

Flexi Network Server, Rel. 4.0, Operating Documentation, v. 4

S1 Interface Description

**DN70669283
Issue 6-1**

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1 Changes in S1 interface description

Changes in release 4.0

Procedure figures removed.

Changes between releases 4.0 and 3.0

- Added the LPPa Transport messages (Downlink Non UE Associated LPPa Transport and Uplink Non UE Associated LPPa Transport messages) in Chapter *Message definition and content*.
- Modified the Downlink NAS transport message content information table to indicate that Flexi NS - MME now supports Handover Restriction List.
- Added the CDMA2000 Tunneling procedure and message information (Uplink S1 CDMA2000 Tunneling and Downlink S1 CDMA2000 Tunneling messages). Related CDMA2000 IEs are also added.
- Added LPPa-PDU and Routing ID IEs.

Changes in release 3.0, between document issues 5-1 and 5-0

- Added a note that the maximum number of TACs in the S1 Setup Request and eNB Configuration Update messages is 10 in Flexi NS - MME.

Changes between releases 3.0 and 2.2

- Baseline updated to 3GPP TS 36.413 v.10.6.0.
- eNB Direct Information Transfer and MME Direct Information Transfer messages have been added. Related IEs Inter-system Information Transfer Type, RIM Information, RIM Routing Address and RIM Transfer have been added.
- SRVCC Operation Possible IE is supported in the Handover Request message.
- Added the following note for S1 Setup Response and MME Configuration Update messages:
 - Additional Served GUMMEIs IEs are included in case the MME is collocated with pooled SGSN network element.
- Time to wait IE is supported in the S1 Setup Failure message.
- The Security Key IE and UE Security Capabilities IE are now supported in the UE Context Modification Request message.
- Extended RNC-ID of the Target ID IE has been marked as not supported.

Changes between releases 2.2 and 2.1

- Baseline updated to 3GPP TS 36.413 v.9.8.0.
- Added SON Configuration Transfer IE.
- Added SON Information IE.
- Added SON Information Reply IE.
- Added X2 TNL Configuration Info IE.
- Added write-replace warning procedure and kill procedure, and the related messages and IEs.
- New message types in Message Type IE: eNB Configuration Transfer and MME Configuration Transfer.

- Added eNB Configuration Transfer and MME Configuration Transfer procedures, and the related messages and IEs.
- SRVCC Operation Possible IE is supported.
- E-RAB Release Indication is now supported also for default bearers. Restriction deleted.
- In E-RAB setup, note (Currently only one E-RAB is set up at a time with the E-RAB setup procedure in Flexi NS - MME) has been removed.
- There are statistical counters available for the S1 interface messages. A link to the Statistics document added in Chapter Message definition and content.

Changes in release 2.1, document issue 3-1

- Modified the note in the Successful Operation section.
- Deleted note about E-RAB being setup/modified/released at a time with the E-RAB setup/modify/release procedures in Flexi NS – MME, in the E-RAB Management Messages section.
- Deleted note about first UL NAS message being always received in the RRC CONNECTION SETUP COMPLETE message, in the Initial UE Message section.

Changes between releases 2.1 and 2.0

- Added additional default bearer case, in the E-RAB setup section.
- Deleted information about selected PLMN being indicated by the PLMN ID part of the TAI IE included in the INITIAL UE MESSAGE, during network sharing.
- Modified information to indicate that Criticality Diagnostics in Handover Command and Handover Request Acknowledge messages, are currently supported.
- Deleted information about only one TAI list item being included in the Paging message.
- Modified the Handover Request message content information table to indicate that Flexi NS - MME now supports Trace Activation.
- Added a note that eNB-initiated E-RAB Release Indication procedure is supported only for dedicated bearers, in Flexi NS - MME.
- Added the eNB-initiated E-RAB Release Indication process and information about the related message.

2 S1 interface

The S1 interface connects the E-UTRAN to the evolved packet core (EPC). It is specified as an open interface that divides the system into radio-specific E-UTRAN and EPC which handles switching, routing and service control.

The S1 interface has two different instances:

- S1-U (S1 user plane) for connecting the eNB and the S-GW
- S1-MME (S1 control plane) for connecting the eNB and the MME.

User plane in S1 interface

The S1 user plane interface (S1-U) provides non guaranteed delivery of user plane protocol data units (PDUs) between the eNB and the S-GW. The transport network layer is built on IP transport and GTP-U is used on top of UDP/IP to carry the user plane PDUs between the eNB and the S-GW.

The S1-U interface protocol stack is identical to the X2-U protocol stack.

Control plane in S1 interface

The S1 control plane interface (S1-MME) is defined between the eNB and the MME. The transport network layer is built on SCTP (Stream Control Transmission Protocol) on top of IP to carry the application layer signaling protocol referred to as S1-AP (S1 Application Protocol).

This interface document describes the S1-MME and is based on [3GPP TS 36.413 v.10.6.0](#).

3 S1AP Services

S1 Application Protocol (S1AP) provides the signaling service between E-UTRAN and the evolved packet core (EPC) that is required to fulfil the S1AP functions. 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 signaling connection.
2. UE-associated services: They are related to one UE. S1AP functions that provide these services are associated with a UE-associated signaling connection that is maintained for the UE in question.

4 Functions of S1 application protocol (S1AP)

The S1AP protocol has the following functions:

- E-RAB management function: This overall functionality is responsible for setting up, modifying and releasing E-RABs, which are triggered by the MME. The release of E-RABs may be triggered by the eNB as well.
- Initial context transfer function which is used to:
 - establish an S1UE context in the eNB.
 - set up the default IP connectivity.
 - set up one or more E-RABs if requested by the MME.
 - transfer NAS-signaling related information to the eNB, if needed.
- UE capability information indication: This function is used to provide the UE Capability Information 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/S-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 function provides the EPC the capability to page the UE.
- S1 interface management functions that comprise the following:
 - reset functionality to ensure a well-defined initialization on the S1 interface.
 - error indication function to allow 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.
 - S1 setup function for initial S1 interface setup for providing configuration information.
 - eNB and MME configuration update functions to update application level configuration data needed for the eNB and MME to interoperate correctly on the S1 interface.
- NAS signaling transport function between the UE and the MME which is used to:
 - transfer NAS signaling related information and to establish the S1 UE context in the eNB.
 - transfer NAS signaling related information when the S1 UE context in the eNB is already established.
- S1 UE context release: This function is used to manage the release of UE-specific context in the eNB and the MME.
- UE context modification: This function allows to modify the established UE context partly.
- Status transfer: This functionality transfers PDCP SN status information from source eNB to target eNB in support of in-sequence delivery and duplication avoidance for intra-LTE handover.
- Trace function: This functionality is to control a trace recording for a UE in ECM-CONNECTED state.

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- LPPa Signalling transport: This functionality transfers LPPa messages between eNB and E-SMLC over the S1 interface.
 - S1 CDMA2000 Tunneling function: This functionality is to carry CDMA2000 signalling between UE and CDMA2000 RAT over the S1 Interface.
 - Warning message transfer function: This functionality provides the means to start and overwrite the broadcasting of warning messages.
 - RAN information management (RIM) function: This functionality allows the request and transfer of RAN system information between two RAN nodes via the core network.
 - Configuration transfer function: This functionality allows the request and transfer of RAN configuration information (for example: SON information) between two RAN nodes via the core network.

5 S1AP procedures

5.1 S1AP elementary procedures

The S1-AP protocol consists of elementary procedures (EPs), which are units of interaction between eNBs and the EPC. These EPs are defined separately and are intended to be used to build up complete sequences in a flexible manner.

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

- elementary procedures with response (success and/or failure) (class 1)
- elementary procedures without response (class 2).

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

- successful:
 - A signaling message explicitly indicates that the elementary procedure successfully completed with the receipt of the response.
- unsuccessful:
 - A signaling message explicitly indicates that the EP failed.
 - On time supervision expiry (that is, absence of expected response).
- successful and unsuccessful:
 - One signaling message reports both successful and unsuccessful outcome for the different requests included. The response message used is the one defined for successful outcome.

Class 2 EPs are considered always successful.

In the following tables, all EPs supported by the Nokia Solutions and Networks Flexi Network Server - MME (Flexi NS - MME) have been divided into class 1 and class 2 EPs.

Table 1 Class 1 procedures

Elementary Procedure	Initiating Message	Successful Outcome Response message	Unsuccessful Outcome 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

Table 1 Class 1 procedures (Cont.)

Elementary Procedure	Initiating Message	Successful Outcome Response message	Unsuccessful Outcome Response message
Handover cancellation	HANDOVER CANCEL	HANDOVER CANCEL ACKNOWLEDGE	
E-RAB setup	E-RAB SETUP REQUEST	E-RAB SETUP RESPONSE	
E-RAB modify	E-RAB MODIFY REQUEST	E-RAB MODIFY RESPONSE	
E-RAB release	E-RAB RELEASE COMMAND	E-RAB RELEASE RESPONSE	
Initial context setup	INITIAL CONTEXT SETUP REQUEST	INITIAL CONTEXT SETUP RESPONSE	INITIAL CONTEXT SETUP FAILURE
Reset	RESET	RESET ACKNOWLEDGE	
S1 setup	S1 SETUP REQUEST	S1 SETUP RESPONSE	S1 SETUP FAILURE
UE context release	UE CONTEXT RELEASE COMMAND	UE CONTEXT RELEASE COMPLETE	
UE context modification	UE CONTEXT MODIFICATION REQUEST	UE CONTEXT MODIFICATION RESPONSE	UE CONTEXT MODIFICATION FAILURE
eNB configuration update	ENB CONFIGURATION UPDATE	ENB CONFIGURATION UPDATE ACKNOWLEDGE	
MME configuration update	MME CONFIGURATION UPDATE	MME CONFIGURATION UPDATE ACKNOWLEDGE	
Write-replace warning	WRITE-REPLACE WARNING REQUEST	WRITE-REPLACE WARNING RESPONSE	
Kill	KILL REQUEST	KILL RESPONSE	

Table 2 Class 2 procedures

Elementary procedure	Message
Handover notification	HANDOVER NOTIFY
E-RAB release indication	E-RAB RELEASE INDICATION

Table 2 Class 2 procedures (Cont.)

Elementary procedure	Message
Paging	PAGING
Initial UE message	INITIAL UE MESSAGE
Downlink NAS transport	DOWNLINK NAS TRANSPORT
Uplink NAS transport	UPLINK NAS TRANSPORT
Error indication	ERROR INDICATION
UE context release request	UE CONTEXT RELEASE REQUEST
Downlink S1 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
Overload start	OVERLOAD START
Overload stop	OVERLOAD STOP
eNB Direct Information Transfer	eNB DIRECT INFORMATION TRANSFER
MME Direct Information Transfer	MME DIRECT INFORMATION TRANSFER
eNB Configuration Transfer	eNB CONFIGURATION TRANSFER
MME Configuration Transfer	MME CONFIGURATION TRANSFER
Downlink Non UE Associated LPPa Transport	DOWNLINK NON UE ASSOCIATED LPPa TRANSPORT
Uplink Non UE Associated LPPa Transport	UPLINK NON UE ASSOCIATED LPPa TRANSPORT

In case of interference between elementary procedures, the reset procedure takes precedence over all other EPs, and the UE context release procedure takes precedence over all other EPs that are using the UE-associated signaling.

5.2 E-RAB management procedures

5.2.1 E-RAB setup

The purpose of the E-RAB setup procedure is to assign resources on S1 for one or several E-RABs and to set up corresponding data radio.

The MME initiates the E-RAB setup procedure during dedicated bearer activation or additional PDN connectivity procedure by sending an E-RAB SETUP REQUEST message to the eNB. The message contains the information required by the eNB to build the E-RAB configuration.

In the E-RAB SETUP RESPONSE message to the MME, the eNB sends an E-RAB Setup List IE that has a list of E-RABs that were successfully established.

The EPC prepares to receive user data before the E-RAB SETUP RESPONSE message is received.

5.2.2 E-RAB modify

The purpose of the E-RAB modification procedure is to enable modification of established E-RABs for a given UE. The modification procedure uses UE-associated signaling.

The MME initiates the E-RAB modification procedure due to HSS or P-GW initiated bearer modification by sending an E-RAB MODIFY REQUEST message to the eNB. The message contains the information required by the eNB to modify one or more E-RABs of the existing E-RAB configuration.

In the E-RAB MODIFY RESPONSE message, the eNB sends the E-RAB Modify List IE that lists the successfully modified E-RABs.

The EPC prepares to receive user data according to the modified E-RAB profile that existed before the E-RAB MODIFY RESPONSE message was received.

5.2.3 E-RAB release

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

MME initiated E-RAB release

The MME initiates the E-RAB release procedure during dedicated bearer deactivation and deactivation of PDN connection, by sending an E-RAB RELEASE COMMAND message. The message contains the information required by the eNB to release E-RABs in the E-RAB To Be Released List IE.

In the E-RAB RELEASE RESPONSE message, MME receives the result for all the E-RABs to be released.

- A list of E-RABs which are released successfully is included in the E-RAB Release List IE.
- A list of E-RABs which failed to be released is included in the E-RAB Failed to Release List IE.

An E-RAB RELEASE COMMAND message on an established UE-associated logical S1-connection containing an E-RAB Release List IE can be sent at any time and can always be replied with an E-RAB RELEASE RESPONSE message.

After an E-RAB RELEASE RESPONSE message containing an E-RAB ID within the E-RAB Release List IE, an E-RAB SETUP REQUEST message requesting establishment of an E-RAB with this E-RAB ID can be sent.

eNB-initiated E-RAB release indication

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

The message contains at least one E-RAB released at the eNB, in the E-RAB Released List IE.

5.3 Context management procedures

5.3.1 Initial context setup

The purpose of the initial context setup procedure is to establish the necessary overall initial UE Context including E-RAB context, the security key, handover restriction list, UE radio capability and UE security capabilities. The procedure uses UE-associated signaling.

Successful operation

The MME initiates the initial context setup procedure (during attach, service request and tracking area update procedures or extended service request due to CSFB) by sending an INITIAL CONTEXT SETUP REQUEST message.

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

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

When the eNB reports unsuccessful establishment of an E-RAB, the cause enables the MME to know the reason for an unsuccessful establishment, for example, "Radio resources not available", or "Failure in the Radio Interface Procedure".

Unsuccessful operation

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

5.3.2 UE context release - eNB initiated

The purpose of the UE context release request procedure is to enable the eNB to request the MME to release the UE-associated logical S1 connection due to E-UTRAN generated reason (for example "TX2_{RELOC}Overall Expiry"). The procedure uses UE-associated signaling.

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. After that, the MME starts the release access bearers procedure towards S-GW and the UE context release procedure towards eNB. The UE CONTEXT RELEASE REQUEST message indicates the appropriate cause value, for example, "User Inactivity", "Radio Connection With UE Lost" for the requested UE-associated logical S1 connection release.

Interactions with UE context release procedure

The UE context release procedure should be initiated upon reception of an UE CONTEXT RELEASE REQUEST message.

5.3.3 UE context release - MME initiated

The purpose of the UE context release procedure is to enable the MME to order the release of the UE-associated logical connection due to various reasons, for example, completion of a transaction between the UE and the EPC. Reason for this can also be the completion of successful handover or completion of handover cancellation. Another typical case is the release of the old UE-associated logical S1 connection when two UE-associated logical S1 connections toward the same UE are detected. The procedure uses UE-associated S1 connection.

The MME initiates the UE context release procedure during S1 release procedure by sending the UE CONTEXT RELEASE COMMAND message to the eNB.

The message contains the UE S1AP ID pair if available; otherwise the message contains MME UE S1AP ID.

After receiving the UE CONTEXT RELEASE COMMAND message, the eNB releases all related signaling and user data transport resources and replies with the UE CONTEXT RELEASE COMPLETE message.

