TYPE ENB-StatusTransfer-TransparentContainer PRESENCE mandatory} ,
    ...
}

-- *****
--
-- MME STATUS TRANSFER
--
-- *****

-- *****
--
-- MME Status Transfer
--
-- *****

MMEStatusTransfer ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container          { {MMEStatusTransferIEs} },
    ...
}

MMEStatusTransferIEs SlAP-PROTOCOL-IES ::= {
    { ID id-MME-UE-SlAP-ID          CRITICALITY reject  TYPE MME-UE-SlAP-ID          PRESENCE mandatory} |
    { ID id-eNB-UE-SlAP-ID          CRITICALITY reject  TYPE ENB-UE-SlAP-ID          PRESENCE mandatory} |
    { ID id-eNB-StatusTransfer-TransparentContainer CRITICALITY reject  TYPE ENB-StatusTransfer-TransparentContainer PRESENCE mandatory} ,
    ...
}

-- *****
--
-- Trace 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-TraceReference         CRITICALITY ignore  TYPE TraceReference          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-TraceReference         CRITICALITY ignore  TYPE TraceReference          PRESENCE mandatory } ,
  ...
}

-- *****

```

```

--
-- 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 optional } ,
    ...
}

-- *****
--
-- 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-RequestType              CRITICALITY ignore  TYPE RequestType            PRESENCE mandatory } ,
    ...
}

```

```
-- *****
--
-- Overload Start
--
-- *****

OverloadStart ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { {OverloadStartIEs} },
    ...
}

OverloadStartIEs S1AP-PROTOCOL-IES ::= {
    { ID id-OverloadResponse          CRITICALITY reject  TYPE OverloadResponse          PRESENCE mandatory  },
    ...
}

-- *****
--
-- Overload Stop
--
-- *****

OverloadStop ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { {OverloadStopIEs} },
    ...
}

OverloadStopIEs S1AP-PROTOCOL-IES ::= {
    ...
}

END
```

9.3.4 Information Element Definitions

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

SLAP-IEs {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (20) modules (3) slap (1) version1 (1) slap-IEs (2) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    id-SAEBearerInformationListItem,
    id-SAEBearerItem,
    id-Bearers-SubjectToStatusTransfer-Item,
    maxNrOfSAEBs,
    maxNrOfInterfaces,
    maxNrOfErrors,
    maxnoofBPLMNs,
    maxnoofPLMNsPerMME,
    maxnoofTACs,
    maxnoofEPLMNs,
    maxnoofEPLMNsPlusOne,
    maxnoofForbLACs,
    maxnoofForbTACs,
    maxnoofTACs,
    maxnoofGUMMEIs

FROM SLAP-Constants

    Criticality,
    ProcedureCode,
    ProtocolIE-ID,
    TriggeringMessage
FROM SLAP-CommonDataTypes

    ProtocolExtensionContainer{},
    SLAP-PROTOCOL-EXTENSION,
    ProtocolIE-SingleContainer{},
    SLAP-PROTOCOL-IES

FROM SLAP-Containers;

-- A

AllocationRetentionPriority ::= INTEGER (0..15)
```

```

-- B

Bearers-SubjectToStatusTransferList ::= SEQUENCE (SIZE(1.. maxNrOfSAEBs)) OF ProtocolIE-SingleContainer { { Bearers-SubjectToStatusTransfer-ItemIEs
} }

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

Bearers-SubjectToStatusTransfer-Item ::= SEQUENCE {
  SAE-Bearer-ID                SAE-Bearer-ID,
  uL-COUNTvalue                 COUNTvalue,
  dL-COUNTvalue                 COUNTvalue,
  iE-Extensions                 ProtocolExtensionContainer { {Bearers-SubjectToStatusTransfer-ItemExtIEs} } OPTIONAL,
  ...
}

Bearers-SubjectToStatusTransfer-ItemExtIEs SIAP-PROTOCOL-EXTENSION ::= {
  ...
}

BitRate ::= INTEGER (0..10000000000)

BPLMNs ::= SEQUENCE (SIZE(1.. maxnoofBPLMNs)) OF PLMNidentity

-- C

Cause ::= CHOICE {
  radioNetwork      CauseRadioNetwork,
  transport         CauseTransport,
  nas               CauseNas,
  protocol          CauseProtocol,
  misc              CauseMisc,
  ...
}

CauseMisc ::= ENUMERATED {
  control-processing-overload,
  not-enough-user-plane-processing-resources,
  hardware-failure,
  om-intervention,
  unspecified,
  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,
    handover-triggered,
    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,
    ...
}

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

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

CellIdentity          ::= BIT STRING (SIZE (28))

Cdma2000PDU ::= OCTET STRING

Cdma2000RATType ::= ENUMERATED {
```

```

    hRPD,
    onexRTT,
    ...
}

Cdma2000SectorID ::= OCTET STRING

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

Cdma2000HORequiredIndication ::= ENUMERATED {
    true,
    ...
}

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

Cdma2000OneXSRVCCInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

Cdma2000OneXMEID ::= OCTET STRING

Cdma2000OneXMSI ::= OCTET STRING

Cdma2000OneXPilot ::= OCTET STRING

Cdma2000OneXRAND ::= OCTET STRING

CGI ::= SEQUENCE {
    pLMNidentity          PLMNidentity,
    lAC                  LAC,
    cI                   CI,
    rAC                  RAC          OPTIONAL
}

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

COUNTvalue ::= SEQUENCE {
    pDCP-SN              PDCP-SN,
    hFN                  HFN,
    ...
}

