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**LTE;
Evolved Universal Terrestrial
Radio Access Network (E-UTRAN);
X2 Application Protocol (X2AP)
(3GPP TS 36.423 version 15.7.0 Release 15)**



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Foreword

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

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

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- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the radio network layer signalling procedures of the control plane between eNBs in E-UTRAN. X2AP supports the functions of X2 interface by signalling procedures defined in this document. X2AP is developed in accordance to the general principles stated in TS 36.401 [2] and TS 36.420 [3].

2 References

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

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

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 36.401: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Architecture Description".
- [3] 3GPP TS 36.420: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 General Aspects and Principles".
- [4] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".
- [5] ITU-T Recommendation X.691 (2002-07): "Information technology - ASN.1 encoding rules - Specification of Packed Encoding Rules (PER) ".
- [6] 3GPP TS 32.422: "Telecommunication Management; Subscriber and Equipment Trace; Trace Control and Configuration Management".
- [7] 3GPP TS 32.421: "Telecommunication Management; Subscriber and Equipment Trace; Trace concepts and requirements".
- [8] 3GPP TS 36.424: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 data transport".
- [9] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRAN); Radio Resource Control (RRC) Protocol Specification".
- [10] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation".
- [11] 3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures ".
- [12] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".
- [13] 3GPP TS 23.203: "Policy and charging control architecture".
- [14] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System; Stage 3".
- [15] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA), Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; stage 2".
- [16] 3GPP TS 36.104: "Base Station (BS) radio transmission and reception ".

- [17] Void.
- [18] 3GPP TS 33.401: "Security architecture".
- [19] 3GPP TS 36.414: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 data transport".
- [20] 3GPP TS 23.216: "Single Radio Voice Call Continuity (SRVCC)".
- [21] 3GPP TS 36.422: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 signaling transport".
- [22] 3GPP TS 36.314: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Layer 2 - Measurements".
- [23] Void.
- [24] 3GPP TS 25.413: "UTRAN Iu interface RANAP signalling"
- [25] 3GPP TS 37.320: "Universal Terrestrial Radio Access (UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Tests (MDT); Overall description; Stage 2".
- [26] 3GPP TS 29.281: "General Packet Radio Service (GPRS); Tunneling Protocol User Plane (GTPv1-U)".
- [27] ITU-T Recommendation X.680 (2002-07): "Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation".
- [28] ITU-T Recommendation X.681 (2002-07): "Information technology – Abstract Syntax Notation One (ASN.1): Information object specification".
- [29] 3GPP TS 23.003: "Technical Specification Group Core Network and Terminals; Numbering, addressing and identification".
- [30] 3GPP TR 25.921 (version.7.0.0): "Guidelines and principles for protocol description and error handling".
- [31] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol Specification".
- [32] 3GPP TS 37.340: "Evolved Universal Terrestrial Radio Access (E-UTRA) and NR; Multi-connectivity; Stage 2".
- [33] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) specification".
- [34] 3GPP TS 38.401: "NG-RAN; Architecture description".
- [35] IETF RFC 5905: "Network Time Protocol Version 4: Protocol and Algorithms Specification".
- [36] 3GPP TS 26.247: "Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH)".
- [37] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".
- [38] 3GPP TS 23.501: "System Architecture for the 5G System"
- [39] 3GPP TS 38.413: "NG Radio Access Network (NG-RAN); NG Application Protocol (NGAP)".
- [40] 3GPP TS 36.322: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Link Control (RLC) protocol specification".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

ACL functionality: A functionality controlling the access to network nodes. In case of Access Control Lists (ACL) functionality is applied in a network node the network node may only accept connections from other peer network nodes once the source addresses of the sending network node is already known in the target node.

Elementary Procedure: X2AP protocol consists of Elementary Procedures (EPs). An X2AP Elementary Procedure is a unit of interaction between two eNBs. An EP consists of an initiating message and possibly a response message. Two kinds of EPs are used:

- Class 1: Elementary Procedures with response (success or failure),
- Class 2: Elementary Procedures without response.

E-RAB: Defined in TS 36.401 [2].

CSG Cell: as defined in TS 36.300 [15].

Dual Connectivity: as defined in TS 36.300 [15].

E-UTRA-NR Dual Connectivity: as defined in TS 37.340 [32].

Hybrid cell: as defined in TS 36.300 [15].

Master eNB: as defined in TS 36.300 [15].

Secondary Cell Group: as defined in TS 36.300 [15].

Secondary eNB: as defined in TS 36.300 [15].

en-gNB: as defined in TS 37.340 [32].

3.2 Symbols

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

<symbol> <Explanation>

3.3 Abbreviations

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

| | |
|--------|--|
| ABS | Almost Blank Subframe |
| ACL | Access Control List |
| BBF | Broadband Forum |
| BL | Bandwidth reduced Low complexity |
| CCO | Cell Change Order |
| CE | Coverage Enhancement |
| CoMP | Coordinated Multi Point |
| DC | Dual Connectivity |
| DL | Downlink |
| EARFCN | E-UTRA Absolute Radio Frequency Channel Number |
| E-CID | Enhanced Cell-ID (positioning method) |
| eNB | E-UTRAN NodeB |

| | |
|----------|--|
| EN-DC | E-UTRA-NR Dual Connectivity |
| EP | Elementary Procedure |
| EPC | Evolved Packet Core |
| E-RAB | E-UTRAN Radio Access Bearer |
| E-UTRAN | Evolved UTRAN |
| GNSS | Global Navigation Satellite System |
| GUMMEI | Globally Unique MME Identifier |
| HFN | Hyper Frame Number |
| IE | Information Element |
| L-GW | Local GateWay |
| LWA | LTE-WLAN Aggregation |
| MCG | Master Cell Group |
| MDT | Minimization of Drive Tests |
| MeNB | Master eNB |
| MME | Mobility Management Entity |
| MTSI | Multimedia Telephony Service for IMS |
| NAICS | Network-Assisted Interference Cancellation and Suppression |
| NR | New Radio |
| PDCP | Packet Data Convergence Protocol |
| PLMN | Public Land Mobile Network |
| ProSe | Proximity Service |
| QMC | QoE Measurement Collection |
| QoE | Quality of Experience |
| SCG | Secondary Cell Group |
| S-GW | Serving Gateway |
| SeNB | Secondary eNB |
| SgNB | Secondary gNB |
| SIPTO | Selected IP Traffic Offload |
| SIPTO@LN | Selected IP Traffic Offload at the Local Network |
| SN | Sequence Number |
| SSID | Service Set Identifier |
| TAC | Tracking Area Code |
| UE | User Equipment |
| UL | Uplink |
| V2X | Vehicle-to-Everything |
| WLAN | Wireless Local Area Network |
| WT | WLAN Termination |

4 General

4.1 Procedure specification principles

The principle for specifying the procedure logic is to specify the functional behaviour of the terminating eNB exactly and completely. Any rule that specifies the behaviour of the originating eNB shall be possible to be verified with information that is visible within the system.

The following specification principles have been applied for the procedure text in clause 8:

- The procedure text discriminates between:
 - 1) Functionality which "shall" be executed

The procedure text indicates that the receiving node "shall" perform a certain function Y under a certain condition. If the receiving node supports procedure X but cannot perform functionality Y requested in the initiating message of a Class 1 EP, the receiving node shall respond with the message used to report unsuccessful outcome for this procedure, containing an appropriate cause value.

- 2) Functionality which "shall, if supported" be executed

The procedure text indicates that the receiving node "shall, if supported," perform a certain function Y under a certain condition. If the receiving node supports procedure X, but does not support functionality Y, the receiving node shall proceed with the execution of the EP, possibly informing the requesting node about the not supported functionality.

- Any required inclusion of an optional IE in a response message is explicitly indicated in the procedure text. If the procedure text does not explicitly indicate that an optional IE shall be included in a response message, the optional IE shall not be included. For requirements on including *Criticality Diagnostics* IE, see section 10.

4.2 Forwards and backwards compatibility

The forwards and backwards compatibility of the protocol is assured by a mechanism where all current and future messages, and IEs or groups of related IEs, include ID and criticality fields that are coded in a standard format that will not be changed in the future. These parts can always be decoded regardless of the standard version.

4.3 Specification notations

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

| | |
|----------------|---|
| Procedure | When referring to an elementary procedure in the specification the Procedure Name is written with the first letters in each word in upper case characters followed by the word "procedure", e.g. Handover Preparation procedure. |
| Message | When referring to a message in the specification the MESSAGE NAME is written with all letters in upper case characters followed by the word "message", e.g. HANDOVER REQUEST message. |
| IE | When referring to an information element (IE) in the specification the <i>Information Element Name</i> is written with the first letters in each word in upper case characters and all letters in Italic font followed by the abbreviation "IE", e.g. <i>E-RAB ID</i> IE. |
| Value of an IE | When referring to the value of an information element (IE) in the specification the "Value" is written as it is specified in sub clause 9.2 enclosed by quotation marks, e.g. "Value". |

5 X2AP services

The present clause describes the services an eNB offers to its neighbours.

5.1 X2AP procedure modules

The X2 interface X2AP procedures are divided into two modules as follows:

1. X2AP Basic Mobility Procedures;
2. X2AP Global Procedures;

The X2AP Basic Mobility Procedures module contains procedures used to handle the UE mobility within E-UTRAN.

The Global Procedures module contains procedures that are not related to a specific UE. The procedures in this module are in contrast to the above module involving two peer eNBs.

5.2 Parallel transactions

Unless explicitly indicated in the procedure specification, at any instance in time one protocol peer shall have a maximum of one ongoing X2AP procedure related to a certain UE.

6 Services expected from signalling transport

The signalling connection shall provide in sequence delivery of X2AP messages. X2AP shall be notified if the signalling connection breaks.

X2 signalling transport is described in TS 36.422 [21].

7 Functions of X2AP

The X2AP protocol provides the following functions:

- Mobility Management. This function allows the eNB to move the responsibility of a certain UE to another eNB. Forwarding of user plane data, Status Transfer and UE Context Release function are parts of the mobility management.
- Dual Connectivity. This function allows the eNB to request another eNB to provide radio resources for a certain UE while keeping responsibility for that UE.
- E-UTRA-NR Dual Connectivity. This function allows the eNB to request another en-gNB to provide radio resources for a certain UE while keeping responsibility for that UE.
- Load Management. This function is used by eNBs to indicate resource status, overload and traffic load to each other.
- Reporting of General Error Situations. This function allows reporting of general error situations, for which function specific error messages have not been defined.
- Resetting the X2. This function is used to reset the X2 interface.
- Setting up the X2. This function is used to exchange necessary data for the eNB or en-gNB for setup the X2 interface and implicitly perform an X2 Reset.
- eNB Configuration Update. This function allows updating of application level data needed for two eNBs to interoperate correctly over the X2 interface.
- Mobility Parameters Management. This function allows the eNB to coordinate adaptation of mobility parameter settings with a peer eNB.
- Mobility Robustness Optimisation. This function allows reporting of information related to mobility failure events.
- Energy Saving. This function allows decreasing energy consumption by enabling indication of cell activation/deactivation over the X2 interface.
- X2 Release. This function allows an eNB to be aware that the signalling connection to a peer eNB is unavailable.
- Message Transfer. This function allows indirect transport of X2AP messages to a peer eNB.
- Registration. This function allows registration of eNB in case indirect transport of X2AP messages is supported.
- Removing the X2. This function allows removing the signalling connection between two eNBs or between eNB and en-gNB in a controlled manner.
- Inter-eNB UE Context Retrieval. This function allows retrieval of a UE context in case of resumption or re-establishment of an RRC connection.
- Secondary RAT Data Usage Report. This function allows eNB to get the uplink and downlink data volumes for the Secondary RAT on a per E-RAB basis.
- E-UTRA - NR Spectrum Sharing. This function allows uplink and downlink spectrum sharing between a number of E - UTRA and a number of NR cells with overlapping coverage.
- EN-DC Configuration Transfer. This function supports en-gNB X2 TNL address discovery.

The mapping between the above functions and X2 EPs is shown in the table below.

Table 7-1: Mapping between X2AP functions and X2AP EPs

| Function | Elementary Procedure(s) |
|---------------------------------------|--|
| Mobility Management | a) Handover Preparation b) SN Status Transfer c) UE Context Release d) Handover Cancel |
| Dual Connectivity | a) SeNB Addition Preparation b) SeNB Reconfiguration Completion c) MeNB initiated SeNB Modification Preparation d) SeNB initiated SeNB Modification e) MeNB initiated SeNB Release f) SeNB initiated SeNB Release g) SeNB Counter Check |
| E-UTRA-NR Dual Connectivity | a) SgNB Addition Preparation b) SgNB Reconfiguration Completion c) MeNB initiated SgNB Modification Preparation d) SgNB initiated SgNB Modification e) SgNB change f) MeNB initiated SgNB Release g) SgNB initiated SgNB Release h) SgNB Counter Check i) RRC transfer j) EN-DC X2 Setup k) EN-DC Configuration Update l) EN-DC Cell Activation m) SgNB Activity Notification n) EN-DC X2 Removal o) gNB Status Indication |
| Load Management | a) Load Indication b) Resource Status Reporting Initiation c) Resource Status Reporting |
| Reporting of General Error Situations | Error Indication |
| Resetting the X2 | Reset |
| Setting up the X2 | X2 Setup |
| eNB Configuration Update | a) eNB Configuration Update b) Cell Activation |
| Mobility Parameters Management | Mobility Settings Change |
| Mobility Robustness Optimisation | a) Radio Link Failure Indication b) Handover Report |
| Energy Saving | a) eNB Configuration Update b) Cell Activation |
| X2 Release | X2 Release |
| Message Transfer Registration | X2AP Message Transfer |
| Removing the X2 | X2 Removal |
| Inter-eNB UE Context Retrieval | a) Retrieve UE Context b) Data Forwarding Address Indication |
| Secondary RAT Data Usage Report | Secondary RAT Data Usage Report |
| E-UTRA – NR Spectrum Sharing | E-UTRA - NR Cell Resource Coordination |
| EN-DC Configuration Transfer | EN-DC Configuration Transfer |

8 X2AP procedures

8.1 Elementary procedures

In the following tables, all EPs are divided into Class 1 and Class 2 EPs.

Table 8.1-1: Class 1 Elementary Procedures

| Elementary Procedure | Initiating Message | Successful Outcome | Unsuccessful Outcome |
|--|--|---|------------------------------------|
| | | Response message | Response message |
| Handover Preparation | HANDOVER REQUEST | HANDOVER REQUEST ACKNOWLEDGE | HANDOVER PREPARATION FAILURE |
| Reset | RESET REQUEST | RESET RESPONSE | |
| X2 Setup | X2 SETUP REQUEST | X2 SETUP RESPONSE | X2 SETUP FAILURE |
| eNB Configuration Update | ENB CONFIGURATION UPDATE | ENB CONFIGURATION UPDATE ACKNOWLEDGE | ENB CONFIGURATION UPDATE FAILURE |
| Resource Status Reporting Initiation | RESOURCE STATUS REQUEST | RESOURCE STATUS RESPONSE | RESOURCE STATUS FAILURE |
| Mobility Settings Change | MOBILITY CHANGE REQUEST | MOBILITY CHANGE ACKNOWLEDGE | MOBILITY CHANGE FAILURE |
| Cell Activation | CELL ACTIVATION REQUEST | CELL ACTIVATION RESPONSE | CELL ACTIVATION FAILURE |
| SeNB Addition Preparation | SENB ADDITION REQUEST | SENB ADDITION REQUEST ACKNOWLEDGE | SENB ADDITION REQUEST REJECT |
| MeNB initiated SeNB Modification Preparation | SENB MODIFICATION REQUEST | SENB MODIFICATION REQUEST ACKNOWLEDGE | SENB MODIFICATION REQUEST REJECT |
| SeNB initiated SeNB Modification | SENB MODIFICATION REQUIRED | SENB MODIFICATION CONFIRM | SENB MODIFICATION REFUSE |
| SeNB initiated SeNB Release | SENB RELEASE REQUIRED | SENB RELEASE CONFIRM | |
| X2 Removal | X2 REMOVAL REQUEST | X2 REMOVAL RESPONSE | X2 REMOVAL FAILURE |
| Retrieve UE Context | RETRIEVE UE CONTEXT REQUEST | RETRIEVE UE CONTEXT RESPONSE | RETRIEVE UE CONTEXT FAILURE |
| SgNB Addition Preparation | SGNB ADDITION REQUEST | SGNB ADDITION REQUEST ACKNOWLEDGE | SGNB ADDITION REQUEST REJECT |
| MeNB initiated SgNB Modification Preparation | SGNB MODIFICATION REQUEST | SGNB MODIFICATION REQUEST ACKNOWLEDGE | SGNB MODIFICATION REQUEST REJECT |
| SgNB initiated SgNB Modification | SGNB MODIFICATION REQUIRED | SGNB MODIFICATION CONFIRM | SGNB MODIFICATION REFUSE |
| SgNB change | SGNB CHANGE REQUIRED | SGNB CHANGE CONFIRM | SGNB CHANGE REFUSE |
| MeNB initiated SgNB Release | SGNB RELEASE REQUEST | SGNB RELEASE REQUEST ACKNOWLEDGE | SGNB RELEASE REQUEST REJECT |
| SgNB initiated SgNB Release | SGNB RELEASE REQUIRED | SGNB RELEASE CONFIRM | |
| EN-DC X2 Setup | EN-DC X2 SETUP REQUEST | EN-DC X2 SETUP RESPONSE | EN-DC X2 SETUP FAILURE |
| EN-DC Configuration Update | EN-DC CONFIGURATION UPDATE | EN-DC CONFIGURATION UPDATE ACKNOWLEDGE | EN-DC CONFIGURATION UPDATE FAILURE |
| EN-DC Cell Activation | EN-DC CELL ACTIVATION REQUEST | EN-DC CELL ACTIVATION RESPONSE | EN-DC CELL ACTIVATION FAILURE |
| E-UTRA - NR Cell Resource Coordination | E-UTRA - NR CELL RESOURCE COORDINATION REQUEST | E-UTRA - NR CELL RESOURCE COORDINATION RESPONSE | |

| Elementary Procedure | Initiating Message | Successful Outcome | Unsuccessful Outcome |
|----------------------|--------------------------|---------------------------|--------------------------|
| | | Response message | Response message |
| EN-DC X2 Removal | EN-DC X2 REMOVAL REQUEST | EN-DC X2 REMOVAL RESPONSE | EN-DC X2 REMOVAL FAILURE |

Table 8.1-2: Class 2 Elementary Procedures

| Elementary Procedure | Initiating Message |
|------------------------------------|------------------------------------|
| Load Indication | LOAD INFORMATION |
| Handover Cancel | HANDOVER CANCEL |
| SN Status Transfer | SN STATUS TRANSFER |
| UE Context Release | UE CONTEXT RELEASE |
| Resource Status Reporting | RESOURCE STATUS UPDATE |
| Error Indication | ERROR INDICATION |
| Radio Link Failure Indication | RLF INDICATION |
| Handover Report | HANDOVER REPORT |
| X2 Release | X2 RELEASE |
| X2AP Message Transfer | X2AP MESSAGE TRANSFER |
| SeNB Reconfiguration Completion | SENB RECONFIGURATION COMPLETE |
| MeNB initiated SeNB Release | SENB RELEASE REQUEST |
| SeNB Counter Check | SENB COUNTER CHECK REQUEST |
| SgNB Reconfiguration Completion | SGNB RECONFIGURATION COMPLETE |
| SgNB Counter Check | SGNB COUNTER CHECK REQUEST |
| RRC Transfer | RRC TRANSFER |
| Secondary RAT Data Usage Report | SECONDARY RAT DATA USAGE REPORT |
| SgNB Activity Notification | SGNB ACTIVITY NOTIFICATION |
| Data Forwarding Address Indication | DATA FORWARDING ADDRESS INDICATION |
| gNB Status Indication | GNB STATUS INDICATION |
| EN-DC Configuration Transfer | EN-DC CONFIGURATION TRANSFER |
| Trace Start | TRACE START |
| Deactivate Trace | DEACTIVATE TRACE |

8.2 Basic mobility procedures

8.2.1 Handover Preparation

8.2.1.1 General

This procedure is used to establish necessary resources in an eNB for an incoming handover.

The procedure uses UE-associated signalling.

8.2.1.2 Successful Operation

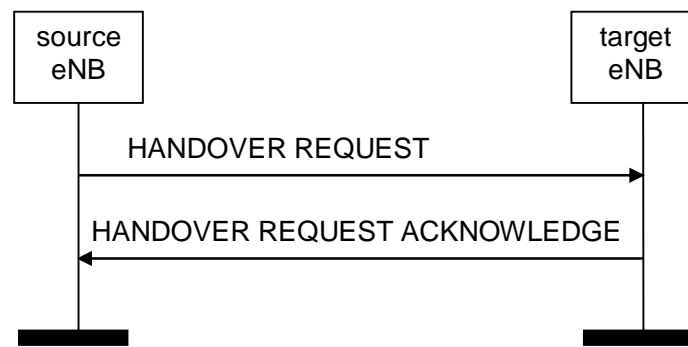


Figure 8.2.1.2-1: Handover Preparation, successful operation

The source eNB initiates the procedure by sending the HANOVER REQUEST message to the target eNB. When the source eNB sends the HANOVER REQUEST message, it shall start the timer $T_{\text{RELOCprep}}$.

The allocation of resources according to the values of the *Allocation and Retention Priority* IE included in the *E-RAB Level QoS Parameters* IE shall follow the principles described for the E-RAB Setup procedure in TS 36.413 [4].

The source eNB may include in the *GUMMEI* IE any GUMMEI corresponding to the source MME node.

If at least one of the requested non-GBR E-RABs is admitted to the cell indicated by the *Target Cell ID* IE, the target eNB shall reserve necessary resources, and send the HANOVER REQUEST ACKNOWLEDGE message back to the source eNB. The target eNB shall include the E-RABs for which resources have been prepared at the target cell in the *E-RABs Admitted List* IE. The target eNB shall include the E-RABs that have not been admitted in the *E-RABs Not Admitted List* IE with an appropriate cause value.

At reception of the HANOVER REQUEST message the target eNB shall:

- prepare the configuration of the AS security relation between the UE and the target eNB by using the information in the *UE Security Capabilities* IE and the *AS Security Information* IE in the *UE Context Information* IE.

For each E-RAB for which the source eNB proposes to do forwarding of downlink data, the source eNB shall include the *DL Forwarding* IE within the *E-RABs To be Setup Item* IE of the HANOVER REQUEST message. For each E-RAB that it has decided to admit, the target eNB may include the *DL GTP Tunnel Endpoint* IE within the *E-RABs Admitted Item* IE of the HANOVER REQUEST ACKNOWLEDGE message to indicate that it accepts the proposed forwarding of downlink data for this bearer. This GTP tunnel endpoint may be different from the corresponding GTP tunnel endpoint, i.e. the information contained in the *Transport Layer address* IE and *GTP TEID* IE in the *E-RAB To Be Switched in Downlink List* IE of the PATH SWITCH REQUEST message (see TS 36.413 [4]) depending on implementation choice.

For each bearer in the *E-RABs Admitted List* IE, the target eNB may include the *UL GTP Tunnel Endpoint* IE to indicate that it requests data forwarding of uplink packets to be performed for that bearer.

Upon reception of the HANOVER REQUEST ACKNOWLEDGE message the source eNB shall stop the timer $T_{\text{RELOCprep}}$, start the timer $\text{TX}_{2\text{RELOCoverall}}$ and terminate the Handover Preparation procedure. The source eNB is then defined to have a Prepared Handover for that X2 UE-associated signalling.

If the *Trace Activation* IE is included in the HANOVER REQUEST message then the target eNB shall, if supported, initiate the requested trace function as described in TS 32.422 [6]. In particular, the target eNB shall, if supported:

- if the *Trace Activation* IE does not include the *MDT Configuration* IE, initiate the requested trace session as described in TS 32.422 [6];
- if the *Trace Activation* IE includes the *MDT Activation* IE, within the *MDT Configuration* IE, set to "Immediate MDT and Trace" initiate the requested trace session and MDT session as described in TS 32.422 [6];
- if the *Trace Activation* IE includes the *MDT Activation* IE, within the *MDT Configuration* IE, set to "Immediate MDT Only" initiate the requested MDT session as described in TS 32.422 [6] and the target eNB shall ignore *Interfaces To Trace* IE, and *Trace Depth* IE;

- if the *Trace Activation* IE includes the *MDT Location Information* IE, within the *MDT Configuration* IE, store this information and take it into account in the requested MDT session;
- if the *Trace Activation* IE includes the *Signalling based MDT PLMN List* IE, within the *MDT Configuration* IE, the eNB may use it to propagate the MDT Configuration as described in TS 37.320 [31];
- if the *Trace Activation* IE includes the *UE Application layer measurement configuration* IE, initiate the requested trace session and QoE Measurement Collection function as described in TS 36.300 [15].
- if the *Trace Activation* IE includes the *Bluetooth Measurement Configuration* IE, within the *MDT Configuration* IE, take it into account for MDT Configuration as described in TS 37.320 [31].
- if the *Trace Activation* IE includes the *WLAN Measurement Configuration* IE, within the *MDT Configuration* IE, take it into account for MDT Configuration as described in TS 37.320 [31].

If the *Management Based MDT Allowed* IE only or the *Management Based MDT Allowed* IE and the *Management Based MDT PLMN List* IE is contained in the HANOVER REQUEST message, the target eNB shall, if supported, store the received information in the UE context, and use this information to allow subsequent selection of the UE for management based MDT defined in TS 32.422 [6].

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

The source eNB shall, if supported and available in the UE context, include the *Management Based MDT Allowed* IE and the *Management Based MDT PLMN List* IE in the HANOVER REQUEST message, except if the source eNB selects a serving PLMN in the target eNB which is not included in the Management Based MDT PLMN List. If the *Management Based MDT PLMN List* IE is not present, the source eNB shall, if supported, include the *Management Based MDT Allowed* IE, if this information is available in the UE context, in the HANOVER REQUEST message, except if the source eNB selects a serving PLMN in the target eNB different from the serving PLMN in the source eNB.

If the *Handover Restriction List* IE is

- contained in the HANOVER REQUEST message, the target eNB shall
 - store the information received in the *Handover Restriction List* IE in the UE context;
 - use this information to determine a target for the UE during subsequent mobility action for which the eNB provides information about the target of the mobility action towards the UE, except when one of the E-RABs has a particular ARP value (TS 23.401 [12]) in which case the information shall not apply;
 - use this information to select a proper SCG during dual connectivity operation.
- not contained in the HANOVER REQUEST message, the target eNB shall consider that no roaming and no access restriction apply to the UE.

If the *Location Reporting Information* IE is included in the HANOVER REQUEST message then the target eNB should initiate the requested location reporting functionality as defined in TS 36.413 [4].

If the *SRVCC Operation Possible* IE is included in the HANOVER REQUEST message, the target eNB shall store the content of such IE in the UE context and use it as defined in TS 23.216 [20].