5.3.4 UE context modification

The purpose of the UE context modification procedure is to modify the established UE context partly, for example, UE-AMBR or Subscriber Profile ID for RAT/Frequency priority. This procedure uses UE-associated signaling.

Successful operation

The MME initiates the UE context modification procedure by sending the UE CONTEXT MODIFICATION REQUEST message to the eNB.

The eNB replies to the MME with the UE CONTEXT MODIFICATION RESPONSE message.

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

Unsuccessful operation

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

5.4 Handover signaling

5.4.1 Handover preparation

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

Successful operation

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

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

Unsuccessful operation

For example, if the EPC or the target system is not able to accept any of the bearers, a failure occurs during the handover preparation or target eNB does not respond to handover request during the handover resource allocation procedure, the MME sends the HANDOVER PREPARATION FAILURE message with an appropriate cause value to the source eNB.

5.4.2 Handover resource allocation

The purpose of the handover resource allocation procedure is to reserve resources at the target eNB for the handover of a UE.

Successful operation

The MME initiates the handover resource allocation procedure, during the handover preparation procedure, by sending the HANDOVER REQUEST message to the target eNB.

After all necessary resources for the admitted E-RABs have been allocated, the target eNB generates the HANDOVER REQUEST ACKNOWLEDGE message.

Unsuccessful operation

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

If the target eNB receives a HANDOVER REQUEST message containing RRC Container IE that does not include required information as specified in [3GPP TS 36.331](#), the target eNB shall send the HANDOVER FAILURE message to the MME.

5.4.3 Handover notification

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.

Successful operation

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

Unsuccessful operation

If handover notification is not received after the handover resource allocation procedure, the MME starts the UE context release procedure towards the target eNB.

5.4.4 Path switch request

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

Successful operation

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

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

After all necessary updates, including the UP path switch, have been successfully completed in the EPC for at least one of the E-RABs included in the PATH SWITCH REQUEST E-RAB To Be Switched in Downlink List IE, the MME sends the PATH SWITCH REQUEST ACKNOWLEDGE message to the eNB, and the procedure ends.

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

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

Unsuccessful operation

If the EPC fails to switch the downlink GTP tunnel endpoint towards a new GTP tunnel endpoint for all E-RAB included in the E-RAB To Be Switched in Downlink List IE during the execution of the path switch request procedure, the MME sends the PATH SWITCH REQUEST FAILURE message to the eNB with an appropriate cause value. In this case, the eNB is expected to decide the subsequent actions.

Abnormal conditions

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

5.4.5 Handover cancellation

The purpose of the handover cancel procedure is to enable a source eNB to cancel an ongoing handover preparation or an already prepared handover. The procedure uses UE-associated signaling.

The source eNB initiates the procedure by sending a HANDOVER CANCEL message to the EPC. The message indicates the reason for cancelling the handover by the appropriate value of the Cause IE.

After receiving the HANDOVER CANCEL message, the EPC terminates the possibly ongoing handover preparation procedure, releases any resources associated with the handover preparation and sends a HANDOVER CANCEL ACKNOWLEDGE message to the source eNB.

Transmission and reception of a HANDOVER CANCEL ACKNOWLEDGE message terminates 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.

5.4.6 eNB status transfer

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

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

5.4.7 MME status transfer

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

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

5.5 Paging

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

The MME initiates the paging procedure if it needs to signal with a UE that is in ECM-IDLE state, by sending the PAGING message to the eNB.

After receiving the PAGING message, the eNB performs paging of the UE in cells which belong to tracking areas as indicated in the List of TAIs IE.

For each cell that belongs to any of the TA indicated in the List of TAIs IE, the eNB generates one page on the radio interface.

5.6 NAS transport

The purpose of the NAS transport procedure is to carry UE - MME signaling over the S1 interface. The NAS messages are not interpreted by the eNB, and their content is outside the scope of this interface description. 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.

5.6.1 Initial UE message

When the eNB has received from the radio interface the first UL NAS message transmitted on an RRC connection to be forwarded to an MME, the eNB invokes the NAS transport procedure and sends the INITIAL UE MESSAGE to the MME, including the NAS message as a NAS-PDU IE. The eNB allocates a unique eNB UE S1AP ID to be used for the UE and the eNB includes this identity in the INITIAL UE MESSAGE. When the eNB has received from the radio interface the S-TMSI IE, it includes it in the INITIAL UE MESSAGE.

Abnormal conditions

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

5.6.2 Downlink NAS transport

If the MME only needs to send a NAS message transparently via the eNB to the UE and a UE-associated logical S1 connection exists for the UE or if the MME has received the eNB UE S1AP ID IE in an INITIAL UE MESSAGE, the MME sends 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 allocates a unique MME UE S1AP ID to be used for the UE and include that in the DOWNLINK NAS TRANSPORT message. By the reception of MME UE S1AP ID 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.

5.6.3 Uplink NAS transport

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 sends the UPLINK NAS TRANSPORT message to the MME, including the NAS message as a NAS-PDU IE. The eNB includes the TAI and ECGI of the current cell in every S1-AP UPLINK NAS TRANSPORT message.

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

5.7 Management procedures

5.7.1 Reset

The purpose of the reset procedure is to initialise or re-initialise the E-UTRAN, or part of E-UTRAN S1AP UE-related contexts, in the event of a failure in the EPC or vice versa. This procedure does not affect the application-level configuration data exchanged during the S1 setup procedure.

The procedure uses non-UE associated signaling.

Successful reset procedure initiated from the MME

The MME initiates the reset procedure, after the failure event (resulted in the loss of some or all transaction reference information), by sending the RESET message to the eNB.



Due to fault tolerant architecture, Flexi NS - MME does not need to initiate the reset procedure from MME.

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 responds 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.

Successful reset procedure initiated from the E-UTRAN

At reception of the RESET message, the MME releases all allocated resources on S1 related to the UE associations indicated explicitly or implicitly in the RESET message and removes 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 responds with the RESET ACKNOWLEDGE message.

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

- The MME uses the MME UE S1AP ID IE or the eNB UE S1AP ID IE or both to explicitly identify the UE associations to be reset.

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

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

Abnormal condition at the EPC

If the RESET message includes the UE-associated logical S1-connection List IE, but neither the MME UE S1AP ID IE nor the eNB UE S1AP ID IE is present for a UE-associated logical S1-connection Item IE, then the MME ignores 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.



Currently, reset procedure collision with other procedures is not fully supported.

Crossing of reset messages

If the 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 responds with the RESET ACKNOWLEDGE message as described in *Reset procedure initiated from the E-UTRAN*.

5.7.2 Error indication

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 using UE-associated signaling, then the error indication procedure uses UE-associated signaling. Otherwise the procedure uses non-UE associated signaling.

Successful operation

When the conditions defined in clause 10 (*Handling of Unknown, Unforeseen and Erroneous Protocol Data*) of 3GPP TS 36.413 are fulfilled, the error indication procedure is initiated by an ERROR INDICATION message sent from the receiving node.

The ERROR INDICATION message contains at least either the Cause IE or the Criticality Diagnostics IE.

In case the error indication procedure is triggered by using UE-associated signaling, the MME UE S1AP ID IE and the eNB UE S1AP IE are included in the ERROR INDICATION message. If either or both IEs are incorrect, the cause is set to appropriate value, for example 'Unknown MME UE S1AP ID', 'Unknown eNB UE S1AP' or 'Unknown pair of UE S1AP ID'.

5.7.3 S1 setup

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

This procedure erases any existing application-level configuration data in the two nodes and replaces it by the one received. This procedure also re-initializes the E-UTRAN S1AP UE-related contexts (if any) and erases all related signaling connections in the two nodes like a reset procedure would do, and clears MME overload state information at the eNB.

Successful operation

The eNB initiates the procedure by sending a S1 SETUP REQUEST message including the appropriate data to the MME. In the S1 setup procedure the eNB and radio network related configuration is automatically configured to the MME. The MME responds with S1 SETUP RESPONSE including the appropriate data.

Unsuccessful operation

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

Abnormal conditions

If the eNB initiates the procedure by sending a S1 SETUP REQUEST message including the PLMN Identity IEs and none of the PLMNs provided by the eNB are identified by the MME, then the MME rejects the eNB S1 setup request procedure with the appropriate cause value, for example "Unknown PLMN".

5.7.4 eNB configuration update

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.



No subscribers should be attached when at least one TA is changed or removed on the eNB supported TAs list.

The eNB initiates the procedure by sending an ENB CONFIGURATION UPDATE message to the MME, including an appropriate set of updated application-level configuration data that it has just taken into operational use. The MME responds with an ENB CONFIGURATION UPDATE ACKNOWLEDGE message to acknowledge that it successfully updated the configuration data.

If an information element is not included in the ENB CONFIGURATION UPDATE message, the MME interprets that the corresponding configuration data is not changed and continues to operate the S1 with the existing related configuration data. If the supported TAs are to be updated, the whole list of supported TAs including those that are not to be updated are included in the Supported TAs IE. The MME overwrites the whole list of TAs.

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

5.7.5 MME configuration update

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.



No subscribers should be attached when the GUMMEI of the MME is changed or removed.

The MME initiates the procedure by sending an MME CONFIGURATION UPDATE message including the appropriate updated application level configuration data to the eNB. The eNB responds with an MME CONFIGURATION UPDATE ACKNOWLEDGE message to acknowledge that it successfully updated the configuration data.

The MME initiates a further MME configuration update procedure only after a previous MME configuration update procedure has been completed.

5.7.6 Overload start

The purpose of the overload start procedure is to inform an eNB to reduce the signaling load towards the MME.

The procedure uses non-UE associated signaling.

Successful operation

The MME sends the OVERLOAD START message to the eNB.

If the Overload Action IE in the OVERLOAD START message is set to any of the following values:

- "Reject all RRC connection establishments for non-emergency mobile originated data transfer"
- "Reject all RRC connection establishments for signaling"
- "Only permit RRC connection establishments for emergency sessions and mobile terminated services",

the eNB ensures that only signaling traffic corresponding to permitted RRC connections is sent to the MME.

5.7.7 Overload stop

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 can resume.

The procedure uses non-UE associated signaling.

Successful operation

The MME sends the OVERLOAD STOP message to the eNB.

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

5.8 CDMA2000 tunneling

5.8.1 Uplink CDMA2000 tunneling

The purpose of the uplink CDMA2000 tunneling procedure is to transfer a 1xRTT message to the MME.

When the eNB receives a CDMA2000 message from the radio interface to be forwarded to the MME in which a UE-associated logical S1-connection for a given UE exists, the eNB sends the UPLINK S1 CDMA2000 TUNNELING message to the MME.

5.8.2 Downlink CDMA2000 tunneling

The purpose of the downlink CDMA2000 tunneling procedure is to transfer a 1xRTT message to the eNB.

The MME initiates the procedure when a 1xRTT message is received from the 1xCS IWS.

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

If the MME receives handover status information along with the tunneled downlink CDMA2000 message, the MME includes the handover status information in the CDMA2000 HO Status IE in the DOWNLINK S1 CDMA2000 TUNNELING message.

5.9 UE capability info indication

The purpose of the UE capability info indication procedure is to enable the eNB to provide to the MME UE capability-related information.

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

5.10 Trace procedures

5.10.1 Trace start

The purpose of the trace start procedure is to allow the MME to request the eNB to start a trace session for a UE in ECM-CONNECTED mode. The procedure uses UE-associated signaling. If no UE-associated logical S1 connection exists, the UE-associated logical S1 connection is established as part of the procedure.

The MME initiates the procedure, after the TAU request if trace is activated, by sending a TRACE START message.

5.10.2 Deactivate trace

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

The MME invokes the deactivate trace procedure by sending a DEACTIVATE TRACE message to the eNB as described in [3GPP TS 32.422](#).

5.11 Warning message transmission procedures

5.11.1 Write-replace warning

The purpose of the write-replace warning procedure is to start or overwrite the broadcasting of warning message. The procedure uses non UE-associated signaling.

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

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

5.11.2 Kill

The purpose of kill procedure is to cancel an already ongoing broadcast of a warning message. The procedure uses non UE-associated signaling.

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

5.12 eNB direct information transfer

The purpose of the eNB direct information transfer procedure is to transfer RAN information from the eNB to the MME in unacknowledged mode. The MME does not interpret the transferred RAN information. This procedure uses non-UE associated signaling.

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

The RIM Transfer IE contains RIM Routing Address IE that identifies the final RAN destination node where the RIM information needs to be transferred by the core network.

5.13 MME direct information transfer

The purpose of the MME direct information transfer procedure is to transfer RAN information from the MME to the eNB in unacknowledged mode. This procedure uses non-UE associated signaling.

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

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

5.14 eNB configuration transfer

The purpose of the eNB configuration transfer procedure is to transfer RAN configuration information from the eNB to the MME in the unacknowledged mode. The MME does not interpret the transferred RAN configuration information. This procedure uses non-UE associated signaling.

eNB sends an eNB CONFIGURATION TRANSFER message to the MME to initiate the procedure.

If the MME receives the SON Configuration Transfer IE, it transfers the SON Configuration Transfer IE to the eNB, indicated in the Target eNB-ID IE, by using the MME CONFIGURATION TRANSFER message. The Target eNB-ID IE is included in the SON Configuration Transfer IE.

5.15 MME configuration transfer

The purpose of the MME configuration transfer procedure is to transfer RAN configuration information from the MME to the eNB in the unacknowledged mode. This procedure uses non-UE associated signaling.

MME sends the MME CONFIGURATION TRANSFER message to the eNB to initiate the procedure.

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

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

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

5.16 LPPa transport

Flexi NS - MME supports non-UE associated LPPa transport between the eNB and the E-SMLC.

LPPa (LTE Positioning Protocol Annex) is a positioning protocol between eNB and ESMLC, tunneled via the MME, supporting eNB-based positioning and configuration exchange for Observed Time Difference Of Arrival (OTDOA) data.

Connectionless information transfer is used to transfer non-positioning related information, such as timing information, between eNB and E-SMLC:

- MME receives the Connectionless Information message from the E-SMLC and stores the received SMLC identity in the memory.
- MME sends the DOWNLINK NON UE ASSOCIATED LPPa TRANSPORT message to the destination eNB indicated in the Connectionless Information message.
- MME receives the UPLINK NON UE ASSOCIATED LPPa TRANSPORT message from the eNB and checks for which the E-SMLC identity is stored.
- MME sends the Connectionless Information message to the E-SMLC.

Counters are updated for received and sent LPPa-related messages.

LPPa support requires that the Location Services feature is enabled in the MME and the SLs interface is configured.