```

```

CriticalityDiagnostics ::= SEQUENCE {
    procedureCode          ProcedureCode          OPTIONAL,
    triggeringMessage      TriggeringMessage      OPTIONAL,
    procedureCriticality   Criticality             OPTIONAL,
    iEsCriticalityDiagnostics CriticalityDiagnostics-IE-List OPTIONAL,
    iE-Extensions         ProtocolExtensionContainer {{CriticalityDiagnostics-ExtIEs}} OPTIONAL,
    ...
}

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

CriticalityDiagnostics-IE-List ::= SEQUENCE (SIZE (1..maxNrOfErrors)) OF CriticalityDiagnostics-IE-Item

CriticalityDiagnostics-IE-Item ::= SEQUENCE {
    iECriticality          Criticality,
    iE-ID                 ProtocolIE-ID,
    typeOfError           TypeOfError,
    iE-Extensions         ProtocolExtensionContainer {{CriticalityDiagnostics-IE-Item-ExtIEs}} OPTIONAL,
    ...
}

CriticalityDiagnostics-IE-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- D

DL-Forwarding ::= ENUMERATED {
    dL-Forwarding-proposed,
    ...
}

Direct-Forwarding-Path-Availability ::= ENUMERATED {
    directPathAvailable,
    ...
}

-- E

ENB-ID ::= CHOICE {
    macroENB-ID          BIT STRING (SIZE(20)),
    homeENB-ID           BIT STRING (SIZE(28)),
    ...
}

Global-ENB-ID ::= SEQUENCE {
    pLMNidentity         PLMNidentity,
    eNB-ID               ENB-ID,
    iE-Extensions        ProtocolExtensionContainer { {GlobalENB-ID-ExtIEs} } OPTIONAL,
    ...
}

```

```
GlobalENB-ID-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
  ...
}

ENB-StatusTransfer-TransparentContainer ::= SEQUENCE {
  bearers-SubjectToStatusTransferList Bearer-SubjectToStatusTransferList OPTIONAL,
  iE-Extensions ProtocolExtensionContainer { {ENB-StatusTransfer-TransparentContainer-ExtIEs} } OPTIONAL,
  ...
}

ENB-StatusTransfer-TransparentContainer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
  ...
}

ENB-UE-S1AP-ID ::= INTEGER (0..16777215)

ENBname ::= OCTET STRING

EPLMNs ::= SEQUENCE (SIZE(1..maxnoofEPLMNs)) OF PLMNidentity
EventType ::= ENUMERATED {
  direct,
  change-of-serve-cell,
  stop-change-of-serve-cell,
  ...
}

EUTRAN-CGI ::= SEQUENCE {
  pLMNidentity PLMNidentity,
  cell-ID CellIdentity,
  iE-Extensions ProtocolExtensionContainer { {EUTRAN-CGI-ExtIEs} } OPTIONAL,
  ...
}

EUTRAN-CGI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
  ...
}

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

-- F

ForbiddenInterRATs ::= ENUMERATED {
  all,
  geran,
  utran,
  ...
}

ForbiddenTAs ::= SEQUENCE (SIZE(1.. maxnoofEPLMNsPlusOne)) OF ForbiddenTAs-Item

ForbiddenTAs-Item ::= SEQUENCE {
  pLMN-Identity PLMNidentity,
```

```

    forbiddenTACs      ForbiddenTACs
}

ForbiddenTACs ::= SEQUENCE (SIZE(1..maxnoofForbTACs)) OF TAC

ForbiddenLAs ::= SEQUENCE (SIZE(1..maxnoofEPLMNsPlusOne)) OF ForbiddenLAs-Item

ForbiddenLAs-Item ::= SEQUENCE {
    pLMN-Identity      PLMNidentity,
    forbiddenLACs      ForbiddenLACs
}

ForbiddenLACs ::= SEQUENCE (SIZE(1..maxnoofForbLACs)) OF LAC

-- G

GBR-QosInformation ::= SEQUENCE {
    sAE-Bearer-MaximumBitrateDL      BitRate,
    sAE-Bearer-MaximumBitrateUL      BitRate,
    sAE-Bearer-GuaranteedBitrateDL    BitRate,
    sAE-Bearer-GuaranteedBitrateUL    BitRate,
    iE-Extensions                     ProtocolExtensionContainer { { GBR-QosInformation-ExtIEs } } OPTIONAL,
    ...
}

GBR-QosInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

GUMMEI                  ::= SEQUENCE {
    pLMN-Identity          PLMNidentity,
    mME-Group-ID          MME-Group-ID,
    mME-Code               MME-Code,
    iE-Extensions          ProtocolExtensionContainer { {GUMMEI-ExtIEs} } OPTIONAL,
    ...
}

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

-- H

HandoverRestrictionList ::= SEQUENCE {
    servingPLMN            PLMNidentity,
    equivalentPLMNs        EPLMNs                OPTIONAL,
    forbiddenTAs           ForbiddenTAs           OPTIONAL,
    forbiddenLAs           ForbiddenLAs           OPTIONAL,
    forbiddenInterRATs     ForbiddenInterRATs     OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {HandoverRestrictionList-ExtIEs} } OPTIONAL,
    ...
}

```

```

}

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

HandoverType ::= ENUMERATED {
  intralte,
  ltetoutran,
  ltetogeran,
  utranoltte,
  gerantolte,
  ...
}

HFN ::= INTEGER (0..1048575)

-- I

IMSI ::= OCTET STRING (SIZE (3..8))

InterfacesToTraceList ::= SEQUENCE (SIZE (1..maxNrOfInterfaces)) OF InterfacesToTraceItem

InterfacesToTraceItem ::= SEQUENCE {
  interfaceType      InterfaceType,
  traceDepth         TraceDepth,
  iE-Extensions      ProtocolExtensionContainer { {InterfacesToTraceItem-ExtIEs} } OPTIONAL,
  ...
}

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

InterfaceType ::= ENUMERATED {
  s1,
  x2,
  uu,
  ...
}

-- J
-- K
-- L

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

LAI ::= SEQUENCE {
  plmnIdentity          PLMNIdentity,
  lac                  LAC,
  iE-Extensions        ProtocolExtensionContainer { {LAI-ExtIEs} } OPTIONAL
}