If the *UE Security Capabilities* IE included in the HANOVER REQUEST message only contains the EIA0 algorithm as defined in TS 33.401 [18] and if this EIA0 algorithm is defined in the configured list of allowed integrity protection algorithms in the eNB (TS 33.401 [18]), the eNB shall take it into use and ignore the keys received in the *AS Security Information* IE.

The HANOVER REQUEST message shall contain the *Subscriber Profile ID for RAT/Frequency priority* IE, if available.

If the *Subscriber Profile ID for RAT/Frequency priority* IE is contained in the HANOVER REQUEST message, the target eNB shall store this information and the target eNB should use the information as defined in TS 36.300 [15].

Upon reception of *UE History Information* IE in the HANOVER REQUEST message, the target eNB shall collect the information defined as mandatory in the *UE History Information* IE and shall, if supported, collect the information defined as optional in the *UE History Information* IE, for as long as the UE stays in one of its cells, and store the collected information to be used for future handover preparations.

Upon reception of the *UE History Information from the UE* IE in the HANDOVER REQUEST message, the target eNB shall, if supported, store the collected information to be used for future handover preparations.

If the *Mobility Information* IE is provided in the HANDOVER REQUEST message, the target eNB shall, if supported, store this information and use it as defined in TS 36.300 [15]. The target eNB shall, if supported, store the C-RNTI of the source cell received in the HANDOVER REQUEST message.

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

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

If the *V2X Services Authorized* IE is contained in the HANDOVER REQUEST message and it contains one or more IEs set to "authorized", the eNB shall, if supported, consider that the UE is authorized for the relevant service(s).

If the *UE Context Reference at the SeNB* IE is contained in the HANDOVER REQUEST message the target eNB may use it as specified in TS 36.300 [15]. In this case, the source eNB may expect the target eNB to include the *UE Context Kept Indicator* IE set to "True" in the HANDOVER REQUEST ACKNOWLEDGE message, which shall use this information as specified in TS 36.300 [15]. If the *UE Context Reference at the WT* IE is contained in the HANDOVER REQUEST message, the target eNB may use it as specified in TS 36.300 [15]. In this case, the source eNB may expect the target eNB to include the *WT UE Context Kept Indicator* IE set to "True" in the HANDOVER REQUEST ACKNOWLEDGE message; the source eNB shall use this information as specified in TS 36.300 [15].

If the *UE Context Reference at the SgNB* IE is contained in the HANDOVER REQUEST message the target eNB may use it as specified in TS 37.340 [32]. In this case, the source eNB may expect the target eNB to include the *UE Context Kept Indicator* IE set to "True" in the HANDOVER REQUEST ACKNOWLEDGE message, which shall use this information as specified in TS 37.340 [32].

If the *Bearer Type* IE is included in the HANDOVER REQUEST message and is set to "non IP", then the target eNB shall not perform header compression for the concerned E-RAB. If the *UE Sidelink Aggregate Maximum Bit Rate* IE is contained in the HANDOVER REQUEST message, the target eNB shall, if supported, use it for the concerned UE's sidelink communication in network scheduled mode for V2X services.

If the *NR UE Security Capabilities* IE is included in the HANDOVER REQUEST message, the target eNB shall, if supported, store this information in the UE context and send it to the respective peer node during subsequent handover preparations and/or EN-DC operations for the UE as defined in TS 33.401 [15].

If the *Aerial UE subscription information* IE is included in the HANDOVER REQUEST message, the target eNB shall, if supported, store this information in the UE context and use it as defined in TS 36.300 [15].

If the *Subscription Based UE Differentiation Information* IE is included in the HANDOVER REQUEST message, the eNB shall, if supported, store this information in the UE context for further use according to TS 23.401 [12].

8.2.1.3 Unsuccessful Operation

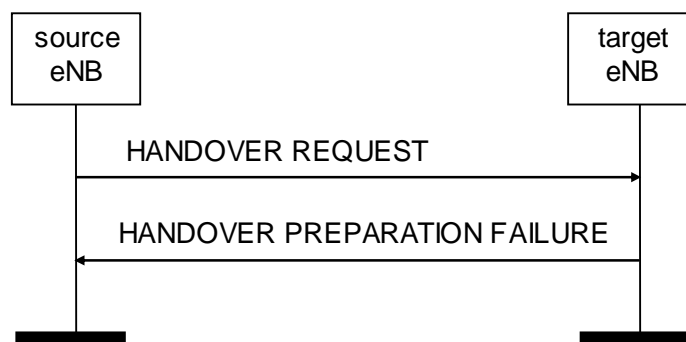


Figure 8.2.1.3-1: Handover Preparation, unsuccessful operation

If the target eNB does not admit at least one non-GBR E-RAB, or a failure occurs during the Handover Preparation, the target eNB shall send the HANDOVER PREPARATION FAILURE message to the source eNB. The message shall contain the *Cause* IE with an appropriate value.

If the target eNB receives a HANOVER REQUEST message containing *RRC Context* IE that does not include required information as specified in TS 36.331 [9], the target eNB shall send the HANOVER PREPARATION FAILURE message to the source eNB.

Interactions with Handover Cancel procedure:

If there is no response from the target eNB to the HANOVER REQUEST message before timer $T_{\text{RELOCprep}}$ expires in the source eNB, the source eNB should cancel the Handover Preparation procedure towards the target eNB by initiating the Handover Cancel procedure with the appropriate value for the *Cause* IE. The source eNB shall ignore any HANOVER REQUEST ACKNOWLEDGE or HANOVER PREPARATION FAILURE message received after the initiation of the Handover Cancel procedure and remove any reference and release any resources related to the concerned X2 UE-associated signalling.

8.2.1.4 Abnormal Conditions

If the target eNB receives a HANOVER REQUEST message containing multiple *E-RAB ID* IEs (in the *E-RABs To Be Setup List* IE) set to the same value, the target eNB shall not admit the corresponding E-RABs.

If the target eNB receives a HANOVER REQUEST message containing a *E-RAB Level QoS Parameters* IE which contains a *QCI* IE indicating a GBR bearer (as defined in TS 23.203 [13]), and which does not contain the *GBR QoS Information* IE, the target eNB shall not admit the corresponding E-RAB.

If the supported algorithms for encryption defined in the *Encryption Algorithms* IE in the *UE Security Capabilities* IE in the *UE Context Information* IE, plus the mandated support of EEA0 in all UEs (TS 33.401 [18]), do not match any algorithms defined in the configured list of allowed encryption algorithms in the target eNB (TS 33.401 [18]), the target eNB shall reject the procedure using the HANOVER PREPARATION FAILURE message.

If the supported algorithms for integrity defined in the *Integrity Protection Algorithms* IE in the *UE Security Capabilities* IE in the *UE Context Information* IE, plus the mandated support of the EIA0 algorithm in all UEs (TS 33.401 [18]), do not match any algorithms defined in the configured list of allowed integrity protection algorithms in the eNB (TS 33.401 [18]), the eNB shall reject the procedure using the HANOVER PREPARATION FAILURE message.

If the target eNB receives a HANOVER REQUEST message which does not contain the *Handover Restriction List* IE, and the PLMN to be used cannot be determined otherwise, the target eNB shall reject the procedure using the HANOVER PREPARATION FAILURE message.

If the target eNB receives a HANOVER REQUEST message containing the *Handover Restriction List* IE, and the serving PLMN is not supported by the target cell, the target eNB shall reject the procedure using the HANOVER PREPARATION FAILURE message.

If the target eNB receives a HANOVER REQUEST message which does not contain the *CSG Membership Status* IE, and the target cell is a hybrid cell, the target eNB shall reject the procedure using the HANOVER PREPARATION FAILURE message.

If the target cell is a CSG cell and the target eNB has not received any CSG ID of the source cell, the target eNB shall reject the procedure using the HANOVER PREPARATION FAILURE message.

If the target cell is a CSG cell with a different CSG from the source cell, the target eNB shall reject the procedure using the HANOVER PREPARATION FAILURE message.

8.2.2 SN Status Transfer

8.2.2.1 General

The purpose of the SN Status Transfer procedure is to transfer the uplink PDCP SN and HFN receiver status and the downlink PDCP SN and HFN transmitter status either, from the source to the target eNB during an X2 handover, between the eNBs involved in dual connectivity and/or LWA, or between MeNB and en-gNB involved in EN-DC, for each respective E-RAB for which PDCP SN and HFN status preservation applies.

If the SN Status Transfer procedure is applied in the course of dual connectivity, LWA, RRC connection re-establishment or EN-DC, in the subsequent specification text

- the behaviour of the eNB from which the E-RAB context is transferred, i.e., the eNB involved in dual connectivity, LWA, RRC connection re-establishment or EN-DC from which data forwarding, is specified by the behaviour of the "source eNB",
- the behaviour of the eNB to which the E-RAB context is transferred, i.e., the eNB involved in dual connectivity, LWA, RRC connection re-establishment or EN-DC to which data is forwarded, is specified by the behaviour of the "target eNB".
- the behaviour of the en-gNB from which the E-RAB context is transferred, i.e., the en-gNB involved in EN-DC from which data forwarding, is specified by the behaviour of the "source en-gNB",
- the behaviour of the en-gNB to which the E-RAB context is transferred, i.e., the en-gNB involved in EN-DC to which data is forwarded, is specified by the behaviour of the "target en-gNB".

The procedure uses UE-associated signalling.

8.2.2.2 Successful Operation

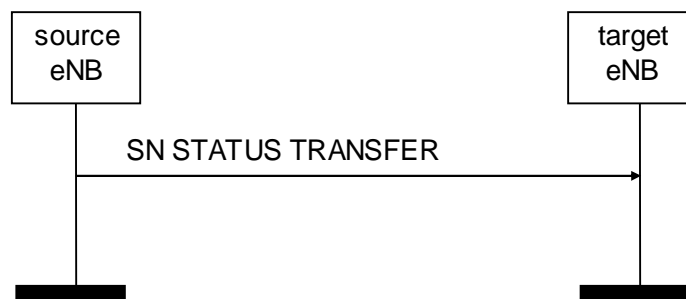


Figure 8.2.2.2-1: SN Status Transfer, successful operation

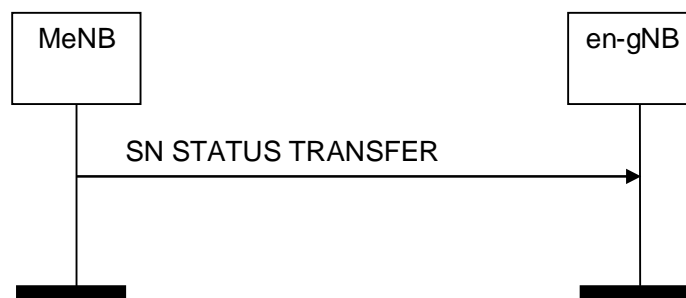


Figure 8.2.2.2-2: MeNB initiated SN Status Transfer for EN-DC, successful operation

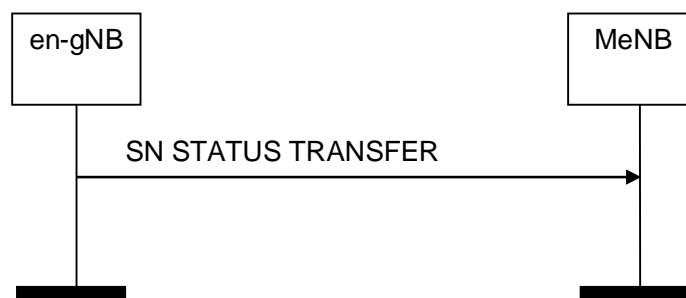


Figure 8.2.2.2-3: en-gNB initiated SN Status Transfer for EN-DC, successful operation

The source eNB initiates the procedure by stop assigning PDCP SNs to downlink SDUs and stop delivering UL SDUs towards the EPC and sending the SN STATUS TRANSFER message to the target eNB at the time point when it considers the transmitter/receiver status to be frozen. The target eNB using Full Configuration for this handover as per TS 36.300 [15] shall ignore the information received in this message.

The *E-RABs Subject To Status Transfer List* IE included in the SN STATUS TRANSFER message contains the E-RAB ID(s) corresponding to the E-RAB(s) for which PDCP SN and HFN status preservation shall be applied.

If the source eNB includes in the SN STATUS TRANSFER message, the information on the missing and received uplink SDUs in the *Receive Status Of UL PDCP SDUs* IE or *Receive Status Of UL PDCP SDUs Extended* IE or *Receive Status Of UL PDCP SDUs for PDCP SN Length 18* IE for each E-RAB for which the source eNB has accepted the request from the target eNB for uplink forwarding, then the target eNB may use it in a Status Report message sent to the UE over the radio.

For each E-RAB for which the *DL COUNT Value* IE is received in the SN STATUS TRANSFER message, the target eNB shall use it to mark with the value contained in the *PDCP-SN* IE of this IE the first downlink packet for which there is no PDCP SN yet assigned. If the *DL COUNT Value Extended* IE or *DL COUNT Value for PDCP SN Length 18* IE is included in the *E-RABs Subject To Status Transfer Item* IE, the target eNB shall, if supported, use the value contained in the *PDCP-SN Extended* IE of the *DL COUNT Value Extended* IE or *PDCP-SN Length 18 IE of the DL COUNT Value for PDCP SN Length 18* IE instead of the value contained in the *PDCP-SN* IE of the *DL COUNT Value* IE.

For each E-RAB for which the *UL COUNT Value* IE is received in the SN STATUS TRANSFER message, the target eNB shall not deliver any uplink packet which has a PDCP SN lower than the value contained in the *PDCP-SN* IE of this IE. If the *UL COUNT Value Extended* IE or *UL COUNT Value for PDCP SN Length 18* IE is included in the *E-RABs Subject To Status Transfer Item* IE, the target eNB shall, if supported, use the value contained in the *PDCP-SN Extended* IE of the *UL COUNT Value Extended* IE or *PDCP-SN Length 18 IE of the UL COUNT Value for PDCP SN Length 18* IE instead of the value contained in the *PDCP-SN* IE of the *UL COUNT Value* IE.

EN-DC

If the en-gNB sends the message to the MeNB, then the *SgNB UE X2AP ID* IE shall be included in the SN STATUS TRANSFER message, while the *Old eNB UE X2AP ID* IE is ignored. The *SgNB UE X2AP ID* IE is used as the old UE ID.

If the MeNB sends the message to the en-gNB, then the *SgNB UE X2AP ID* IE shall be included in the SN STATUS TRANSFER message, while the *New eNB UE X2AP ID* IE is ignored. The *SgNB UE X2AP ID* IE is used as the new UE ID.

8.2.2.3 Abnormal Conditions

If the target eNB receives this message for a UE for which no prepared handover exists at the target eNB, the target eNB shall ignore the message.

8.2.3 UE Context Release

8.2.3.1 General

For handover, the UE Context Release procedure is initiated by the target eNB to indicate to the source eNB that radio and control plane resources for the associated UE context are allowed to be released.

For dual connectivity, UE Context Release procedure is initiated by the MeNB to finally release the UE context at the SeNB. For dual connectivity specific mobility scenarios specified in TS 36.300 [15] only resources related to the UE-associated signalling connection between the MeNB and the SeNB are released. For EN-DC, the UE Context Release procedure is initiated by the MeNB to finally release the UE context at the en-gNB. For EN-DC specific mobility scenarios specified in TS 37.340 [32] where SCG radio resources in the en-gNB are kept, only resources related to the UE-associated signalling connection between the MeNB and the en-gNB are released.

The procedure uses UE-associated signalling.

8.2.3.2 Successful Operation



Figure 8.2.3.2-1: UE Context Release, successful operation for handover



Figure 8.2.3.2-2: UE Context Release, successful operation for dual connectivity



Figure 8.2.3.2-3: UE Context Release, successful operation for EN-DC

Handover

The UE Context Release procedure is initiated by the target eNB. By sending the UE CONTEXT RELEASE message the target eNB informs the source eNB of Handover success and triggers the release of resources.

Upon reception of the UE CONTEXT RELEASE message, the source eNB may release radio and control plane related resources associated to the UE context. For E-RABs for which data forwarding has been performed, the source eNB should continue forwarding of U-plane data as long as packets are received at the source eNB from the EPC or the source eNB buffer has not been emptied (an implementation dependent mechanism decides that data forwarding can be stopped). When the eNB supporting L-GW function for SIPTO@LN operation releases radio and control plane related resources associated to the UE context, it shall also request using intra-node signalling the collocated L-GW to release the SIPTO@LN PDN connection as defined in TS 23.401 [12].

Dual Connectivity

The UE Context Release procedure is initiated by the MeNB. By sending the UE CONTEXT RELEASE message the MeNB informs the SeNB that the UE Context can be removed.

Upon reception of the UE CONTEXT RELEASE message, the SeNB may release radio and control plane related resources associated to the UE context. For E-RABs for which data forwarding has been performed, the SeNB should continue forwarding of U-plane data as long as packets are received at the SeNB from the EPC or the SeNB buffer has not been emptied (an implementation dependent mechanism decides that data forwarding can be stopped). The SeNB supporting L-GW function for LIPA operation shall also request using intra-node signalling the collocated L-GW to

release the LIPA PDN connection as defined in TS 23.401 [12]. If the *SIPTO Bearer Deactivation Indication* IE is received in the UE CONTEXT RELEASE message, the SeNB supporting L-GW function for SIPTO@LN operation shall also request using intra-node signalling the collocated L-GW to release the SIPTO@LN PDN connection as defined in TS 23.401 [12].

EN-DC

The UE Context Release procedure is initiated by the MeNB. By sending the UE CONTEXT RELEASE message the MeNB informs the en-gNB that the UE Context can be removed.

Upon reception of the UE CONTEXT RELEASE message, the en-gNB may release radio and control plane related resources associated to the UE context. For E-RABs for which data forwarding has been performed, the en-gNB should continue forwarding of U-plane data as long as packets are received at the en-gNB from the EPC or the en-gNB buffer has not been emptied (an implementation dependent mechanism decides that data forwarding can be stopped).

In the course of signalling for EN-DC, the *SgNB UE X2AP ID* IE shall be included in the UE CONTEXT RELEASE message, while the *Old eNB UE X2AP ID* IE is ignored. The *SgNB UE X2AP ID* IE is used as the new UE ID.

Interaction with the MeNB initiated SeNB Release procedure:

The SeNB may receive the SENB RELEASE REQUEST message including the *UE Context Kept Indicator* IE set to "True", upon which the SeNB shall, if supported, only release the resources related to the UE-associated signalling connection between the MeNB and the SeNB, as specified in TS 36.300 [15].

Interaction with the MeNB initiated SgNB Release procedure:

The en-gNB may receive the SGNB RELEASE REQUEST message including the *UE Context Kept Indicator* IE set to "True", upon which the en-gNB shall, if supported, only release the resources related to the UE-associated signalling connection between the MeNB and the en-gNB, as specified in TS 37.340 [32].

8.2.3.3 Unsuccessful Operation

Not applicable.

8.2.3.4 Abnormal Conditions

If the UE Context Release procedure is not initiated towards the source eNB from any prepared eNB before the expiry of the timer TX2_{RELOCoverall}, the source eNB shall request the MME to release the UE context.

If the UE returns to source eNB before the reception of the UE CONTEXT RELEASE message or the expiry of the timer TX2_{RELOCoverall}, the source eNB shall stop the TX2_{RELOCoverall} and continue to serve the UE.

8.2.4 Handover Cancel

8.2.4.1 General

The Handover Cancel procedure is used to enable a source eNB to cancel an ongoing handover preparation or an already prepared handover.

The procedure uses UE-associated signalling.

8.2.4.2 Successful Operation



Figure 8.2.4.2-1: Handover Cancel, successful operation

The source eNB initiates the procedure by sending the HANOVER CANCEL message to the target eNB. The source eNB shall indicate the reason for cancelling the handover by means of an appropriate cause value.

At the reception of the HANOVER CANCEL message, the target eNB shall remove any reference to, and release any resources previously reserved to the concerned UE context.

The *New eNB UE X2AP ID* IE and, if available, the *New eNB UE X2AP ID Extension* IE shall be included if it has been obtained from the target eNB.

8.2.4.3 Unsuccessful Operation

Not applicable.

8.2.4.4 Abnormal Conditions

Should the HANOVER CANCEL message refer to a context that does not exist, the target eNB shall ignore the message.

8.3 Global Procedures

8.3.1 Load Indication

8.3.1.1 General

The purpose of the Load Indication procedure is to transfer load and interference co-ordination information between eNBs controlling intra-frequency neighboring cells, and additionally between eNBs controlling inter-frequency neighboring cells for TDD.

The procedure uses non UE-associated signalling.

8.3.1.2 Successful Operation

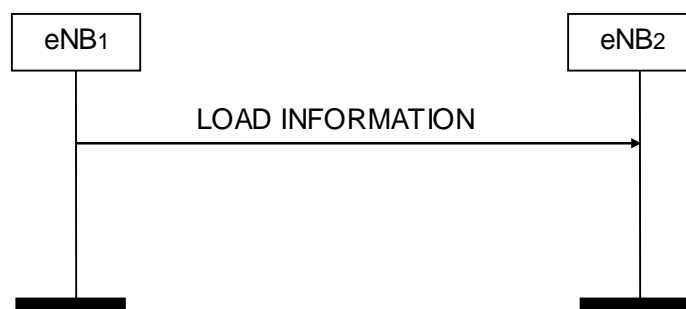


Figure 8.3.1.2-1: Load Indication, successful operation

An eNB₁ initiates the procedure by sending LOAD INFORMATION message to a peer eNB₂.

If the *UL Interference Overload Indication* IE is received in the LOAD INFORMATION message, it indicates the interference level experienced by the indicated cell on all resource blocks, per PRB. If the *Extended UL Interference Overload Info* IE is received in the LOAD INFORMATION message, the *UL Interference Overload Indication* IE indicates the interference level experienced by the indicated cell ignoring the UL subframe(s) represented as value "1" in the *Associated Subframes* IE. The receiving eNB may take such information into account when setting its scheduling policy and shall consider the received *UL Interference Overload Indication* IE value valid until reception of a new LOAD INFORMATION message carrying an update of the same IE.

If the *UL High Interference Indication* IE is received in the LOAD INFORMATION message, it indicates, per PRB, the occurrence of high interference sensitivity, as seen from the sending eNB. The receiving eNB should try to avoid scheduling cell edge UEs in its cells for the concerned PRBs. The *Target Cell ID* IE received within the *UL High Interference Information* IE group in the LOAD INFORMATION message indicates the cell for which the corresponding UL High Interference Indication is meant. The receiving eNB shall consider the value of the *UL High Interference Information* IE group valid until reception of a new LOAD INFORMATION message carrying an update.

If the *Relative Narrowband Tx Power (RNTP)* IE is received in the LOAD INFORMATION message, it indicates, per PRB or per subframe per PRB (Enhanced RNTP), whether downlink transmission power is lower than the value indicated by the *RNTP Threshold* IE. If the *Enhanced RNTP* IE is included in the *Relative Narrowband Tx Power (RNTP)* IE, it additionally indicates whether the downlink transmission power is lower than the value specified by the *RNTP High Power Threshold* IE. The receiving eNB may take such information into account when setting its scheduling policy and shall consider the received *Relative Narrowband Tx Power (RNTP)* IE value valid until reception of a new LOAD INFORMATION message carrying an update. If the *Enhanced RNTP* IE included in the *Relative Narrowband Tx Power (RNTP)* IE is present, the receiving eNB shall consider the received *Enhanced RNTP* IE value valid starting from the subframe indicated by the *Start SFN* IE and *Start Subframe Number* IE, if present.

If the *ABS Information* IE is included in the LOAD INFORMATION message, the *ABS Pattern Info* IE indicates the subframes designated as almost blank subframes by the sending eNB for the purpose of interference coordination. The receiving eNB may take such information into consideration when scheduling UEs.

The receiving eNB may use the *Measurement Subset* IE received in the LOAD INFORMATION message, for the configuration of specific measurements towards the UE.

The receiving eNB shall consider the received information as immediately applicable. The receiving eNB shall consider the value of the *ABS Information* IE valid until reception of a new LOAD INFORMATION message carrying an update.

If an ABS indicated in the *ABS pattern info* IE coincides with a MBSFN subframe, the receiving eNB shall consider that the subframe is designated as almost blank subframe by the sending eNB.

If the *Invoke Indication* IE is included in the LOAD INFORMATION message, it indicates which type of information the sending eNB would like the receiving eNB to send back. The receiving eNB may take such request into account.

If the *Invoke Indication* IE is set to "ABS Information", it indicates the sending eNB would like the receiving eNB to initiate the Load Indication procedure, with the LOAD INFORMATION message containing the *ABS Information* IE indicating non-zero ABS patterns in the relevant cells. If the *Invoke Indication* IE is set to "Start NAICS Information", it indicates the sending eNB would like the receiving eNB to initiate the Load Indication procedure with the LOAD INFORMATION message containing the *Dynamic DL transmission information* IE. The first time the *Dynamic DL transmission information* IE is signalled after receiving the *Invoke Indication* IE set to "Start NAICS Information", all the NAICS parameters in the *NAICS Information* IE shall be included. If the *Invoke Indication* IE is set to "Stop NAICS Information", it indicates the sending eNB does not need NAICS information and therefore the receiving eNB should stop signalling NAICS parameters for the concerned cell.

If the *NAICS Information* IE is set to "NAICS Active", the receiving eNB may use it for the configuration of DL interference mitigation assistance information towards the UE. Information included in the *NAICS Information* IE shall replace corresponding NAICS information existing at the receiver. If the *NAICS Information* IE is set to "NAICS Inactive", the receiving eNB shall consider the existing NAICS information as invalid.

If the *Intended UL-DL Configuration* IE is included in the LOAD INFORMATION message, it indicates the UL-DL configuration intended to be used by the indicated cell. The receiving eNB may take such information into account when setting its scheduling policy and shall consider the received *Intended UL-DL Configuration* IE value valid until reception of a new LOAD INFORMATION message carrying an update of the same IE.

If the *Extended UL Interference Overload Info* IE is received in the LOAD INFORMATION message, the *Extended UL Interference Overload Indication* IE indicates the interference level experienced by the indicated cell on all resource blocks, per PRB, in the UL subframe(s) which is represented as value "1" in the *Associated Subframes* IE. The receiving eNB may take such information into account when setting its scheduling policy and shall consider the received *Extended UL Interference Overload Info* IE value valid until reception of a new LOAD INFORMATION message carrying an update of the same IE.

If the *CoMP Information* IE is received in the LOAD INFORMATION message, the receiving eNB may take the IE into account for RRM. The receiving eNB shall consider the *CoMP Information* IE valid starting in the subframe indicated by the *Start SFN* IE and *Start Subframe Number* IE, if present. If the *Start SFN* IE and *Start Subframe Number* IE are not present, then the receiving eNB shall consider the *CoMP Information* IE as immediately valid. The receiving eNB shall consider the *CoMP Information* IE valid until an update of the same IE, received in a new LOAD INFORMATION message, is considered valid.

8.3.1.3 Unsuccessful Operation

Not applicable.

8.3.1.4 Abnormal Conditions

Void.

8.3.2 Error Indication

8.3.2.1 General

The Error Indication procedure is initiated by an eNB to report detected errors in one incoming message, provided they cannot be reported by an appropriate failure message.