6 Message definition and content

Flexi NS - MME supports the following messages in the S1 interface:

- E-RAB SETUP REQUEST
- E-RAB SETUP RESPONSE
- E-RAB MODIFY REQUEST
- E-RAB MODIFY RESPONSE
- E-RAB RELEASE COMMAND
- E-RAB RELEASE RESPONSE
- E-RAB RELEASE INDICATION
- INITIAL CONTEXT SETUP REQUEST
- INITIAL CONTEXT SETUP RESPONSE
- INITIAL CONTEXT SETUP FAILURE
- UE CONTEXT RELEASE REQUEST
- UE CONTEXT RELEASE COMMAND
- UE CONTEXT RELEASE COMPLETE
- UE CONTEXT MODIFICATION REQUEST
- UE CONTEXT MODIFICATION RESPONSE
- UE CONTEXT MODIFICATION FAILURE
- HANDOVER REQUIRED
- HANDOVER COMMAND
- HANDOVER PREPARATION FAILURE
- HANDOVER REQUEST
- HANDOVER REQUEST ACKNOWLEDGE
- HANDOVER FAILURE
- HANDOVER NOTIFY
- PATH SWITCH REQUEST
- PATH SWITCH REQUEST ACKNOWLEDGE
- PATH SWITCH REQUEST FAILURE
- HANDOVER CANCEL
- HANDOVER CANCEL ACKNOWLEDGE
- ENB STATUS TRANSFER
- MME STATUS TRANSFER
- PAGING
- INITIAL UE MESSAGE
- DOWNLINK NAS TRANSPORT
- UPLINK NAS TRANSPORT
- RESET
- RESET ACKNOWLEDGE
- ERROR INDICATION
- S1 SETUP REQUEST
- S1 SETUP RESPONSE
- S1 SETUP FAILURE
- ENB CONFIGURATION UPDATE
- ENB CONFIGURATION UPDATE ACKNOWLEDGE

- MME CONFIGURATION UPDATE
- MME CONFIGURATION UPDATE ACKNOWLEDGE
- OVERLOAD START
- OVERLOAD STOP
- UPLINK S1 CDMA2000 TUNNELING
- DOWNLINK S1 CDMA2000 TUNNELING
- UE CAPABILITY INFO INDICATION
- TRACE START
- DEACTIVATE TRACE
- WRITE-REPLACE WARNING REQUEST
- WRITE-REPLACE WARNING RESPONSE
- KILL REQUEST
- KILL RESPONSE
- ENB DIRECT INFORMATION TRANSFER
- MME DIRECT INFORMATION TRANSFER
- eNB CONFIGURATION TRANSFER
- MME CONFIGURATION TRANSFER
- DOWNLINK NON UE ASSOCIATED LPPA TRANSPORT
- UPLINK NON UE ASSOCIATED LPPA TRANSPORT

Counters are available for the messages sent on the S1 interface. See *Statistics* for details.

6.1 General information on S1AP messages

Presence

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

Table 3 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.

Criticality

Each information element or group of information elements may have criticality information applied to it. The possible cases have been described in the table below.

Table 4 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 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.

Range

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

Assigned criticality

This column provides the actual criticality information as defined in clause 10 of [3GPP TS 36.413](#): Handling of Unknown, Unforeseen and Erroneous Protocol Data, if applicable.

6.2 E-RAB management messages

6.2.1 E-RAB Setup Request

MME sends the E-RAB setup request message to request the eNB to assign resources on UE and S1 for one or multiple E-RABs.

Direction: MME -> eNB

Table 5 E-RAB Setup Request message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject

Table 5 E-RAB Setup Request message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
UE Aggregate Maximum Bit Rate	O				YES	reject
E-RAB to be Setup List		1			YES	reject
>E-RAB To Be Setup Item IEs		1 to <maxnoof E-RABs>*			EACH	reject
>> E-RAB ID	M				-	
>> E-RAB Level QoS Parameters	M			Includes necessary QoS parameters	-	
>> Transport Layer Address	M				-	
>> GTP- TEID	M			EPC TEID		
>> NAS - PDU	M				-	

*maxnoofE-RABs = Maximum number of E-RAB allowed towards one UE, the maximum value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.2.2 E-RAB Setup Response

eNB sends the E-RAB setup response message in reply to the E-RAB Setup Request message.

Direction: eNB -> MME

Table 6 E-RAB Setup Response message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore

Table 6 E-RAB Setup Response message content (Cont.)

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
eNB UE S1AP ID	M				YES	ignore
E-RAB Setup List		0..1			YES	ignore
>E-RAB Setup Item IEs		1 to <maxnoof E-RABs>*			EACH	ignore
>> E-RAB ID	M				-	
>> Transport Layer Address	M				-	
>> GTP-TEID	M				-	
E-RAB Failed to Setup List	O		E-RAB List	a value for E-RAB ID shall only be present once in E-RAB Failed to Setup List IE	YES	ignore
Criticality Diagnostics	O				YES	ignore

*maxnoofE-RABs = Maximum number of E-RAB allowed towards one UE, the maximum value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.2.3 E-RAB Modify Request

MME sends the E-RAB Modify Request message to request the eNB to modify the data radio bearers and the allocated resources on Uu, and S1 for one or several E-RABs.

Direction: MME -> eNB

Table 7 E-RAB Modify Request message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject

Table 7 E-RAB Modify Request message content (Cont.)

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
UE Aggregate Maximum Bit Rate	O				YES	reject
E-RAB to be Modified List		1			YES	reject
>E-RAB To Be Modified Item IEs		1 to <maxnoof E-RABs>*			EACH	reject
>> E-RAB ID	M				-	
>> E-RAB Level QoS Parameters	M			Includes necessary QoS parameters	-	
>> NAS-PDU	M				-	

*maxnoofE-RABs = Maximum number of E-RAB allowed towards one UE, the maximum value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.2.4 E-RAB Modify Response

eNB sends the E-RAB Modify Response message to the MME in reply to the E-RAB Modify Request message.

Direction: eNB -> MME

Table 8 E-RAB Modify Response message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject

Table 8 E-RAB Modify Response message content (Cont.)

IE/Groupname	Presence	Range	IE type andreference	Semanticsdescription	Criticality	Assignedcriticality
MME UE S1AP ID	M				YES	ignore
eNB UE S1AP ID	M				YES	ignore
E-RAB Modify List		0..1			YES	ignore
>E-RAB Modify Item IEs		1 to <maxnoof E-RABs>*			EACH	ignore
>> E-RAB ID	M				-	
E-RAB Failed to Modify List	O		E-RAB List	a value for E-RAB ID shall only be present once in E-RAB Modify List IE + E-RAB Failed to Modify List	YES	ignore
Criticality Diagnostics	O				YES	ignore

*maxnoofE-RABs = Maximum number of E-RAB allowed towards one UE, the maximum value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.2.5 E-RAB Release Command

MME sends the E-RAB Release Command message to eNB requesting to release the allocated resources on UE and S1 for one or several E-RABs.

Direction: MME -> eNB

Table 9 E-RAB Release Command message content

IE/Groupname	Presence	Range	IE type andreference	Semanticsdescription	Criticality	Assignedcriticality
Message Type	M				YES	reject

Table 9 E-RAB Release Command message content (Cont.)

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
UE Aggregate Maximum Bit Rate	O				YES	reject
E-RAB To Be Released List	M		E-RAB List	A value for E-RAB ID shall only be present once in E-RAB To Be Released List IE	YES	ignore
NAS PDU	O				YES	ignore

6.2.6 E-RAB Release Response

eNB sends the E-RAB Release Response message to MME requesting to report the outcome of the E-RAB Release Command message.

Direction: eNB -> MME

Table 10 E-RAB Release Response message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore
eNB UE S1AP ID	M				YES	ignore
E-RAB Release List		0..1			YES	ignore
>E-RAB Release Item IEs		1 to <maxnoof E-RABs>*			EACH	ignore

Table 10 E-RAB Release Response message content (Cont.)

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
>> E-RAB ID	M				-	
E-RAB Failed to Release List	O		E-RAB List	A value for E-RAB ID shall only be present once in E-RAB Release List IE + E-RAB Failed to Release List IE	YES	ignore
Criticality Diagnostics	O				YES	ignore

*maxnoofE-RABs = Maximum number of E-RAB allowed towards one UE, the maximum value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.2.7 E-RAB Release Indication

eNB sends the E-RAB Release Indication message to MME requesting to release one or several E-RABs for one UE.

Direction: eNB -> MME

Table 11 E-RAB Release Indication message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
E-RAB Released List	M		E-RAB List	A value for E-RAB ID shall only be present once	YES	ignore

Table 11 E-RAB Release Indication message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
				in E-RAB Released List IE.		

6.3 Context Management Messages

6.3.1 Initial Context Setup Request

MME sends the Initial Context setup Request message to eNB requesting a setup of a UE context.

Direction: MME -> eNB

Table 12 Initial Context Setup Request message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
UE Aggregate Maximum Bit Rate	M				YES	reject
E-RAB to be Setup List		1			YES	reject
>E-RAB To Be Setup Item IEs	M	1 to <maxnoof E-RABs>*			EACH	reject
>> E-RAB ID	M				-	
>> E-RAB Level QoS Parameters	M			Includes necessary QoS parameters	-	

Table 12 Initial Context Setup Request message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
>> Transport Layer Address	M				-	
>> GTP-TEID	M				-	
>> NAS - PDU	O				-	
UE Security Capabilities	M				YES	reject
Security Key	M			The KeNB is provided after the key generation in the MME, see 3GPP TS 33.401	YES	reject
Trace Activation	O				YES	ignore
Handover Restriction List	O				YES	ignore
UE Radio Capability	O				YES	ignore
Subscriber Profile ID for RAT/Frequency priority	O				YES	ignore
CS Fallback Indicator	O				YES	reject
SRVCC Operation Possible	O				YES	ignore
[CSG Membership]	[O]		[Not supported by Flexi NS - MME]		[YES]	[ignore]

Table 12 Initial Context Setup Request message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Registered LAI	O				YES	ignore

*maxnoofE-RABs = Maximum number of E-RAB allowed towards one UE, the maximum value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.3.2 Initial Context Setup Response

eNB sends the Initial Context Setup Response message to MME confirming the setup of a UE context.

Direction: eNB -> MME

Table 13 E-RAB Setup Response message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore
eNB UE S1AP ID	M				YES	ignore
E-RAB Setup List		1			YES	ignore
>E-RAB Setup Item IEs		1 to <maxnoof E-RABs>*			EACH	ignore
>> E-RAB ID	M				-	
>> Transport Layer Address	M				-	
>> GTP-TEID	M				-	
E-RAB Failed to Setup List	O		E-RAB List	a value for <i>E-RAB ID</i> shall only be present once in <i>E-RAB</i>	YES	ignore

Table 13 E-RAB Setup Response message content (Cont.)

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
				<i>Setup List IE + E-RAB Failed to Setup List IE</i>		
Criticality Diagnostics	O				YES	ignore

*maxnoofE-RABs = Maximum number of E-RAB allowed towards one UE, the maximum value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.3.3 Initial Context Setup Failure

eNB sends the Initial Context Setup Failure message to MME indicating that the setup of the UE context was unsuccessful.

Direction: eNB -> MME

Table 14 E-RAB Setup Response message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore
eNB UE S1AP ID	M				YES	ignore
Cause	M				YES	ignore
Criticality Diagnostics	O				YES	ignore

6.3.4 UE Context Release Request

eNB sends the UE Context Release Request message to MME requesting the release of the UE-associated S1 logical connection over the S1 interface.

Direction: eNB -> MME

Table 15 UE Context Release Request message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
Cause	M				YES	ignore

6.3.5 UE Context Release Command

MME sends the UE Context Release Command message to eNB requesting the release of the UE-associated S1 logical connection over the S1 interface.

Direction: MME -> eNB

Table 16 UE Context Release Command message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
CHOICE UE S1 AP IDs	M				YES	reject
>UE S1 AP ID pair	M					
>MME UE S1AP ID	M					
Cause	M				YES	ignore

6.3.6 UE Context Release Complete

eNB sends the UE Context Release Complete message to MME confirming the release of the UE-associated S1 logical connection over the S1 interface.

Direction: eNB -> MME

Table 17 UE Context Release Complete message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore
eNB UE S1AP ID	M				YES	ignore
Criticality Diagnostics	O				YES	ignore

6.3.7 UE Context Modification Request

MME sends the UE Context Modification Request to eNB providing UE Context information changes to the eNB.

Direction: MME -> eNB

Table 18 UE Context Modification Request message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1 AP IDs	M				YES	reject
eNB UE S1AP ID	M				YES	reject
Security Key	O				YES	reject
Subscriber Profile ID for RAT/Frequency priority	O				YES	ignore
UE Aggregate Maximum Bit Rate	O				YES	ignore
CS Fallback Indicator	O				YES	reject

Table 18 UE Context Modification Request message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
UE Security Capabilities	O				YES	reject
[CSG Membership Status]	[O]		[Not supported by Flexi NS - MME]		[YES]	[ignore]
Registered LAI	O				YES	ignore

6.3.8 UE Context Modification Response

eNB sends the UE Context Modification Response message to MME confirming the performed UE context updates.

Direction: eNB -> MME

Table 19 UE Context Modification Response message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore
eNB UE S1AP ID	M				YES	ignore
Criticality Diagnostics	O				YES	ignore

6.3.9 UE Context Modification Failure

eNB sends the UE Context Modification Failure message to MME, in case the performed UE context update is not successful.

Direction: eNB -> MME

Table 20 UE Context Modification Failure message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore
eNB UE S1AP ID	M				YES	ignore
Cause	M				YES	ignore
Criticality Diagnostics	O				YES	ignore

6.4 Handover Signaling Messages

6.4.1 Handover Required

The source eNB sends the Handover Required message to the MME requesting the preparation of resources at the target.

Direction: eNB -> MME

Table 21 Handover Required message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
Handover Type	M				YES	reject
Cause	M				YES	ignore
Target ID	M				YES	reject

Table 21 Handover Required message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
[Direct Forwarding Path Availability]	[O]		[Not supported by Flexi NS - MME]		[YES]	[ignore]
SRVCC HO Indication	O				YES	reject
Source to Target Transparent Container	M				YES	reject
Source to Target Transparent Container Secondary	O		Not supported by Flexi NS - MME	Source to Target Transparent Container	YES	reject
[MS Classmark 2]	[C-if SRVCC to GERAN]		[Not supported by Flexi NS - MME]		[YES]	[reject]
[MS Classmark 3]	[C-if SRVCC to GERAN]		[Not supported by Flexi NS - MME]		[YES]	[ignore]
[CSG Id]	[O]		[Not supported by Flexi NS - MME]		[YES]	[reject]
[Cell Access Mode]	[O]		[Not supported by Flexi NS - MME]		[YES]	[reject]
PS Service Not Available	O				YES	ignore

*maxnoofE-RABs = Maximum number of E-RAB allowed towards one UE, the maximum value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.4.2 Handover Command

MME sends the Handover Command message to inform the source eNB that resources for the handover have been prepared at the target side.

Direction: MME -> eNB

Table 22 Handover Command message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
Handover Type	M				YES	reject
NAS Security Parameters from E-UTRAN	C-if to UTRAN GERAN			The eNB shall use this IE as specified in [15].	YES	reject
E-RABs Subject to Forwarding List		0..1			YES	ignore
>E-RABs Subject to Forwarding Item IEs		1 to <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M				-	
>>DL Transport Layer Address	O				-	
>>DL GTP-TEID	O			To deliver forwarded DL PDCP SDUs	-	
>>UL Transport Layer Address	O					

Table 22 Handover Command message content (Cont.)

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
>>UL GTP-TEID	O			To deliver forwarded UL PDCP SDUs		
E-RABs to Release List	O		E-RAB List		YES	ignore
Target to Source Transparent Container	M				YES	reject
Target to Source Transparent Container Secondary	O				YES	reject
Criticality Diagnostics	O				YES	ignore

*maxnoofE-RABs = Maximum number of E-RABs for one UE. Value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.4.3 Handover Preparation Failure

MME sends the Handover Preparation Failure message to inform the source eNB that the Handover Preparation has failed.

Direction: MME -> eNB

Table 23 Handover Preparation Failure message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore
eNB UE S1AP ID	M				YES	ignore
Cause	M				YES	ignore

Table 23 Handover Preparation Failure message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Criticality Diagnostics	O				YES	ignore

6.4.4 Handover Request

MME sends the Handover message to the target eNB to request the preparation of resources.