```

```
LAI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- M

MMENAME ::= OCTET STRING

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))

-- N

NAS-PDU ::= OCTET STRING

-- O
OverloadAction ::= ENUMERATED {
    reject-non-emergency-mo-dt,
    reject-all-rrc-cr-signalling,
    permit-emergency-sessions-only,
    ...
}

OverloadResponse ::= CHOICE {
    overloadAction OverloadAction,
    ...
}

-- P

PagingDRX ::= INTEGER (0..4095)

PagingCause ::= ENUMERATED {
    terminating-conversational-call,
    terminating-streaming-call,
    terminating-interactive-call,
    terminating-background-call,
    terminating-low-priority-signalling,
    ...,
    terminating-high-priority-signalling
}
```

```

PDCP-SN ::= INTEGER (0..4095)

PLMNIdentity ::= TBCD-STRING

-- Q

QCI ::= INTEGER (1..256)

-- R

RelativeMMECapacity ::= INTEGER (0..255)

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

RequestType ::= SEQUENCE {
    eventType          EventType,
    reportArea         ReportArea,
    iE-Extensions      ProtocolExtensionContainer { { RequestType-ExtIEs } } OPTIONAL,
    ...
}

RequestType-ExtIEs SIAP-PROTOCOL-EXTENSION ::= {
    ...
}

ReportArea ::= OCTET STRING

RNC-ID ::= INTEGER (0..4095)

RRC-Container ::= OCTET STRING

-- S

SAE-Bearer-ID ::= INTEGER (0..15, ...)

SAEBearerInformationList ::= SEQUENCE (SIZE (1.. maxNrOfSAEBs)) OF ProtocolIE-SingleContainer { { SAEBearerInformationListIEs } }

SAEBearerInformationListIEs SIAP-PROTOCOL-IES ::= {
    { ID id-SAEBearerInformationListItem          CRITICALITY ignore TYPE SAEBearerInformationListItem PRESENCE mandatory },
    ...
}

SAEBearerInformationListItem ::= SEQUENCE {
    sAE-Bearer-ID          SAE-Bearer-ID,
    dL-Forwarding          DL-Forwarding OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {SAEBearerInformationListItem-ExtIEs} } OPTIONAL,
    ...
}

```

```

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

SAEBearerList ::= SEQUENCE (SIZE(1.. maxNrOfSAEBs)) OF ProtocolIE-SingleContainer { {SAEBearerItemIEs} }

SAEBearerItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SAEBearerItem CRITICALITY ignore TYPE SAEBearerItem PRESENCE mandatory },
    ...
}

SAEBearerItem ::= SEQUENCE {
    sAE-Bearer-ID SAE-Bearer-ID,
    cause Cause,
    iE-Extensions ProtocolExtensionContainer { {SAEBearerItem-ExtIEs} } OPTIONAL,
    ...
}

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

SAE-BearerLevelQoSParameters ::= SEQUENCE {
    qCI QCI,
    allocationRetentionPriority AllocationRetentionPriority,
    gbrQoSInformation GBR-QoSInformation OPTIONAL,
    iE-Extensions ProtocolExtensionContainer { {SAE-Bearer-QoSParameters-ExtIEs} } OPTIONAL,
    ...
}

SAE-Bearer-QoSParameters-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

SecurityInfo ::= SEQUENCE {
    securityKey SecurityKey,
    iE-Extensions ProtocolExtensionContainer { { SecurityInfo-ExtIEs} } OPTIONAL,
    ...
}

SecurityKey ::= BIT STRING (SIZE(128))

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

SecurityInformation ::= SEQUENCE {
    securityPlaceholder SecurityPlaceholder,

```

```

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

SecurityPlaceholder ::= ENUMERATED {
    whatever,
    ...
}

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

SourceBSS-ToTargetBSS-TransparentContainer ::= OCTET STRING

SourceeNodeB-ToTargeteNodeB-TransparentContainer ::= SEQUENCE {
    rRC-Container          RRC-Container,
    sABearerInformationList SABearerInformationList OPTIONAL,
    targetCell-ID          EUTRAN-CGI,
    subscriberProfileIDforRFP SubscriberProfileIDforRFP OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {SourceeNodeB-ToTargeteNodeB-TransparentContainer-ExtIEs} } OPTIONAL,
    ...
}

SourceeNodeB-ToTargeteNodeB-TransparentContainer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

SourceRNC-ToTargetRNC-TransparentContainer ::= OCTET STRING

ServedGUMMEIs ::= SEQUENCE (SIZE(1.. maxnoofGUMMEIs)) OF GUMMEI

ServedPLMNs ::= SEQUENCE (SIZE(1.. maxnoofPLMNsPerMME)) OF PLMNidentity

SubscriberProfileIDforRFP ::= INTEGER (1..256)

SupportedTAs ::= SEQUENCE (SIZE(1.. maxnoofTACs)) OF SupportedTAs-Item

SupportedTAs-Item ::= SEQUENCE {
    tAC          TAC,
    broadcastPLMNs BPLMNs,
    ...
}

S-TMSI ::= SEQUENCE {
    mMEC MME-Code,
    m-TMSI M-TMSI,
    ...
}

-- T