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

8.3.2.2 Successful Operation



Figure 8.3.2.2-1: Error Indication, successful operation.



Figure 8.3.2.2-2: eNB initiated Error Indication for EN-DC, successful operation.

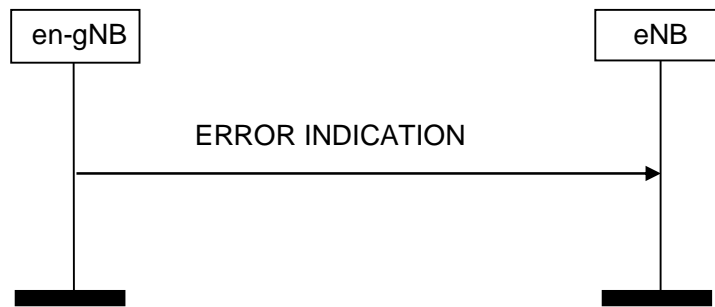


Figure 8.3.2.2-3: en-gNB initiated Error Indication for EN-DC, successful operation.

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

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

In case the Error Indication procedure is triggered by UE associated signalling, in the course of handover signalling and signalling for dual connectivity, the *Old eNB UE X2AP ID IE* and the *New eNB UE X2AP ID IE* shall be included in the ERROR INDICATION message. In case the Error Indication procedure is triggered by UE associated signalling, in the course of signalling for EN-DC, the *Old en-gNB UE X2AP ID IE* and the *New eNB UE X2AP ID IE* shall be included in the ERROR INDICATION message. If any of *Old eNB UE X2AP ID IE*, *Old en-gNB UE X2AP ID IE* and *New eNB UE X2AP ID IE* is not correct, the cause shall be set to appropriate value e.g. "unknown Old eNB UE X2AP ID", "unknown Old en-gNB UE X2AP ID", "unknown New eNB UE X2AP ID" or "unknown pair of UE X2AP ID".

If the UE-associated signalling connection is identified by extended eNB UE X2AP IDs the specification text above is applicable for the UE X2AP ID Extension accordingly.

In case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], if the Error Indication procedure is triggered by non UE-associated signalling, the ERROR INDICATION message shall include the *Interface Instance Indication IE* to identify the corresponding interface instance.

8.3.2.3 Unsuccessful Operation

Not applicable.

8.3.2.4 Abnormal Conditions

Not applicable.

8.3.3 X2 Setup

8.3.3.1 General

The purpose of the X2 Setup procedure is to exchange application level configuration data needed for two eNBs to interoperate correctly over the X2 interface. This procedure erases any existing application level configuration data in the two nodes and replaces it by the one received. This procedure also resets the X2 interface like a Reset procedure would do.

The procedure uses non UE-associated signalling.

8.3.3.2 Successful Operation

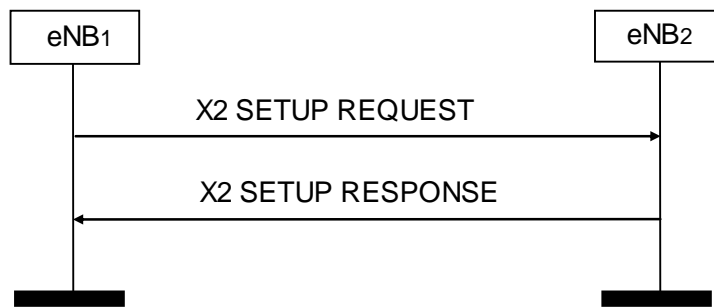


Figure 8.3.3.2-1: X2 Setup, successful operation

An eNB₁ initiates the procedure by sending the X2 SETUP REQUEST message to a candidate eNB₂. The candidate eNB₂ replies with the X2 SETUP RESPONSE message. The initiating eNB₁ shall transfer the complete list of its served cells and, if available, a list of supported GU Group Ids to the candidate eNB₂. The candidate eNB₂ shall reply with the complete list of its served cells and shall include, if available, a list of supported GU Group Ids in the reply.

If a cell is switched off for energy savings reasons, it should be activated before initiating or responding to the X2 Setup procedure and shall still be included in the list of served cells.

The initiating eNB₁ may include the *Neighbour Information* IE in the X2 SETUP REQUEST message. The candidate eNB₂ may also include the *Neighbour Information* IE in the X2 SETUP RESPONSE message. The *Neighbour Information* IE shall only include E-UTRAN cells that are direct neighbours of cells in the reporting eNB. A direct neighbour of one cell of a given eNB may be any cell belonging to an eNB that is a neighbour of that given eNB cell e.g. even if the cell has not been reported by a UE. The initiating eNB₁ may include the *TAC* IE with the *Neighbour Information* IE in the X2 SETUP REQUEST message. The candidate eNB₂ may also include the *TAC* IE with the *Neighbour Information* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use it according to TS 36.300 [15].

The initiating eNB₁ may include the *NR Neighbour Information* IE in the X2 SETUP REQUEST message. The candidate eNB₂ may also include the *NR Neighbour Information* IE in the X2 SETUP RESPONSE message. The *NR Neighbour Information* IE shall only include NR cells capable of performing EN-DC with the corresponding served E-UTRA cell. The eNB receiving the *NR Neighbour Information* IE may use it according to TS 36.300 [15].

The initiating eNB₁ may include the *Number of Antenna Ports* IE in the X2 SETUP REQUEST message. The candidate eNB₂ may also include the *Number of Antenna Ports* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use it according to TS 36.331 [9].

The initiating eNB₁ may include the *PRACH Configuration* IE in the X2 SETUP REQUEST message. The candidate eNB₂ may also include the *PRACH Configuration* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use this information for RACH optimisation.

The initiating eNB₁ may include the *MBSFN Subframe Info* IE in the X2 SETUP REQUEST message. The candidate eNB₂ may also include the *MBSFN Subframe Info* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use it according to TS 36.331 [9].

For each CSG cell or hybrid cell served by the initiating eNB₁ the X2 SETUP REQUEST message shall contain the *CSG ID* IE. For each CSG cell or hybrid cell served by the candidate eNB₂ the X2 SETUP RESPONSE message shall contain the *CSG ID* IE. The eNB receiving the IE shall take this information into account when further deciding whether X2 handover between the source cell and the target cell may be performed.

The initiating eNB₁ may include the *MBMS Service Area Identity List* IE in the X2 SETUP REQUEST message. The candidate eNB₂ may also include the *MBMS Service Area Identity List* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use it according to TS 36.300 [15].

For each cell served by the initiating eNB₁ the X2 SETUP REQUEST message may contain the *MultibandInfoList* IE and may also contain the *FreqBandIndicatorPriority* IE. For each cell served by the candidate eNB₂ the X2 SETUP RESPONSE message may contain the *MultibandInfoList* IE and may also contain the *FreqBandIndicatorPriority* IE. The eNB receiving the *MultibandInfoList* IE shall, if supported, take this information into account when further deciding whether subsequent mobility actions between the source cell and the target cell may be performed, and use this IE and the *FreqBandIndicatorPriority* IE, if received, as specified in TS 36.331 [9].

The initiating eNB₁ may include the *LHN ID* IE in the X2 SETUP REQUEST message. The candidate eNB₂ may also include *LHN ID* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use it according to TS 36.300 [15].

The initiating eNB₁ may include the *BandwidthReducedSI* IE in the X2 SETUP REQUEST message. The candidate eNB₂ may also include *BandwidthReducedSI* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use it to determine a suitable target in case of subsequent outgoing mobility involving BL UEs or UEs requiring CE.

8.3.3.3 Unsuccessful Operation

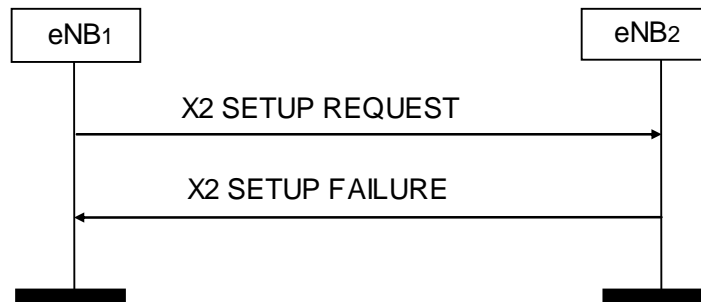


Figure 8.3.3.3-1: X2 Setup, unsuccessful operation

If the candidate eNB₂ cannot accept the setup it shall respond with an X2 SETUP FAILURE message with appropriate cause value.

If the X2 SETUP FAILURE message includes the *Time To Wait* IE the initiating eNB₁ shall wait at least for the indicated time before reinitiating the X2 Setup procedure towards the same eNB₂.

8.3.3.4 Abnormal Conditions

If the first message received for a specific TNL association is not an X2 SETUP REQUEST, X2 SETUP RESPONSE, or X2 SETUP FAILURE message then this shall be treated as a logical error.

If the initiating eNB₁ does not receive either X2 SETUP RESPONSE message or X2 SETUP FAILURE message, the eNB₁ may reinitiate the X2 Setup procedure towards the same eNB, provided that the content of the new X2 SETUP REQUEST message is identical to the content of the previously unacknowledged X2 SETUP REQUEST message.

If the initiating eNB₁ receives an X2 SETUP REQUEST message from the peer entity on the same X2 interface:

- In case the eNB₁ answers with an X2 SETUP RESPONSE message and receives a subsequent X2 SETUP FAILURE message, the eNB₁ shall consider the X2 interface as non operational and the procedure as unsuccessfully terminated according to sub clause 8.3.3.3.
- In case the eNB₁ answers with an X2 SETUP FAILURE message and receives a subsequent X2 SETUP RESPONSE message, the eNB₁ shall ignore the X2 SETUP RESPONSE message and consider the X2 interface as non operational.

8.3.4 Reset

8.3.4.1 General

The purpose of the Reset procedure is to align the resources in eNB₁ and eNB₂, or the resources in eNB and en-gNB involved in the EN-DC in the event of an abnormal failure. The procedure resets the X2 interface. This procedure doesn't affect the application level configuration data exchanged during, e.g., the X2 Setup procedure, EN-DC X2 Setup procedure.

The procedure uses non UE-associated signalling.

8.3.4.2 Successful Operation

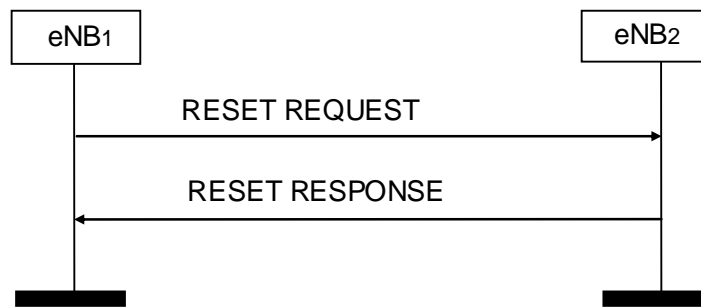


Figure 8.3.4.2-1: Reset, successful operation

The procedure is initiated with a RESET REQUEST message sent from the eNB₁ to the eNB₂. Upon receipt of this message, eNB₂ shall abort any other ongoing procedures over X2 between eNB₁ and eNB₂. The eNB₂ shall delete all the context information related to the eNB₁, except the application level configuration data exchanged during the X2 Setup or eNB Configuration Update procedures, and release the corresponding resources. After completion of release of the resources, the eNB₂ shall respond with a RESET RESPONSE message.

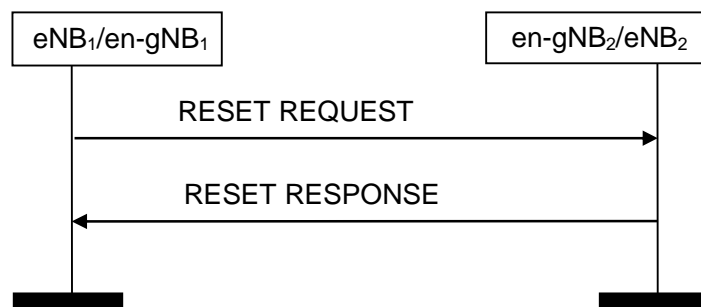


Figure 8.3.4.2-2: Reset, successful operation for EN-DC.

The procedure is initiated with a RESET REQUEST message sent from the eNB₁/en-gNB₁ to en-gNB₂/eNB₂. Upon receipt of this message, eNB₂/en-gNB₂ shall abort any other ongoing procedures over X2 between both nodes. eNB₂/en-gNB₂ shall delete all the context information related to eNB₁/en-gNB₁, except the application level configuration data exchanged during the EN-DC X2 Setup or EN-DC Configuration Update procedures, and release the corresponding resources. After completion of release of the resources, eNB₂/en-gNB₂ shall respond with a RESET RESPONSE message.

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the RESET REQUEST and the RESET RESPONSE messages shall include the *Interface Instance Indication* IE to identify the corresponding interface instance.

8.3.4.3 Unsuccessful Operation

Void.

8.3.4.4 Abnormal Conditions

If the RESET REQUEST message is received, any other ongoing procedure (except another Reset procedure) on the same X2 interface shall be aborted.

If Reset procedure is ongoing and the responding node receives the RESET REQUEST message from the peer entity on the same X2 interface, it shall respond with the RESET RESPONSE message as described in 8.3.4.2.

If the initiating node does not receive RESET RESPONSE message, the initiating node may reinitiate the Reset procedure towards the same eNB/en-gNB, provided that the content of the new RESET REQUEST message is identical to the content of the previously unacknowledged RESET REQUEST message.

8.3.5 eNB Configuration Update

8.3.5.1 General

The purpose of the eNB Configuration Update procedure is to update application level configuration data needed for two eNBs to interoperate correctly over the X2 interface.

The procedure uses non UE-associated signalling.

8.3.5.2 Successful Operation

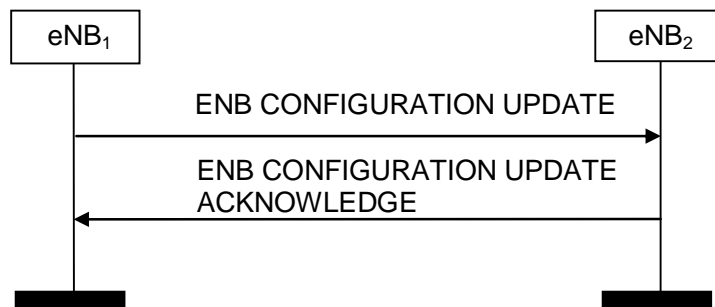


Figure 8.3.5.2-1: eNB Configuration Update, successful operation

An eNB₁ initiates the procedure by sending an ENB CONFIGURATION UPDATE message to a peer eNB₂. Such message shall include an appropriate set of up-to-date configuration data, including, but not limited to, the complete lists of added, modified and deleted served cells, that eNB₁ has just taken into operational use.

Upon reception of an ENB CONFIGURATION UPDATE message, eNB₂ shall update the information for eNB₁ as follows:

Update of Served Cell Information:

- If *Served Cells To Add* IE is contained in the ENB CONFIGURATION UPDATE message, eNB₂ shall add cell information according to the information in the *Served Cell Information* IE.
- If *Number of Antenna Ports* IE is contained in the *Served Cell Information* IE in the ENB CONFIGURATION UPDATE message, eNB₂ may use this information according to TS 36.331 [9].
- If the *PRACH Configuration* IE is contained in the *Served Cell Information* IE in the ENB CONFIGURATION UPDATE message, the eNB receiving the IE may use this information for RACH optimisation.
- If *Served Cells To Modify* IE is contained in the ENB CONFIGURATION UPDATE message, eNB₂ shall modify information of cell indicated by *Old ECGI* IE according to the information in the *Served Cell Information* IE.
- If *MBSFN Subframe Info* IE is contained in the *Served Cell Information* IE in the ENB CONFIGURATION UPDATE message, eNB₂ may use this information according to TS 36.331 [9]. If a MBSFN subframe indicated in the *MBSFN Subframe Info* IE coincides with an ABS, the eNB₂ shall consider that the subframe is designated as ABS by the sending eNB.
- If *BandwidthReducedSI* IE is contained in the *Served Cell Information* IE in the ENB CONFIGURATION UPDATE message, eNB₂ may use this information to determine a suitable target in case of subsequent outgoing mobility involving BL UEs or UEs requiring CE.

When either served cell information or neighbour information of an existing served cell in eNB₁ need to be updated, the whole list of neighbouring cells, if any, shall be contained in the *Neighbour Information* IE.

If the *Deactivation Indication* IE is contained in *Served Cells To Modify* IE, it indicates that the concerned cell was switched off to lower energy consumption.

The eNB₂ shall overwrite the served cell information and the whole list of neighbour cell information for the affected served cell.

- If *Served Cells To Delete* IE is contained in the ENB CONFIGURATION UPDATE message, eNB₂ shall delete information of cell indicated by *Old ECGI* IE.
- If *MBMS Service Area Identity List* IE is contained in the *Served Cell Information* IE in the ENB CONFIGURATION UPDATE message, the eNB receiving the IE may use it according to TS 36.300 [15].

When the MBMS Service Area Identities of a cell in eNB₁ need to be updated, the whole list of MBMS Service Area Identities of the affected cell shall be contained in the *Served Cell Information* IE.

Update of GU Group Id List:

- If *GU Group Id To Add List* IE is contained in the ENB CONFIGURATION UPDATE message, eNB₂ shall add the GU Group Id to its GU Group Id List.
- If *GU Group Id To Delete List* IE is contained in the ENB CONFIGURATION UPDATE message, eNB₂ shall remove the GU Group Id from its GU Group Id List.

If *Neighbour Information* IE is contained in the ENB CONFIGURATION UPDATE message, eNB₂ may use this information to update its neighbour cell relations, or use it for other functions, like PCI selection. The *Neighbour Information* IE shall only include E-UTRAN cells that are direct neighbours of cells in the reporting eNB. A direct neighbour of one cell of a given eNB may be any cell belonging to an eNB that is a neighbour of that given eNB cell e.g. even if that cell has not been reported by a UE. The *Neighbour Information* IE may contain the *TAC* IE of the included cells. The receiving eNB may use *TAC* IE, as described in TS 36.300 [15].

If the *NR Neighbour Information* IE is contained in the ENB CONFIGURATION UPDATE message, eNB₂ may use this information to update its neighbour cell relations or use it for other functions. The *NR Neighbour Information* IE shall only include NR cells capable of performing EN-DC with the corresponding served E-UTRA cell. The eNB receiving the *NR Neighbour Information* IE may use it according to TS 36.300 [15].

After successful update of requested information, eNB₂ shall reply with the ENB CONFIGURATION UPDATE ACKNOWLEDGE message to inform the initiating eNB₁ that the requested update of application data was performed successfully. In case the peer eNB₂ receives an ENB CONFIGURATION UPDATE without any IE except for *MessageType* IE it shall reply with ENB CONFIGURATION UPDATE ACKNOWLEDGE message without performing any updates to the existing configuration.

The eNB₁ may initiate a further eNB Configuration Update procedure only after a previous eNB Configuration Update procedure has been completed.

For each cell served by the initiating eNB₁ the ENB CONFIGURATION UPDATE message may contain the *MultibandInfoList* IE and may also contain the *FreqBandIndicatorPriority* IE. The eNB receiving the *MultibandInfoList* IE shall, if supported, take this information into account when further deciding whether subsequent mobility actions between the source cell and the target cell may be performed, and use this IE and the *FreqBandIndicatorPriority* IE, if received, as specified in TS 36.331 [9].

If the *Coverage Modification List* IE is present, eNB₂ may use the information in the *Cell Coverage State* IE to identify the cell deployment configuration enabled by eNB₁ and for configuring the mobility towards the cell(s) indicated by the *ECGI* IE, as described in TS 36.300 [15]. If the *Cell Deployment Status Indicator* IE is present in the *Coverage Modification List* IE, the eNB₂ shall consider the cell deployment configuration of the cell to be modified as the next planned configuration and shall remove any planned configuration stored for this cell. If the *Cell Deployment Status Indicator* IE is present and the *Cell Replacing Info* IE contains non-empty cell list, the eNB₂ may use this list to avoid connection or re-establishment failures during the reconfiguration, e.g. consider the cells in the list as possible alternative handover targets. If the *Cell Deployment Status Indicator* IE is not present, the eNB₂ shall consider the cell deployment configuration of cell to be modified as activated and replace any previous configuration for the cells indicated in the *Coverage Modification List* IE.

Interaction with the eNB Configuration Update procedure:

If an eNB₂ which has not stored a *FreqBandIndicatorPriority* IE received from eNB₁, but has signaled a *FreqBandIndicatorPriority* IE to eNB₁ after the TNL association has become available, receives an ENB CONFIGURATION UPDATE message from eNB₁ containing the *FreqBandIndicatorPriority* IE, the eNB₂ shall initiate the eNB Configuration Update procedure towards eNB₁ including the *FreqBandIndicatorPriority* IE.

8.3.5.3 Unsuccessful Operation

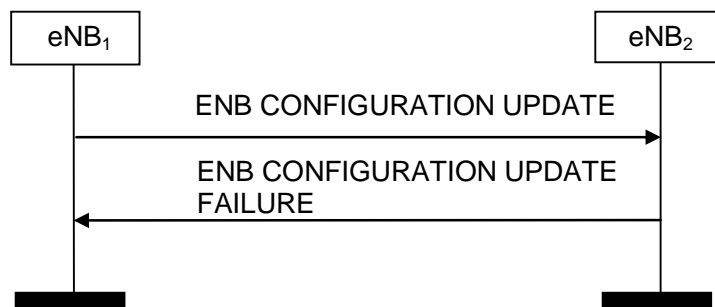


Figure 8.3.5.3-1: eNB Configuration Update, unsuccessful operation

If the eNB₂ can not accept the update it shall respond with an ENB CONFIGURATION UPDATE FAILURE message and appropriate cause value.

If the ENB CONFIGURATION UPDATE FAILURE message includes the *Time To Wait* IE the eNB₁ shall wait at least for the indicated time before reinitiating the eNB Configuration Update procedure towards the same eNB₂. Both nodes shall continue to operate the X2 with their existing configuration data.

8.3.5.4 Abnormal Conditions

If the eNB₁ after initiating eNB Configuration Update procedure receives neither ENB CONFIGURATION UPDATE ACKNOWLEDGE message nor ENB CONFIGURATION UPDATE FAILURE message, the eNB₁ may reinitiate the eNB Configuration Update procedure towards the same eNB₂, provided that the content of the new ENB CONFIGURATION UPDATE message is identical to the content of the previously unacknowledged ENB CONFIGURATION UPDATE message.

8.3.6 Resource Status Reporting Initiation

8.3.6.1 General

This procedure is used by an eNB to request the reporting of load measurements to another eNB.

The procedure uses non UE-associated signalling.

8.3.6.2 Successful Operation

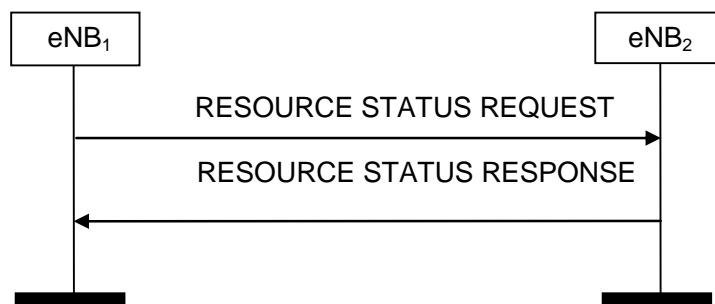


Figure 8.3.6.2-1: Resource Status Reporting Initiation, successful operation

The procedure is initiated with a RESOURCE STATUS REQUEST message sent from eNB₁ to eNB₂. Upon receipt, eNB₂:

- shall initiate the requested measurement according to the parameters given in the request in case the *Registration Request* IE set to "start"; or
- shall stop all cells measurements and terminate the reporting in case the *Registration Request* IE is set to "stop"; or

- if supported, stop cell measurements and terminate the reporting for cells indicated in the *Cell To Report* IE list, in case the *Registration Request* IE is set to "partial stop"; or
- if supported, add cells indicated in the *Cell To Report* IE list to the measurements initiated before for the given measurement IDs, in case the *Registration Request* IE is set to "add".

If the eNB₂ received a RESOURCE STATUS REQUEST message, which includes the *Registration Request* IE set to "stop", the *Cell To Report* IE list shall be ignored.

If the *Registration Request* IE is set to "start" then the *Report Characteristics* IE shall be included in RESOURCE STATUS REQUEST message. The eNB₂ shall ignore the *Report Characteristics* IE, if the *Registration Request* IE is not set to "start".

The *Report Characteristics* IE indicates the type of objects eNB₂ shall perform measurements on. For each cell, the eNB₂ shall include in the RESOURCE STATUS UPDATE message:

- the *Radio Resource Status* IE, if the first bit, "PRB Periodic" of the *Report Characteristics* IE included in the RESOURCE STATUS REQUEST message is set to 1;
- the *S1 TNL Load Indicator* IE, if the second bit, "TNL Load Ind Periodic" of the *Report Characteristics* IE included in the RESOURCE STATUS REQUEST message is set to 1;
- the *Hardware Load Indicator* IE, if the third bit, "HW Load Ind Periodic" of the *Report Characteristics* IE included in the RESOURCE STATUS REQUEST message is set to 1;
- the *Composite Available Capacity Group* IE, if the fourth bit, "Composite Available Capacity Periodic" of the *Report Characteristics* IE included in the RESOURCE STATUS REQUEST message is set to 1. If *Cell Capacity Class Value* IE is included within the *Composite Available Capacity Group* IE, this IE is used to assign weights to the available capacity indicated in the *Capacity Value* IE;
- the *ABS Status* IE, if the fifth bit, "ABS Status Periodic" of the *Report Characteristics* IE included in the RESOURCE STATUS REQUEST message is set to 1 and eNB₁ had indicated the ABS pattern to eNB₂;
- the *RSRP Measurement Report List* IE, if the sixth bit, "RSRP Measurement Report Periodic" of the *Report Characteristics* IE included in the RESOURCE STATUS REQUEST message is set to 1;
- the *CSI Report* IE, if the seventh bit, "CSI Report Periodic" of the *Report Characteristics* IE included in the RESOURCE STATUS REQUEST message is set to 1.

If the *Reporting Periodicity* IE is included in the RESOURCE STATUS REQUEST message, eNB₂ shall use its value as the time interval between two subsequent RESOURCE STATUS UPDATE messages that include the *Radio Resource Status* IE, *S1 TNL Load Indicator* IE, *Hardware Load Indicator* IE, *Composite Available Capacity Group* IE, or *ABS Status* IE.

If the *Reporting Periodicity of RSRP Measurement Report* IE is included in the RESOURCE STATUS REQUEST message, eNB₂ shall use its value as the minimum time interval between two subsequent RESOURCE STATUS UPDATE messages that include the *RSRP Measurement Report List* IE.

If the *Reporting Periodicity of CSI Report* IE is included in the RESOURCE STATUS REQUEST message, eNB₂ shall use its value as the minimum time interval between two subsequent RESOURCE STATUS UPDATE messages that include the *CSI Report* IE.