Direction: MME -> eNB

Table 24 Handover Request message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	reject
Handover Type	M				YES	reject
Cause	M				YES	ignore
UE Aggregate Maximum Bit Rate	M				YES	reject
E-RAB to be Setup List		1			YES	reject
>E-RAB To Be Setup Item IEs	M	1 to <maxnoof E-RABs>*			EACH	reject
>> E-RAB ID	M				-	
>> Transport Layer Address	M				-	
>> GTP-TEID	M			To deliver UL PDUs	-	

Table 24 Handover Request message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
>> E-RAB Level QoS Parameters	M			Includes necessary QoS parameters	-	
[>> Data Forwarding Not Possible]	[O]				[YES]	[ignore]
Source to Target Transparent Container	M				YES	reject
UE Security Capabilities	M				YES	reject
Handover Restriction List	O				YES	ignore
Trace Activation	O				YES	ignore
[Request Type]	[O]		[Not supported by Flexi NS - MME]		[YES]	[ignore]
SRVCC Operation Possible	O				YES	ignore
Security Context	M				YES	reject
[NAS Security Parameters to E-UTRAN]	[C-if from UTRAN GERAN]		[Not supported by Flexi NS - MME]	[The eNB shall use this IE as specified in MME.]	[YES]	[reject]
[CSG id]	[O]		[Not supported by Flexi NS - MME]		[YES]	[reject]

Table 24 Handover Request message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
[CSG Membership Status]	[O]		[Not supported by Flexi NS - MME]		[YES]	[ignore]



The details of required IEs to indicate security parameters in the message (for example, encryption and integrity protection information) are FFS.

*maxnoofE-RABs = Maximum number of E-RABs for one UE. Value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.4.5 Handover Request Acknowledge

eNB sends the Handover Request Acknowledge message to inform the MME about the prepared resources at the target.

Direction: eNB -> MME

Table 25 Handover Request Acknowledge message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore
eNB UE S1AP ID	M			allocated at the target eNB	YES	ignore
E-RABs Admitted List		1			YES	ignore
>E-RABs Admitted Item IEs		1 to <maxnoof E-RABs>			EACH	ignore
>>E-RAB ID	M				-	
>>Transport Layer Address	M				-	

Table 25 Handover Request Acknowledge message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
>>GTP-TEID	M			To deliver DL PDUs	-	
>>DL Transport Layer Address	O				-	
>>DL GTP-TEID	O			To deliver forwarded DL PDCP SDUs.	-	
>>UL Transport Layer Address	O				-	
>>UL GTP-TEID	O			To deliver forwarded UL PDCP SDUs.	-	
E-RABs Failed to Setup List	O		E-RAB List	a value for E-RAB ID shall only be present once in E-RABs Admitted List IE + E-RABs Failed to Setup List IE	YES	ignore
Target to Source Transparent Container	M				YES	reject
[CSG Id]	[O]				[YES]	[ignore]
Criticality Diagnostics	O				YES	ignore

*maxnoofE-RABs = Maximum no. of E-RABs for one UE. Value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.4.6 Handover Failure

eNB sends the Handover Failure message to inform the MME that the preparation of resources has failed.

Direction: eNB -> MME

Table 26 Handover Failure message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore
Cause	M				YES	ignore
Criticality Diagnostics	O				YES	ignore

6.4.7 Handover Notify

The target eNB sends the Handover Notify message to inform the MME that the UE has been identified in the target cell and the S1 handover has been completed.

Direction: eNB -> MME

Table 27 Handover Notify message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
E-UTRAN CGI	M				YES	ignore
TAI	M				YES	ignore

6.4.8 Path Switch Request

eNB sends the Path Switch Request message to request the MME to switch DL GTP tunnel termination point(s) from one end-point to another.

Direction: eNB -> MME

Table 28 Path Switch Request message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
eNB UE S1AP ID	M				YES	reject
E-RAB To Be Switched in Downlink List		1			YES	reject
>E-RABs Switched in Downlink Item IEs		1 to <maxnoofE-RABs>*			EACH	reject
>>E-RAB ID	M				-	
>>Transport Layer Address	M				-	
>> GTP TEID	M			To deliver DL PDUs	-	
Source MME UE S1AP ID	M				YES	reject
E-UTRAN CGI	M				YES	ignore
TAI	M				YES	ignore
UE Security Capabilities	M				YES	ignore

*maxnoofE-RABs = Maximum number of E-RABs for one UE. The value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.4.9 Path Switch Request Acknowledge

MME sends the Path Switch Request Acknowledge message to inform the eNB that the path switch has been successfully completed in the EPC.

Direction: MME -> eNB

Table 29 Path Switch Request Acknowledge message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore
eNB UE S1AP ID	M				YES	ignore
UE Aggregate Maximum Bit Rate	O				YES	ignore
E-RAB To Be Switched in Uplink List		0..1			YES	ignore
>E-RABs Switched in Uplink Item IEs		1 to <maxnoofE-RABs>*			EACH	ignore
>>E-RAB ID	M				-	
>>Transport Layer Address	M				-	
>> GTP TEID	M					
E-RAB To Be Released List	O		E-RAB List		YES	ignore
Security Context	M			One pair of {NCC, NH} is provided	YES	reject
Criticality Diagnostics	O				YES	ignore

*maxnoofE-RABs = Maximum number of E-RABs for one UE. The value is 256. This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.

6.4.10 Path Switch Request Failure

MME sends the Path Switch Request Failure message to inform the eNB that a failure has occurred in the EPC during the Path switch request procedure.

Direction: MME -> eNB

Table 30 Path Switch Request Failure message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore
eNB UE S1AP ID	M				YES	ignore
Cause	M				YES	ignore
Criticality Diagnostics	O				YES	ignore

6.4.11 Handover Cancel

The source eNB sends the Handover Cancel message to the MME to request the cancellation of an ongoing handover.

Direction: eNB -> MME

Table 31 Handover Cancel message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
Cause	M				YES	ignore

6.4.12 Handover Cancel Acknowledge

MME sends the Handover Cancel Acknowledge message to the source eNB to confirm that the ongoing handover was cancelled.

Direction: MME -> eNB

Table 32 Handover Cancel Acknowledge message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
MME UE S1AP ID	M				YES	ignore
eNB UE S1AP ID	M				YES	ignore
Criticality Diagnostics	O				YES	ignore

6.4.13 eNB Status Transfer

The source eNB sends the eNB Status Transfer message to transfer the PDCP SN receiver and transmitter status.

Direction: eNB -> MME

Table 33 eNB Status Transfer message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
eNB Status Transfer Transparent Container	M				YES	reject

6.4.14 MME Status Transfer

MME sends the MME Status Transfer message to transfer the PDCP SN receiver and transmitter status.

Direction: MME -> eNB

Table 34 MME Status Transfer message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
eNB Status Transfer Transparent Container	M				YES	reject

6.5 Paging

MME sends the Paging message and the message is used to page a UE in one or several tracking areas.

Direction: MME -> eNB

Table 35 Paging message content

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
UE Identity Index value	M				YES	ignore
UE Paging Identity	M				YES	ignore
Paging DRX	O	Sent, if received in attach or tracking area update.			YES	ignore
CN Domain	M				YES	ignore
List of TAIs		1			YES	ignore

Table 35 Paging message content (Cont.)

IE/Groupname	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
>TAI List Item		1 to < maxnoofTAIs >*			EACH	ignore
>>TAI	M				-	
[CSG Id List]		[0..1]	[Not supported by Flexi NS - MME]		[GLOBAL]	[ignore]
[>CSG Id]	[M]	[1 to < maxnoofCSGId >]**]	[Not supported by Flexi NS - MME]			
Paging Priority	O				YES	ignore

*maxnoofTAIs = Maximum number of TAIs. The value is 256.

**maxnoofCSGId = Maximum number of CSG Ids within the CSG Id List. The value is 256.

6.6 NAS Transport messages

6.6.1 Initial UE Message

eNB sends the Initial UE message to transfer the initial layer three message to the MME over the S1 interface.

Direction: eNB -> MME

Table 36 Initial UE Message message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
eNB UE S1AP ID	M				YES	reject
NAS-PDU	M				YES	reject

Table 36 Initial UE Message message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
TAI	M			Indicating the Tracking Area from which the UE has sent the NAS message.	YES	reject
E-UTRAN CGI	M			Indicating the E-UTRAN CGI from which the UE has sent the NAS message.	YES	ignore
S-TMSI	O				YES	reject
[CSG Id]	[O]		[Not supported by Flexi NS - MME]		[YES]	[reject]
RRC Establishment cause	M				YES	ignore
GUMMEI	O				YES	reject
[Cell Access Mode]	[O]		[Not supported by Flexi NS - MME]		[YES]	[reject]
GW Transport Layer Address	O			Indicating GW Transport Layer Address if the GW is collocated with eNB	YES	ignore
Relay Node Indicator	O			Indicating a relay node	YES	reject

6.6.2 Downlink NAS Transport

MME sends the Downlink NAS Transport message to eNB and is used for carrying NAS information over the S1 interface.

Direction: MME -> eNB

Table 37 Downlink NAS Transport message content

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

6.6.3 Uplink NAS Transport

MME sends the Uplink NAS Transport message and is used for carrying NAS information over the S1 interface.

Direction: eNB -> MME

Table 38 Uplink NAS Transport message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
MME UE S1AP	M				YES	reject
eNB UE S1AP ID	M				YES	reject
NAS-PDU	M				YES	reject
E-UTRAN CGI	M				YES	ignore

Table 38 Uplink NAS Transport message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
TAI	M				YES	ignore

6.7 Management messages

6.7.1 Reset

Both MME and eNB sends the Reset message, which is used to request that the S1 interface, or parts of the S1 interface, is reset.

Direction: MME -> eNB and eNB -> MME

Table 39 Reset message content

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M				YES	reject
Cause	M				YES	ignore
Choice Reset Type	M				YES	reject
>S1 interface					-	-
>> Reset All	M			ENUMERATED (Reset all,...)	-	-
>Part of S1 interface						
>> UE-associated logical S1-connection list		1			-	-
>>>UE-associated logical S1-connection Item		1 to <maxnoofIndividualS1ConnectionsToReset>*			EACH	reject

Table 39 Reset message content (Cont.)

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
>>>> MME UE S1AP ID	O				-	-
>>>> eNB UE S1AP ID	O				-	-

* maxnoofIndividualS1ConnectionsToReset = Maximum number of UE-associated logical S1 connections allowed to reset in one message. The value is 256.

6.7.2 Reset Acknowledge

Both eNB and MME send the Reset Acknowledge message as a response to a Reset message.

Direction: eNB -> MME and MME -> eNB

Table 40 Reset Acknowledge message content

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

* maxnoofIndividualS1ConnectionsToReset = Maximum number of UE-associated logical S1 connections allowed to reset in one message. The value is 256.

6.7.3 Error Indication

Both eNB and MME send the Error Indication message. It is used to indicate that some error has been detected in the node.

Direction: MME -> eNB and eNB -> MME

Table 41 Error Indication message content

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M				YES	ignore
MME UE S1AP ID	O				YES	ignore
eNB UE S1AP ID	O				YES	ignore
Cause	O				YES	ignore
Criticality Diagnostics	O				YES	ignore

* maxnoofIndividualS1ConnectionsToReset = Maximum number of UE-associated logical S1 connections allowed to reset in one message. The value is 256.

6.7.4 S1 Setup Request

eNB sends the S1 Setup Request message to transfer information for a TNL association.

Direction: eNB -> MME

Table 42 S1 Setup Request message content

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M				YES	reject
Global eNB ID	M				YES	reject
eNB Name	O		PrintableString(1..150,...)		YES	ignore

Table 42 S1 Setup Request message content (Cont.)

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
Supported TAs		1..<maxnoofTACs>*		Supported TAs in the eNB	GLOBAL	reject
>TAC	M			Broadcasted TAC	-	
>Broadcast PLMNs		1..<maxnoofBPLMNs>**		Broadcasted PLMNs		
>>PLMN Identity	M					
[CSG Id List]		[0..1]		[Not supported by Flexi NS - MME]	[GLOBAL]	[reject]
[>CSG Id]	M	[0 to <maxnoofCSGIds>***]		[Not supported by Flexi NS - MME]		
Default paging DRX	M				YES	ignore

*maxnoofTACs = Maximum number of TACs. The value is 256. Note that Flexi NS - MME supports a maximum of 10 TACs.

**maxnoofBPLMNs = Maximum number of Broadcasted PLMNs. The value is 6.

***maxnoofCSGIds = Maximum number of CSG Ids within the CSG Id List. The value is 256.

6.7.5 S1 Setup Response

MME sends the S1 Setup Response message to transfer information for a TNL association.

Direction: MME -> eNB

Table 43 S1 Setup Response message content

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

*maxnoofRATs = Maximum number of RATs. The value is 8.

**maxnoofPLMNsPer MME = Maximum number of PLMNs per MME. The value is 32.

***maxnoofGroupIDs = Maximum number of GroupIDs per node per RAT. The value is 65535.

****maxnoofMMECs = Maximum number of MMECs per node per RAT. The value is 256.



Additional Served GUMMEIs IEs are included in case the MME is collocated with pooled SGSN network element.

6.7.6 S1 Setup Failure

MME sends the S1 Setup Failure message to indicate S1 Setup failure.

Direction: MME -> eNB

Table 44 S1 Setup Failure message content

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M				YES	reject
Cause	M				YES	ignore
Time to wait	O				YES	ignore
Criticality Diagnostics	O				YES	ignore

*maxnoofRATs = Maximum number of RATs. The value is 8.

**maxnoofPLMNsPer MME = Maximum number of PLMNs per MME. The value is 32.

***maxnoofGroupIDs = Maximum number of GroupIDs per node per RAT. The value is 65535.

****maxnoofMMECs = Maximum number of MMECs per node per RAT. The value is 256.

The MME uses the Time to wait IE in S1 Setup Failure message in case the S1 Setup Request message is received while the MME is still releasing resources belonging to the same eNB.

This scenario takes place when all the following conditions are met:

1. The SCTP connection to the eNB is lost.
2. The MME starts to release resources associated with the eNB.
3. After the break the eNB regains SCTP connectivity.
4. The eNB sends a new S1 Setup Request message to the MME before MME completes the release.

6.7.7 eNB Configuration Update

eNB sends the eNB Configuration Update message to transfer updated information for a TNL association.

Direction: eNB -> MME

Table 45 eNB Configuration Update message content

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M				YES	reject
eNB Name	O			PrintableString (1..150,...)	YES	ignore
Supported TAs	O	0..<maxnoofTACs> *		Supported TAs in the eNB	GLOBAL	reject
>TAC	M			Broadcasted PLMNs	-	
>Broadcast PLMNs		1..<maxnoofBPLMNs>		Broadcasted PLMNs	-	
>>PLMN Identity	M				-	
[CSG Id List]		[0..1]	[Not supported by Flexi NS - MME]		[GLOBAL]	[reject]
[>CSG Id]		[1 to <maxnoofCSGIds>***]	[Not supported by Flexi NS - MME]		-	-
Default paging DRX	O				YES	ignore

*maxnoofTACs = Maximum number of TACs. The value is 256. Note that Flexi NS - MME supports a maximum of 10 TACs.

**maxnoofBPLMNs = Maximum number of Broadcasted PLMNs. The value is 6.

***maxnoofCSGIds = Maximum number of CSG Ids within the CSG Id List. The value is 256.

6.7.8 eNB Configuration Update Acknowledge

MME sends the eNB Configuration Update Acknowledge to acknowledge the eNB transfer updated information for a TNL association.

Direction: MME -> eNB

Table 46 eNB Configuration Update Acknowledge message content

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M				YES	reject
Criticality Diagnostics	O				YES	ignore

6.7.9 MME Configuration Update

MME sends the MME Configuration Update message to transfer updated information for a TNL association.