```

```

TAC ::= OCTET STRING

TAI ::= SEQUENCE {
    plMNidentity          PLMNidentity,
    tAC                   TAC,
    iE-Extensions         ProtocolExtensionContainer { {TAI-ExtIEs} } OPTIONAL
}

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

TBCD-STRING ::= OCTET STRING (SIZE (3))

TargetID ::= CHOICE {
    targeteNB-ID          Global-ENB-ID,
    targetRNC-ID          TargetRNC-ID,
    CGI                   CGI,
    ...
}

TargetRNC-ID ::= SEQUENCE {
    lAI                   LAI,
    rAC                   RAC          OPTIONAL,
    rNC-ID                RNC-ID,
    extendedRNC-ID        ExtendedRNC-ID    OPTIONAL
}

TargeteNodeB-ToSourceeNodeB-TransparentContainer ::= SEQUENCE {
    rRC-Container          RRC-Container,
    iE-Extensions         ProtocolExtensionContainer { {TargeteNodeB-ToSourceeNodeB-TransparentContainer-ExtIEs} } OPTIONAL,
    ...
}

TargeteNodeB-ToSourceeNodeB-TransparentContainer-ExtIEs SLAP-PROTOCOL-EXTENSION ::= {
    ...
}

TargetRNC-ToSourceRNC-TransparentContainer ::= OCTET STRING
TargetBSS-ToSourceBSS-TransparentContainer ::= OCTET STRING

TimeToWait ::= OCTET STRING

TransportLayerAddress ::= BIT STRING (SIZE(1..160, ...))

TraceActivation ::= SEQUENCE {
    traceReference        TraceReference,
    interfacesToTraceList InterfacesToTraceList,
    iE-Extensions         ProtocolExtensionContainer { { TraceActivation-ExtIEs} }    OPTIONAL
}

```

```

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

TraceDepth ::= ENUMERATED {
    minimum,
    medium,
    maximum,
    vendorMinimum,
    vendorMedium,
    vendorMaximum,
    ...
}

TraceReference ::= OCTET STRING (SIZE (8))

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

-- U

UEAggregateMaximumBitrate ::= SEQUENCE {
    uEAggregateMaximumBitRateDL      BitRate,
    uEAggregateMaximumBitRateUL      BitRate,
    iE-Extensions                     ProtocolExtensionContainer { {UEAggregate-MaximumBitrates-ExtIEs} } OPTIONAL,
    ...
}

UEAggregate-MaximumBitrates-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

UE-S1AP-IDs ::= CHOICE{
    uE-S1AP-ID-pair      UE-S1AP-ID-pair,
    mME-UE-S1AP-ID      MME-UE-S1AP-ID,
    ...
}

UE-S1AP-ID-pair ::= SEQUENCE{
    mME-UE-S1AP-ID      MME-UE-S1AP-ID,
    eNB-UE-S1AP-ID      ENB-UE-S1AP-ID
}

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 ::= OCTET STRING

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

UERadioCapability ::= OCTET STRING

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

END
```

9.3.5 Common Definitions

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

SlAP-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (20) 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
```

9.3.6 Constant Definitions

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

SlAP-Constants {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (20) 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-SABearerSetup                ProcedureCode ::= 5
id-SABearerModify               ProcedureCode ::= 6
id-SABearerRelease              ProcedureCode ::= 7
id-SABearerReleaseRequest       ProcedureCode ::= 8
id-InitialContextSetup          ProcedureCode ::= 9
id-Paging                       ProcedureCode ::= 10
id-downlinkNASTransport         ProcedureCode ::= 11
id-initialUEMessage             ProcedureCode ::= 12
id-uplinkNASTransport           ProcedureCode ::= 13
id-Reset                        ProcedureCode ::= 14
id-ErrorIndication              ProcedureCode ::= 15
id-NASNonDeliveryIndication     ProcedureCode ::= 16
id-S1Setup                      ProcedureCode ::= 17
id-UEContextReleaseRequest      ProcedureCode ::= 18
id-DownlinkS1cdma2000tunneling  ProcedureCode ::= 19
id-UplinkS1cdma2000tunneling    ProcedureCode ::= 20
id-UEContextModification        ProcedureCode ::= 21
id-UECapabilityInfoIndication   ProcedureCode ::= 22
id-UEContextRelease             ProcedureCode ::= 23
id-eNBStatusTransfer            ProcedureCode ::= 24
id-MMEStatusTransfer            ProcedureCode ::= 25
id-DeactivateTrace              ProcedureCode ::= 26
id-TraceStart                   ProcedureCode ::= 27
id-TraceFailureIndication       ProcedureCode ::= 28
id-ENBConfigurationUpdate       ProcedureCode ::= 29
id-MMEConfigurationUpdate       ProcedureCode ::= 30
id-LocationReportingControl     ProcedureCode ::= 31
id-LocationReportingFailureIndication ProcedureCode ::= 32
id-LocationReport               ProcedureCode ::= 33
id-OverloadStart                ProcedureCode ::= 34

```

```

id-OverloadStop                ProcedureCode ::= 35

-- *****
--
-- Extension constants
--
-- *****

maxPrivateIEs                  INTEGER ::= 65535
maxProtocolExtensions          INTEGER ::= 65535
maxProtocolIEs                 INTEGER ::= 65535
-- *****
--
-- Lists
--
-- *****

maxNrOfSAEBs                   INTEGER ::= 256
maxNrOfInterfaces              INTEGER ::= 3   --FFS
maxnoofTAI                     INTEGER ::= 256 --FFS
maxnoofTACs                    INTEGER ::= 256 --FFS
maxNrOfErrors                  INTEGER ::= 256
maxnoofBPLMNs                 INTEGER ::= 6
maxnoofPLMNsPerMME            INTEGER ::= 32 -- FFS
maxnoofEPLMNs                 INTEGER ::= 15
maxnoofEPLMNsPlusOne          INTEGER ::= 16
maxnoofForbLACs               INTEGER ::= 4096
maxnoofForbTACs               INTEGER ::= 4096
maxNrOfIndividualS1ConnectionsToReset  INTEGER ::= 256
maxnoofGUMMEIs                INTEGER ::= 256 -- FFS

-- *****
--
-- 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-Intra-LTEHOInformationReq   ProtocolIE-ID ::= 5
id-LTEtoUTRANHOInformationReq ProtocolIE-ID ::= 6
id-LTEtoGERANHOInformationReq ProtocolIE-ID ::= 7
id-eNB-UE-S1AP-ID             ProtocolIE-ID ::= 8
id-Intra-LTEHOInformationRes   ProtocolIE-ID ::= 9
id-LTEtoUTRANHOInformationRes ProtocolIE-ID ::= 10
id-LTEtoGERANHOInformationRes ProtocolIE-ID ::= 11
id-SAEBearerSubjecttoDataForwardingList ProtocolIE-ID ::= 12
id-SAEBearerToReleaseListHOCmd ProtocolIE-ID ::= 13