If eNB₂ is capable to provide all requested resource status information, it shall initiate the measurement as requested by eNB₁, and respond with the RESOURCE STATUS RESPONSE message.

If eNB₂ is capable to provide some but not all of the requested resource status information and the *Partial Success Indicator* IE is present in the RESOURCE STATUS REQUEST message, it shall initiate the measurement for the admitted measurement objects and include the *Measurement Initiation Result* IE in the RESOURCE STATUS RESPONSE message.

8.3.6.3 Unsuccessful Operation

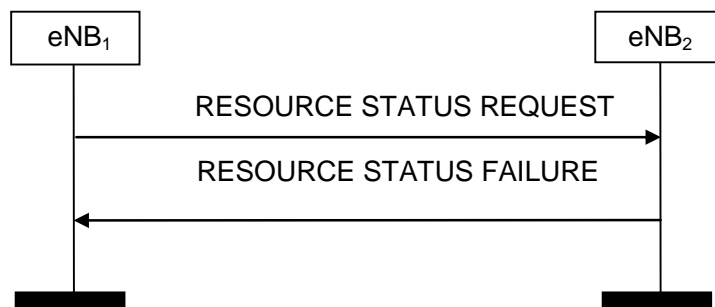


Figure 8.3.6.3-1: Resource Status Reporting Initiation, unsuccessful operation

If none of the requested measurements can be initiated, eNB₂ shall send a RESOURCE STATUS FAILURE message. The *Cause* IE shall be set to an appropriate value e.g. "Measurement Temporarily not Available" or "Measurement not Supported For The Object" for each requested measurement object. The eNB may use the *Complete Failure Cause Information* IE to enhance the failure cause information per measurement in the RESOURCE STATUS FAILURE message.

8.3.6.4 Abnormal Conditions

If the initiating eNB₁ does not receive either RESOURCE STATUS RESPONSE message or RESOURCE STATUS FAILURE message, the eNB₁ may reinitiate the Resource Status Reporting Initiation procedure towards the same eNB, provided that the content of the new RESOURCE STATUS REQUEST message is identical to the content of the previously unacknowledged RESOURCE STATUS REQUEST message.

If the initiating eNB₁ receives the RESOURCE STATUS RESPONSE message including the *Measurement Initiation Result* IE containing no admitted measurements, the eNB₁ shall consider the procedure as failed.

If the *Report Characteristics* IE bitmap is set to "0" (all bits are set to "0") in the RESOURCE STATUS REQUEST message then eNB₂ shall initiate a RESOURCE STATUS FAILURE message, the cause shall be set to appropriate value e.g. "ReportCharacteristicsEmpty".

If the *Reporting Periodicity* IE value is not specified when at least one of the bits of the *Report Characteristics* IE, for which semantics is specified, other than the sixth or seventh bit, is set to 1 then eNB₂ shall initiate a RESOURCE STATUS FAILURE message, the cause shall be set to appropriate value e.g. "NoReportPeriodicity".

If the *Reporting Periodicity of RSRP Measurement Report* IE value is not specified when the sixth bit of the *Report Characteristics* IE is set to 1, then eNB₂ shall initiate the RESOURCE STATUS FAILURE message and the cause shall be set to appropriate value e.g. "NoReportPeriodicity".

If the *Reporting Periodicity of CSI Report* IE value is not specified when the seventh bit of the *Report Characteristics* IE is set to 1, then eNB₂ shall initiate the RESOURCE STATUS FAILURE message and the cause shall be set to appropriate value e.g. "NoReportPeriodicity".

If the eNB₂ received a RESOURCE STATUS REQUEST message which includes the *Registration Request* IE set to "start" and the *eNB1 Measurement ID* IE corresponding to an existing on-going load measurement reporting, then eNB₂ shall initiate a RESOURCE STATUS FAILURE message, the cause shall be set to appropriate value e.g. "ExistingMeasurementID".

If the *Registration Request* IE is set to "stop", "partial stop" or "add" and the RESOURCE STATUS REQUEST message does not contain *eNB2 Measurement ID* IE, eNB₂ shall consider the procedure as failed and respond with the RESOURCE STATUS FAILURE message, the cause shall be set to appropriate value e.g. "Unknown eNB Measurement ID".

If the *Registration Request* IE is set to "partial stop" and the *Cell To Report* IE contains cells that have not been initiated for the reporting before, eNB₂ shall consider the procedure as failed and respond with the RESOURCE STATUS FAILURE message, the cause shall be set to appropriate value e.g. "Cell not Available". If the *Registration Request* IE is set to "add" and the *Cell To Report* IE contains cells that have been initiated for the reporting before, eNB₂ shall consider the procedure as failed and respond with the RESOURCE STATUS FAILURE message, the cause shall be set to appropriate value e.g. "Cell not Available".

8.3.7 Resource Status Reporting

8.3.7.1 General

This procedure is initiated by eNB₂ to report the result of measurements admitted by eNB₂ following a successful Resource Status Reporting Initiation procedure.

The procedure uses non UE-associated signalling.

8.3.7.2 Successful Operation



Figure 8.3.7.2-1: Resource Status Reporting, successful operation

The eNB₂ shall report the results of the admitted measurements in RESOURCE STATUS UPDATE message. The admitted measurements are the measurements that were successfully initiated during the preceding Resource Status Reporting Initiation procedure, and thus not reported in the *Measurement Failed Report Characteristics* IE for the concerned cell in the RESOURCE STATUS RESPONSE message.

If the eNB₁ receives the RESOURCE STATUS UPDATE message which includes the *UE ID* IE in the *RSRP Measurement Report List* IE, the eNB₁ may use the *UE ID* IE to link the associated RSRP measurement report with other measurement results (e.g. CSI reports, RSRP measurement reports) of the same UE.

If the *CSI Report* IE including the *CSI Process Configuration Index* IE is received, eNB₁ shall interpret this IE as an index identifying one of the CSI process configurations that can be configured for all UEs within the cell where the CSI measurements were collected. For all UEs within the cell, the maximum number of CSI process configurations is given by the maximum value of the *CSI Process Configuration Index* IE.

If the eNB₁ receives the RESOURCE STATUS UPDATE message, which includes the *Cell Reporting Indicator* IE set to "stop request" in one or more items of the *Cell Measurement Result* IE, the eNB₁ should initialise the Resource Status Reporting Initiation procedure to remove all or some of the corresponding cells from the measurement.

8.3.7.3 Unsuccessful Operation

Not applicable.

8.3.7.4 Abnormal Conditions

If the eNB₁ receives a RESOURCE STATUS UPDATE message which includes the *ABS Status* IE, and all bits in the *Usable ABS Pattern Info* IE are set to '0', the eNB₁ shall ignore the *DL ABS Status* IE.

8.3.8 Mobility Settings Change

8.3.8.1 General

This procedure enables an eNB to negotiate the handover trigger settings with a peer eNB controlling neighbouring cells.

The procedure uses non UE-associated signalling.

8.3.8.2 Successful Operation

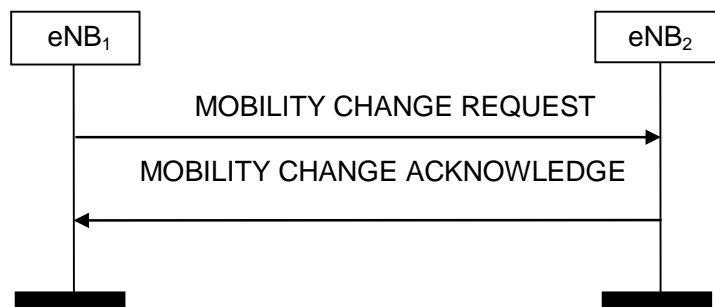


Figure 8.3.8.2-1: Mobility Settings Change, successful operation

The procedure is initiated with a MOBILITY CHANGE REQUEST message sent from eNB₁ to eNB₂.

Upon receipt, eNB₂ shall evaluate if the proposed eNB₂ handover trigger modification may be accepted. If eNB₂ is able to successfully complete the request it shall reply with MOBILITY CHANGE ACKNOWLEDGE.

8.3.8.3 Unsuccessful Operation

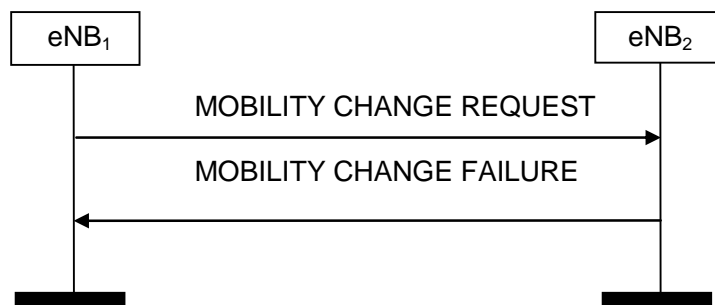


Figure 8.3.8.3-1: Mobility Settings Change, unsuccessful operation

If the requested parameter modification is refused by the eNB₂, or if the eNB₂ is not able to complete the procedure, the eNB₂ shall send a MOBILITY CHANGE FAILURE message with the *Cause* IE set to an appropriate value. The eNB₂ may include *eNB2 Mobility Parameters Modification Range* IE in MOBILITY CHANGE FAILURE message, for example in cases when the proposed change is out of permitted range.

8.3.8.4 Abnormal Conditions

Void.

8.3.9 Radio Link Failure Indication

8.3.9.1 General

The purpose of the Radio Link Failure Indication procedure is to transfer information regarding RRC re-establishment attempts, or received RLF Reports, between eNBs. The signalling takes place from the eNB at which a re-establishment attempt is made, or an RLF Report is received, to an eNB to which the UE concerned may have previously been attached prior to the connection failure. This may aid the detection of radio link failure and handover failure cases (TS 36.300 [15]).

The procedure uses non UE-associated signalling.

8.3.9.2 Successful Operation

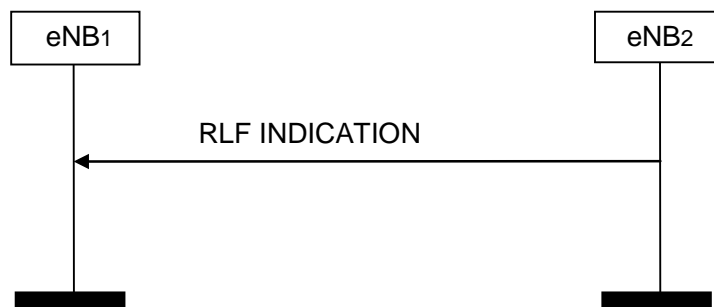


Figure 8.3.9.2-1: Radio Link Failure Indication, successful operation

eNB₂ initiates the procedure by sending the RLF INDICATION message to eNB₁ following a re-establishment attempt or an RLF Report reception from a UE at eNB₂, when eNB₂ considers that the UE may have previously suffered a connection failure at a cell controlled by eNB₁.

eNB₂ may include the *ShortMAC-I* IE in the RLF INDICATION message, e.g., in order to aid the eNB₁ to resolve a potential PCI confusion situation or to aid the eNB₁ to identify the UE.

eNB₂ may include the *UE RLF Report Container* IE and optionally also the *UE RLF Report Container for extended bands* IE in the RLF INDICATION message, which may be used by the eNB₁ to determine the nature of the failure. If the *UE RLF Report Container* IE is included in the RLF INDICATION message sent after successful re-establishment, the eNB₂ shall use the *Re-establishment Cell ECGI* IE in the RLF INDICATION message to indicate the ECGI of the cell where the re-establishment was successful.

eNB₂ may include the *RRC Conn Setup Indicator* IE in the RLF INDICATION message, which indicates that the RLF Report is retrieved after an RRC connection setup or an incoming successful handover.

If the *RRC Conn Setup Indicator* IE is present in the RLF INDICATION message, the eNB₁ shall ignore the values in the *Failure cell PCI* IE, *Re-establishment cell ECGI* IE, *C-RNTI* IE and *ShortMAC-I* IE.

eNB₂ may include the *RRC Conn Reestab Indicator* IE in the RLF INDICATION message, which may be used by the eNB₁ to determine where the failure occurred.

8.3.9.3 Unsuccessful Operation

Not applicable.

8.3.9.4 Abnormal Conditions

Void.

8.3.10 Handover Report

8.3.10.1 General

The purpose of the Handover Report procedure is to transfer mobility related information between eNBs.

The procedure uses non UE-associated signalling.

8.3.10.2 Successful Operation



Figure 8.3.10.2-1: Handover Report, successful operation

An eNB initiates the procedure by sending an **HANDOVER REPORT** message to another eNB. By sending the message eNB₁ indicates to eNB₂ that a mobility-related problem was detected.

If the *Handover Report Type* IE is set to "HO too early" or "HO to wrong cell", then the eNB₁ indicates to eNB₂ that, following a successful handover from a cell of eNB₂ to a cell of eNB₁, a radio link failure occurred and the UE attempted RRC Re-establishment either at the original cell of eNB₂ (Handover Too Early), or at another cell (Handover to Wrong Cell). The detection of Handover Too Early and Handover to Wrong Cell events is made according to TS 36.300 [15].

If the UE-related information is available in eNB₁, the eNB₁ should include in **HANDOVER REPORT** message:

- the *Mobility Information* IE, if the *Mobility Information* IE was sent for this handover from eNB₂;
- the *Source cell C-RNTI* IE.

If received, the eNB₂ uses the above information according to TS 36.300 [15].

If the UE RLF Report received from the eNB sending the RLF INDICATION message, as described in TS 36.300 [15], is available, the eNB₁ may also include it in the **HANDOVER REPORT** as *UE RLF Report Container* IE and optionally also *UE RLF Report Container for extended bands* IE.

If the *Handover Report Type* IE is set to "InterRAT ping-pong", then the eNB₁ indicates to eNB₂ that a completed handover from a cell of eNB₂ to a cell in other RAT might have resulted in an inter-RAT ping-pong and the UE was successfully handed over to a cell of eNB₁ (indicated with *Failure cell ECGI* IE).

The report contains the source and target cells, and cause of the handover. If the *Handover Report Type* IE is set to "HO to wrong cell", then the *Re-establishment cell ECGI* IE shall be included in the **HANDOVER REPORT** message. If the *Handover Report Type* IE is set to "InterRAT ping-pong", then the *Target cell in UTRAN* IE shall be included in the **HANDOVER REPORT** message.

8.3.10.3 Unsuccessful Operation

Not applicable.

8.3.10.4 Abnormal Conditions

Void.

8.3.11 Cell Activation

8.3.11.1 General

The purpose of the Cell Activation procedure is to request to a neighbouring eNB to switch on one or more cells, previously reported as inactive due to energy saving reasons.

The procedure uses non UE-associated signalling.

8.3.11.2 Successful Operation

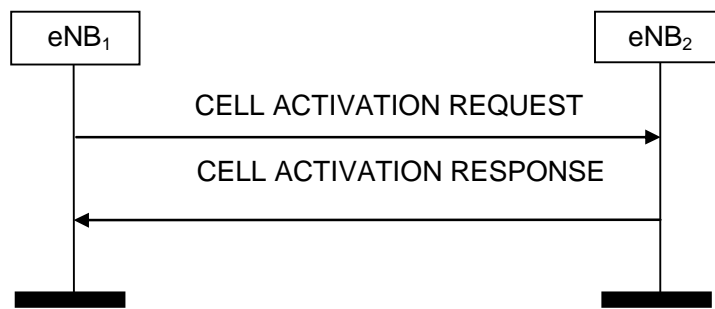


Figure 8.3.11.2-1: Cell Activation, successful operation

An eNB₁ initiates the procedure by sending a CELL ACTIVATION REQUEST message to a peer eNB₂.

Upon receipt of this message, eNB₂ should activate the cell(s) indicated in the CELL ACTIVATION REQUEST message and shall indicate in the CELL ACTIVATION RESPONSE message for which cells the request was fulfilled.

Interactions with eNB Configuration Update procedure:

eNB₂ shall not send an ENB CONFIGURATION UPDATE message to eNB₁ just for the reason of the cell(s) indicated in the CELL ACTIVATION REQUEST message changing state, as the receipt of the CELL ACTIVATION RESPONSE message by eNB₁ is used to update the information about cell activation state of eNB₂ cells in eNB₁.

8.3.11.3 Unsuccessful Operation

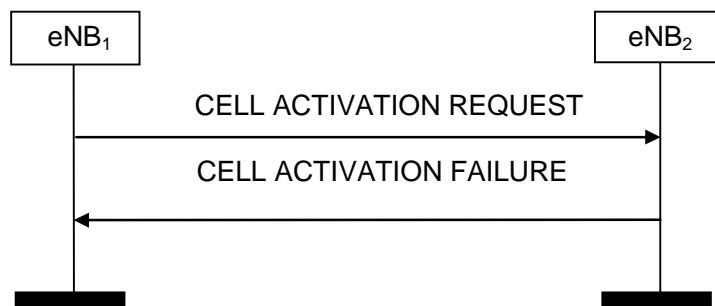


Figure 8.3.11.3-1: Cell Activation, unsuccessful operation

If the eNB₂ cannot activate any of the cells indicated in the CELL ACTIVATION REQUEST message, it shall respond with a CELL ACTIVATION FAILURE message with an appropriate cause value.

8.3.11.4 Abnormal Conditions

Not applicable.

8.3.12 X2 Removal

8.3.12.1 General

The purpose of the X2 Removal procedure is to remove the signaling connection between two eNBs in a controlled manner. If successful, this procedure erases any existing application level configuration data in the two nodes.

The procedure uses non UE-associated signaling.

8.3.12.2 Successful Operation

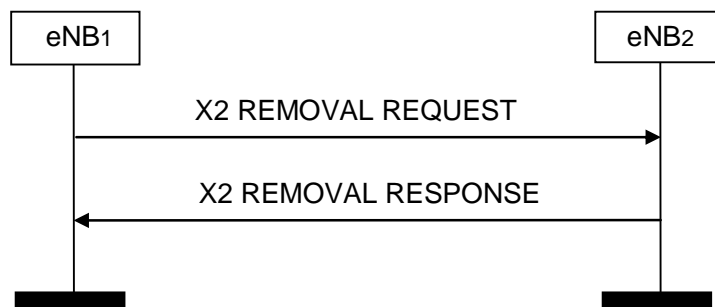


Figure 8.3.12.2-1: X2 Removal, successful operation

An eNB₁ initiates the procedure by sending the X2 REMOVAL REQUEST message to a candidate eNB₂. Upon reception of the X2 REMOVAL REQUEST message the candidate eNB₂ shall reply with the X2 REMOVAL RESPONSE message. After receiving the X2 REMOVAL RESPONSE message, the initiating eNB₁ shall initiate removal of the TNL association towards eNB₂ and may remove all resources associated with that signaling connection. The candidate eNB₂ may then remove all resources associated with that signaling connection.

If the *X2 Removal Threshold* IE is included in the X2 REMOVAL REQUEST message, the candidate eNB₂ shall, if supported, accept to remove the signalling connection with eNB₁ if the X2 Benefit Value of the signalling connection determined at the candidate eNB₂ is lower than the value of the *X2 Removal Threshold* IE.

8.3.12.3 Unsuccessful Operation

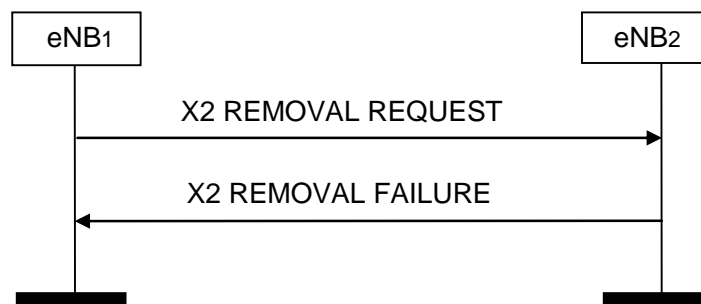


Figure 8.3.12.3-1: X2 Removal, unsuccessful operation

If the candidate eNB₂ cannot accept to remove the signaling connection with eNB₁ it shall respond with an X2 REMOVAL FAILURE message with an appropriate cause value.

8.3.12.4 Abnormal Conditions

Void.

8.3.13 Retrieve UE Context

8.3.13.1 General

The purpose of the Retrieve UE Context procedure is to retrieve the UE context from the eNB where the RRC connection has been suspended (old eNB) and transfer it to the eNB where the RRC Connection has been requested to be resumed (new eNB) or to retrieve the UE context for a UE which attempts to re-establish its RRC connection in an eNB (the new eNB) different from the eNB (the old eNB) where the RRC connection failed, e.g. due to RLF.

The procedure uses UE-associated signalling.

8.3.13.2 Successful Operation

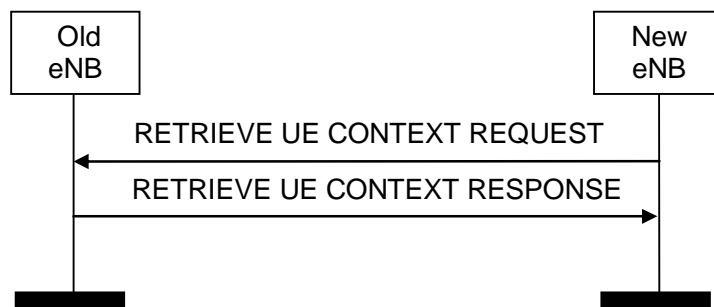


Figure 8.3.13.2-1: Retrieve UE Context, successful operation

The new eNB initiates the procedure by sending the RETRIEVE UE CONTEXT REQUEST message to the old eNB.

If the old eNB is able to identify the UE context and to successfully verify the UE by means of the Resume ID, the ShortMAC-I, optionally the C-RNTI, the failure cell PCI and the E-UTRAN Cell Identifier of the new cell contained in the RETRIEVE UE CONTEXT REQUEST message, it shall respond with the RETRIEVE UE CONTEXT RESPONSE message. The allocation of resources according to the values of the *Allocation and Retention Priority* IE included in the *E-RAB Level QoS Parameters* IE shall follow the principles described for the E-RAB Setup procedure in TS 36.413 [4].

If the *C-RNTI* IE is present in the RETRIEVE UE CONTEXT REQUEST, the old eNB shall ignore the *Resume ID* IE.

The old eNB may include in the *GUMMEI* IE any GUMMEI corresponding to the source MME node.

If the PLMN of the new cell is not the Serving PLMN stored in the UE Context the old eNB shall replace the Serving PLMN with the PLMN of the new cell and move the Serving PLMN to the equivalent PLMN list, before propagating the roaming and access restriction information to the new eNB. The new eNB shall act upon reception of the

- *UE Security Capabilities* IE,
- *AS Security Information* IE,
- *Subscriber Profile ID for RAT/Frequency priority* IE,
- *Handover Restriction List* IE,
- *Location Reporting Information* IE,
- *Management Based MDT Allowed* IE
- *Management Based MDT PLMN List* IE
- *Trace Activation* IE,
- *SRVCC Operation Possible* IE,
- *Masked IMEISV* IE
- *Expected UE Behaviour* IE,
- *ProSe Authorized* IE,
- *V2X Services Authorized* IE,
- *Aerial UE subscription information* IE,
- *Subscription Based UE Differentiation Information* IE,

within the RETRIEVE UE CONTEXT RESPONSE message as specified for the target eNB upon reception of the HANDOVER REQUEST message for the Handover Preparation procedure.

If the *UE Sidelink Aggregate Maximum Bit Rate* IE is contained in the RETRIEVE UE CONTEXT RESPONSE message, the new eNB shall, if supported, use it for the concerned UE's sidelink communication in network scheduled mode for V2X services.

If the *Aerial UE subscription information* IE is included in the RETRIEVE UE CONTEXT RESPONSE message, the target eNB shall, if supported, store this information in the UE context and use it as defined in TS 36.300 [15].

For each E-RAB for which the old eNB proposes to do forwarding of downlink data, the old eNB shall include the *DL Forwarding* IE within the *E-RABs To Be Setup Item* IE of the RETRIEVE UE CONTEXT RESPONSE message.

8.3.13.3 Unsuccessful Operation

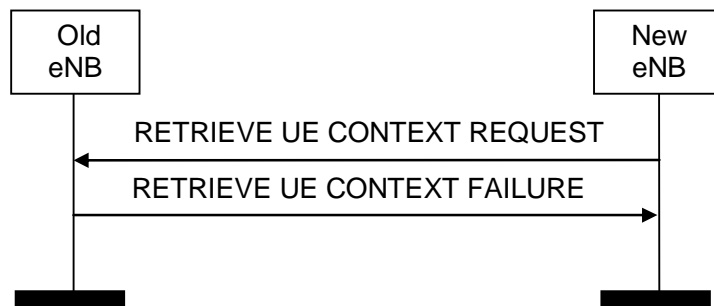


Figure 8.3.13.3-1: Retrieve UE Context, unsuccessful operation

If the old eNB is not able to identify the UE context by means of the Resume ID, or with the ShortMAC-I, C-RNTI, failed cell PCI and new E-UTRAN Cell Identifier contained in the RETRIEVE UE CONTEXT REQUEST message, it shall respond to the new eNB with the RETRIEVE UE CONTEXT FAILURE message.

8.3.13.4 Abnormal Conditions

Void.

8.3.14 EN-DC X2 Removal

8.3.14.1 General

The purpose of the EN-DC X2 Removal procedure is to remove the signaling connection between eNB and en-gNB in a controlled manner. If successful, this procedure erases any existing application level configuration data in the two nodes.

NOTE: In case the signalling transport is shared among several X2-C interface instances, and the TNL association is still used by one or more X2-C interface instances, the initiating node should not initiate the removal of the TNL association.

The procedure uses non UE-associated signaling.

8.3.14.2 Successful Operation

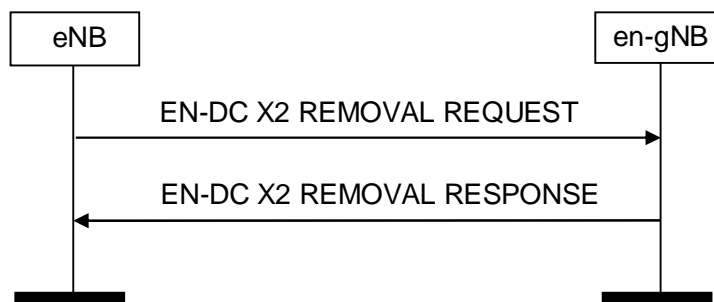


Figure 8.3.14.2-1: eNB Initiated EN-DC X2 Removal, successful operation

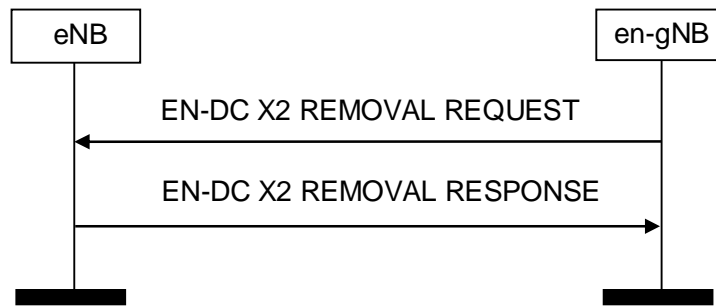


Figure 8.3.14.2-2: en-gNB Initiated EN-DC X2 Removal, successful operation

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC X2 REMOVAL REQUEST message and the EN-DC X2 REMOVAL RESPONSE message shall include the *Interface Instance Indication* IE to identify the corresponding interface instance.

eNB initiated EN-DC X2 Removal:

An eNB initiates the procedure by sending the EN-DC X2 REMOVAL REQUEST message to a candidate en-gNB. Upon reception of the EN-DC X2 REMOVAL REQUEST message the candidate en-gNB shall reply with the EN-DC X2 REMOVAL RESPONSE message. After receiving the EN-DC X2 REMOVAL RESPONSE message, the initiating eNB shall initiate removal of the TNL association towards en-gNB and may remove all resources associated with that signaling connection. The candidate eNB may then remove all resources associated with that signaling connection.