Direction: MME -> eNB

Table 47 MME Configuration Update message content

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M				YES	reject
MME Name	O				YES	ignore
Served GUMMEIs		0..<maxnoofRATs>*		The LTE related pool configuration is included on the first place in the list.	GLOBAL	reject
>Served PLMNs		1..<maxnoofPLMNsPerMME>**			-	
>>PLMN Identity	M				-	
>Served GroupIDs		1..<maxnoofGroupIDs>***			-	
>>MME Group ID	M		OCTET STRING (2)		-	
>Served MMECs		1..<maxnoofMMECs>****			-	-
>>MME Code	M				-	-

Table 47 MME Configuration Update message content (Cont.)

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
Relative MME Capacity	O				YES	reject

*maxnoofRATs = Maximum number of RATs. The value is 8.

**maxnoofPLMNsPer MME = Maximum number of PLMNs per MME. The value is 32.

***maxnoofGroupIDs = Maximum number of GroupIDs per node per RAT. The value is 65535.

****maxnoofMMECs = Maximum number of MMECs per node per RAT. The value is 256.



Additional Served GUMMEIs IEs are included in case the MME is collocated with pooled SGSN network element.

6.7.10 MME Configuration Update Acknowledge

eNB sends the MME Configuration Update Acknowledge message to acknowledge the MME transfer updated information for a TNL association.

Direction: eNB -> MME

Table 48 MME Configuration Update Acknowledge message content

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M				YES	reject
Criticality Diagnostics	O				YES	ignore

6.7.11 Overload Start

MME sends the Overload Start message to indicate to the eNB that the MME is overloaded.

Direction: MME -> eNB

Table 49 Overload Start message content

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M				YES	ignore
Overload Response	M				YES	reject
[GUMMEI List]		[0..1]	[Not supported by Flexi NS - MME]		[YES]	[ignore]
[>GUMMEI List item]		[1..<maxnoofMMECs>]	[Not supported by Flexi NS - MME]		[Each]	[ignore]
[>>GUMMEI]	[M]		[Not supported by Flexi NS - MME]			
[Traffic Load Reduction Indication]	[O]		[Not supported by Flexi NS - MME]		[YES]	[ignore]

*maxnoofMMECs = Maximum number of MMECs per node per RAT. The value is 256.

6.7.12 Overload Stop

MME sends the Overload stop message to indicate that the MME is no longer overloaded.

Direction: MME -> eNB

Table 50 Overload Stop message content

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M				YES	reject
[GUMMEI List]		[0..1]	[Not supported by Flexi NS - MME]		[YES]	[ignore]

Table 50 Overload Stop message content (Cont.)

IE/Group Name	Presence	Range	IE Type and reference	Semantics Description	Criticality	Assigned Criticality
[>GUMME/ List item]		[1..<maxnoofM MECs>]	[Not sup- ported by Flexi NS - MME]		[Each]	[ignore]
[>>GUMME]	[M]		[Not sup- ported by Flexi NS - MME]			

6.8 CDMA2000 Tunneling messages

6.8.1 Uplink S1 CDMA2000 Tunneling

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

Direction: eNB => MME

Table 51 Uplink S1 CDMA2000 Tunneling message

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
MME UE S1AP ID	M				YES	reject
eNodeB UE S1AP ID	M				YES	reject
CDMA2000 RAT Type	M				YES	reject
CDMA2000 Sector ID	M				YES	reject
CDMA2000 HO Required Indication	O				YES	ignore
CDMA2000 1xRTT SRVCC Info	O				YES	reject
CDMA2000 1xRTT RAND	O				YES	reject
CDMA2000 -PDU	M				YES	reject

Table 51 Uplink S1 CDMA2000 Tunneling message (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
EUTRAN Round Trip Delay Estimation Info	O				YES	ignore

6.8.2 Downlink S1 CDMA2000 Tunneling

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

Direction: MME => eNB

Table 52 Downlink S1 CDMA2000 Tunneling message

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
MME UE S1AP ID	M				YES	reject
eNodeB UE S1AP ID	M				YES	reject
E-RABs Subject to Forwarding List		0...1			YES	ignore
>E-RABs Subject to Forwarding Item IEs		1 to <maxnoofE-RABs>			EACH	ignore
[>>E-RAB ID]	[M]		[Not supported by Flexi NS - MME]		-	
[>>DL Transport Layer Address]	[O]		[Not supported by Flexi NS - MME]		-	
[>>DL GTP-TEID]	[O]		[Not supported by Flexi NS - MME]	[This indicates the tunnel endpoint for forwarding DL data]	-	
[>>UL Transport Layer Address]	[O]		[Not supported by Flexi NS - MME]		-	
[>>UL GTP-TEID]	[O]		[Not supported]		-	

Table 52 Downlink S1 CDMA2000 Tunneling message (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
			by Flexi NS - MME]			
CDMA2000 HO Status	O					ignore
CDMA2000 RAT Type	M				YES	reject
CDMA2000 -PDU	M				YES	reject

6.9 UE Capability Info Indication

eNB sends the UE Capability Info Indication message to provide UE Radio Capability information to the MME.

Direction: eNB -> MME

Table 53 UE Capability Info Indication message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
UE Radio Capability	M				YES	ignore

6.10 Trace Start

MME sends the Trace Start message to initiate trace recording for a UE.

Direction: MME -> eNB

Table 54 Trace Start message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
MME UE S1AP ID	M				YES	reject
eNB UE S1AP ID	M				YES	reject
Trace Activation	M				YES	ignore

6.11 Deactivate Trace

MME sends the Deactivate Trace message to deactivate trace.

Direction: MME -> eNB

Table 55 Deactivate Trace message content

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

6.12 Warning message transmission messages

6.12.1 Write-Replace Warning Request

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

Direction: MME -> eNB

Table 56 Write-Replace Warning Request message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
Message Identifier	M				YES	reject
Serial Number	M				YES	reject
Warning Area List	O				YES	ignore
Repetition Period	M				YES	reject
Extended Repetition Period	O				YES	reject
Number of Broadcasts Requested	M				YES	reject
Warning Type	O				YES	ignore
Warning Security Information	O				YES	ignore
Data Coding Scheme	O				YES	ignore
Warning Message Contents	O				YES	ignore
Concurrent Warning Message Indicator	O				YES	reject

6.12.2 Write-Replace Warning Response

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

Direction: eNB -> MME

Table 57 Write-Replace Warning Response message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
Message Identifier	M				YES	reject

Table 57 Write-Replace Warning Response message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Serial Number	M				YES	reject
Broadcast Completed Area List	O				YES	ignore
Criticality Diagnostics	O				YES	ignore

6.12.3 Kill Request

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

Direction: MME -> eNB

Table 58 Kill Request message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
Message Identifier	M				YES	reject
Serial Number	M				YES	reject
Warning Area List	O				YES	ignore

6.12.4 Kill Response

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

Direction: eNB -> MME

Table 59 Kill Response message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	reject
Message Identifier	M				YES	reject
Serial Number	M				YES	reject

Table 59 Kill Response message content (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Broadcast Cancelled Area List	O				YES	ignore
Criticality Diagnostics	O				YES	ignore

6.13 eNB Direct Information Transfer

eNB sends this message to transfer specific information.

Direction: eNB -> MME

Table 60 eNB Direct InformationTransfer message content

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

6.14 MME Direct Information Transfer

MME sends this message to transfer specific information.

Direction: MME -> eNB

Table 61 MME Direct InformationTransfer message content

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

6.15 eNB Configuration Transfer

eNB sends this message to transfer RAN configuration information.

Direction: eNB -> MME

Table 62 eNB Configuration Transfer message content

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

6.16 MME Configuration Transfer

MME sends this message to transfer RAN configuration information.

Direction: MME -> eNB

Table 63 MME Configuration Transfer message content

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

6.17 LPPa Transport Messages

6.17.1 Downlink Non UE Associated LPPa Transport

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

Direction: MME -> eNB

Table 64 Downlink Non UE Associated LPPa Transport message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
Routing ID	M				YES	reject
LPPa-PDU	M				YES	reject

6.17.2 Uplink Non UE Associated LPPa Transport

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

Direction: eNB -> MME

Table 65 Uplink Non UE Associated LPPa Transport message content

IE/Group name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned criticality
Message Type	M				YES	ignore
Routing ID	M				YES	reject
LPPa-PDU	M				YES	reject

7 Information element definitions

7.1 Radio Network Layer related IEs

7.1.1 Allocation and Retention Priority

This information element specifies the relative importance compared to other E-RABs for allocation and retention of the E-UTRAN radio access bearer.

Table 66 Allocation and Retention Priority

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

7.1.2 Bit Rate

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

Table 67 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.

7.1.3 Broadcast Cancelled Area List

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

Table 68 Broadcast Cancelled Area List

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE Broadcast Cancelled Area		-		-
>CID Cancelled				
>>Cell ID Cancelled		1 to <maxnoofCellID>		
>>>E-CGI	M			
>>>Number of Broadcasts	M			
>TAI Cancelled				
>>TAI Cancelled		1 to <maxnoofTAIs>		
>>>TAI	M			
>>>Cancelled Cell in TAI List		1 to <maxnoofCellIDinTA>		
>>>>E-CGI	M			
>>>>Number of Broadcasts	M			
>Emergency Area Cancelled				

Table 68 Broadcast Cancelled Area List (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
>>Emergency Area ID Cancelled		1 to <maxnoofEmergencyAreaID>		
>>>Emergency Area ID	M			
>>>Cancelled Cell in Emergency Area ID List		1 to <maxnoofCellinEA>		
>>>>E-CGI	M			
>>>>Number of Broadcasts	M			

Table 69 Range

Range bound	Explanation
maxnoofCellID	Maximum number of Cell ID subject for warning message broadcast. Value is 65535.
maxnoofTAI	Maximum number of TAI subject for warning message broadcast. Value is 65535.
maxnoofEmergencyAreaID	Maximum number of Emergency Area ID subject for warning message broadcast. Value is 65535.
maxnoofCellIDinTA	Maximum number of Cell ID within a TAI. Value is 65535.
maxnoofCellIDinEA	Maximum number of Cell ID within an Emergency Area. Value is 65535.

7.1.4 Broadcast Completed Area List

The Broadcast Completed Area List IE indicates the areas where broadcast was performed successfully.

Table 70 Broadcast Completed Area List

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE Broadcast Completed Area		-		-
>Broadcast Completed Area				

Table 70 Broadcast Completed Area List (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
>>Cell ID Broadcast		1 to <maxnoofCellID>		
>>>E-CGI	M			
>TAI Broadcast				
>>TAI Broadcast		1 to <maxnoofTAIs>		
>>>TAI	M			
>>>Completed Cell in TAI List		1 to <maxnoofCellIDinTA>		
>>>>E-CGI	M			
>Emergency Area ID				
>>Emergency Area ID Broadcast		1 to <maxnoofEmergencyAreaID>		
>>>Emergency Area ID	M			
>>>Completed Cell in Emergency Area ID List		1 to <maxnoofCellinEA>		
>>>>E-CGI	M			

Table 71 Range

Range bound	Explanation
maxnoofCellID	Maximum number of Cell ID subject for warning message broadcast. Value is 65535.
maxnoofTAI	Maximum number of TAI subject for warning message broadcast. Value is 65535.
maxnoofEmergencyAreaID	Maximum number of Emergency Area ID subject for warning message broadcast. Value is 65535.
maxnoofCellIDinTA	Maximum number of Cell ID within a TAI. Value is 65535.
maxnoofCellIDinEA	Maximum number of Cell ID within an Emergency Area. Value is 65535.

7.1.5 Cause

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

Table 72 Cause

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, TX2RELOCoverall Expiry, Successful HO, Release due to E-UTRAN Generated Reason, HO Cancelled, Partial HO, HO Failure In Target EPC/eNB Or Target System, HO Target not allowed, TS1RELOCoverall Expiry, TS1RELOCprep Expiry, Cell not available, Unknown Target ID, No Radio Resources Available in Target Cell, Unknown or already allocated MME UE S1AP ID, Unknown or already allocated eNB UE S1AP ID, Unknown or inconsistent pair of UE S1AP ID, HO desirable for radio reasons, Time critical HO, Resource optimisation HO, Reduce load in serving cell, User inactivity, Radio Connection with UE Lost, Load Balancing TAU Required, CSFB Triggered, UE not Available for PS Service, Radio resources not available, Failure in Radio Interface Procedure, Invalid QoS combination, Inter-RAT redirection, Interaction with other procedure, Unknown E-RAB ID, Multiple E-RAB ID instances, Encryption or integrity protection algorithms not supported, S1 intrasystem HO triggered, S1 intersystem HO triggered, X2HO triggered, Redirection towards 1xRTT, invalid CSG Id...)	-
>Transport Layer	-	-	-	-
>>Transport Layer Cause	M	-	ENUMERATED (Transport Resource Unavailable, Unspecified, ...)	-
>NAS	-	-	-	-
>>NAS Cause	M	-	ENUMERATED (Normal Release, Authentication failure, Detach, Unspecified, CSG Subscription Expiry...)	-
>Protocol	-	-	-	-
>>Protocol Cause	M	-	ENUMERATED (Transfer Syntax Error, Abstract Syntax Error (Reject), Abstract Syntax Error (Ignore and Notify), Message not Compatible with Receiver State, Semantic Error, Abstract Syntax Error (Falsely Constructed Message), Unspecified,...)	-

Table 72 Cause (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
>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 tables. 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.

Table 73 Radio network layer cause values

Radio network layer cause	Meaning
Unspecified	Sent for radio network layer cause when none of the specified cause values applies.
TX2RELOCOverall Expiry	The timer guarding the handover that takes place over X2 has abnormally expired.
Successful Handover	Successful handover.
Release due to E-UTRAN generated reason	Release is initiated due to E-UTRAN-generated reason.
Handover Cancelled	The reason for the action is cancellation of handover.
Partial Handover	Provides a reason for the handover cancellation. The Handover Command message from MME contained E-RABs to Release List IE and the source eNB estimated service continuity for the UE would be better by not proceeding with handover towards this particular target eNB.
Handover Failure In Target EPC/eNB Or Target System	The handover failed due to a failure in target EPC/eNB or target system.
Handover Target not allowed	Handover to the indicated target cell is not allowed for the UE in question.
TS1RELOCOverall Expiry	The reason for the action is expiry of timer TS1RELOCOverall.
TS1RELOCprep Expiry	Handover preparation procedure is cancelled when timer TS1RELOCprep expires.

Table 73 Radio network layer cause values (Cont.)

Radio network layer cause	Meaning
Cell not available	The concerned cell is not available.
Unknown Target ID	Handover rejected because the target ID is not known to the EPC.
No radio resources available in target cell	Load on target cell is too high.
Unknown or already allocated MME UE S1AP ID	The action failed because the MME UE S1AP ID is either unknown, or (for a first message received at the eNB) is known and already allocated to an existing context.
Unknown or already allocated eNB UE S1AP ID	The action failed because the eNB UE S1AP ID is either unknown, or (for a first message received at the MME) is known and already allocated to an existing context.
Unknown or inconsistent pair of UE S1AP ID	The action failed because both UE S1AP IDs are unknown, or are known but do not define a single UE context.
Handover Desirable for Radio Reasons	The reason for requesting handover is radio-related.
Time Critical Handover	Handover is requested for time critical reason. That is, this cause value is reserved to represent all critical cases where the connection is likely to be dropped if handover is not performed.
Resource Optimisation Handover	The reason for requesting handover is to improve the load distribution with the neighbour cells.
Reduce Load in Serving Cell	Load on serving cell needs to be reduced.
User Inactivity	The action is requested due to user inactivity on all E-RABs, for example, S1 is requested to be released in order to optimise the radio resources.
Radio Connection With UE Lost	The action is requested due to losing the radio connection to the UE.
Load Balancing TAU Required	The action is requested for all load balancing and offload cases in the MME.
CS Fallback triggered	The action is due to a CS fallback that has been triggered.
UE Not Available for PS Service	The action is requested due to a cell change order that has been triggered.