```

id-SAEBearerDataForwardingItem	ProtocolIE-ID ::= 14
id-SAEBearerReleaseItemBearerRelComp	ProtocolIE-ID ::= 15
id-SAEBearerToBeSetupListBearerSReq	ProtocolIE-ID ::= 16
id-SAEBearerToBeSetupItemBearerSReq	ProtocolIE-ID ::= 17
id-SAEBearerAdmittedList	ProtocolIE-ID ::= 18
id-SAEBearerFailedToSetupListHReqAck	ProtocolIE-ID ::= 19
id-SAEBearerAdmittedItem	ProtocolIE-ID ::= 20
id-SAEBearerFailedtoSetupItemHReqAck	ProtocolIE-ID ::= 21
id-SAEBearerToBeSwitchedDLList	ProtocolIE-ID ::= 22
id-SAEBearerToBeSwitchedDLItem	ProtocolIE-ID ::= 23
id-SAEBearerToBeSetupListCtxtSReq	ProtocolIE-ID ::= 24
id-TraceActivation	ProtocolIE-ID ::= 25
id-NAS-PDU	ProtocolIE-ID ::= 26
id-SAEBearerToBeSetupItemHReq	ProtocolIE-ID ::= 27
id-SAEBearerSetupListBearerSRes	ProtocolIE-ID ::= 28
id-SAEBearerFailedToSetupListBearerSRes	ProtocolIE-ID ::= 29
id-SAEBearerToBeModifiedListBearerModReq	ProtocolIE-ID ::= 30
id-SAEBearerModifyListBearerModRes	ProtocolIE-ID ::= 31
id-SAEBearerFailedToModifyList	ProtocolIE-ID ::= 32
id-SAEBearerToBeReleasedList	ProtocolIE-ID ::= 33
id-SAEBearerFailedToReleaseList	ProtocolIE-ID ::= 34
id-SAEBearerItem	ProtocolIE-ID ::= 35
id-SAEBearerToBeModifiedItemBearerModReq	ProtocolIE-ID ::= 36
id-SAEBearerModifyItemBearerModRes	ProtocolIE-ID ::= 37
id-SAEBearerReleaseItem	ProtocolIE-ID ::= 38
id-SAEBearerSetupItemBearerSRes	ProtocolIE-ID ::= 39
id-Security-Information	ProtocolIE-ID ::= 40
id-HandoverRestrictionList	ProtocolIE-ID ::= 41
id-UEPagingID	ProtocolIE-ID ::= 43
id-pagingDRX	ProtocolIE-ID ::= 44
id-pagingCause	ProtocolIE-ID ::= 45
id-TAILList	ProtocolIE-ID ::= 46
id-TAIItem	ProtocolIE-ID ::= 47
id-SAEBearerFailedToSetupListCtxtSRes	ProtocolIE-ID ::= 48
id-SAEBearerReleaseItemHOCmd	ProtocolIE-ID ::= 49
id-SAEBearerSetupItemCtxtSRes	ProtocolIE-ID ::= 50
id-SAEBearerSetupListCtxtSRes	ProtocolIE-ID ::= 51
id-SAEBearerToBeSetupItemCtxtSReq	ProtocolIE-ID ::= 52
id-SAEBearerToBeSetupListHReq	ProtocolIE-ID ::= 53
id-GERANToLTEHOInformationRes	ProtocolIE-ID ::= 55
id-UTRANToLTEHOInformationRes	ProtocolIE-ID ::= 57
id-CriticalityDiagnostics	ProtocolIE-ID ::= 58
id-Global-ENB-ID	ProtocolIE-ID ::= 59
id-eNBname	ProtocolIE-ID ::= 60
id-MMEname	ProtocolIE-ID ::= 61
id-ServedPLMNs	ProtocolIE-ID ::= 63
id-SupportedTAs	ProtocolIE-ID ::= 64
id-TimeToWait	ProtocolIE-ID ::= 65
id-uEAggregateMaximumBitrate	ProtocolIE-ID ::= 66
id-TAI	ProtocolIE-ID ::= 67
id-SAEBearerReleaseListBearerRelComp	ProtocolIE-ID ::= 69
id-cdma2000PDU	ProtocolIE-ID ::= 70
id-cdma2000RATType	ProtocolIE-ID ::= 71
id-cdma2000SectorID	ProtocolIE-ID ::= 72

```

id-SecurityInfo ProtocolIE-ID ::= 73
id-UERadioCapability ProtocolIE-ID ::= 74
id-GUMMEI-ID ProtocolIE-ID ::= 75
id-SABearerInformationListItem ProtocolIE-ID ::= 78
id-Direct-Forwarding-Path-Availability ProtocolIE-ID ::= 79
id-UEIdentityIndexValue ProtocolIE-ID ::= 80
id-cdma2000HOStatus ProtocolIE-ID ::= 83
id-cdma2000HORequiredIndication ProtocolIE-ID ::= 84
id-TraceReference 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-SABearerToBeSwitchedULItem ProtocolIE-ID ::= 94
id-SABearerToBeSwitchedULList 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-SABearerFailedToSwitchDLList ProtocolIE-ID ::= 103
id-SourceNodeB-ToTargeteNodeB-TransparentContainer ProtocolIE-ID ::= 104
id-ServedGUMMEIs ProtocolIE-ID ::= 105
id-SubscriberProfileIDforRFP ProtocolIE-ID ::= 106
END

```

9.3.7 Container Definitions

```

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

SlAP-Containers {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (20) 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
```

9.4 Message Transfer Syntax

S1AP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax as specified in ref. [3].