If the *X2 Removal Threshold* IE is included in the EN-DC X2 REMOVAL REQUEST message, the candidate en-gNB shall, if supported, accept to remove the signalling connection with eNB if the X2 Benefit Value of the signalling connection determined at the candidate en-gNB is lower than the value of the *X2 Removal Threshold* IE.

en-gNB initiated EN-DC X2 Removal:

An en-gNB initiates the procedure by sending the EN-DC X2 REMOVAL REQUEST message to a candidate eNB. Upon reception of the EN-DC X2 REMOVAL REQUEST message the candidate eNB shall reply with the EN-DC X2 REMOVAL RESPONSE message. After receiving the EN-DC X2 REMOVAL RESPONSE message, the initiating en-gNB shall initiate removal of the TNL association towards eNB and may remove all resources associated with that signaling connection. The candidate eNB may then remove all resources associated with that signaling connection.

If the *X2 Removal Threshold* IE is included in the EN-DC X2 REMOVAL REQUEST message, the candidate eNB shall, if supported, accept to remove the signalling connection with en-gNB if the X2 Benefit Value of the signalling connection determined at the candidate eNB is lower than the value of the *X2 Removal Threshold* IE.

8.3.14.3 Unsuccessful Operation

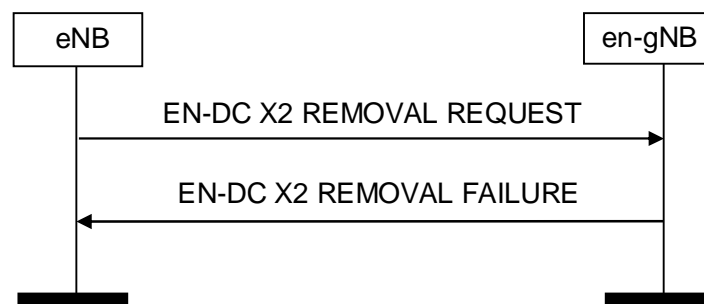


Figure 8.3.14.3-1: eNB Initiated EN-DC X2 Removal, unsuccessful operation

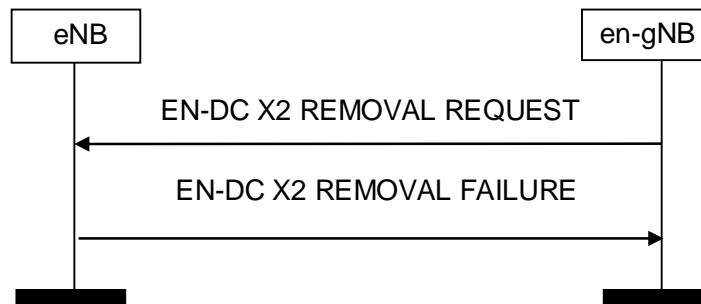


Figure 8.3.14.3-2: en-gNB Initiated EN-DC X2 Removal, unsuccessful operation

If the candidate receiving node cannot accept to remove the signaling connection with initiating node it shall respond with an EN-DC X2 REMOVAL FAILURE message with an appropriate cause value.

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC X2 REMOVAL REQUEST message and the EN-DC X2 REMOVAL FAILURE message shall include the *Interface Instance Indication* IE to identify the corresponding interface instance.

8.3.14.4 Abnormal Conditions

Void.

8.3.15 Data Forwarding Address Indication

8.3.15.1 General

The purpose of the Data Forwarding Address Indication procedure is to allow the new eNB to provide data forwarding addresses to the old eNB in case the RRC connection has been re-established, as specified in TS 36.300 [15].

The procedure uses UE-associated signalling.

8.3.15.2 Successful Operation

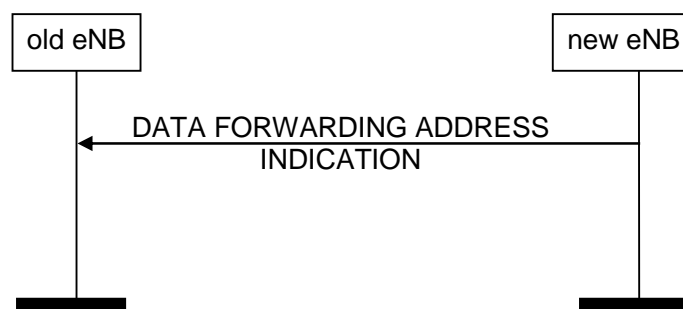


Figure 8.3.15.2-1: Data Forwarding Address Indication, successful operation

The new eNB initiates the procedure by sending a DATA FORWARDING ADDRESS INDICATION message to the old eNB.

For each E-RAB included in *E-RABs Data Forwarding Address List* IE, the new eNB indicates that it requests data forwarding of downlink packets to the GTP TEID indicated in the *DL GTP Tunnel Endpoint* IE.

8.3.15.3 Unsuccessful Operation

Not applicable.

8.3.15.4 Abnormal Conditions

Void.

8.4 X2 Release

8.4.1 General

The purpose of the X2 Release procedure is to inform an eNB that the signalling (i.e. SCTP) connection to a peer eNB is unavailable.

8.4.2 Successful Operation



Figure 8.4.2-1: X2AP Release, successful operation

eNB₁ initiates the procedure by sending the X2 RELEASE message to eNB₂. Upon the reception of X2 RELEASE message, eNB₂ shall consider that the signalling connection to an eNB indicated by the *eNB ID* IE is unavailable. eNB₂ may delete all the context information related to the indicated eNB.

8.4.3 Unsuccessful Operation

Not Applicable

8.4.4 Abnormal Condition

Not Applicable.

8.5 X2AP Message Transfer

8.5.1 General

The purpose of the X2AP Message Transfer procedure is to allow indirect transport of an X2AP message (except the X2AP MESSAGE TRANSFER message) between two eNBs and to allow an eNB to perform registration.

8.5.2 Successful Operation



Figure 8.5.2-1: X2AP Message Transfer, successful operation

eNB₁ initiates the procedure by sending the X2AP MESSAGE TRANSFER message to eNB₂.

Upon the reception of X2 MESSAGE TRANSFER message the target eNB may:

- Retrieve the X2AP message included in the *X2AP Message IE*;
- Consider the target eNB ID contained in the *Target eNB ID IE*, included in the *RNL Header IE*, as the destination for the X2AP message signaled in the *X2AP Message IE*;
- Consider the source eNB ID contained in the *Source eNB ID IE*, included in the *RNL Header IE*, as the source of the X2AP message signaled in the *X2AP Message IE*.

In case the included *RNL Header IE* does not contain the *Target eNB ID IE*, the receiving eNB shall consider the eNB ID included in the *Source eNB ID IE* as the eNB ID corresponding to the TNL address(es) of the sender and update its internal information.

8.5.3 Unsuccessful Operation

Not Applicable.

8.5.4 Abnormal Condition

Not Applicable.

8.6 Procedures for Dual Connectivity

8.6.1 SeNB Addition Preparation

8.6.1.1 General

The purpose of the SeNB Addition Preparation procedure is to request the SeNB to allocate resources for dual connectivity operation for a specific UE.

The procedure uses UE-associated signalling.

8.6.1.2 Successful Operation

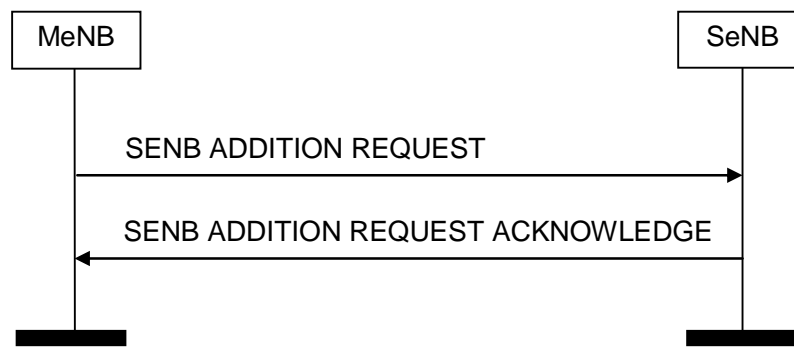


Figure 8.6.1.2-1: SeNB Addition Preparation, successful operation

The MeNB initiates the procedure by sending the SENB ADDITION REQUEST message to the SeNB. When the MeNB sends the SENB ADDITION REQUEST message, it shall start the timer T_{DCprep} .

The allocation of resources according to the values of the *Allocation and Retention Priority* IE included in the *E-RAB Level QoS Parameters* IE shall follow the principles described for the E-RAB Setup procedure in TS 36.413 [4].

If the SENB ADDITION REQUEST message contains the *Serving PLMN* IE, the SeNB may use it for RRM purposes.

If the SENB ADDITION REQUEST message contains the *Expected UE Behaviour* IE, the SeNB shall, if supported, store this information and may use it to optimize resource allocation.

The SeNB shall report to the MeNB, in the SENB ADDITION REQUEST ACKNOWLEDGE message, the result for all the requested E-RABs in the following way:

- A list of E-RABs which are successfully established shall be included in the *E-RABs Admitted To Be Added List* IE.
- A list of E-RABs which failed to be established shall be included in the *E-RABs Not Admitted List* IE.

NOTE: The MeNB may trigger the SeNB Addition Preparation procedure in the course of the Inter-MeNB handover without SeNB change procedure as described in 36.300 [15]. The deleted E-RABs are not included in the *E-RABs To Be Added List* IE in the SENB ADDITION REQUEST message, from MeNB point of view. If the SeNB reports a certain E-RAB to be successfully established, respective SCG resources, from an SeNB point of view, may be actually successfully established or modified or kept; if a certain E-RAB is reported to be failed to be established, respective SCG resources, from an SeNB point of view, may be actually failed to be established or modified or kept.

For each E-RAB configured with the SCG bearer option

- the SeNB shall choose the ciphering algorithm based on the information in the *UE Security Capabilities* IE and locally configured priority list of AS encryption algorithms and apply the key indicated in the *SeNB Security Key* IE as specified in the TS 33.401 [18].
- the MeNB may propose to apply forwarding of downlink data by including the *DL Forwarding* IE within the *E-RABs To be Added Item* IE of the SENB ADDITION REQUEST message. For each E-RAB that it has decided to admit, the SeNB may include the *DL Forwarding GTP Tunnel Endpoint* IE within the *E-RABs Admitted To Be Added Item* IE of the SENB ADDITION REQUEST ACKNOWLEDGE message to indicate that it accepts the proposed forwarding of downlink data for this bearer. This GTP tunnel endpoint may be different from the corresponding GTP tunnel endpoint, i.e the information contained in the *Transport Layer Address* IE and the *DL GTP TEID* IE in the *E-RAB To Be Modified List* IE of the E-RAB MODIFICATION INDICATION message (see TS 36.413 [4]) depending on implementation choice.
- the SeNB may include for each bearer in the *E-RABs Admitted To Be Added List* IE the *UL Forwarding GTP Tunnel Endpoint* IE to indicate that it requests data forwarding of uplink packets to be performed for that bearer.
- If the *Correlation ID* IE for the concerned E-RAB is received by the SeNB, the SeNB shall use this information for LIPA operation for the concerned E-RAB.

- If the *SIPTO Correlation ID* IE for the concerned E-RAB is received by the SeNB, the SeNB shall use this information for SIPTO@LN operation for the concerned E-RAB.
- If the *Bearer Type* IE for the concerned E-RAB is received by the SeNB and is set to "non IP", the SeNB shall, if supported, not perform header compression for the concerned E-RAB.

If the *CSG Membership Status* IE is included in the SENB ADDITION REQUEST message, the SeNB shall act as specified in TS 36.300 [15].

Upon reception of the SENB ADDITION REQUEST ACKNOWLEDGE message the MeNB shall stop the timer T_{DCprep} .

If the *GW Transport Layer Address* IE is received in the SENB ADDITION REQUEST ACKNOWLEDGE message, the MeNB stores this information and use it according to TS 36.300 [15].

If the *SIPTO L-GW Transport Layer Address* IE is received in the SENB ADDITION REQUEST ACKNOWLEDGE message, the MeNB stores this information and use it according to TS 36.300 [15].

If the *SeNB UE X2AP ID* IE and/or *SeNB UE X2AP ID Extension* IE are contained in the SENB ADDITION REQUEST message, the SeNB shall, if supported, store this information and use it as defined in TS 36.300 [15].

If the *Tunnel Information for BBF* IE is received in the SENB ADDITION REQUEST ACKNOWLEDGE message, the MeNB shall, if supported, transfer the tunnel information for BBF to the core network.

Interactions with the SeNB Reconfiguration Completion procedure:

If the SeNB admits at least one E-RAB, the SeNB shall start the timer $T_{DCoverall}$ when sending the SENB ADDITION REQUEST ACKNOWLEDGE message to the MeNB. The reception of the SENB RECONFIGURATION COMPLETE message shall stop the timer $T_{DCoverall}$.

8.6.1.3 Unsuccessful Operation

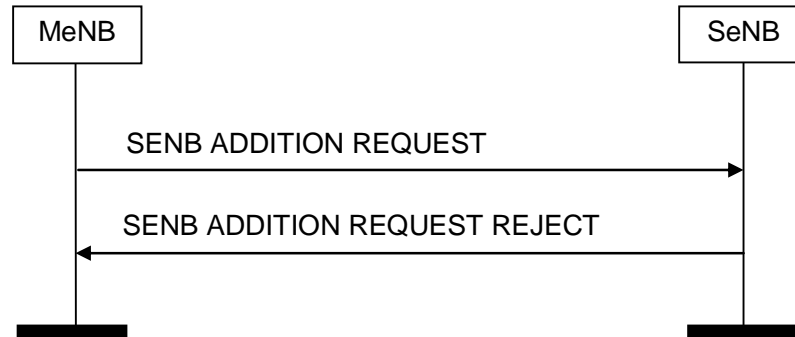


Figure 8.6.1.3-1: SeNB Addition Preparation, unsuccessful operation

If the SeNB is not able to accept any of the bearers or a failure occurs during the SeNB Addition Preparation, the SeNB sends the SENB ADDITION REQUEST REJECT message with an appropriate cause value to the MeNB.

8.6.1.4 Abnormal Conditions

If the SeNB receives a SENB ADDITION REQUEST message containing multiple *E-RAB ID* IEs (in the *E-RABs To Be Added List* IE) set to the same value, the SeNB shall consider the establishment of the corresponding E-RAB as failed.

If the SeNB receives a SENB ADDITION REQUEST message containing a *E-RAB Level QoS Parameters* IE which contains a *QCI* IE indicating a GBR bearer (as defined in TS 23.203 [13]), and which does not contain the *GBR QoS Information* IE, the SeNB shall consider the establishment of the corresponding E-RAB as failed.

If the supported algorithms for encryption defined in the *Encryption Algorithms* IE in the *UE Security Capabilities* IE, plus the mandated support of EEA0 in all UEs (TS 33.401 [18]), do not match any algorithms defined in the configured list of allowed encryption algorithms in the SeNB (TS 33.401 [18]), the SeNB shall reject the procedure using the SENB ADDITION REQUEST REJECT message.

If the SeNB receives a SENB ADDITION REQUEST message which does not contain the *CSG Membership Status* IE, and the SCell served by the SeNB is a hybrid cell, the SeNB shall reject the procedure using the SENB ADDITION REQUEST REJECT message.

If the SeNB receives a SENB ADDITION REQUEST message containing a *SeNB UE X2AP ID* IE that does not match any existing UE Context that has such ID, the SeNB shall reject the procedure using the SENB ADDITION REQUEST REJECT message.

If the SeNB receives a SENB ADDITION REQUEST message containing both the *Correlation ID* and the *SIPTO Correlation ID* IEs for the same E-RAB, the SeNB shall consider the establishment of the corresponding E-RAB as failed.

Interactions with the SeNB Reconfiguration Completion and SeNB initiated SeNB Release procedure:

If the timer $T_{DCoverall}$ expires before the SeNB has received the SENB RECONFIGURATION COMPLETE or the SENB RELEASE REQUEST message, the SeNB shall regard the requested RRC connection reconfiguration as being not applied by the UE and shall trigger the SeNB initiated SeNB Release procedure.

Interactions with the MeNB initiated SeNB Release procedure:

If the timer T_{DCprep} expires before the MeNB has received the SENB ADDITION REQUEST ACKNOWLEDGE message, the MeNB shall regard the SeNB Addition Preparation procedure as being failed and shall trigger the MeNB initiated SeNB Release procedure.

8.6.2 SeNB Reconfiguration Completion

8.6.2.1 General

The purpose of the SeNB Reconfiguration Completion procedure is to provide information to the SeNB whether the requested configuration was successfully applied by the UE.

The procedure uses UE-associated signalling.

8.6.2.2 Successful Operation



Figure 8.6.2.2-1: SeNB Reconfiguration Complete procedure, successful operation.

The MeNB initiates the procedure by sending the SENB RECONFIGURATION COMPLETE message to the SeNB.

The SENB RECONFIGURATION COMPLETE message may contain information that

- either the UE has successfully applied the configuration requested by the SeNB. The MeNB may also provide configuration information in the *MeNB to SeNB Container* IE.
- or the MeNB has not triggered configuration requested by the SeNB. The MeNB shall provide information with sufficient precision in the included *Cause* IE to enable the SeNB to know the reason for an unsuccessful reconfiguration. The MeNB may also provide configuration information in the *MeNB to SeNB Container* IE.

Upon reception of the SENB RECONFIGURATION COMPLETE message the SeNB shall stop the timer $T_{DCoverall}$.

8.6.2.3 Abnormal Conditions

Void.

8.6.3 MeNB initiated SeNB Modification Preparation

8.6.3.1 General

This procedure is used to enable an MeNB to request an SeNB to modify the UE context at the SeNB.

The procedure uses UE-associated signalling.

8.6.3.2 Successful Operation

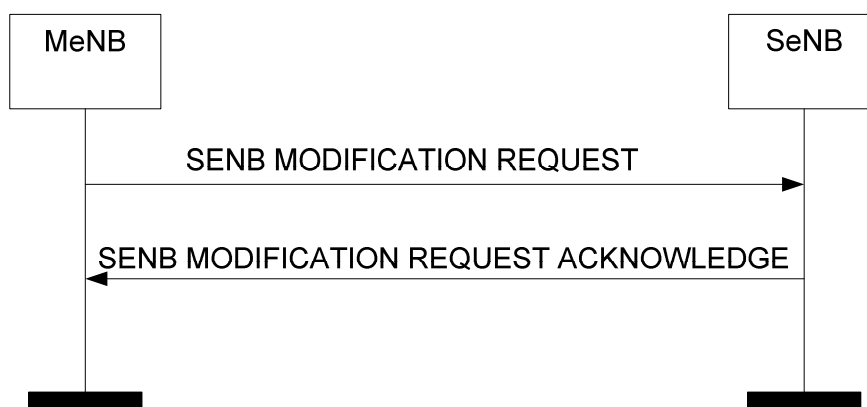


Figure 8.6.3.2-1: MeNB initiated SeNB Modification Preparation, successful operation

The MeNB initiates the procedure by sending the SENB MODIFICATION REQUEST message to the SeNB. When the MeNB sends the SENB MODIFICATION REQUEST message, it shall start the timer T_{DCprep} .

The SENB MODIFICATION REQUEST message may contain

- within the *UE Context Information IE*;
- E-RABs to be added within the *E-RABs To Be Added Item IE*;
- E-RABs to be modified within the *E-RABs To Be Modified Item IE*;
- E-RABs to be released within the *E-RABs To Be Released Item IE*;
- the *SeNB UE Aggregate Maximum Bit Rate IE*;
- the *MeNB to SeNB Container IE*;
- the *SCG Change Indication IE*;
- the *CSG Membership Status IE*.

If the SENB MODIFICATION REQUEST message contains the *Serving PLMN IE*, the SeNB may use it for RRM purposes.

If the *SeNB UE Aggregate Maximum Bit Rate IE* is included in the SENB MODIFICATION REQUEST message, the SeNB shall:

- replace the previously provided SeNB UE Aggregate Maximum Bit Rate by the received SeNB UE Aggregate Maximum Bit Rate in the UE context;
- use the received SeNB UE Aggregate Maximum Bit Rate for non-GBR Bearers for the concerned UE as defined in TS 36.300 [15].

The allocation of resources according to the values of the *Allocation and Retention Priority* IE included in the *E-RAB Level QoS Parameters* IE shall follow the principles described for the E-RAB Setup procedure in TS 36.413 [4].

If at least one of the requested modifications is admitted by the SeNB, the SeNB shall modify the related part of the UE context accordingly and send the SENB MODIFICATION REQUEST ACKNOWLEDGE message back to the MeNB.

The SeNB shall include the E-RABs for which resources have been either added or modified or released at the SeNB either in the *E-RABs Admitted To Be Added List* IE or the *E-RABs Admitted To Be Modified List* IE or the *E-RABs Admitted To Be Released List* IE. The SeNB shall include the E-RABs that have not been admitted in the *E-RABs Not Admitted List* IE with an appropriate cause value.

For each E-RAB configured with the SCG bearer option

- the SeNB shall, if included, choose the ciphering algorithm based on the information in the *UE Security Capabilities* IE and locally configured priority list of AS encryption algorithms and apply the key indicated in the *SeNB Security Key* IE as specified in the TS 33.401 [18].
- if applicable, the MeNB may propose to apply forwarding of downlink data by including the *DL Forwarding* IE within the *E-RABs To Be Added Item* IE of the SENB MODIFICATION REQUEST message. For each E-RAB that it has decided to admit, the SeNB may include the *DL Forwarding GTP Tunnel Endpoint* IE within the *E-RABs Admitted To Be Added Item* IE of the SENB MODIFICATION REQUEST ACKNOWLEDGE message to indicate that it accepts the proposed forwarding of downlink data for this bearer. The MeNB may also provide for an applicable E-RAB to be released the *DL Forwarding GTP Tunnel Endpoint* IE and the *UL Forwarding GTP Tunnel Endpoint* IE within the *E-RABs To Be Released Item* IE of the SENB MODIFICATION REQUEST message.
- if applicable, the SeNB may include for each bearer in the *E-RABs Admitted To Be Added List* IE in the SENB MODIFICATION REQUEST ACKNOWLEDGE message the *UL Forwarding GTP Tunnel Endpoint* IE to indicate that it requests data forwarding of uplink packets to be performed for that bearer.
- If the *Correlation ID* IE for the concerned E-RAB is received by the SeNB, the SeNB shall use this information for LIPA operation for the concerned E-RAB.
- If the *SIPTO Correlation ID* IE for the concerned E-RAB is received by the SeNB, the SeNB shall use this information for SIPTO@LN operation for the concerned E-RAB.
- If the *Bearer Type* IE for the concerned E-RAB is received by the SeNB and is set to "non IP", the SeNB shall, if supported, not perform header compression for the concerned E-RAB.

For each E-RAB configured with the split bearer option to be modified, if the SENB MODIFICATION REQUEST message includes the *SCG Change Indication* IE and the *MeNB GTP Tunnel Endpoint* IE in the *E-RABs To Be Modified Item* IE, the SeNB shall act as specified in TS 36.300 [15].

For each E-RAB configured with the split bearer option to be modified (released)

- if applicable, the MeNB may provide for an applicable E-RAB to be released the *DL Forwarding GTP Tunnel Endpoint* IE within the *E-RABs To Be Released Item* IE of the SENB MODIFICATION REQUEST message.

If the *E-RAB level QoS parameter* IE is included in the SENB MODIFICATION REQUEST message for an E-RAB to be modified the SeNB shall allocate respective resources and provide corresponding radio configuration information within the *SeNB to MeNB Container* IE as described in TS 36.300 [15].

If the SENB MODIFICATION REQUEST message contains for an E-RAB to be modified which is configured with the SCG bearer option the *S1 UL GTP Tunnel Endpoint* IE the SeNB shall use it as the new UL S1-U address.

If the SENB MODIFICATION REQUEST message contains for an E-RAB to be modified which is configured with the split bearer option the *MeNB GTP Tunnel Endpoint* IE the SeNB shall use it as the new UL X2-U address.

For an E-RAB to be modified which is configured with the SCG bearer option the SeNB may include in the SENB MODIFICATION REQUEST ACKNOWLEDGE message the *S1 DL GTP Tunnel Endpoint* IE.

For an E-RAB to be modified which is configured with the split bearer option the SeNB may include in the SENB MODIFICATION REQUEST ACKNOWLEDGE message the *SeNB GTP Tunnel Endpoint* IE.

If the *SCG Change Indication* IE is included in the SENB MODIFICATION REQUEST message, the SeNB shall act as specified in TS 36.300 [15].

If the *CSG Membership Status* IE is included in the SENB MODIFICATION REQUEST message, the SeNB shall act as specified in TS 36.300 [15].

Upon reception of the SENB MODIFICATION REQUEST ACKNOWLEDGE message the MeNB shall stop the timer T_{DCprep} . If the SENB MODIFICATION REQUEST ACKNOWLEDGE message has included the *SeNB to MeNB Container* IE the MeNB is then defined to have a Prepared SeNB Modification for that X2 UE-associated signalling.

When the SeNB supporting L-GW function for LIPA operation releases radio and control plane related resources associated to the LIPA bearer, it shall also request using intra-node signalling the collocated L-GW to release the LIPA PDN connection as defined in TS 23.401 [12].

Interactions with the SeNB Reconfiguration Completion procedure:

If the SeNB admits a modification of the UE context requiring the MeNB to report about the success of the RRC connection reconfiguration procedure, the SeNB shall start the timer $T_{DCoverall}$ when sending the SENB MODIFICATION REQUEST ACKNOWLEDGE message to the MeNB. The reception of the SENB RECONFIGURATION COMPLETE message shall stop the timer $T_{DCoverall}$.