Table 73 Radio network layer cause values (Cont.)

Radio network layer cause	Meaning
Radio resources not available	No requested radio resources are available.
Invalid QoS combination	The action was failed because of invalid QoS combination.
Inter-RAT Redirection	The release is requested due to inter-RAT redirection.
Failure in the Radio Interface Procedure	Radio interface procedure has failed.
Interaction with other procedure	The action is due to an ongoing interaction with another procedure.
Unknown E-RAB ID	The action failed because the E-RAB ID is unknown in the eNB.
Multiple E-RAB ID Instances	The action failed because multiple instance of the same E-RAB had been provided to the eNB.
Encryption and/or integrity protection algorithms not supported	The eNB is unable to support any of the encryption and/or integrity protection algorithms supported by the UE.
S1 Intra system Handover triggered	The action is due to a S1 intra-system handover that has been triggered.
S1 Inter system Handover triggered	The action is due to a S1 inter-system handover that has been triggered.
X2 Handover triggered	The action is due to a X2 handover that has been triggered.
Redirection towards 1xRTT	The release is requested due to redirection towards a 1xRTT system due to mobility, CS fallback to 1xRTT, or SRVCC to 1xRTT, when the PS service suspension is required in the EPC.
Not supported QCI Value	The E-RAB setup failed because the requested QCI is not supported.
Invalid CSG Id	The CSG ID provided to the target eNB was found invalid.

Table 74 Transport layer cause values

Transport layer cause	Meaning
Transport Resource Unavailable	The required transport resources are not available.

Table 74 Transport layer cause values (Cont.)

Transport layer cause	Meaning
Unspecified	Sent when none of the above cause values applies but still the cause is transport network layer related.

Table 75 NAS cause values

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

Table 76 Protocol cause values

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.

Table 77 Miscellaneous cause values

Miscellaneous cause	Meaning
Control Processing Overload	Control processing overload.
Not Enough User Plane Processing Resources Available	Not enough resources related to user plane processing are available.
Hardware Failure	Action related to hardware failure.
O&M Intervention	The action is due to O&M intervention.
Unspecified Failure	Sent when none of the above cause values applies and the cause is not related to any of the categories radio network layer, transport network layer, NAS or protocol.
Unknown PLMN	The MME does not identify at least one of the PLMN provided by the eNB.

7.1.6 CDMA2000 HO Status

The CDMA2000 HO Status 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.

Table 78 CDMA2000 HO Status

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.

7.1.7 CDMA2000-PDU

The CDMA2000-PDU IE contains a CDMA2000 message between the UE and CDMA2000 RAT that is transferred without interpretation in the eNB.

Table 79 CDMA2000-PDU

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

7.1.8 CDMA2000 RAT Type

In the uplink, the CDMA2000 RAT Type IE 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.

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

Table 80 CDMA2000 RAT Type

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.

Note: CDMA2000 tunneling with only 1xRTT RAT type is supported by Flexi NS - MME.

7.1.9 CDMA2000 Sector ID

The CDMA2000 Sector ID IE, along with the RAT Type IE is used for routing the tunnelled CDMA2000 message to the proper destination node in the CDMA2000 RAT.

Table 81 CDMA2000 Sector ID

IE/Group name	Presence	Range	IE type and reference	Semantics description
CDMA2000 Sector ID	M		OCTET STRING	This IE is set to CDMA2000 Reference Cell ID corresponding to the HRPD/1xRTT sector under the HRPD AN/1xBS towards which the signalling is performed. The CDMA2000 Reference Cell ID is statically configured in the eNB. If the RAT type is HRPD, this IE contains

Table 81 CDMA2000 Sector ID (Cont.)

IE/Group name	Presence	Range	IE type and reference	Semantics description
				the HRPD Sector ID as specified in the 3GPP2 C.S0024-A reference. If the RAT type is 1x RTT, this IE is encoded as the Reference Cell ID IE as specified in the 3GPP2 A.S0008-C reference.

Note: CDMA2000 tunneling with only 1xRTT RAT type is supported by Flexi NS - MME.

7.1.10 CDMA2000 1xRTT RAND

The CDMA2000 1xRTT RAND IE is a random number generated by the eNB and tunnelled to the 1xCS IWS as specified in the TS 23.402 reference. It is transparent to the MME.

Table 82 CDMA2000 1xRTT RAND

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

7.1.11 CDMA2000 1xRTT SRVCC Info

The CDMA2000 1xRTT SRVCC Info IE defines SRVCC related information elements that are assembled by the MME to be tunnelled transparently to the 1xCS IWS system as specified in the TS 23.402 reference.

Table 83 CDMA2000 1xRTT SRVCC Info

IE/Group name	Presence	Range	IE type and reference	Semantics description
CDMA2000 1xRTT SRVCC Info				
=> CDMA2000 1xRTT MEID	M		OCTET STRING	This information element is the Mobile Equipment Identifier or Hardware ID that is tunnelled from the UE and is transparent to the eNB. This IE is used to derive a MEID-based PLCM that is used for channelization in the 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. It is encoded as the Pilot List IE from the A21-1x Air Interface Signaling message as specified in the 3GPP2 A.S0008-C reference.



The MME only uses the 1xRTT Pilot List field.

7.1.12 Concurrent Warning Message Indicator

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

Table 84 Concurrent Warning Message Indicator

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

7.1.13 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.

Table 85 Criticality Diagnostics

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

Table 85 Criticality Diagnostics (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
>Type of Error	M	-	ENUMERATED(not understood, missing, ...)	-

Table 86 Range explanation

Range bound	Explanation
maxnooferrors	Maximum number of IE errors allowed to be reported with a single message. The value for maxnooferrors is 256.

7.1.14 Data Coding Scheme

The Data Coding Scheme IE identifies the alphabet or coding employed for the message characters and message handling at the UE (it is passed transparently from the EPC to the UE).

Table 87 Data Coding Scheme

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Data Coding Scheme	M	-	BIT STRING(8)	-

7.1.15 Emergency Area ID

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

Table 88 Emergency Area ID

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Emergency Area ID	M	-	OCTET STRING(3)	Emergency Area ID may consist of several cells. Emergency Area ID is defined by the operator.

7.1.16 eNB Status Transfer Transparent Container

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

This IE is transparent to the EPC.

Table 89 eNB Status Transfer Transparent Container

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
E-RABs Subject to Status Transfer List		1	-	-	-	-
>E-RABs Subject to Status Transfer Item	-	1 to <maxnoof E-RABs>	-	-	EACH	ignore
>>E-RAB ID	M	-	-	-	-	-
>>>UL COUNT value	M	-	COUNT value	PDCP-SN and HFN of first missing UL PDCP SDU.	-	-
>>>DL COUNT value	M	-	COUNT value	PDCP-SN and HFN that the target eNB should assign for the next DL SDU not having an SN yet.	-	-
>>>Receive Status of UL PDCP SDUs	O	-	BIT STRING (4096)	PDCP Sequence Number = (First Missing SDU Number + bit position) modulo 40960 0: PDCP SDU has not been received. 1: PDCP SDU has been received correctly	-	-

Table 90 Range explanation

Range bound	Explanation
maxnoofE-RABs	Maximum number of E-RABs for one UE. Value is 256.
Note: This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.	

7.1.17 E-RAB ID

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

Table 91 E-RAB ID

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

7.1.18 E-RAB Level QoS Parameters

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

Table 92 E-RAB Level QoS Parameters

IE/Group Name	Presence	Range	IE type and reference	Semantics description
E-RAB Level QoS Parameters	-	-	-	-
>QCI	M	-	INTEGER (0..255)	QoS Class Identifier defined in 3GPP TS 23.401 . Logical range and coding specified in 3GPP TS 23.203 .
>Allocation and Retention Priority	M	-	-	-
>GBS QoS Information	O	-	-	This IE applies to GBR bearers only and is ignored otherwise.

7.1.19 E-RAB List

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

Table 93 E-RAB List

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

Table 94 Range explanation

Range bound	Explanation
maxnoofE-RABs	Maximum number of E-RAB allowed towards one UE, the maximum value is 256
Note: This is the maximum number allowed in the protocol, as defined in standards. Flexi NS supports a maximum of 11 bearers for one UE, as defined in standards.	

7.1.20 E-UTRAN CGI

This element is used to globally identify a cell (see [3GPP TS 36.401](#)).

Table 95 E-UTRAN CGI

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

7.1.21 Extended Repetition Period

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

Table 96 Extended Repetition Period

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Extended Repetition Period	M	-	INTEGER (4096..2 ¹⁷ -1)	The Extended Repetition Period IE is used if the Repetition Period has a value larger than 4095.

7.1.22 Global eNB ID

This information element is used to globally identify an eNB (see [3GPP TS 36.401](#)).

Table 97 Global eNB ID

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN identity	M	-	-	-

Table 97 Global eNB ID (Cont.)

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

7.1.23 Handover Restriction List

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

Table 98 Handover Restriction List

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Serving PLMN	M	-		-
Equivalent PLMNs		0 to <maxnoof EPLMNs>		Allowed PLMNs in addition to Serving PLMN. This list corresponds to the list of "equivalent PLMNs" as defined in TS 24.301 [24]
>PLMN identity	M			
Forbidden TAs		0 to <maxnoof EPLMNsPlusOne>		intra LTE roaming restrictions
>PLMN identity	M			The PLMN of forbidden TAs
>Forbidden TAs		1 to <maxnoof ForbTAs>		
>>TAC				The TAC of the forbidden TAI

Table 98 Handover Restriction List (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Forbidden LAs		0 to <maxnoof EPLMNsPlusOne>		inter-3GPP RAT roaming restrictions
>PLMN identity	M			
>Forbidden LACs		1 to <maxnoof ForbTACs>		
>>LAC	M		OCTET STRING(2)	
Forbidden interRATs	O		ENUMERATED(ALL, GERAN,UTRAN, CDMA2000,...,GERAN and UTRAN, CDMA2000 and UTRAN)	inter-3GPP and 3GPP2 RAT access restrictions

Table 99 Range explanation

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.

7.1.24 Handover Type

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

Table 100 Handover Type

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

7.1.25 Inter-system Information Transfer Type

This IE indicates the type of information that the eNB requests to transfer.

Table 101 Inter-system Information Transfer Type IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE Inter-system Information Transfer Type	-	-	-	-
> RIM	-	-	-	-
>> RIM Transfer	-	-	-	-

7.1.26 Message Identifier

The purpose of the Message Identifier IE is to identify the warning message. Message Identifier IE is set by the EPC and transferred to the UE by the eNB.

Table 102 Message Identifier

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Message Identifier	M	-	BIT STRING (16)	This IE is set by the EPC, transferred to the UE by the eNB. The eNB shall treat it as an identifier of the message.

7.1.27 Message Type

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

Table 103 Message Type

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Message Type	-	-	-	Assumed maximum number of messages is 256.
>Procedure Code	M	-	(Handover Preparation, Handover Resource Allocation, Handover Notification, Patch Switch Request, Handover Cancellation, E-RAB Setup, E-RAB Modify, E-RAB Release, E-RAB Release Indication, Initial Context Setup, Paging,	-

Table 103 Message Type (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
			Downlink NAS transport, Initial UE Message, Uplink NAS transport, Reset, Error Indication, NAS Non Delivery Indication, S1 Setup, UE Context Release Request, UE Context Release, Downlink S1 CDMA2000 Tunneling, Uplink S1 CDMA2000 Tunneling; UE Context Modification, UE Capability Info Indication, eNB Status Transfer, MME Status Transfer, Deactivate Trace, Trace Start, Trace Failure Indication, eNB Configuration Update, MME Configuration Update, Location Reporting Control, Location Reporting Failure Indication, Location Report, Overload Start, Overload Stop, Private Message, Write-Replace Warning, eNB Direct Information Transfer, MME Direct Information Transfer, Cell Traffic Trace, eNB Configuration Transfer, MME Configuration Transfer, Downlink Non UE Associated LPPa transport, Uplink Non UE Associated LPPa transport, ...)	
>Type of Message	M	-	CHOICE (Initiating Message, Successful Outcome, Unsuccessful Outcome, ...)	-

7.1.28 MME Relay Support Indicator

This IE is set by the MME to advertise its support of Relay functionalities.

Table 104 MME Relay Support Indicator

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MME Relay Support Indicator	M	-	ENUMERATED (true, ...)	-

7.1.29 Number of Broadcasts

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

Table 105 Number of Broadcasts

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Number of Broadcasts	M	-	INTEGER(0..65535)	This IE is set to '0' if valid results are not known or not available. It is set to 65535 if the counter results have overflowed.

7.1.30 Number of Broadcasts Requested

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

Table 106 Number of Broadcast Requested

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Number of Broadcast Requested	M	-	INTEGER (0..65535)	-

7.1.31 Paging DRX

This IE indicates the Paging DRX as defined in [3GPP TS 36.304](#).

Table 107 Paging DRX

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

7.1.32 Paging Priority

The Paging Priority IE indicates the paging priority for paging a UE.

Table 108 Paging Priority

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Paging Priority	M	-	ENUMERATED (PrioLevel1, PrioLevel2, PrioLevel3,	Lower value codepoint indicates higher priority

Table 108 Paging Priority (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
			PrioLevel4, PrioLevel5, PrioLevel6, PrioLevel7, PrioLevel8,...)	

7.1.33 Relay Node Indicator

The Relay Node Indicator IE indicates a relay node.

Table 109 Relay Node Indicator

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Relay Node Indicator	M	-	INTEGER (true,...)	-

7.1.34 Repetition Period

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

Table 110 Repetition Period

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Repetition Period	M	-	INTEGER (0..4095)	Range 1 to 4095: unit [second].

7.1.35 RRC Establishment Cause

The purpose of the RRC Establishment Cause IE is to indicate to the MME the reason for RRC Connection Establishment. The encoding is the same as that of the Establishment Cause IE defined in [3GPP TS 36.331](#).

Table 111 RRC Establishment Cause

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

7.1.36 Security Context

The purpose of the Security Context IE is to provide security-related parameters to the eNB, which are used to derive security keys for user plane traffic and RRC signaling messages and for security parameter generation for subsequent X2 or intra-eNB handovers, or for the security parameters for the current S1 handover.

Table 112 Security Context

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Next Hop Chaining Count	M	-	INTEGER (0..7)	Next Hop Chaining Counter (NCC) defined in 3GPP TS 33.401 .
Next-Hop NH	M	-	Security Key	The NH together with the NCC is used to derive the security configuration.

7.1.37 Security Key

The Security Key IE is used to apply security in the eNB for different scenarios as defined in [3GPP TS 33.401](#).

Table 113 Security Key

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Security Key	M	-	BIT STRING (SIZE(256))	Key material for KeNB or Next Hop Key as defined in 3GPP TS 33.401 .

7.1.38 Serial Number

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

Table 114 Serial Number

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Serial Number	M	-	BIT STRING (16)	-

7.1.39 Source to Target Transparent Container

The Source to Target Transparent Container IE is an information element that is used to transparently pass radio related information from the handover source to the handover target through the EPC; it is produced by the source RAN node and is transmitted to the target RAN node.

Table 115 Source to Target Transparent Container

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Source to Target Transparent Container	M	-	OCTET STRING	This IE includes a transparent container from the source RAN node to the target RAN node. The octets of the OCTET STRING are encoded according to the specifications of the target system.

7.1.40 SRVCC Operation Possible

This element indicates that both the UE and the MME are SRVCC-capable. E-UTRAN behaviour on receipt of this IE is specified in [3GPP TS 23.216](#).

Table 116 SRVCC Operation Possible

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SRVCC Operation Possible	M		ENUMERATED (Possible, ...)	

7.1.41 Target ID

The Target ID IE identifies the target for the handover. The target ID may be, for example 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) .