9.5 Timers

Void

10 Handling of Unknown, Unforeseen and Erroneous Protocol Data

10.1 General

Protocol Error cases can be divided into three classes:

- Transfer Syntax Error.
- Abstract Syntax Error.
- Logical Error.

Protocol errors can occur in the following functions within a receiving node:

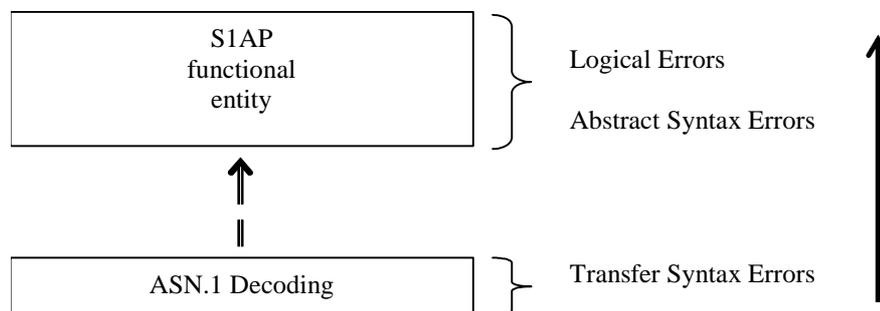


Figure 10.1: Protocol Errors in S1AP.

The information stated in subclauses 10.2, 10.3 and 10.4, to be included in the message used when reporting an error, is what at minimum shall be included. Other optional information elements within the message may also be included, if available. This is also valid for the case when the reporting is done with a response message. The latter is an exception to what is stated in subclause 4.1.

10.2 Transfer Syntax Error

A Transfer Syntax Error occurs when the receiver is not able to decode the received physical message. Transfer syntax errors are always detected in the process of ASN.1 decoding. If a Transfer Syntax Error occurs, the receiver should initiate Error Indication procedure with appropriate cause value for the Transfer Syntax protocol error.

Examples for Transfer Syntax Errors are:

- Violation of value ranges in ASN.1 definition of messages. E.g.: If an IE has a defined value range of 0 to 10 (ASN.1: INTEGER (0..10)), and 12 will be received, then this will be treated as a transfer syntax error.
- Violation in list element constraints. E.g.: If a list is defined as containing 1 to 10 elements, and 12 elements will be received, than this case will be handled as a transfer syntax error.
- Missing mandatory elements in ASN.1 SEQUENCE definitions (as sent by the originator of the message).
- Wrong order of elements in ASN.1 SEQUENCE definitions (as sent by the originator of the message).

10.3 Abstract Syntax Error

10.3.1 General

An Abstract Syntax Error occurs when the receiving functional S1AP entity:

1. receives IEs or IE groups that cannot be understood (unknown IE ID);
2. receives IEs for which the logical range is violated (e.g.: ASN.1 definition: 0 to 15, the logical range is 0 to 10 (values 11 to 15 are undefined), and 12 will be received; this case will be handled as an abstract syntax error using criticality information sent by the originator of the message);
3. does not receive IEs or IE groups but according to the specified presence of the concerning object, the IEs or IE groups should have been present in the received message.
4. receives IEs or IE groups that are defined to be part of that message in wrong order or with too many occurrences of the same IE or IE group;
5. receives IEs or IE groups but according to the conditional presence of the concerning object and the specified condition, the IEs or IE groups should not have been present in the received message.

Cases 1 and 2 (not comprehended IE/IE group) are handled based on received Criticality information. Case 3 (missing IE/IE group) is handled based on Criticality information and Presence information for the missing IE/IE group specified in the version of the specification used by the receiver. Case 4 (IEs or IE groups in wrong order or with too many occurrences) and Case 5 (erroneously present conditional IEs or IE groups) result in rejecting the procedure.

If an Abstract Syntax Error occurs, the receiver shall read the remaining message and shall then for each detected Abstract Syntax Error that belong to cases 1-3 act according to the Criticality Information and Presence Information for the IE/IE group due to which Abstract Syntax Error occurred in accordance with subclauses 10.3.4 and 10.3.5. The handling of cases 4 and 5 is specified in subclause 10.3.6.

10.3.2 Criticality Information

In the S1AP messages there is criticality information set for individual IEs and/or IE groups. This criticality information instructs the receiver how to act when receiving an IE or an IE group that is not comprehended, i.e. the entire item (IE or IE group) which is not (fully or partially) comprehended shall be treated in accordance with its own criticality information as specified in subclause 10.3.4.

In addition, the criticality information is used in case of the missing IE/IE group abstract syntax error (see subclause 10.3.5).

The receiving node shall take different actions depending on the value of the Criticality Information. The three possible values of the Criticality Information for an IE/IE group are:

- Reject IE.
- Ignore IE and Notify Sender.
- Ignore IE.

The following rules restrict when a receiving entity may consider an IE, an IE group, or an EP not comprehended (not implemented), and when action based on criticality information is applicable:

1. IE or IE group: When one new or modified IE or IE group is implemented for one EP from a standard version, then other new or modified IEs or IE groups specified for that EP in that standard version shall be considered comprehended by a receiving entity (some may still remain unsupported).
2. EP: The comprehension of different Eps within a standard version or between different standard versions is not mandated. Any EP that is not supported may be considered not comprehended, even if another EP from that standard version is comprehended, and action based on criticality shall be applied.