8.6.3.3 Unsuccessful Operation

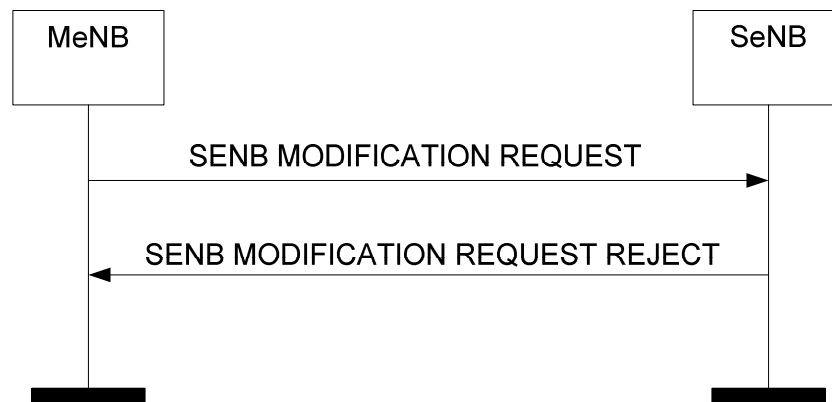


Figure 8.6.3.3-1: MeNB initiated SeNB Modification Preparation, unsuccessful operation

If the SeNB does not admit any modification requested by the MeNB, or a failure occurs during the MeNB initiated SeNB Modification Preparation, the SeNB shall send the SENB MODIFICATION REQUEST REJECT message to the MeNB. The message shall contain the *Cause* IE with an appropriate value.

If the SeNB receives a SENB MODIFICATION REQUEST message containing the *MeNB to SeNB Container* IE that does not include required information as specified in TS 36.331 [9], the SeNB shall send the SENB MODIFICATION REQUEST REJECT message to the MeNB.

8.6.3.4 Abnormal Conditions

If the SeNB receives a SENB MODIFICATION REQUEST message containing multiple *E-RAB ID* IEs (in the *E-RABs To Be Added List* IE and/or the *E-RABs To Be Modified List* IE) set to the same value, the SeNB shall not admit the action requested for the corresponding E-RABs.

If the SeNB receives a SENB MODIFICATION REQUEST message containing multiple *E-RAB ID* IEs (in the *E-RAB To Be Released List* IE) set to the same value, the SeNB shall initiate the release of one corresponding E-RAB and ignore the duplication of the instances of the selected corresponding E-RABs.

If the SeNB receives a SENB MODIFICATION REQUEST message containing a *E-RAB Level QoS Parameters* IE which contains a *QCI* IE indicating a GBR bearer (as defined in TS 23.203 [13]), and which does not contain the *GBR QoS Information* IE, the SeNB shall not admit the corresponding E-RAB.

If the supported algorithms for encryption defined in the *Encryption Algorithms* IE in the *UE Security Capabilities* IE in the *UE Context Information* IE, plus the mandated support of EEA0 in all UEs (TS 33.401 [18]), do not match any algorithms defined in the configured list of allowed encryption algorithms in the SeNB (TS 33.401 [18]), the SeNB shall reject the procedure using the SENB MODIFICATION REQUEST REJECT message.

If the timer T_{DCprep} expires before the MeNB has received the SENB MODIFICATION REQUEST ACKNOWLEDGE message, the MeNB shall regard the MeNB initiated SeNB Modification Preparation procedure as being failed and shall release the UE Context at the SeNB.

If the SeNB receives a SENB MODIFICATION REQUEST message containing both the *Correlation ID* and the *SIPTO Correlation ID* IEs for the same E-RAB, the SeNB shall consider the establishment of the corresponding E-RAB as failed.

Interactions with the SeNB Reconfiguration Completion and SeNB initiated SeNB Release procedure:

If the timer $T_{DCoverall}$ expires before the SeNB has received the SENB RECONFIGURATION COMPLETE or the SENB RELEASE REQUEST message, the SeNB shall regard the requested modification RRC connection reconfiguration as being not applied by the UE and shall trigger the SeNB initiated SeNB Release procedure.

Interaction with the SeNB initiated SeNB Modification Preparation procedure:

If the MeNB, after having initiated the MeNB initiated SeNB Modification procedure, receives the SENB MODIFICATION REQUIRED message, the MeNB shall refuse the SeNB initiated SeNB Modification procedure with an appropriate cause value in the *Cause* IE.

If the MeNB has a Prepared SeNB Modification and receives the SENB MODIFICATION REQUIRED message, the MeNB shall respond with the SENB MODIFICATION REFUSE message to the SeNB with an appropriate cause value in the *Cause* IE.

8.6.4 SeNB initiated SeNB Modification

8.6.4.1 General

This procedure is used by the SeNB to modify the UE context in the SeNB.

The procedure uses UE-associated signalling.

8.6.4.2 Successful Operation

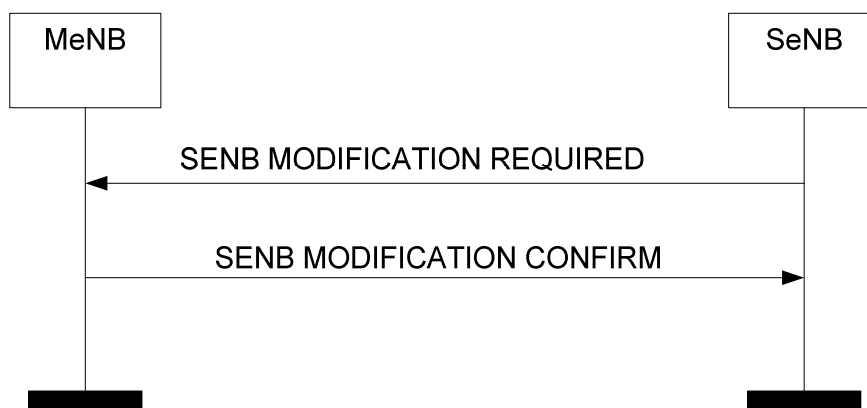


Figure 8.6.4.2-1: SeNB initiated SeNB Modification, successful operation.

The SeNB initiates the procedure by sending the SENB MODIFICATION REQUIRED message to the MeNB. When the SeNB sends the SENB MODIFICATION REQUIRED message, it shall start the timer $T_{DCoverall}$.

The SENB MODIFICATION REQUIRED message may contain

- the *SeNB to MeNB Container* IE.
- E-RABs to be released within the *E-RABs To Be Released Item* IE;
- the *SCG Change Indication* IE.

If the MeNB receives a SENB MODIFICATION REQUIRED message containing the *SCG Change Indication* IE, the MeNB shall act as specified in TS 36.300 [15].

If the MeNB is able to perform the modifications requested by the SeNB, the MeNB shall send the SENB MODIFICATION CONFIRM message to the SeNB. The SENB MODIFICATION CONFIRM message may contain the *MeNB to SeNB Container IE*.

Upon reception of the SENB MODIFICATION CONFIRM message the SeNB shall stop the timer $T_{DCoverall}$.

Interaction with the MeNB initiated SeNB Modification Preparation procedure:

If applicable, as specified in TS 36.300 [15], the SeNB may receive, after having initiated the SeNB initiated SeNB Modification procedure, the SENB MODIFICATION REQUEST message including the *DL Forwarding GTP Tunnel Endpoint IE* and the *UL Forwarding GTP Tunnel Endpoint IE* within the *E-RABs To Be Released List IE*.

If applicable, as specified in TS 36.300 [15], the SeNB may receive, after having initiated the SeNB initiated SeNB Modification procedure, the SENB MODIFICATION REQUEST message including the *SeNB Security Key IE* within the *UE Context Information IE*.

If the SeNB has initiated the SeNB initiated SeNB Modification procedure with the SENB MODIFICATION REQUIRED message including the *E-RABs To Be Released Item IE*, it may receive the SENB MODIFICATION REQUEST message including the *SCG Change Indication IE*, upon which the SeNB shall provide respective information in the *SeNB to MeNB Container IE* within the SENB MODIFICATION REQUEST ACKNOWLEDGMENT message, as specified in TS 36.300 [15].

8.6.4.3 Unsuccessful Operation

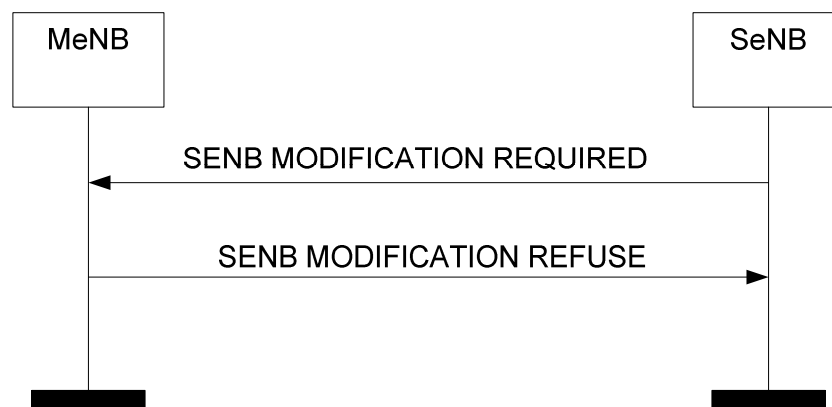


Figure 8.6.4.3-1: SeNB initiated SeNB Modification, unsuccessful operation.

In case the request modification cannot be performed successfully the MeNB shall respond with the SENB MODIFICATION REFUSE message to the SeNB with an appropriate cause value in the *Cause IE*.

The MeNB may also provide configuration information in the *MeNB to SeNB Container IE*.

8.6.4.4 Abnormal Conditions

If the timer $T_{DCoverall}$ expires before the SeNB has received the SENB MODIFICATION CONFIRM or the SENB MODIFICATION REFUSE message, the SeNB shall regard the requested modification as failed and may take further actions like triggering the SeNB initiated SeNB Release procedure to release all SeNB resources allocated for the UE.

If the MeNB is aware that the SeNB didn't receive the latest configuration information concerning the MCG, the MeNB may respond with the SENB MODIFICATION REFUSE message to the SeNB with an appropriate cause value in the *Cause IE*.

If the value received in the *E-RAB ID IE* of any of the *E-RABs To Be Released Items IE* is not known at the MeNB, the MeNB shall regard the procedure as failed and may take appropriate actions like triggering the MeNB initiated SeNB Release procedure.

Interaction with the MeNB initiated SeNB Modification Preparation procedure:

If the SeNB, after having initiated the SeNB initiated SeNB Modification procedure, receives the SENB MODIFICATION REQUEST message including other IEs than an applicable *SeNB Security Key* IE and/or applicable forwarding addresses and/or the *SCG Change Indication* IE the SeNB shall

- regard the SeNB initiated SeNB Modification Procedure as being failed,
- stop the $T_{DCoverall}$, which was started to supervise the SeNB initiated SeNB Modification procedure,
- be prepared to receive the SENB MODIFICATION REFUSE message from the MeNB and
- continue with the MeNB initiated SeNB Modification Preparation procedure as specified in section 8.6.3.

8.6.5 MeNB initiated SeNB Release

8.6.5.1 General

The MeNB initiated SeNB Release procedure is triggered by the MeNB to initiate the release of the resources for a specific UE.

The procedure uses UE-associated signalling.

8.6.5.2 Successful Operation



Figure 8.6.5.2-1: MeNB initiated SeNB Release, successful operation

The MeNB initiates the procedure by sending the SENB RELEASE REQUEST message. Upon reception of the SENB RELEASE REQUEST message the SeNB shall stop providing user data to the UE. The *SeNB UE X2AP ID* IE and, if available, the *SeNB UE X2AP ID Extension* IE shall be included if it has been obtained from the SeNB. The MeNB may provide appropriate information within the *Cause* IE.

If the bearer context in the SeNB was configured with the SCG bearer option, for each SCG bearer for which the MeNB requests forwarding of uplink/downlink data, the MeNB includes the *UL Forwarding GTP Tunnel Endpoint/ DL Forwarding GTP Tunnel Endpoint* IE within the *E-RABs To Be Released Item* IE of the SENB RELEASE REQUEST message to indicate that the SeNB should perform data forwarding of uplink/downlink packets for that SCG bearer.

If the bearer context in the SeNB was configured with the split bearer option, for each Split bearer for which the MeNB requests forwarding of downlink data, the MeNB includes the *DL Forwarding GTP Tunnel Endpoint* IE within the *E-RABs To Be Released Item* IE of the SENB RELEASE REQUEST message to indicate that the SeNB should perform data forwarding of downlink packets for that split bearer.

Upon reception of the SENB RELEASE REQUEST message containing *UE Context Kept Indicator* IE set to "True", the SeNB shall, if supported, only initiate the release of the resources related to the UE-associated signalling connection between the MeNB and the SeNB.

Upon reception of the SENB RELEASE REQUEST message containing *MakeBeforeBreak Indicator* IE set to "True", the SeNB shall, if supported, perform Make-Before-Break SeNB change as specified in TS 36.300 [15].

8.6.5.3 Unsuccessful Operation

Not applicable.

8.6.5.4 Abnormal Conditions

Should the SENB RELEASE REQUEST message refer to a context that does not exist, the SeNB shall ignore the message.

When the MeNB has initiated the procedure and did not include the *SeNB UE X2AP ID* IE the MeNB shall regard the resources for the UE at the SeNB as being fully released.

8.6.6 SeNB initiated SeNB Release

8.6.6.1 General

This procedure is triggered by the SeNB to initiate the release of the resources for a specific UE.

The procedure uses UE-associated signalling.

8.6.6.2 Successful Operation

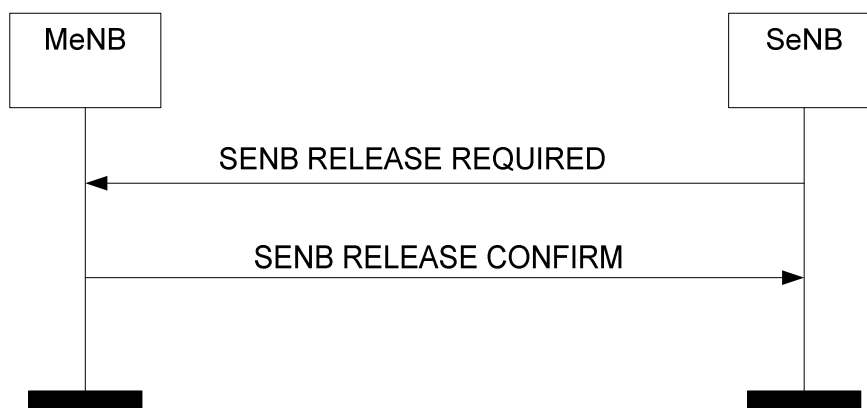


Figure 8.6.6.2-1: SeNB initiated SeNB Release, successful operation.

The SeNB initiates the procedure by sending the SENB RELEASE REQUIRED message to the MeNB.

Upon reception of the SENB RELEASE REQUIRED message, the MeNB replies with the SENB RELEASE CONFIRM message. For each E-RAB configured with the SCG bearer option, the MeNB may include the *DL Forwarding GTP Tunnel Endpoint* IE and the *UL Forwarding GTP Tunnel Endpoint* IE within the *E-RABs To Be Released Item* IE to indicate that it requests data forwarding of uplink and downlink packets to be performed for that bearer. For each E-RAB configured with the split bearer option, the MeNB may include the *DL Forwarding GTP Tunnel Endpoint* IE within the *E-RABs To Be Released Item* IE to indicate that it requests data forwarding of downlink packets to be performed for that bearer.

The SeNB may start data forwarding and stop providing user data to the UE upon reception of the SENB RELEASE CONFIRM message,

8.6.6.3 Unsuccessful Operation

Not applicable.

8.6.6.4 Abnormal Conditions

Void.

8.6.7 SeNB Counter Check

8.6.7.1 General

This procedure is initiated by the SeNB to request the MeNB to execute a counter check procedure to verify the value of the PDCP COUNTs associated with SCG bearers established in the SeNB.

The procedure uses UE-associated signalling.

8.6.7.2 Successful Operation

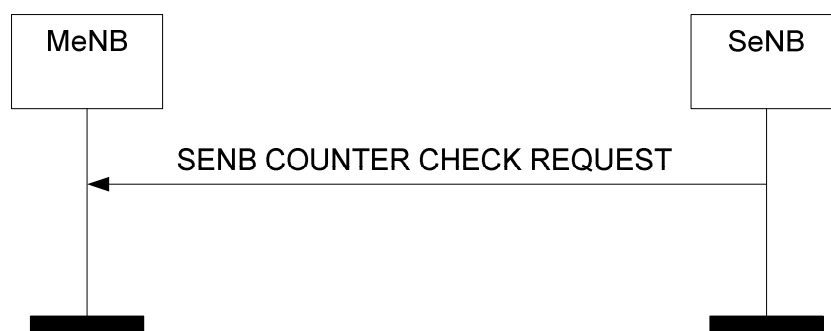


Figure 8.6.7.2-1: SeNB Counter Check procedure, successful operation.

The SeNB initiates the procedure by sending the SENB COUNTER CHECK REQUEST message to the MeNB.

Upon reception of the SENB COUNTER CHECK REQUEST message, the MeNB may perform the RRC counter check procedure as defined in TS 33.401 [18].

8.6.7.3 Unsuccessful Operation

Not applicable.

8.6.7.4 Abnormal Conditions

Not applicable.

8.7 Procedures for E-UTRAN-NR Dual Connectivity

8.7.1 EN-DC X2 Setup

8.7.1.1 General

The purpose of the EN-DC X2 Setup procedure is to exchange application level configuration data needed for eNB and en-gNB to interoperate correctly over the X2 interface. This procedure erases any existing application level configuration data in the two nodes and replaces it by the one received. This procedure also resets the X2 interface like a Reset procedure would do.

NOTE: If X2-C signalling transport is shared among multiple X2-C interface instances, one EN-DC X2 Setup procedure is issued per X2-C interface instance to be setup, i.e. several X2 Setup procedures may be issued via the same TNL association after that TNL association has become operational.

The procedure uses non UE-associated signalling.

8.7.1.2 Successful Operation

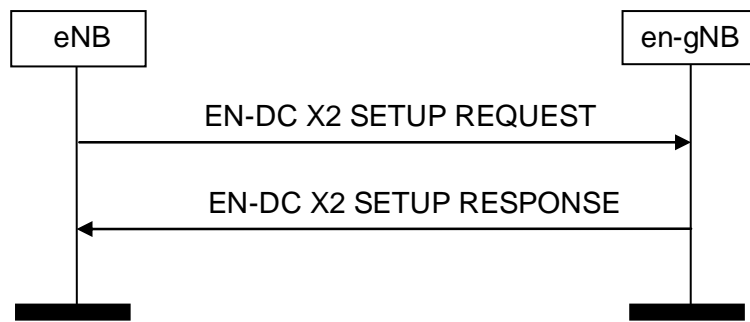


Figure 8.7.1.2-1: eNB Initiated EN-DC X2 Setup, successful operation

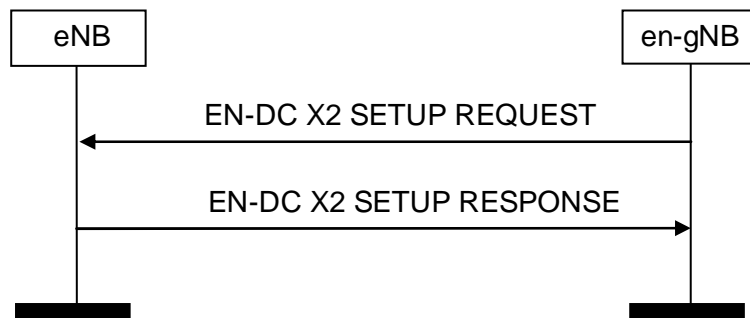


Figure 8.7.1.2-2: en-gNB Initiated EN-DC X2 Setup, successful operation

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC X2 SETUP REQUEST message and the EN-DC X2 SETUP RESPONSE message shall include the *Interface Instance Indication* IE to identify the corresponding interface instance.

eNB initiated EN-DC X2 Setup:

An eNB initiates the procedure by sending the EN-DC X2 SETUP REQUEST message to a candidate en-gNB. The candidate en-gNB replies with the EN-DC X2 SETUP RESPONSE message. The initiating eNB shall transfer the complete list of its served cells to the candidate en-gNB. The candidate en-gNB shall reply with the complete list of its served cells. If Supplementary Uplink is configured at the candidate en-gNB, the candidate en-gNB shall include in the EN-DC X2 SETUP RESPONSE message the *SUL Information* IE and the *Supported SUL band List* IE for each served cell where supplementary uplink is configured.

If the EN-DC X2 SETUP REQUEST message contains the *Protected E-UTRA Resource Indication* IE, the receiving en-gNB should take this into account for cell-level resource coordination with the eNB. The en-gNB shall consider the received *Protected E-UTRA Resource Indication* IE content valid until reception of a new update of the IE for the same eNB.

The protected resource pattern indicated in the *Protected E-UTRA Resource Indication* IE is not valid in subframes indicated by the *Reserved Subframes* IE, as well as in the non-control region of the MBSFN subframes i.e. it is valid only in the control region therein. The size of the control region of MBSFN subframes is indicated in the *Protected E-UTRA Resource Indication* IE.

en-gNB initiated EN-DC X2 Setup:

An en-gNB initiates the procedure by sending the EN-DC X2 SETUP REQUEST message to a candidate eNB. The candidate eNB replies with the EN-DC X2 SETUP RESPONSE message. The initiating en-gNB shall transfer the complete list of its served cells to the candidate eNB. The candidate eNB shall reply with the complete list of its served cells.

If Supplementary Uplink is configured at the en-gNB, the en-gNB shall include in the EN-DC X2 SETUP REQUEST message the *SUL Information* IE and the *Supported SUL band List* IE for each served cell where supplementary uplink is configured.

If the EN-DC X2 SETUP RESPONSE message contains the *Protected E-UTRA Resource Indication* IE, the receiving en-gNB should take this into account for cell-level resource coordination with the eNB. The en-gNB shall consider the received *Protected E-UTRA Resource Indication* IE content valid until reception of a new update of the IE for the same eNB.

8.7.1.3 Unsuccessful Operation

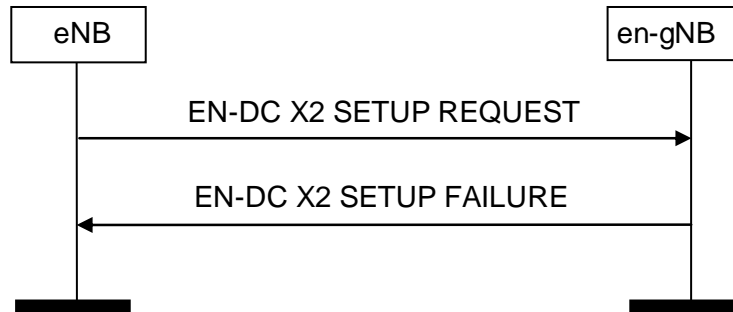


Figure 8.7.1.3-1: eNB Initiated EN-DC X2 Setup, unsuccessful operation

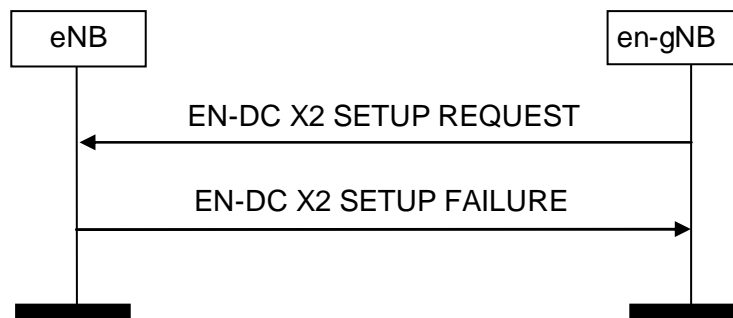


Figure 8.7.1.3-2: en-gNB Initiated EN-DC X2 Setup, unsuccessful operation

If the candidate receiving node cannot accept the setup it shall respond with an EN-DC X2 SETUP FAILURE message with appropriate cause value.

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC X2 SETUP REQUEST message and the EN-DC X2 SETUP FAILURE message shall include the *Interface Instance Indication* IE to identify the corresponding interface instance.

8.7.1.4 Abnormal Conditions

If the first message received for a specific TNL association is not an EN-DC X2 SETUP REQUEST, EN-DC X2 SETUP RESPONSE, or EN-DC X2 SETUP FAILURE message then this shall be treated as a logical error.

If the initiating node does not receive either EN-DC X2 SETUP RESPONSE message or EN-DC X2 SETUP FAILURE message, the initiating node may reinitiate the EN-DC X2 Setup procedure towards the same candidate node, provided that the content of the EN-DC X2 SETUP REQUEST message is identical to the content of the previously unacknowledged EN-DC X2 SETUP REQUEST message.

If the EN-DC X2 SETUP FAILURE message includes the *Time To Wait* IE the initiating node shall wait at least for the indicated time before reinitiating the EN-DC X2 Setup procedure towards the same peer node.

If the initiating node receives an EN-DC X2 SETUP REQUEST message from the peer entity on the same X2 interface:

- In case the initiating node answers with an EN-DC X2 SETUP RESPONSE message and receives a subsequent EN-DC X2 SETUP FAILURE message, the initiating node shall consider the X2 interface as non operational and the procedure as unsuccessfully terminated according to sub clause 8.7.1.3.
- In case the initiating node answers with an EN-DC X2 SETUP FAILURE message and receives a subsequent EN-DC X2 SETUP RESPONSE message, the initiating node shall ignore the EN-DC X2 SETUP RESPONSE message and consider the X2 interface as non operational.

8.7.2 EN-DC Configuration Update

8.7.2.1 General

The purpose of the EN-DC Configuration Update procedure is to update application level configuration data needed for eNB and en-gNB to interoperate correctly over the X2 interface.

The procedure uses non UE-associated signalling.

8.7.2.2 Successful Operation

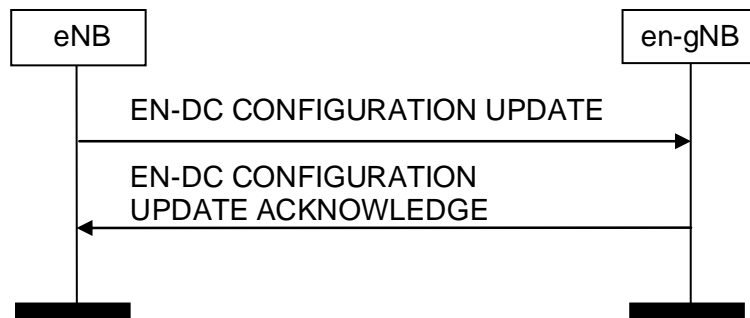


Figure 8.7.2.2-1: eNB Initiated EN-DC Configuration Update, successful operation

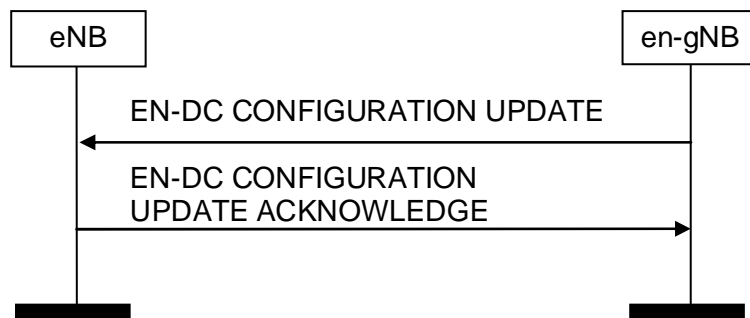


Figure 8.7.2.2-2: en-gNB Initiated EN-DC Configuration Update, successful operation

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC CONFIGURATION UPDATE message and the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message shall include the *Interface Instance Indication* IE to identify the corresponding interface instance.

eNB initiated EN-DC Configuration Update:

An eNB initiates the procedure by sending an EN-DC CONFIGURATION UPDATE message to a peer en-gNB.