Table 117 Target ID

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Choice TargetID	-	-	-	-	-	-
>Target eNB-ID	-	-	-	-	-	-
>>Global eNB ID	M	-	-	-	-	-
>>Selected TAI	M	-	TAI	-	-	-
>Target RNC-ID	-	-	-	-	-	-
>>LAI	M	-	-	-	-	-
>>RAC	O	-	-	-	-	-
>>RNC-ID	M	-	INTEGER (0..4095)	If the Extended RNC-ID IE is included in the Target ID IE, the RNC-ID IE shall be ignored.	-	-
[>>Extended RNC-ID]	[O]	-	-	[The Extended RNC-ID IE shall be used if the RNC identity has a value larger than 4095.] [Not supported by Flexi NS - MME]	-	-
>CGI	-	-	-	-	-	-
>>PLMN identity	M	-	-	-	-	-
>>LAC	M	-	OCTET STRING (2)	0000 and FFFE not allowed.	-	-
>>CI	M	-	OCTET STRING (2)	-	-	-
>>RAC	O	-	-	-	-	-

7.1.42 Target to Source Transparent Container

The Source to Target Transparent Container IE is an information element that is used to transparently pass radio related information from the handover source to the handover target through the EPC; it is produced by the source RAN node and is transmitted to the target RAN node.

Table 118 Target to Source Transparent Container

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Target to Source Transparent Container	M	-	OCTET STRING	-

7.1.43 Time to wait

This IE defines the minimum allowed waiting times.

Table 119 Time to wait

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

7.1.44 Trace activation

Trace activation defines parameters related to a trace activation.

Table 120 Trace activation

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
E-UTRAN Trace ID	M	-	OCTET STRING (8)	The E-UTRAN Trace ID IE is composed of the following: Trace Reference defined in 3GPP TS 32.422 (leftmost 6 octets, with PLMN information coded as in 9.2.3.8), and Trace Recording Session Reference defined in 3GPP TS 32.422 (last 2 octets)	-	-

Table 120 Trace activation (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Interfaces To Trace	M	-	BIT STRING (8)	Each position in the bitmap represents a eNB interfaz; First bit =S1-MME, second bit =X2, third bit =Uu; Other bits reserved for future use. Value '1' indicates 'should be traced'. Value '0' indicates 'should not be traced'.	-	-
Trace depth	M	-	ENUMERATED(minimum, medium, maximum, MinimumWithoutVendorSpecificExtension, MediumWithoutVendorSpecificExtension, MaximumWithoutVendorSpecificExtension, ...)	Defined in 3GPP TS 32.422 .	-	-
Trace Collection Entity IP Address	M	-	Transport Layer Address 9.2.2.1	Defined in 3GPP TS 32.422 .	-	-

7.1.45 UE Aggregate Maximum Bit Rate

The UE Aggregate Maximum Bit Rate 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.

Table 121 UE Aggregate Maximum Bit Rate

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Aggregate Maximum Bit Rate	-	-		Description: Applicable for non-GBR E-RABs
>UE Aggregate Maximum Bit Rate Downlink	M		Bit Rate	Description: This IE indicates the UE AMBR in the downlink direction.
>UE Aggregate Maximum Bit Rate Uplink	M		Bit Rate	Description: This IE indicates the UE AMBR in the uplink direction.

Table 121 UE Aggregate Maximum Bit Rate (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
				Receiving both the UE Aggregate Maximum Bit Rate Downlink IE and the UE Aggregate Maximum Bit Rate Uplink IE equal to value zero is considered as a logical error by the eNB.

7.1.46 UE Radio Capability

This IE contains UE Radio Capability information.

Table 122 UE Radio Capability

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Radio Capability	M	-	OCTET STRING	Includes the UE Radio Access Capability Information message as defined in 10.2.2 of [12].

7.1.47 UE Security Capabilities

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

Table 123 UE Security Capabilities

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Security Capabilities	-	-	-	-
>Encryption Algorithms	M	-	BIT STRING (16, ...)	Each position in the bitmap represents an encryption algorithm: 'all bits equal to 0' - UE supports no other algorithm than EEA0 'first bit' - 128-EEA1, 'second bit' - 128-EEA2, other bits reserved for future use. Value '1' indicates support and value '0' indicates no support of the algorithm. Algorithms are defined in 3GPP TS 33.401 .
>Integrity Protection Algorithms	M	-	BIT STRING (16, ...)	Each position in the bitmap represents an integrity protection algorithm: 'first bit' - 128-EIA1, 'second bit' - 128-EIA2, other bits reserved for future use. Value '1' indicates

Table 123 UE Security Capabilities (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
				support and value '0' indicates no support of the algorithm. Algorithms are defined in 3GPP TS 33.401 .

7.1.48 Warning Area List

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

Table 124 Warning Area List

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE Warning Area	-	-	-	-
>Cell ID List	-	1 to <maxnoofCellID>	-	-
>>E-CGI	M	-	-	-
>TAI List	-	1 to <maxnoofTAIfor Warning>	-	-
>>TAI	M	-	-	-
>Emergency Area ID List	-	1 to <maxnoofEmergencyAreaID>	-	-
>>Emergency Area ID	M	-	-	-

Table 125 Range values

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

7.1.49 Warning Message Contents

The Warning Message Contents IE contains user information, for example, the message with warning contents, and will be broadcast over the radio interface.

Table 126 Warning Message Contents

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Warning Message Contents		-	OCTET STRING (SIZE(1..9600))	The length of this IE varies between 1 to 9600 bytes.

7.1.50 Warning Security Information

The Warning Security Information IE provides the security information needed for securing the Primary Notification.

Table 127 Warning Security Information

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Warning Security Information	M	-	OCTET STRING(50)	-

7.1.51 Warning Type

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

Table 128 Warning Type

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Warning Type	M	-	OCTET STRING(2)	-

7.2 Transport Network Layer Related IEs

7.2.1 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.

Table 129 GTP TEID

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

7.2.2 Transport Layer Address

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

Table 130 Transport Layer Address

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Transport Layer Address	M	-	BIT STRING (1..160, ...)	The radio network layer is not supposed to interpret the address information. It should pass it to the transport layer for interpretation. For details on the Transport Layer Address, see 3GPP TS 36.414 .

The Transport Layer Address signalled in S1-AP messages is a bit string of:

- 32 bits in case of IPv4 address according to [IETF RFC 791](#)
- 128 bits in case of IPv6 address according to [IETF RFC 2460](#)

7.3 NAS Related IEs

7.3.1 CN Domain

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

Table 131 CN Domain

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

7.3.2 CS Fallback Indicator

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

Table 132 CS Fallback Indicator

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

7.3.3 eNB UE S1AP ID

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

Table 133 eNB UE S1AP ID

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

7.3.4 GUMMEI

This information element indicates the globally unique MME identity.

Table 134 GUMMEI

IE/Group Name	Presence	Range	IE type and reference	Semantics description
GUMMEI	-	-	-	-
>PLMN identity	M	-		

Table 134 GUMMEI (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
>MME Group ID	M	-	OCTET STRING (2)	-
>MME code	M	-	-	-

7.3.5 IMSI

This information element contains an International Mobile Subscriber Identity, which is commonly used to identify the UE in the core network.

Table 135 IMSI

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

7.3.6 LAI

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

Table 136 LAI

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

7.3.7 LPPa-PDU

This information element contains an eNB – E-SMLC or E-SMLC – eNB message that is transferred without interpretation in the MME.

Table 137 LPPa-PDU

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

7.3.8 MMEC

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

Table 138 MMEC

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

7.3.9 MME UE S1AP ID

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

Table 139 MME UE S1AP ID

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MME UE S1AP ID	M	-	INTEGER (0 .. $2^{32}-1$)	-

7.3.10 NAS-PDU

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

Table 140 NAS-PDU

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

7.3.11 Overload Action

The Overload Action IE indicates which signaling traffic is subject to rejection by the eNB in an MME overload situation.

Table 141 Overload Action

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

7.3.12 Overload Response

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

Table 142 Overload Response

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

7.3.13 PLMN Identity

This information element indicates the PLMN Identity.

Table 143 PLMN Identity

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN identity	M	-	OCTET STRING (SIZE (3))	Digits 0 to 9, encoded 0000 to 1001; 1111 used as filler digit, two digits per octet; bits 4 to 1 of octet n encoding digit 2n-1; bits 8 to 5 of octet n encoding digit 2n. The Selected 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).

7.3.14 Relative MME Capacity

This IE indicates the relative processing capacity of an MME with respect to the other MMEs in the pool in order to load-balance MMEs within a pool (defined in [3GPP TS 23.401](#)).

Table 144 Relative MME Capacity

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

7.3.15 RIM Information

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

Table 145 RIM Information

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RIM information	-	-	-	-

Table 145 RIM Information (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
>RIM Information	M		OCTET STRING	Contains the BSSGP RIM PDU as defined in 3GPP TS 48.018 .

7.3.16 RIM Routing Address

This IE identifies the destination node where the RIM Information needs to be routed by the CN.

Table 146 RIM Routing Address

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE RIM Routing Address	-	-	-	-
>GERAN-Cell-ID	-	-	-	-
>>LAI	M	-	-	-
>>RAC	M	-	-	-
>>CI	M	-	OCTET STRING (2)	
>Target RNC-ID	-	-	-	-
>>LAI	M	-	-	-
>>RAC	O	-	-	-
>>RNC-ID	M		INTEGER (0..4095)	If the Extended RNC-ID IE is included in the Target ID IE, the RNC-ID IE shall be ignored.
>>Extended RNC-ID	O			The Extended RNC-ID IE shall be used if the RNC identity has a value larger than 4095.

7.3.17 RIM Transfer

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

Table 147 RIM Transfer

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RIM Transfer	-	-	-	-
> RIM Information	M	-	-	-
>> RIM Transfer	O	-	-	-

7.3.18 Routing ID

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

Table 148 Routing ID

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

7.3.19 SON Configuration Transfer

This IE contains the SON Information and additionally includes the eNB identifier of the destination of this SON information and the eNB identifier of the source of this information.

Table 149 SON Configuration Transfer

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SON Configuration Transfer	-	-	-	-
>Target eNB-ID	M	-	-	-
>>Global eNB ID	M	-	-	-
>>Selected TAI	M	-	TAI	-
>Source eNB-ID	M	-	-	-
>>Global eNB ID	M	-	-	-
>>Selected TAI	M	-	TAI	-

Table 149 SON Configuration Transfer (Cont.)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
>SON Information	M	-	-	-
>X2 TNL Configuration Info	O	-	-	Source eNB X2 TNL Configuration

7.3.20 SON Information

This IE identifies the nature of the SON information transferred i.e. a request or a reply.

Table 150 SON Information

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
CHOICE SON Information	-	-	-	-	-	-
>SON Information Request	-	-	-	-	-	-
>>SON Information Request	-	-	-	ENUMERATED(X2 TNL Configuration Info, ..., Time synchronization Info)	-	-
>SON Information Reply	-	-	-	-	-	-
>>SON Information Reply	-	-	-	-	-	-

7.3.21 SON Information Reply

This IE contains the SON Information to be replied to the eNB.

Table 151 SON Information Reply

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SON Information Reply	-	-	-	-
>X2 TNL Configuration Info	O	-	-	-
>Time synchronization Info	O	-	-	-

7.3.22 S-TMSI

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

Table 152 S-TMSI

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

7.3.23 TAC

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

Table 153 TAC

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

7.3.24 TAI

This element is used to uniquely identify a Tracking Area.

Table 154 TAI

IE/Group Name	Presence	Range	IE type and reference	Semantics description
TAI	-	-	-	-
>PLMN identity	M	-	-	-
>TAC	M	-	-	-

7.3.25 UE Identity Index value

The UE Identity Index value IE is used by the eNB to calculate the Paging Frame (see [3GPP TS 36.304](#)).

Table 155 UE Identity Index value

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Identity Index value	M	-	BIT STRING (10)	Coded as specified in 3GPP TS 36.304 .

7.3.26 UE Paging Identity

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

Table 156 UE Paging Identity

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

7.3.27 UE S1AP ID pair

This IE contains a pair of UE S1 AP identities.

Table 157 UE S1AP ID

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

7.3.28 X2 TNL Configuration Info

The X2 TNL Configuration Info IE is used for signalling X2 TNL Configuration information for automatic X2 SCTP association establishment.

Table 158 X2 Transport Layer Addresses

IE/Group Name	Presence	Range	IE type and reference	Semantics description
eNB X2 Transport Layer Addresses	-	1 to < maxnoofeNBX2TLAs>	-	-
>Transport Layer Address	M	-	-	Transport Layer Addresses for X2 SCTP end-point.
eNB X2 Extended Transport Layer Address	-	0 to < maxnoofeNBX2ExtTLAs>	-	-
> IP-Sec Transport Layer Address	O	-	-	Transport Layer Addresses for IP-Sec end-point
> eNB GTP Transport Layer Addresses	-	0 to < maxnoofeNBX2GTPTLAs>	-	-
>> GTP Transport Layer Address	M	-	-	GTP Transport Layer Addresses for GTP end-points (used for data forwarding over X2)

Table 159 Range explanation

Range bound	Explanation
maxnoofeNBX2TLAs	Maximum no. of eNB X2 Transport Layer Addresses for an SCTP end-point. Value is 2.
maxnoofeNBX2ExtTLAs	Maximum no. of eNB X2 Extended Transport Layer Addresses in the message. Value is 16.
maxnoofeNBX2GTPTLAs	Maximum no. of eNB X2 GTP Transport Layer Addresses for an GTP end-point in the message. Value is 16.

8 Handling protocol errors

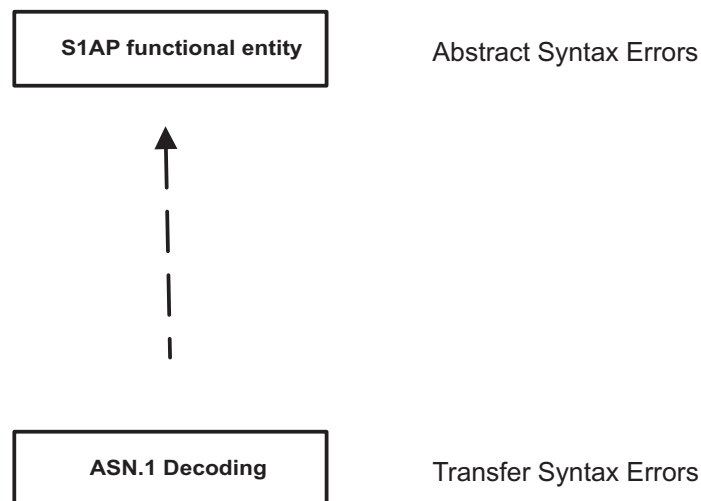
Protocol errors occur in the following functions within a receiving node:

- S1AP functional entity
- ASN.1 decoding

Types of protocol errors are:

- transfer syntax errors
- abstract syntax errors
- logical errors

Figure 1 Protocol errors in S1AP



8.1 Transfer syntax errors

Transfer syntax errors occur when the receiver is not able to decode the received physical message. Transfer syntax errors are always detected during ASN.1 decoding. If a transfer syntax error occurs, the receiver initiates the error indication procedure with appropriate cause value for the transfer syntax protocol error.

Examples of transfer syntax errors are:

- An IE has a defined value range of 0 to 10 and twelve values are received, then this is treated as a transfer syntax error.
- A list is defined as containing 1 to 10 elements, and 12 elements are received, then this is treated 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).