10.3.3 Presence Information

For many IEs/IE groups which are optional according to the ASN.1 transfer syntax, S1AP specifies separately if the presence of these IEs/IE groups is optional or mandatory with respect to RNS application by means of the presence field of the concerning object of class S1AP-PROTOCOL-IES, S1AP-PROTOCOL-IES-PAIR, S1AP-PROTOCOL-EXTENSION or S1AP-PRIVATE-IES.

The presence field of the indicated classes supports three values:

1. Optional;
2. Conditional;
3. Mandatory.

If an IE/IE group is not included in a received message and the presence of the IE/IE group is mandatory or the presence is conditional and the condition is true according to the version of the specification used by the receiver, an abstract syntax error occurs due to a missing IE/IE group.

If an IE/IE group is included in a received message and the presence of the IE/IE group is conditional and the condition is false according to the version of the specification used by the receiver, an abstract syntax error occurs due to this erroneously present conditional IE/IE group.

10.3.4 Not comprehended IE/IE group

10.3.4.1 Procedure Code

The receiving node shall treat the different types of received criticality information of the *Procedure Code* IE according to the following:

Reject IE:

- If a message is received with a *Procedure Code* IE marked with "*Reject IE*" which the receiving node does not comprehend, the receiving node shall reject the procedure using the Error Indication procedure.

Ignore IE and Notify Sender:

- If a message is received with a *Procedure Code* IE marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the procedure and initiate the Error Indication procedure.

Ignore IE:

- If a message is received with a *Procedure Code* IE marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the procedure.

When using the Error Indication procedure to reject a procedure or to report an ignored procedure it shall include the *Procedure Code* IE, the *Triggering Message* IE, and the *Procedure Criticality* IE in the *Criticality Diagnostics* IE.

10.3.4.1A Type of Message

When the receiving node cannot decode the *Type of Message* IE, the Error Indication procedure shall be initiated with an appropriate cause value.

10.3.4.2 IEs other than the Procedure Code and Type of Message

The receiving node shall treat the different types of received criticality information of an IE/IE group other than the *Procedure Code* IE and *Type of Message* IE according to the following:

Reject IE:

- If a message *initiating* a procedure is received containing one or more IEs/IE group marked with "*Reject IE*" which the receiving node does not comprehend; none of the functional requests of the message shall be executed.

The receiving node shall reject the procedure and report the rejection of one or more IEs/IE group using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- If a message *initiating* a procedure that does not have a message to report unsuccessful outcome is received containing one or more IEs/IE groups marked with "*Reject IE*" which the receiving node does not comprehend, the receiving node shall terminate the procedure and initiate the Error Indication procedure.
- If a *response* message is received containing one or more IEs marked with "*Reject IE*", that the receiving node does not comprehend, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

Ignore IE and Notify Sender:

- If a message *initiating* a procedure is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups, and report in the response message of the procedure that one or more IEs/IE groups have been ignored. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the response message, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.
- if a message *initiating* a procedure that does not have a message to report the outcome of the procedure is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups, and initiate the Error Indication procedure to report that one or more IEs/IE groups have been ignored.
- If a *response* message is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups and initiate the Error Indication procedure.

Ignore IE:

- If a message *initiating* a procedure is received containing one or more IEs/IE groups marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups and continue with the procedure as if the not comprehended IEs/IE groups were not received using the understood IEs/IE groups.
- If a *response* message is received containing one or more IEs/IE groups marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups and continue with the procedure as if the not comprehended IEs/IE groups were not received using the understood IEs/IE groups.

When reporting not comprehended IEs/IE groups marked with "*Reject IE*" or "*Ignore IE and Notify Sender*" using a response message defined for the procedure, the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

When reporting not comprehended IEs/IE groups marked with "*Reject IE*" or "*Ignore IE and Notify Sender*" using the Error Indication procedure, the *Procedure Code* IE, the *Triggering Message* IE, *Procedure Criticality* IE, and the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

10.3.5 Missing IE or IE group

The receiving node shall treat the missing IE/IE group according to the criticality information for the missing IE/IE group in the received message specified in the version of this specification used by the receiver:

Reject IE:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality "*Reject IE*"; none of the functional requests of the message shall be executed. The receiving node shall reject the procedure and report the missing IEs/IE groups using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.
- if a received message *initiating* a procedure that does not have a message to report unsuccessful outcome is missing one or more IEs/IE groups with specified criticality "*Reject IE*", the receiving node shall terminate the procedure and initiate the Error Indication procedure.
- if a received *response* message is missing one or more IEs/IE groups with specified criticality "*Reject IE*", the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

Ignore IE and Notify Sender:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and report in the response message of the procedure that one or more IEs/IE groups were missing. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the response message, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.
- if a received message *initiating* a procedure that does not have a message to report the outcome of the procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and initiate the Error Indication procedure to report that one or more IEs/IE groups were missing.
- if a received *response* message is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and initiate the Error Indication procedure to report that one or more IEs/IE groups were missing.

Ignore IE:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality '*Ignore IE*', the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message.
- if a received *response* message is missing one or more IEs/IE groups with specified criticality '*Ignore IE*', the receiving node shall ignore that those IEs/IE groups are missing and continue with the procedure based on the other IEs/IE groups present in the message.