After successful update of requested information, en-gNB shall reply with the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message to inform the initiating eNB that the requested update of application data was performed successfully.

If the *Cell Assistance Information* IE is present, the en-gNB may use it to generate the *List of Served NR Cells* IE and include the list in the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message.

If the EN-DC CONFIGURATION UPDATE REQUEST message contains the Protected E-UTRA Resource Indication IE, the receiving en-gNB should take this into account for cell-level resource coordination with the eNB. The en-gNB shall consider the received Protected E-UTRA Resource Indication IE content valid until reception of a new update of the IE for the same eNB. The protected resource pattern indicated in the Protected E-UTRA Resource Indication IE is not valid in subframes indicated by the Reserved Subframes IE, as well as in the non-control region of the MBSFN subframes i.e. it is valid only in the control region therein. The size of the control region of MBSFN subframes is indicated in the Protected E-UTRA Resource Indication IE.

The eNB may initiate a further EN-DC Configuration Update procedure only after a previous EN-DC Configuration Update procedure has been completed.

If Supplementary Uplink is configured at the en-gNB, the en-gNB shall include in the EN-DC X2 CONFIGURATION UPDATE ACKNOWLEDGE message the *SUL Information IE* and the *Supported SUL band List IE* for each cell added in the Served NR Cells To Add IE and in the Served NR Cells To Modify IE.

en-gNB initiated EN-DC Configuration Update:

An en-gNB initiates the procedure by sending an EN-DC CONFIGURATION UPDATE message to an eNB.

If Supplementary Uplink is configured at the en-gNB, the en-gNB shall include in the EN-DC X2 CONFIGURATION UPDATE message the *SUL Information IE* and the *Supported SUL band List IE* for each served cell added in the Served NR Cells To Add IE and in the Served NR Cells To Modify IE.

If the Deactivation Indication IE is contained in the *Served NR Cells To Modify IE*, it indicates that the concerned NR cell was switched off to lower energy consumption, and is available for activation on request from the eNB, as described in TS 36.300 [15].

After successful update of requested information, eNB shall reply with the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message to inform the initiating en-gNB that the requested update of application data was performed successfully. In case the eNB receives an EN-DC CONFIGURATION UPDATE without any IE except for *Message Type IE* it shall reply with EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message without performing any updates to the existing configuration.

Upon reception of an EN-DC CONFIGURATION UPDATE message, eNB shall update the information for en-gNB as follows:

Update of Served NR Cell Information:

- If *Served NR Cells To Add IE* is contained in the EN-DC CONFIGURATION UPDATE message, eNB shall add cell information according to the information in the *Served NR Cell Information IE*.
- If *Served NR Cells To Modify IE* is contained in the EN-DC CONFIGURATION UPDATE message, eNB shall modify information of cell indicated by *Old NR-CGI IE* according to the information in the *Served NR Cell Information IE*.
- If *Served NR Cells To Delete IE* is contained in the EN-DC CONFIGURATION UPDATE message, eNB shall delete information of cell indicated by *Old NR-CGI IE*.

If the EN-DC CONFIGURATION UPDATE RESPONSE message contains the Protected E-UTRA Resource Indication IE, the receiving en-gNB should take this into account for cell-level resource coordination with the eNB. The en-gNB shall consider the received *Protected E-UTRA Resource Indication IE* content valid until reception of a new update of the IE for the same eNB.

The en-gNB may initiate a further EN-DC Configuration Update procedure only after a previous EN-DC Configuration Update procedure has been completed.

8.7.2.3 Unsuccessful Operation

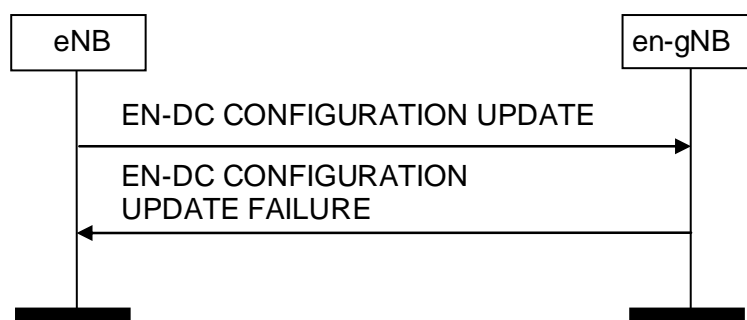


Figure 8.7.2.3-1: eNB Initiated EN-DC Configuration Update, unsuccessful operation

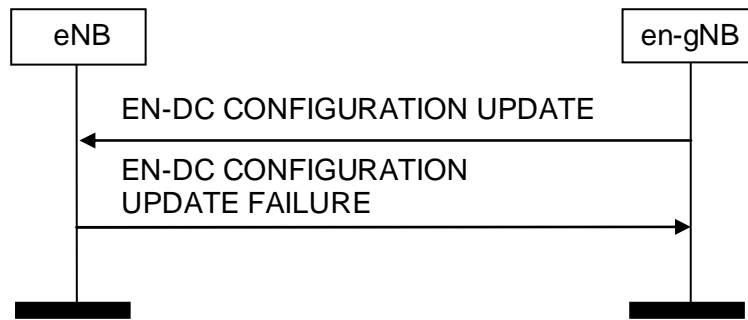


Figure 8.7.2.3-2: en-gNB Initiated EN-DC Configuration Update, unsuccessful operation

If the candidate receiving node can not accept the update it shall respond with an EN-DC CONFIGURATION UPDATE FAILURE message and appropriate cause value.

If the EN-DC CONFIGURATION UPDATE FAILURE message includes the *Time To Wait* IE the initiating node shall wait at least for the indicated time before reinitiating the EN-DC Configuration Update procedure towards the same peer node. Both nodes shall continue to operate the X2 with their existing configuration data.

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC CONFIGURATION UPDATE message and the EN-DC CONFIGURATION UPDATE FAILURE message shall include the *Interface Instance Indication* IE to identify the corresponding interface instance.

8.7.2.4 Abnormal Conditions

If the initiating node after initiating EN-DC Configuration Update procedure receives neither EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message nor EN-DC CONFIGURATION UPDATE FAILURE message, the initiating node may reinitiate the EN-DC Configuration Update procedure towards the same candidate receiving node, provided that the content of the EN-DC CONFIGURATION UPDATE message is identical to the content of the previously unacknowledged EN-DC CONFIGURATION UPDATE message.

8.7.3 EN-DC Cell Activation

8.7.3.1 General

The purpose of the EN-DC Cell Activation procedure is to enable an eNB to request a neighbouring en-gNB to switch on one or more cells, previously reported as inactive due to energy saving reasons.

The procedure uses non UE-associated signalling.

8.7.3.2 Successful Operation

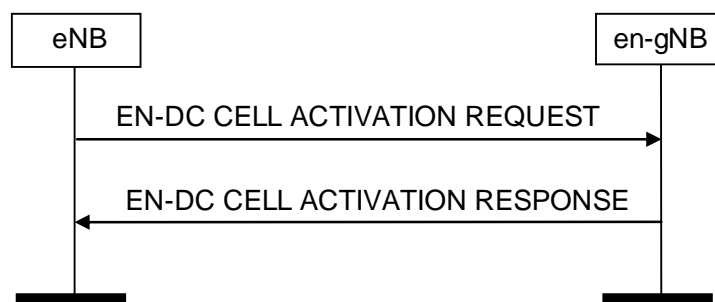


Figure 8.7.3.2-1: EN-DC Cell Activation, successful operation

An eNB initiates the procedure by sending a EN-DC CELL ACTIVATION REQUEST message to a peer en-gNB.

Upon receipt of this message, the en-gNB should activate the cell(s) indicated in the EN-DC CELL ACTIVATION REQUEST message and shall indicate in the EN-DC CELL ACTIVATION RESPONSE message for which cells the request was fulfilled.

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC CELL ACTIVATION REQUEST message and the EN-DC CELL ACTIVATION RESPONSE message shall contain the *Interface Instance Indication* IE to identify the corresponding interface instance.

Interactions with EN-DC Configuration Update procedure:

The en-gNB shall not send an EN-DC CONFIGURATION UPDATE message to the eNB just for the reason of the cell(s) indicated in the EN-DC CELL ACTIVATION REQUEST message changing cell activation state, as the receipt of the EN-DC CELL ACTIVATION RESPONSE message by the eNB is used to update the information about the activation state of en-gNB cells in the eNB.

8.7.3.3 Unsuccessful Operation

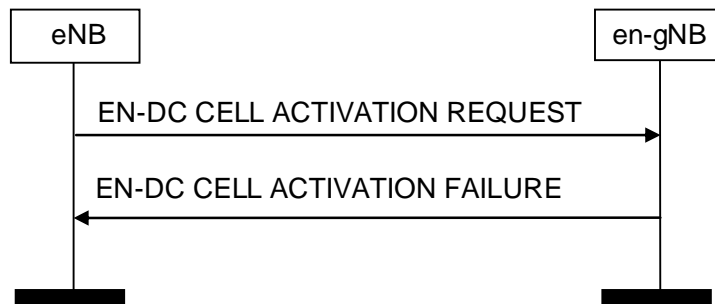


Figure 8.7.3.3-1: EN-DC Cell Activation, unsuccessful operation

If the en-gNB cannot activate any of the cells indicated in the EN-DC CELL ACTIVATION REQUEST message, it shall respond with a EN-DC CELL ACTIVATION FAILURE message with an appropriate cause value.

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC CELL ACTIVATION REQUEST message and the EN-DC CELL ACTIVATION FAILURE message shall contain the *Interface Instance Indication* IE to identify the corresponding interface instance.

8.7.3.4 Abnormal Conditions

Not applicable.

8.7.4 SgNB Addition Preparation

8.7.4.1 General

The purpose of the SgNB Addition Preparation procedure is to request the en-gNB to allocate resources for EN-DC connectivity operation for a specific UE.

The procedure uses UE-associated signalling.

8.7.4.2 Successful Operation

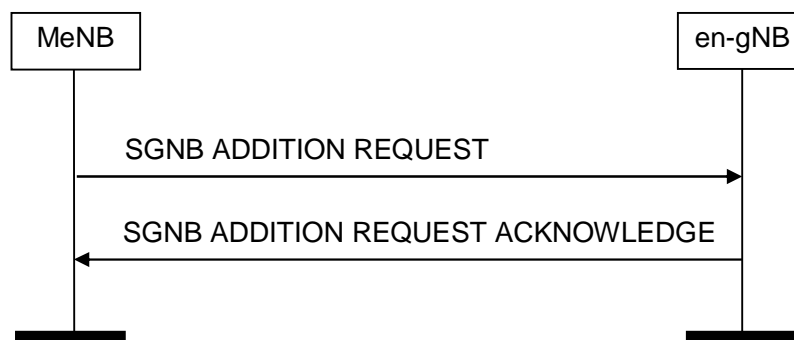


Figure 8.7.4.2-1: SgNB Addition Preparation, successful operation

The MeNB initiates the procedure by sending the SGNB ADDITION REQUEST message to the en-gNB. When the MeNB sends the SGNB ADDITION REQUEST message, it shall start the timer T_{DCprep} .

The allocation of resources according to the values of the *Allocation and Retention Priority* IE included in the *Full E-RAB Level QoS Parameters* IE or in the *Requested MCG E-RAB Level QoS Parameters* IE or in the *Requested SCG E-RAB Level QoS Parameters* IE shall follow the principles described for the E-RAB Setup procedure in TS 36.413 [4].

If the SGNB ADDITION REQUEST message contains the *Serving PLMN* IE, the en-gNB may use it for RRM purposes.

If the SGNB ADDITION REQUEST message contains the *Expected UE Behaviour* IE, the en-gNB shall, if supported, store this information and may use it to optimize resource allocation.

If the SGNB ADDITION REQUEST message contains the *Handover Restriction List* IE, the en-gNB node, if supported, shall store this information and use it to select an appropriate NR cell.

If the SGNB ADDITION REQUEST message contains the *MeNB Resource Coordination Information* IE, the en-gNB should forward it to lower layers and it may use it for the purpose of resource coordination with the MeNB. The en-gNB shall consider the received *UL Coordination Information* IE value valid until reception of a new update of the IE for the same UE. The en-gNB shall consider the received *DL Coordination Information* IE value valid until reception of a new update of the IE for the same UE. If the *MeNB Coordination Assistance Information* IE is contained in the *MeNB Resource Coordination Information* IE, the en-gNB shall, if supported, use the information to determine further coordination of resource utilisation between the en-gNB and the MeNB.

The en-gNB shall choose the ciphering algorithm based on the information in the *NR UE Security Capabilities* IE and locally configured priority list of AS encryption algorithms and apply the key indicated in the *SgNB Security Key* IE as specified in the TS 33.401 [18].

If the SGNB ADDITION REQUEST message contains the *Subscriber Profile ID for RAT/Frequency Priority* IE, the en-gNB may use it for RRM purposes.

The en-gNB shall search for the target NR cell among the NR neighbour cells of the E-UTRAN cell indicated in *MeNB Cell ID* IE, as specified in the TS 37.340 [32].

If the *Masked IMEISV* IE is contained in the SGNB ADDITION REQUEST message the en-gNB shall, if supported, use it to determine the characteristics of the UE for subsequent handling.

The en-gNB shall report to the MeNB, in the SGNB ADDITION REQUEST ACKNOWLEDGE message, the result for all the requested E-RABs in the following way:

- a list of E-RABs which are successfully established shall be included in the *E-RABs Admitted To Be Added List* IE;
- a list of E-RABs which failed to be established shall be included in the *E-RABs Not Admitted List* IE.

NOTE: The MeNB may trigger the SgNB Addition Preparation procedure in the course of the Inter-MeNB handover without SgNB change procedure as described in TS 37.340 [32]. The deleted E-RABs are not included in the *E-RABs To Be Added List* IE in the SGNB ADDITION REQUEST message, from MeNB point of view. If the en-gNB reports a certain E-RAB to be successfully established, respective SCG resources, from an en-gNB point of view, may be actually successfully established or modified or kept; if a certain E-RAB is reported to be failed to be established, respective SCG resources, from an en-gNB point of view, may be actually failed to be established or modified or kept.

For each E-RAB successfully established in the en-gNB, the en-gNB shall report to the MeNB, in the SGNB ADDITION REQUEST ACKNOWLEDGE message, the same value in the *EN-DC Resource Configuration* IE as received in the SGNB ADDITION REQUEST message.

For each E-RAB for which allocation of the PDCP entity is requested at the en-gNB:

- the MeNB may propose to apply forwarding of downlink data by including the *DL Forwarding* IE within the *E-RABs To be Added Item* IE of the SGNB ADDITION REQUEST message. For each E-RAB that it has decided to admit, the en-gNB may include the *DL Forwarding GTP Tunnel Endpoint* IE within the *E-RABs Admitted To Be Added Item* IE of the SGNB ADDITION REQUEST ACKNOWLEDGE message to indicate that it accepts the proposed forwarding of downlink data for this bearer. This GTP tunnel endpoint may be different from the corresponding GTP tunnel endpoint, i.e the information contained in the *Transport Layer Address* IE and the *DL*

GTP TEID IE in the *E-RAB To Be Modified List* IE of the E-RAB MODIFICATION INDICATION message (see TS 36.413 [4]) depending on implementation choice;

- the en-gNB may include for each bearer in the *E-RABs Admitted To Be Added List* IE the *UL Forwarding GTP Tunnel Endpoint* IE to indicate that it requests data forwarding of uplink packets to be performed for that bearer.
- the en-gNB shall use the *S1 UL GTP Tunnel Endpoint* IE of the SGNB ADDITION REQUEST message as the UL S1-U address.
- the MeNB shall use the *SgNB UL GTP Tunnel Endpoint at PDCP* IE of the SGNB ADDITION REQUEST ACKNOWLEDGE message as the UL X2-U address.
- if the SGNB ADDITION REQUEST message contains for an E-RAB to be added which is requested to be configured with MCG resources the *MeNB DL GTP Tunnel Endpoint at MCG* IE the en-gNB shall use it as the DL X2-U address for delivery of DL PDCP PDUs.
- the en-gNB shall include in the SGNB ADDITION REQUEST ACKNOWLEDGE message the *S1 DL GTP Tunnel Endpoint at the SgNB* IE.
- the en-gNB shall include in the SGNB ADDITION REQUEST ACKNOWLEDGE message the *RLC Mode* IE.
- the en-gNB may include for each bearer in the *E-RABs Admitted To Be Added List* IE in the SGNB ADDITION REQUEST ACKNOWLEDGE the *PDCP SN Length* IE to indicate the PDCP SN length for that bearer.
- If the *RLC Mode* IE is included for an E-RAB within the *E-RABs To be Added List* IE in the SGNB ADDITION REQUEST message, it indicates the mode that the MeNB used for the E-RAB when it was hosted at the MeNB.
- If the *Bearer Type* IE for the concerned E-RAB is received by the en-gNB and is set to "non IP", the en-gNB shall, if supported, not perform header compression for the concerned E-RAB.

Upon reception of the SGNB ADDITION REQUEST ACKNOWLEDGE message the MeNB shall stop the timer T_{DCprep} .

If the SGNB ADDITION ACKNOWLEDGE message contains the *SgNB Resource Coordination Information* IE, the MeNB may use it for the purpose of resource coordination with the en-gNB. The MeNB shall consider the received *UL Coordination Information* IE value valid until reception of a new update of the IE for the same UE. The MeNB shall consider the received *DL Coordination Information* IE value valid until reception of a new update of the IE for the same UE. If the *SgNB Coordination Assistance Information* IE is contained in the *SgNB Resource Coordination Information* IE, the MeNB shall, if supported, use the information to determine further coordination of resource utilisation between the en-gNB and the MeNB.

If the *SgNB UE X2AP ID* IE is contained in the SGNB ADDITION REQUEST message, the en-gNB shall, if supported, store this information and use it as defined in TS 37.340 [32].

If the SGNB ADDITION REQUEST message contains the *SGNB Addition Trigger Indication*, the en-gNB shall include the *RRC config indication* IE in the SGNB ADDITION REQUEST ACKNOWLEDGE message to inform the MeNB if the en-gNB applied full or delta configuration, as specified in TS 37.340 [32].

If the en-gNB receives for an E-RAB for which the PDCP entity is allocated at the MeNB the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP* IE and the *Duplication Activation* IE in the SGNB ADDITION REQUEST message, it may provide the *Secondary SgNB DL GTP Tunnel Endpoint at SCG* IE and the *LCID* IE to the MeNB in the SGNB ADDITION REQUEST ACKNOWLEDGE message if PDCP duplication is configured at the en-gNB.

If the SGNB ADDITION REQUEST message contains the *UL PDCP SN Length* IE and the *DL PDCP SN Length* IE, the en-gNB shall, if supported, store this information and use it for lower layer configuration of the concerned MN terminated bearer.

The SgNB may include the *Location Information at SgNB* IE in the SGNB ADDITION REQUEST ACKNOWLEDGE message, if respective information is available at the SgNB.

If the *Location Information at SgNB Reporting* IE set to "pscell" is included in the SGNB ADDITION REQUEST, the SgNB shall start providing information about the current location of the UE. If the *Location Information at SgNB* IE is included in the SGNB ADDITION REQUEST ACKNOWLEDGE, the MeNB shall store the included information so that it may be transferred towards the MME.

If *Trace Activation* IE has previously been received for this UE, it shall be included in the SGNB ADDITION REQUEST message. If the *Trace Activation* IE is included in the SGNB ADDITION REQUEST message, the en-gNB shall, if supported, initiate the requested trace function as described in TS 32.422 [6].

Interactions with the MeNB initiated SgNB Modification procedure:

If the en-gNB provides for an E-RAB for which the PDCP entity is allocated at the MeNB the *Secondary SgNB DL GTP Tunnel Endpoint at SCG* IE to the MeNB in the SGNB ADDITION REQUEST ACKNOWLEDGE message and the MeNB has not provided the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP* IE in the SGNB ADDITION REQUEST message, the MeNB shall trigger the MeNB initiated SgNB Modification procedure to provide the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP* IE to the SgNB.

Interactions with the SgNB Reconfiguration Completion procedure:

If the en-gNB admits at least one E-RAB, the en-gNB shall start the timer $T_{DCoverall}$ when sending the SGNB ADDITION REQUEST ACKNOWLEDGE message to the MeNB. The reception of the SGNB RECONFIGURATION COMPLETE message shall stop the timer $T_{DCoverall}$.

Interaction with the Activity Notification procedure

Upon receiving an SGNB ADDITION REQUEST message containing the *Desired Activity Notification Level* IE, the en-gNB shall, if supported, use this information to decide whether to trigger subsequent SgNB Activity Notification procedures according to the requested notification level.

8.7.4.3 Unsuccessful Operation

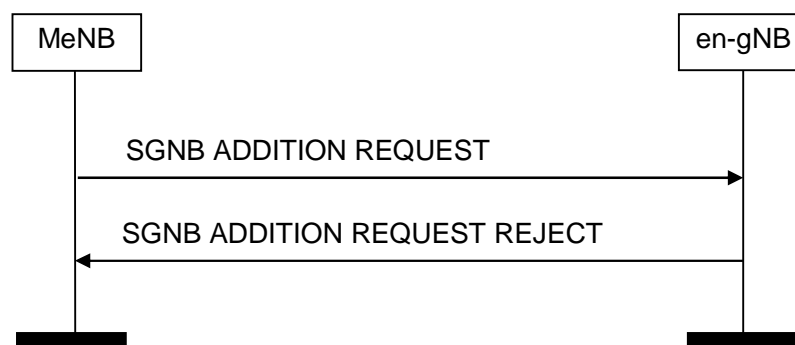


Figure 8.7.4.3-1: SgNB Addition Preparation, unsuccessful operation

If the en-gNB is not able to accept any of the bearers or a failure occurs during the SgNB Addition Preparation, the en-gNB sends the SGNB ADDITION REQUEST REJECT message with an appropriate cause value to the MeNB.

8.7.4.4 Abnormal Conditions

If the en-gNB receives a SGNB ADDITION REQUEST message containing multiple *E-RAB ID* IEs (in the *E-RABs To Be Added List* IE) set to the same value, the en-gNB shall consider the establishment of the corresponding E-RAB as failed.

If the en-gNB receives a SGNB ADDITION REQUEST message containing a *E-RAB Level QoS Parameters* IE which contains a *QCI* IE indicating a GBR bearer (as defined in TS 23.203 [13]), and which does not contain the *GBR QoS Information* IE, the en-gNB shall consider the establishment of the corresponding E-RAB as failed.

If the supported algorithms for encryption defined in the *NR Encryption Algorithms* IE in the *NR UE Security Capabilities* IE, plus the mandated support of NEA0 in all UEs (TS 33.401 [18]), do not match any algorithms defined in the configured list of allowed encryption algorithms in the en-gNB (TS 33.401 [18]), the en-gNB shall reject the procedure using the SGNB ADDITION REQUEST REJECT message.

If the supported algorithms for integrity defined in the *NR Integrity Protection Algorithms* IE in the *NR UE Security Capabilities* IE do not match any algorithms defined in the configured list of allowed integrity protection algorithms in the en-gNB (TS 33.401 [18]), the en-gNB shall reject the procedure using the SGNB ADDITION REQUEST REJECT message.

If the en-gNB receives a SGNB ADDITION REQUEST message containing a *SgNB UE X2AP ID IE* that does not match any existing UE Context that has such ID, the en-gNB shall reject the procedure using the SGNB ADDITION REQUEST REJECT message.

If the MeNB has provided the en-gNB for an E-RAB for which the PDCP entity is allocated at the MeNB the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP IE* and the *Duplication Activation IE* in the SGNB ADDITION REQUEST message, and the en-gNB does not provide the *Secondary SgNB DL GTP Tunnel Endpoint at SCG IE* and the *LCID IE* to the MeNB in the SGNB ADDITION REQUEST ACKNOWLEDGE message, the MeNB shall assume that PDCP duplication was not configured at the en-gNB and releases duplication resources.

If the en-gNB provides for an E-RAB for which the PDCP entity is allocated at the MeNB the *Secondary SgNB DL GTP Tunnel Endpoint at SCG IE* and the *LCID IE* to the MeNB in the SGNB ADDITION REQUEST ACKNOWLEDGE message and the MeNB has not provided the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP IE* and the *Duplication Activation IE* in the SGNB ADDITION REQUEST message, and the MeNB does not trigger the MeNB initiated SgNB Modification procedure to provide the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP IE* and the *Duplication Activation IE* to the SgNB the en-gNB before the SgNB Reconfiguration Completion procedure was triggered, the en-gNB shall trigger the release of the concerned E-RAB.

Interactions with the SgNB Reconfiguration Completion and SgNB initiated SgNB Release procedure:

If the timer $T_{Dcoverall}$ expires before the en-gNB has received the SGNB RECONFIGURATION COMPLETE or the SGNB RELEASE REQUEST message, the en-gNB shall regard the requested RRC connection reconfiguration as being not applied by the UE and shall trigger the SgNB initiated SgNB Release procedure.

Interactions with the MeNB initiated SgNB Release procedure:

If the timer T_{DCprep} expires before the MeNB has received the SGNB ADDITION REQUEST ACKNOWLEDGE message, the MeNB shall regard the SgNB Addition Preparation procedure as being failed and shall trigger the MeNB initiated SgNB Release procedure.

8.7.5 SgNB Reconfiguration Completion

8.7.5.1 General

The purpose of the SgNB Reconfiguration Completion procedure is to provide information to the en-gNB whether the requested configuration was successfully applied by the UE.

The procedure uses UE-associated signalling.

8.7.5.2 Successful Operation



Figure 8.7.5.2-1: SgNB Reconfiguration Complete procedure, successful operation.

The MeNB initiates the procedure by sending the SGNB RECONFIGURATION COMPLETE message to the en-gNB.

The SGNB RECONFIGURATION COMPLETE message may contain information that

- either the UE has successfully applied the configuration requested by the en-gNB. The MeNB may also provide *NR RRCReconfigurationComplete* message in the *MeNB to SgNB Container IE*.

- or the configuration requested by the en-gNB has been rejected. The MeNB shall provide information with sufficient precision in the included *Cause* IE to enable the en-gNB to know the reason for an unsuccessful reconfiguration.

Upon reception of the SGNB RECONFIGURATION COMPLETE message the en-gNB shall stop the timer $T_{DCoverall}$.

8.7.5.3 Abnormal Conditions

Void.

8.7.6 MeNB initiated SgNB Modification Preparation

8.7.6.1 General

This procedure is used to enable an MeNB to request an en-gNB to modify the UE context at the en-gNB, or to query the current SCG configuration for supporting delta signalling in MeNB initiated SgNB change, or to provide the S-RLF-related information to the en-gNB.

The procedure uses UE-associated signalling.