8.2 Abstract syntax errors

Abstract syntax errors occur when the receiving functional S1AP entity:

- receives IEs or IE groups that cannot be understood (unknown IE ID) by the receiving node.
- receives IEs for which the logical range is violated. For example, the IEs ASN.1 definition is 0 to 15, the logical range is 0 to 10, but the (receiving) node receives twelve IEs. Here the values 11 to 15 are not defined, so this is treated as an abstract syntax error.
- does not receive IEs or IE groups when the presence field shows that IEs or IE groups are present in the received message.
- receives IEs or IE groups (that are defined to be part of a message) in the wrong order or with too many occurrences of the same IE or IE group.
- receives IEs or IE groups when the presence field states the IEs or IE groups are not present in the received message.

8.2.1 Criticality information

S1AP messages contain criticality information for individual IEs and IE groups. Criticality information has instructions (on handling an IE or IE group) for the receiver when it receives an IE or an IE group that is not comprehended.

Criticality Information is used in the case of missing IE or IE group abstract syntax errors.

The possible values of the criticality information for an IE or IE group are:

- Reject IE
- Ignore IE and Notify Sender
- Ignore IE

8.2.2 Presence field

The presence field (in the class S1AP-PROTOCOL-IEs, S1AP-PROTOCOL-IEs -Pair, S1AP-PROTOCOL-EXTENSION, or S1AP-PRIVATE-IEs) specifies if the presence of IEs or IE groups is optional or mandatory with respect to RNS application.

The presence field supports the following values:

- optional
- conditional
- mandatory

Examples of abstract syntax errors are:

- If an IE or IE group is not included in a received message and the presence of the IE or 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 or IE group.

- If an IE or IE group is included in a received message and the presence of the IE or 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 or IE group.

8.2.3 Not comprehended IE or IE group

8.2.3.1 Procedure Code

The receiving node handles the different types of received criticality information of the Procedure Code IE as explained in the following section.

Reject IE

If a message is received with a Procedure Code IE marked with Reject IE, the receiving node rejects 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, the receiving node ignores the procedure and initiates the error indication procedure.

Ignore IE

If a message is received with a Procedure Code IE marked with Ignore IE, the receiving node ignores the procedure.

During the error indication procedure (used to reject or report an ignored procedure), the receiving node includes the following in the Criticality Diagnostics IE:

- Procedure Code IE
- Triggering Message IE
- Procedure Criticality IE

8.2.3.2 Type of Message

When the receiving node is not able to decode the Type of Message IE, the error indication procedure is initiated with an appropriate cause value.

8.2.3.3 IEs other than the Procedure Code and Type of Message

The receiving node handles the different types of received criticality information of an IE or IE group, other than the Procedure Code IE and Type of Message IE, as explained in the following section.

Reject IE

If a message initiating a procedure is received containing one or more IEs or IE groups marked with Reject IE, the receiving node:

- does not execute the functional requests of the message.
- rejects the procedure and reports the rejection of one or more IEs or IE groups.
- terminates the procedure and initiates the error indication procedure, if the information in the initiating message was not sufficient to determine a value for all IEs that should be present in the message (which is used to report the unsuccessful outcome of the procedure).

If a message initiating a procedure is received containing one or more IEs or IE groups marked with Reject IE, the receiving node:

- does not execute the functional requests of the message.
- rejects the procedure and reports the rejection of one or more IEs or IE groups.
- terminates the procedure and initiates the error indication procedure, if the information in the initiating message is not sufficient to determine a value for all IEs that should be present in the message (which is used to report the unsuccessful outcome of the procedure).

If a message initiating a procedure (which does not have a message to report an unsuccessful outcome), is received with one or more IEs or IE groups marked with Reject IE, the receiving node terminates the procedure and initiates the error indication procedure.

If a response message is received with one or more IEs marked with Reject IE, the receiving node considers the procedure as terminated and initiates local error handling.

Ignore IE and Notify Sender

If a message initiating a procedure is received with one or more IEs or IE groups marked with Ignore IE and Notify Sender, the receiving node:

- ignores the content of the IEs or IE groups.
- continues with the procedure as if the IEs or IE groups were not received
- reports (in the response message of the procedure) that one or more IEs or IE groups have been ignored.
- terminates the procedure and initiates the error indication procedure, if the information in the initiating message is not sufficient to determine a value for all IEs that should be present in the message (which is used to report the unsuccessful outcome of the procedure).

If a message initiating a procedure (which does not have a message to report the outcome of the procedure) is received, containing one or more IEs or IE groups marked with Ignore IE and Notify Sender, the receiving node:

- ignores the content of the IEs or IE groups.
- continues with the procedure as if the IEs or IE groups were not received.
- initiates the error indication procedure to report that one or more IEs or IE groups have been ignored.

If a response message is received containing one or more IEs or IE groups marked with Ignore IE and Notify Sender, the receiving node:

- ignores the content of the IEs or IE groups.
- continues with the procedure as if the IEs or IE groups were not received.
- initiates the error indication procedure.

Ignore IE

If a message initiating a procedure is received containing one or more IEs or IE groups marked with Ignore IE, the receiving node:

- ignores the content of the IEs or IE groups (marked with Ignore IE).
- continues with the procedure, with IEs or IE groups that were not marked with Ignore IE.

If a response message is received containing one or more IEs or IE groups marked with Ignore IE, the receiving node:

- ignores the content of IEs or IE groups (marked with Ignore IE).
- continues with the procedure using the IEs or IE groups that were not marked with Ignore IE.

When reporting IEs or 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 is included in the Criticality Diagnostics IE for each reported IE or IE group.

When reporting IEs or IE groups marked with Reject IE or Ignore IE and Notify Sender, using the error indication procedure, the following are included in the Criticality Diagnostics IE for each reported IE or IE group:

- Procedure Code IE
- Triggering Message IE
- Procedure Criticality IE
- Information Element Criticality Diagnostics IE

8.2.4 Missing IE or IE group

The receiving node handles the missing IE or IE group according to the criticality information for the missing IE or IE group in the received message.

Reject IE

If a received message initiating a procedure is missing one or more IEs or IE groups marked with Reject IE, the receiving node:

- does not execute functional requests of the message.
- rejects the procedure.
- reports missing IEs or IE groups.
- terminates the procedure and initiates error indication procedure, if the information in the initiating message was not sufficient to determine a value for all IEs that should be present in the message (which is used to report the unsuccessful outcome of the procedure).

If a received message initiating a procedure (which does not have a message to report the unsuccessful outcome) is missing one or more IEs or IE groups marked with Reject IE, the receiving node terminates the procedure and initiates the error indication procedure.

If a received response message is missing one or more IEs or IE groups marked with Reject IE, the receiving node considers the procedure as terminated and initiates local error handling.

Ignore IE and Notify Sender

If a received message initiating a procedure is missing one or more IEs or IE groups marked with Ignore IE and Notify Sender, the receiving node:

- ignores the missing IEs.
- continues with the procedure based on the other IEs or IE groups present in the message.

- reports (in the response message of the procedure) that one or more IEs or IE groups was missing.
- terminates the procedure and initiates the error indication procedure, if the information received in the initiating message was not sufficient to determine a value for all IEs that should be present in the response message.

If a received message initiating a procedure (which does not have a message to report the outcome of the procedure) is missing one or more IEs or IE groups marked with Ignore IE and Notify Sender, the receiving node:

- ignores the missing IEs.
- continues with the procedure based on the other IEs or IE groups present in the message.
- initiates the error indication procedure to report that one or more IEs or IE groups was missing.

If a received response message is missing one or more IEs and IE groups marked with Ignore IE and Notify Sender, the receiving node:

- ignores the missing IEs.
- continues with the procedure based on the other IEs and IE groups present in the message.
- initiates the error indication procedure to report that one or more IEs or IE groups was missing.

Ignore IE

If a received message initiating a procedure has one or more missing IEs or IE groups marked with Ignore IE, the receiving node:

- ignores the missing IEs.
- continues with the procedure based on the other IEs or IE groups present in the message.

If a received response message has one or more missing IEs and IE groups marked with Ignore IE, the receiving node

- ignores the missing IEs and IE groups.
- continues with the procedure based on the other IEs or IE groups present in the message.

When reporting missing IEs or 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 is included in the Criticality Diagnostics IE for each reported IE or IE group.

When reporting missing IEs or IE groups marked with Reject IE or Ignore IE and Notify Sender, using the error indication procedure, the following IEs are included in the Criticality Diagnostics IE for each reported IE or IE group:

- Procedure Code IE
- Triggering Message IE
- Procedure Criticality IE
- Information Element Criticality Diagnostics IE

8.2.5 Wrong order, erroneous presence, or multiple occurrence of IEs or IE groups

This section explains how the receiving node handles the messages with IE or IE groups:

- in the wrong order.
- with too many occurrences.
- with a conditional presence, where the IEs or IE groups are present but the condition is not met (for example, erroneously present).

If a message initiating a procedure is received containing IEs or IE groups in the wrong order, or with too many occurrences, or erroneously present, the receiving node:

- does not execute the functional requests of the message.
- rejects the procedure and reports the cause value abstract syntax error (Falsely Constructed Message), using the message normally used to report the unsuccessful outcome of the procedure.
- terminates the procedure and initiates the error indication procedure, if the information received in the initiating message was not sufficient to determine a value for all IEs that should be present in the message (which is used to report the unsuccessful outcome of the procedure).

If a message initiating a procedure (that does not have a message to report the unsuccessful outcome) is received containing IEs or IE groups in the wrong order, or with too many occurrences, or erroneously present, the receiving node:

- terminates the procedure.
- initiates the error indication procedure.

The receiving node considers the procedure as terminated and initiates local error handling, if received response message has IEs or IE groups:

- in the wrong order.
- with too many occurrences.
- erroneously present.

8.3 Logical errors

Logical error situations occur when a message:

- is understood correctly, but the information contained within the message is not valid.
- describes a procedure which is not compatible with the state of the receiver.

In the above conditions, the following behavior is performed 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:

- When the logical error occurs in a request message of a class 1 procedure, and the procedure has a message to report this unsuccessful outcome, the message is sent with an appropriate cause value. Typical cause values are:

- semantic error
- message not compatible with receiver state
- When the logical error occurs in a request message of a class 1 procedure, and the procedure does not have a message to report this unsuccessful outcome, the procedure is terminated and the error indication procedure is initiated with an appropriate cause value. The Procedure Code IE and the Triggering Message IE within the Criticality Diagnostics IE are then included to identify the message containing the logical error.
- When the logical error occurs in a response message of a class 1 procedure, the procedure is considered as unsuccessfully terminated and local error handling is 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.

8.4 Exceptions

The error handling for all the cases described in this section takes precedence over any other error handling described in the other sections in this chapter. The following are the exceptions:

- If any type of error (transfer syntax error, abstract syntax error or logical error) is detected in the error indication message, it does not trigger the error indication procedure in the receiving node and local error handling is initiated.
- If 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 is considered as unsuccessfully terminated and local error handling is initiated.
- If an error that terminates a procedure occurs, the returned cause value reflects the error that caused the termination of the procedure, even if one or more abstract syntax errors with criticality "ignore and notify" have earlier occurred within the same procedure.
- If an AP ID error is detected, the error handling as described in *Handling AP ID Errors* is applied.

8.4.1 Handling AP ID errors

The "first message", the "first returned message" and the "last message" as used below refer to messages for a UE-associated logical connection. The "first message" has a new AP ID from the sending node and the "first returned message" is the first response message, which has a new AP ID from the node sending the "first returned message". After this, the two AP IDs are included in all messages over the UE-associated logical connection. The "last message" is a message sent by a node in order to complete the termination of a given UE-associated logical connection, such that no other messages for the same connection are expected in either direction.

If a node receives a first message that includes an erroneous remote AP ID (For example, an AP ID which has been stored previously for another UE-associated logical connection for the same peer node) the receiving node initiates an error indication procedure, including only the received AP ID from the peer node and an appropriate cause value. In this case, both nodes locally release any established UE-associated logical connection, having the erroneous AP ID as local or remote identifier.

If a node receives a first returned message that includes a remote AP ID which has been stored for another UE-associated logical connection for the same peer node (for example, the local AP ID is unknown or already allocated to another UE-associated logical connection), the receiving node initiates an Error Indication procedure, including the received AP IDs from the peer node and an appropriate cause value. Both nodes locally release any established UE-associated logical connection, having these AP IDs as local or remote identifier.

If a node receives a message (other than the first or first returned messages) that includes AP IDs, identifying a logical connection that is unknown to the node:

- If this message is not the last message for this UE-associated logical connection, the node initiates an error indication procedure, including the received AP IDs from the peer node and an appropriate cause value. Both nodes locally release any established UE-associated logical connection, having the erroneous AP IDs as local or remote identifier.
- If this message is the last message for this UE-associated logical connection, the receiving node locally release any established UE-associated logical connection that have either the local or remote AP IDs as identifiers.

9 References

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10 Glossary

Term	Definition
3GPP	3rd Generation Partnership Project. Project in which standards organizations and other related bodies have agreed to co-operate for the production of globally applicable technical specifications for a third generation mobile system.
AMBR	Aggregate Maximum Bit Rate
APN	Access Point Name
APN-OI	APN operator identifier
AuC	Authentication Centre
AV	Authentication Vector
AVP	Attribute Value Pair
CDMA	Code Division Multiple Access
CN	Core Network
CS	Circuit Switched
Closed Subscriber Group	Closed Subscriber Group
DL	Downlink
E-RAB	E-UTRAN Radio Access Bearer
E-UTRAN	Evolved UTRAN. Evolution of a third generation radio-access network towards a high-data-rate, low-latency, and packet-optimized radio-access network.
ECGI	E-UTRAN Cell Global Identifier
EIR	Equipment Identity Register
eNB	E-UTRAN NodeB
EP	Elementary Procedure
EPC	Evolved packet core. Evolution of the 3GPP system to a higher-data-rate, lower-latency, packet-optimized system that supports multiple radio-access technologies.

Term	Definition
EPS	Evolved packet system. Evolution of the third generation network that is characterised by a higher-data-rate, lower-latency, packet-optimized system that supports multiple radio access technologies.
Flexi NS	Nokia Solutions and Networks Flexi Network Server
GBR	Guaranteed Bit Rate
GERAN	GSM/EDGE radio access network
GPRS	General Packet Radio Service
GTP	GPRS Tunnelling Protocol
GUMMEI	Globally Unique MME Identifier
HSS	Home Subscriber Server
IE	Information Element
IETF	The Internet Engineering Task Force
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
KASME	Key Access Security Management Entries
LTE	Long-term evolution. Evolution effort within the Third Generation Partnership Project (3GPP) to improve the UMTS standard to cope with future requirements.
MCC	Mobile Country Code
MME	Mobility Management Entity
MNC	Mobile Network Code
MSISDN	Mobile Station ISDN
NAI	Network Access Identifier
NAS	Non Access Stratum
P-GW	PDN gateway
PDN	Packet Data Network

Term	Definition
PDP	Packet Data Protocol
PDU	Protocol Data Unit
PLMN	Public Land Mobile Network
PS	Packet Switched
QoS	Quality of Service
RADIUS	Remote Authentication Dial-in User Service
RAT	Radio Access Technology
Request	Message that requires service from a RADIUS server
RFC	Request For Comment
RIM	RAN Information Management
RRC	Radio Resource Control
SON	Self-organising Network
S-GW	Serving gateway
SCTP	Stream Control Transmission Protocol
SGSN	Serving GPRS Support Node
S-TMSI	S-Temporary Mobile Subscriber Identity
SRVCC	Single Radio Voice Call Continuity
TA	Tracking area
TAI	Tracking Area Identity
TEID	Tunnel Endpoint Identifier
TNL	Transport network layer
TS	Technical specification
UDP	User Datagram Protocol
UE	User Equipment
UL	Uplink

Term	Definition
ULA	Update Location Answer
ULR	Update Location Request
UP	User Plane
UTRAN	UMTS terrestrial radio access network