When reporting missing IEs/IE groups with specified criticality '*Reject IE*' or '*Ignore IE and Notify Sender*' using a response message defined for the procedure, the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

When reporting missing IEs/IE groups with specified criticality '*Reject IE*' or '*Ignore IE and Notify Sender*' using the Error Indication procedure, the *Procedure Code* IE, the *Triggering Message* IE, *Procedure Criticality* IE, and the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

10.3.6 IEs or IE groups received in wrong order or with too many occurrences or erroneously present

If a message with IEs or IE groups in wrong order or with too many occurrences is received or if IEs or IE groups with a conditional presence are present when the condition is not met (i.e. erroneously present), the receiving node shall behave according to the following:

- If a message *initiating* a procedure is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, none of the functional requests of the message shall be executed. The receiving node shall reject the procedure and report the cause value "Abstract Syntax Error (Falsely Constructed

Message)" using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- If a message *initiating* a procedure that does not have a message to report unsuccessful outcome is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, the receiving node shall terminate the procedure and initiate the Error Indication procedure, and use cause value "Abstract Syntax Error (Falsely Constructed Message)".
- If a *response* message is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

When determining the correct order only the IEs specified in the specification version used by the receiver shall be considered.

10.4 Logical Error

Logical error situations occur when a message is comprehended correctly, but the information contained within the message is not valid (i.e. semantic error), or describes a procedure which is not compatible with the state of the receiver. In these conditions, the following behaviour shall be performed (unless otherwise specified) as defined by the class of the elementary procedure, irrespective of the criticality information of the IEs/IE groups containing the erroneous values.

Class 1:

Where the logical error occurs in a request message of a class 1 procedure, and the procedure has a message to report this unsuccessful outcome, this message shall be sent with an appropriate cause value. Typical cause values are:

- Semantic Error.
- Message not compatible with receiver state.

Where the logical error is contained in a request message of a class 1 procedure, and the procedure does not have a message to report this unsuccessful outcome, the procedure shall be terminated and the Error Indication procedure shall be initiated with an appropriate cause value. The *Procedure Code* IE and the *Triggering Message* IE within the *Criticality Diagnostics* IE shall then be included in order to identify the message containing the logical error.

Where the logical error exists in a response message of a class 1 procedure, the procedure shall be considered as unsuccessfully terminated and local error handling shall be initiated.

Class 2:

Where the logical error occurs in a message of a class 2 procedure, the procedure shall be terminated and the Error Indication procedure shall be initiated with an appropriate cause value. The *Procedure Code* IE and the *Triggering Message* IE within the *Criticality Diagnostics* IE shall then be included in order to identify the message containing the logical error.

10.5 Exceptions

The error handling for all the cases described hereafter shall take precedence over any other error handling described in the other subclauses of clause 10.

- If any type of error (Transfer Syntax Error, Abstract Syntax Error or Logical Error) is detected in the ERROR INDICATION message, it shall not trigger the Error Indication procedure in the receiving Node but local error handling.
- In case a response message or Error Indication message needs to be returned, but the information necessary to determine the receiver of that message is missing, the procedure shall be considered as unsuccessfully terminated and local error handling shall be initiated.

- If an error that terminates a procedure occurs, the returned cause value shall reflect the error that caused the termination of the procedure even if one or more abstract syntax errors with criticality 'ignore and notify' have earlier occurred within the same procedure.

10.6 Handling of AP ID

Note: The 'first message' and the 'first returned message' as shown below correspond to the message 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 have 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.

If a subsequent message followed by the first message is to be sent before receiving a first returned message from the peer node, the subsequent message shall include the previously sent AP ID. The node which receives such a subsequent message shall not initiate an Error Indication procedure. If such subsequent message is the last message for this UE-associated logical connection, the node which receives such a subsequent message initiates a local release of any established UE-associated logical connection having the received AP ID as remote node identifier.

If a node detects a first message that includes an AP ID which is erroneous e.g. an AP ID for the same peer node which have been stored previously for another UE-associated logical connection, the receiving node shall return an ERROR INDICATION message 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 message other than the first message that include an AP ID which is unknown to the node, the 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. The peer node shall initiate a local release of any established UE-associated logical connection having the AP ID as identifier.

If a node receives an unrecognized message the 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.

Editor's Note: How to retrieve the APID of the peer node from the unrecognized message is FFS

Annex A (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2007-01					Scope, Skeleton		0.0.0
2007-05					inclusion of post-RAN3#55bis-email agreed text proposals	0.0.0	0.0.1
2007-06					inclusion of post-RAN3#56-email agreed text-proposals	0.0.1	0.1.0
2007-08					Updates according to discussions in RAN3#57	0.1.0	0.2.0
2007-09	37				Presentation to TSG-RAN for information -version 1.0.0	0.2.0	1.0.0
2007-10					Updates according to agreements in RAN3#57bis for ASN.1 framework and error handling, MME UE S1AP ID, eNB UE S1AP ID within all messages	1.0.0	1.1.0
2007-10					Updates according to agreements on the RAN3 email reflector following the 'complementing' exercise. The incorporated documents are R3-072031, R3-072032, R3-072033, R3-072034 and R3-072035. The content is related to tabular message representation with tabular representation of Information Elements and ASN.1 code. V120 then served as a base for RAN3#58	1.1.0	1.2.0
2007-11					Updates according to agreements in R3-072320 and R3-072355 achieved in RAN3#58 and according to post RAN3#58 email check: R3-072417, R3-072348, R3-072435, R3-072420, R3-072422, R3-072437, R3-072436, R3-072422, R3-072423.	1.2.0	1.3.0
2007-11	38	RP-070851			Presentation to TSG-RAN for approval	1.3.0	2.0.0
2007-12	38				specification approved at TSG-RAN and placed under change control	2.0.0	8.0.0
2008-03	39	RP-080080	58		RAN3 agreed changes for TS 36.413	8.0.0	8.1.0
2008-06	40	RP-080304	59	1	RAN3 agreed changes for TS 36.413	8.1.0	8.2.0
2008-09	41	RP-080584	223		changes to TS36.413 agreed in RAN3#61	8.2.0	8.3.0

History

Document history		
V8.2.0	November 2008	Publication
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