8.7.6.2 Successful Operation

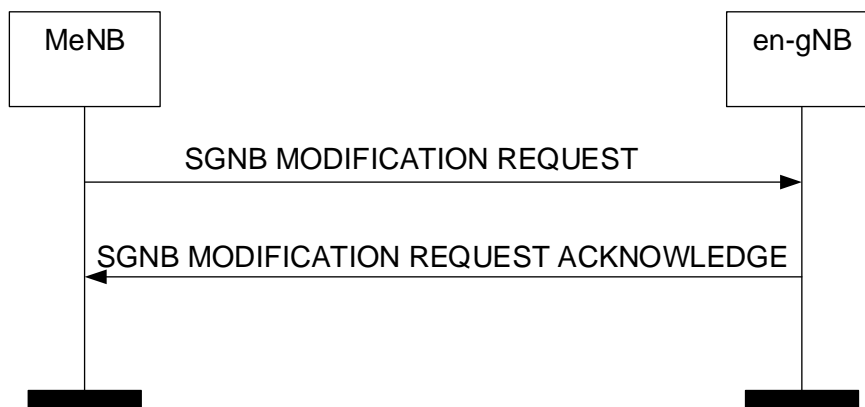


Figure 8.7.6.2-1: MeNB initiated SgNB Modification Preparation, successful operation

The MeNB initiates the procedure by sending the SGNB MODIFICATION REQUEST message to the en-gNB. When the MeNB sends the SGNB MODIFICATION REQUEST message, it shall start the timer T_{DCprep} .

The SGNB MODIFICATION REQUEST message may contain:

- within the *UE Context Information* IE (if the modification of the UE context at the en-gNB is requested);
- E-RABs to be added within the *E-RABs To Be Added Item* IE;
- E-RABs to be modified within the *E-RABs To Be Modified Item* IE;
- E-RABs to be released within the *E-RABs To Be Released Item* IE;
- the *SgNB UE Aggregate Maximum Bit Rate* IE;
- the *MeNB to SgNB Container* IE;
- the *SCG Configuration Query* IE;
- the *MeNB Resource Coordination Information* IE;
- the *Requested split SRBs* IE;
- the *Requested split SRBs release* IE.

If the SGNB MODIFICATION REQUEST message contains the *Serving PLMN* IE, the en-gNB may use it for RRM purposes.

If the SGNB MODIFICATION REQUEST message contains the *Handover Restriction List* IE, the en-gNB shall

- replace the previously provided Handover Restriction List by the received Handover Restriction List in the UE context;
- use this information to select an appropriate NR cell.

If the *SgNB UE Aggregate Maximum Bit Rate* IE is included in the SGNB MODIFICATION REQUEST message, the en-gNB shall:

- replace the previously provided SgNB UE Aggregate Maximum Bit Rate by the received SgNB UE Aggregate Maximum Bit Rate in the UE context;
- use the received SgNB UE Aggregate Maximum Bit Rate for non-GBR Bearers for the concerned UE as defined in TS 37.340 [32].

The allocation of resources according to the values of the *QCI* IE, *Allocation and Retention Priority* IE or *GBR QoS Information* IE included in the *Full E-RAB Level QoS Parameters* IE or in the *Requested SCG E-RAB Level QoS Parameters* IE shall follow the principles described for the E-RAB Setup procedure in TS 36.413 [4].

If the SGNB MODIFICATION REQUEST message contains the *MeNB Resource Coordination Information* IE, the en-gNB should forward it to lower layers and it may use it for the purpose of resource coordination with the MeNB. The en-gNB shall consider the received *UL Coordination Information* IE value valid until reception of a new update of the IE for the same UE. The en-gNB shall consider the received *DL Coordination Information* IE value valid until reception of a new update of the IE for the same UE. If the *MeNB Coordination Assistance Information* IE is contained in the *MeNB Resource Coordination Information* IE, the en-gNB shall, if supported, use the information to determine further coordination of resource utilisation between the en-gNB and the MeNB.

If at least one of the requested modifications is admitted by the en-gNB, the en-gNB shall modify the related part of the UE context accordingly and send the SGNB MODIFICATION REQUEST ACKNOWLEDGE message back to the MeNB.

The en-gNB shall include the E-RABs for which resources have been either added or modified or released at the en-gNB either in the *E-RABs Admitted To Be Added List* IE or the *E-RABs Admitted To Be Modified List* IE or the *E-RABs Admitted To Be Released List* IE. The en-gNB shall include the E-RABs that have not been admitted in the *E-RABs Not Admitted List* IE with an appropriate cause value.

For each E-RAB successfully established or modified or released in the en-gNB, the en-gNB shall report to the MeNB, in the SGNB MODIFICATION REQUEST ACKNOWLEDGE message, the same value in the *EN-DC Resource Configuration* IE as received in the SGNB MODIFICATION REQUEST message.

The en-gNB shall, if included, choose the ciphering algorithm based on the information in the *NR UE Security Capabilities* IE and locally configured priority list of AS encryption algorithms and apply the key indicated in the *SgNB Security Key* IE as specified in the TS 33.401 [18].

For each E-RAB for which allocation of the PDCP entity is requested at the en-gNB:

- if applicable, the MeNB may propose to apply forwarding of downlink data by including the *DL Forwarding* IE within the *E-RABs To Be Added Item* IE of the SGNB MODIFICATION REQUEST message. For each E-RAB that it has decided to admit, the en-gNB may include the *DL Forwarding GTP Tunnel Endpoint* IE within the *E-RABs Admitted To Be Added Item* IE of the SGNB MODIFICATION REQUEST ACKNOWLEDGE message to indicate that it accepts the proposed forwarding of downlink data for this bearer. The MeNB may also provide for an applicable E-RAB to be released the *DL Forwarding GTP Tunnel Endpoint* IE and the *UL Forwarding GTP Tunnel Endpoint* IE within the *E-RABs To Be Released Item* IE of the SGNB MODIFICATION REQUEST message.
- if applicable, the en-gNB may include for each bearer in the *E-RABs Admitted To Be Added List* IE in the SGNB MODIFICATION REQUEST ACKNOWLEDGE message the *UL Forwarding GTP Tunnel Endpoint* IE to indicate that it requests data forwarding of uplink packets to be performed for that bearer.
- if applicable, the en-gNB may include for each bearer in the *E-RABs Admitted To Be Modified List* IE which is configured with the SN terminated split bearer option in the SGNB MODIFICATION REQUEST

ACKNOWLEDGE message the *UL Configuration* IE to indicate that the MCG UL configuration of the UE has changed.

- if applicable, the en-gNB may include for each bearer in the *E-RABs Admitted To Be Added List* IE in the SGNB MODIFICATION REQUEST ACKNOWLEDGE message the *UL PDCP SN Length* IE and the *DL PDCP SN Length* IE to indicate the PDCP SN length for that bearer.
- If the *Bearer Type* IE for the concerned E-RAB is received by the en-gNB and is set to "non IP", then the en-gNB shall, if supported, not perform header compression for the concerned E-RAB.

For each E-RAB configured with SCG resources and the PDCP entity is hosted by the MeNB and

- requested to be modified,
 - if the SGNB MODIFICATION REQUEST message includes the *MeNB UL GTP Tunnel Endpoint at PDCP* IE in the *E-RABs To Be Modified Item* IE, the en-gNB shall act as specified in TS 37.340 [32].
 - if the SGNB MODIFICATION REQUEST message contains the *MeNB UL GTP Tunnel Endpoint at PDCP* IE the en-gNB shall use it as the new UL X2-U address.
 - the en-gNB may include in the SGNB MODIFICATION REQUEST ACKNOWLEDGE message the *SgNB DL GTP Tunnel Endpoint at SCG* IE.

If, dependent on the configured bearer type, the *Full E-RAB Level QoS Parameters* IE or the *Maximum MCG admissible E-RAB Level QoS Parameters* IE or the *Requested SCG E-RAB level QoS Parameters* IE are included in the SGNB MODIFICATION REQUEST message for an E-RAB to be modified the en-gNB shall allocate respective resources and provide corresponding radio configuration information within the *SgNB to MeNB Container* IE as described in TS 37.340 [32].

If the SGNB MODIFICATION REQUEST message contains, for an E-RAB to be modified which is configured with the PDCP entity in the en-gNB, the *S1 UL GTP Tunnel Endpoint* IE, the en-gNB shall use it as the new UL S1-U address.

If the SGNB MODIFICATION REQUEST message contains an E-RAB to be modified which is configured with the MN terminated split bearer option, the MeNB may include the *UL Configuration* IE to indicate that the SCG UL configuration of the UE has changed.

If the SGNB MODIFICATION REQUEST message contains for an E-RAB to be modified which is configured with the PDCP entity in the en-gNB and MCG resources the *MeNB DL GTP Tunnel Endpoint at MCG* IE the en-gNB shall use it as the DL X2-U address.

If the SGNB MODIFICATION REQUEST message contains the *Subscriber Profile ID for RAT/Frequency Priority* IE, the en-gNB may use it for RRM purposes.

For an E-RAB to be modified which is configured with the PDCP entity in the en-gNB the en-gNB may include in the SGNB MODIFICATION REQUEST ACKNOWLEDGE message the *S1 DL GTP Tunnel Endpoint at the SgNB* IE.

If the SGNB MODIFICATION REQUEST ACKNOWLEDGE message contains the *SgNB Resource Coordination Information* IE, the MeNB may use it for the purpose of resource coordination with the en-gNB. The MeNB shall consider the received *UL Coordination Information* IE value valid until reception of a new update of the IE for the same UE. The MeNB shall consider the received *DL Coordination Information* IE value valid until reception of a new update of the IE for the same UE. If the *SgNB Coordination Assistance Information* IE is contained in the *SgNB Resource Coordination Information* IE, the MeNB shall, if supported, use the information to determine further coordination of resource utilisation between the en-gNB and the MeNB.

Upon reception of the SGNB MODIFICATION REQUEST ACKNOWLEDGE message the MeNB shall stop the timer T_{DCprep} . If the SGNB MODIFICATION REQUEST ACKNOWLEDGE message has included the *SgNB to MeNB Container* IE the MeNB is then defined to have a Prepared SgNB Modification for that X2 UE-associated signalling.

If the *SCG Configuration Query* IE is included in the SGNB MODIFICATION REQUEST message, the en-gNB shall provide corresponding radio configuration information within the *SgNB to MeNB Container* IE as described in TS 37.340 [32].

If the SGNB MODIFICATION REQUEST message contains the *Requested split SRBs* IE, the en-gNB may use it to add split SRBs. If the SGNB MODIFICATION REQUEST message contains the *Requested split SRBs release* IE, the en-gNB may use it to release split SRBs.

If the en-gNB receives for an E-RAB to be setup for which the PDCP entity is allocated at the MeNB the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP* IE and the *Duplication Activation* IE in the SGNB MODIFICATION REQUEST message, it may provide the *Secondary SgNB DL GTP Tunnel Endpoint at SCG* IE and the *LCID* IE to the MeNB in the SGNB MODIFICATION REQUEST ACKNOWLEDGE message if PDCP duplication is configured at the en-gNB.

If the SGNB MODIFICATION REQUEST message contains the *RLC Status* IE, the en-gNB shall assume that RLC has been reestablished at the MeNB and may trigger PDCP data recovery.

If the en-gNB applied a full configuration or delta configuration, e.g. as part of a mobility procedure involving a change of DU, the en-gNB shall inform the MeNB by including the *RRC config indication* IE in the SGNB MODIFICATION REQUEST ACKNOWLEDGE message.

If SGNB MODIFICATION REQUEST message contains the *UL PDCP SN Length* IE and the *DL PDCP SN Length* IE, the en-gNB shall, if supported, store this information and use it for lower layer configuration of the concerned MN terminated bearer.

If the *RLC Mode* IE is included for an E-RAB within the *E-RABs To be Added List* IE in the SGNB MODIFICATION REQUEST message, it indicates the mode that the MeNB used for the E-RAB when it was hosted at the MeNB.

If the SGNB MODIFICATION REQUEST message contains the *MeNB Cell ID* IE, the en-gNB may search for the target NR cell among the NR neighbour cells of the E-UTRAN cell indicated in *MeNB Cell ID* IE, as specified in the TS 37.340 [32].

If the SGNB MODIFICATION REQUEST ACKNOWLEDGE message contains the *RLC Status* IE, the MeNB shall assume that RLC has been reestablished at the en-gNB and may trigger PDCP data recovery.

The SgNB may include the *Location Information at SgNB* IE in the SGNB MODIFICATION REQUEST ACKNOWLEDGE message, if respective information is available at the SgNB.

If the *Location Information at SgNB Reporting* IE set to "pscell" is included in the SGNB MODIFICATION REQUEST, the SgNB shall start providing information about the current location of the UE. If the *Location Information at SgNB* IE is included in the SGNB MODIFICATION REQUEST ACKNOWLEDGE, the MeNB shall store the included information so that it may be transferred towards the MME.

Interactions with the MeNB initiated SgNB Modification procedure:

If the en-gNB provides for an E-RAB to be setup for which the PDCP entity is allocated at the MeNB the *Secondary SgNB DL GTP Tunnel Endpoint at SCG* IE and the *LCID* IE to the MeNB in the SGNB MODIFICATION REQUEST ACKNOWLEDGE message and the MeNB has not provided the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP* IE and the *Duplication Activation* IE in the SGNB MODIFICATION REQUEST message, the MeNB shall trigger the MeNB initiated SgNB Modification procedure to provide the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP* IE and the *Duplication Activation* IE to the SgNB.

Interactions with the SgNB Reconfiguration Completion procedure:

If the en-gNB admits a modification of the UE context requiring the MeNB to report about the success of the RRC connection reconfiguration procedure, the en-gNB shall start the timer $T_{D\text{Coverall}}$ when sending the SGNB MODIFICATION REQUEST ACKNOWLEDGE message to the MeNB. The reception of the SGNB RECONFIGURATION COMPLETE message shall stop the timer $T_{D\text{Coverall}}$.

Interaction with the Activity Notification procedure

Upon receiving an SGNB MODIFICATION REQUEST message containing the *Desired Activity Notification Level* IE, the en-gNB shall, if supported, use this information to decide whether to trigger subsequent SgNB Activity Notification procedures, or stop or modify ongoing triggering of these procedures due to a previous request.

8.7.6.3 Unsuccessful Operation

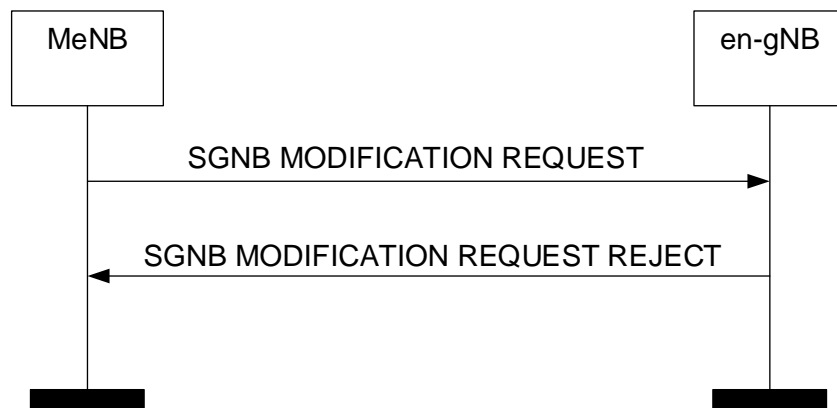


Figure 8.7.6.3-1: MeNB initiated SgNB Modification Preparation, unsuccessful operation

If the en-gNB does not admit any modification requested by the MeNB, or a failure occurs during the MeNB initiated SgNB Modification Preparation, the en-gNB shall send the SGNB MODIFICATION REQUEST REJECT message to the MeNB. The message shall contain the *Cause* IE with an appropriate value.

If the en-gNB receives a SGNB MODIFICATION REQUEST message containing the *MeNB to SgNB Container IE* that does not include required information as specified in TS 38.331 [31], the en-gNB shall send the SGNB MODIFICATION REQUEST REJECT message to the MeNB.

8.7.6.4 Abnormal Conditions

If the en-gNB receives a SGNB MODIFICATION REQUEST message containing multiple *E-RAB ID* IEs (in the *E-RABs To Be Added List IE* and/or the *E-RABs To Be Modified List IE*) set to the same value, the en-gNB shall not admit the action requested for the corresponding E-RABs.

If the en-gNB receives an SGNB MODIFICATION REQUEST message containing multiple *E-RAB ID* IEs (in the *E-RAB To Be Released List IE*) set to the same value, the en-gNB shall initiate the release of one corresponding E-RAB and ignore the duplication of the instances of the selected corresponding E-RABs.

If the en-gNB receives a SGNB MODIFICATION REQUEST message containing, dependent on the configured bearer type, the *Full E-RAB Level QoS Parameters IE* or the *Requested SCG E-RAB Level QoS Parameters IE* which contains a *QCI* IE indicating a GBR bearer (as defined in TS 23.203 [13]), and which does not contain the *GBR QoS Information IE*, the en-gNB shall not admit the corresponding E-RAB.

If the supported algorithms for encryption defined in the *NR Encryption Algorithms IE* in the *NR UE Security Capabilities IE* in the *UE Context Information IE*, plus the mandated support of NEA0 in all UEs (TS 33.401 [18]), do not match any algorithms defined in the configured list of allowed encryption algorithms in the en-gNB (TS 33.401 [18]), the en-gNB shall reject the procedure using the SGNB MODIFICATION REQUEST REJECT message.

If the supported algorithms for integrity defined in the *NR Integrity Protection Algorithms IE* in the *NR UE Security Capabilities IE* in the *UE Context Information IE* do not match any algorithms defined in the configured list of allowed integrity protection algorithms in the en-gNB (TS 33.401 [18]), the en-gNB shall reject the procedure using the SGNB MODIFICATION REQUEST REJECT message.

If the timer T_{DCprep} expires before the MeNB has received the SGNB MODIFICATION REQUEST ACKNOWLEDGE message, the MeNB shall regard the MeNB initiated SgNB Modification Preparation procedure as being failed and shall release the UE Context at the en-gNB.

If the MeNB has provided the en-gNB for an E-RAB to be setup which the PDCP entity is allocated at the MeNB the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP IE* in the SGNB MODIFICATION REQUEST message, and the en-gNB does not provide the *Secondary SgNB DL GTP Tunnel Endpoint at SCG IE* to the MeNB in the SGNB MODIFICATION REQUEST ACKNOWLEDGE message, the MeNB shall assume that PDCP duplication was not configured at the en-gNB and releases duplication resources.

If the en-gNB provides for an E-RAB to be setup for which the PDCP entity is allocated at the MeNB the *Secondary SgNB DL GTP Tunnel Endpoint at SCG IE* to the MeNB in the SGNB MODIFICATION REQUEST

ACKNOWLEDGE message and the MeNB has not provided the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP* IE in the SGNB MODIFICATION REQUEST message, and the MeNB does not trigger the MeNB initiated SgNB Modification procedure to provide the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP* IE to the SgNB the en-gNB before the SgNB Reconfiguration Completion procedure was triggered, the en-gNB shall trigger the release of the concerned E-RAB.

Interactions with the SgNB Reconfiguration Completion and SgNB initiated SgNB Release procedure:

If the timer $T_{DCoverall}$ expires before the en-gNB has received the SGNB RECONFIGURATION COMPLETE or the SGNB RELEASE REQUEST message, the en-gNB shall regard the requested modification RRC connection reconfiguration as being not applied by the UE and shall trigger the SgNB initiated SgNB Release procedure.

Interaction with the SgNB initiated SgNB Modification Preparation procedure:

If the MeNB, after having initiated the MeNB initiated SgNB Modification procedure, receives the SGNB MODIFICATION REQUIRED message, the MeNB shall refuse the SgNB initiated SgNB Modification procedure with an appropriate cause value in the *Cause* IE.

If the MeNB has a Prepared SgNB Modification and receives the SGNB MODIFICATION REQUIRED message, the MeNB shall respond with the SGNB MODIFICATION REFUSE message to the en-gNB with an appropriate cause value in the *Cause* IE.

Interactions with the MeNB initiated SgNB Release procedure:

If the timer T_{DCprep} expires before the MeNB has received the SGNB MODIFICATION REQUEST ACKNOWLEDGE message, the MeNB shall regard the SgNB Modification Preparation procedure as being failed and may trigger the MeNB initiated SgNB Release procedure.

8.7.7 SgNB initiated SgNB Modification

8.7.7.1 General

This procedure is used by the en-gNB to modify the UE context in the en-gNB.

The procedure uses UE-associated signalling.

8.7.7.2 Successful Operation

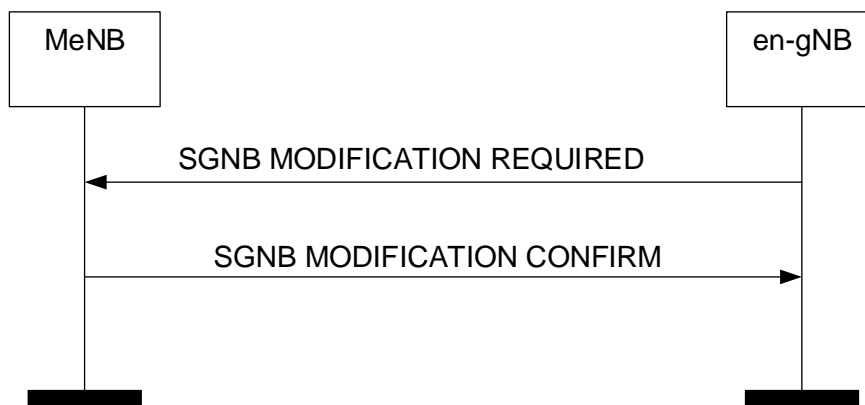


Figure 8.7.7.2-1: SgNB initiated SgNB Modification, successful operation.

The en-gNB initiates the procedure by sending the SGNB MODIFICATION REQUIRED message to the MeNB. When the en-gNB sends the SGNB MODIFICATION REQUIRED message, it shall start the timer $T_{DCoverall}$.

The SGNB MODIFICATION REQUIRED message may contain

- the *PDCP Change Indication* IE;
- the *SgNB to MeNB Container* IE.

- E-RABs to be modified within the *E-RABs To Be Modified Item IE*;
- E-RABs to be released within the *E-RABs To Be Released Item IE*;
- the *SgNB Resource Coordination Information IE*.

For the SN terminated split bearers, the en-gNB may include in the SGNB MODIFICATION REQUIRED message the *UL Configuration IE* to indicate that the MCG UL configuration of the UE has changed.

The en-gNB may include for each bearer in the *E-RABs to Be Modified List IE* in the SGNB MODIFICATION REQUIRED message the *New DRB ID Request IE* to request the MeNB to assign a new DRB ID for that bearer.

If the MeNB is able to perform the change requested by the en-gNB, the MeNB shall send the SGNB MODIFICATION CONFIRM message to the en-gNB. The SGNB MODIFICATION CONFIRM message may contain the *MeNB to SgNB Container IE*.

If the SGNB MODIFICATION REQUIRED message contains the *SgNB Resource Coordination Information IE*, the MeNB may use it for the purpose of resource coordination with the en-gNB. The MeNB shall consider the received *UL Coordination Information IE* value valid until reception of a new update of the IE for the same UE. The MeNB shall consider the received *DL Coordination Information IE* value valid until reception of a new update of the IE for the same UE. If the *SgNB Coordination Assistance Information IE* is contained in the *SgNB Resource Coordination Information IE*, the MeNB shall, if supported, use the information to determine further coordination of resource utilisation between the en-gNB and the MeNB.

If the en-gNB applied a full configuration or delta configuration, e.g. as part of a mobility procedure involving a change of DU, the en-gNB shall inform the MeNB by including the *RRC config indication IE* in the SGNB MODIFICATION REQUIRED message.

For each E-RAB successfully modified or released as requested by the en-gNB, the MeNB shall inform the en-gNB, in the SGNB MODIFICATION CONFIRM message, the same value in the *EN-DC Resource Configuration IE* as received in the SGNB MODIFICATION REQUIRED message.

Upon reception of the SGNB MODIFICATION CONFIRM message the en-gNB shall stop the timer $T_{DCoverall}$.

If the SGNB MODIFICATION CONFIRM message contains the *MeNB Resource Coordination Information IE*, the en-gNB should forward it to lower layers and it may use it for the purpose of resource coordination with the MeNB. The en-gNB shall consider the received *UL Coordination Information IE* value valid until reception of a new update of the IE for the same UE. The en-gNB shall consider the received *DL Coordination Information IE* value valid until reception of a new update of the IE for the same UE. If the *MeNB Coordination Assistance Information IE* is contained in the *MeNB Resource Coordination Information IE*, the en-gNB shall, if supported, use the information to determine further coordination of resource utilisation between the en-gNB and the MeNB.

If the MeNB receives for an E-RAB for which the PDCP entity is allocated at the MeNB the *Secondary SgNB DL GTP Tunnel Endpoint at SCG IE* in the SGNB MODIFICATION REQUIRED message, it shall provide the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP IE* to the en-gNB in the SGNB MODIFICATION CONFIRM message. If the *LCID IE* is included in the SGNB MODIFICATION REQUIRED message, the MeNB should take it into account.

If the SGNB MODIFICATION REQUIRED message contains the *RLC Status IE*, the MeNB shall assume that RLC has been reestablished at the en-gNB and may trigger PDCP data recovery.

If the *RLC Mode IE* is included for an E-RAB within the *E-RABs To Be Released List IE* (for E-RABs hosted at the en-gNB) in the SGNB MODIFICATION REQUIRED message, it indicates the mode that the en-gNB used for the E-RAB when it was hosted at the en-gNB.

The MeNB shall include only E-RABs with the following IE in *E-RABs Admitted To Be Modified List IE*:

- the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP IE*.

If the *Location Information at SgNB IE* is included in the SGNB MODIFICATION REQUIRED, the MeNB shall store the included information so that it may be transferred towards the MME.

Interaction with the MeNB initiated SgNB Modification Preparation procedure:

If applicable, as specified in TS 37.340 [32], the en-gNB may receive, after having initiated the SgNB initiated SgNB Modification procedure, the SGNB MODIFICATION REQUEST message including the *DL Forwarding GTP Tunnel Endpoint IE* and the *UL Forwarding GTP Tunnel Endpoint IE* within the *E-RABs To Be Released List IE*.

If applicable, as specified in TS 37.340 [32], the en-gNB may receive, after having initiated the SgNB initiated SgNB Modification procedure, the SGNB MODIFICATION REQUEST message including the *SgNB Security Key* IE within the *UE Context Information* IE.

If applicable, as specified in TS 37.340 [32], the en-gNB may receive, after having initiated the SgNB initiated SgNB Modification procedure, the SGNB MODIFICATION REQUEST message including the *measGapConfig* IE as defined in TS 38.331 [31] within the *MeNB to SgNB Container* IE.

The en-gNB may receive, after having initiated the SgNB initiated SgNB modification procedure including the *New DRB ID Request* IE for an SN terminated bearer within the *E-RABs To Be Modified List* IE, the SGNB MODIFICATION REQUEST message to release and add the same bearer with a new DRB ID or with the same DRB ID but together with the *SgNB Security Key* IE within the *UE Context Information* IE.

8.7.7.3 Unsuccessful Operation

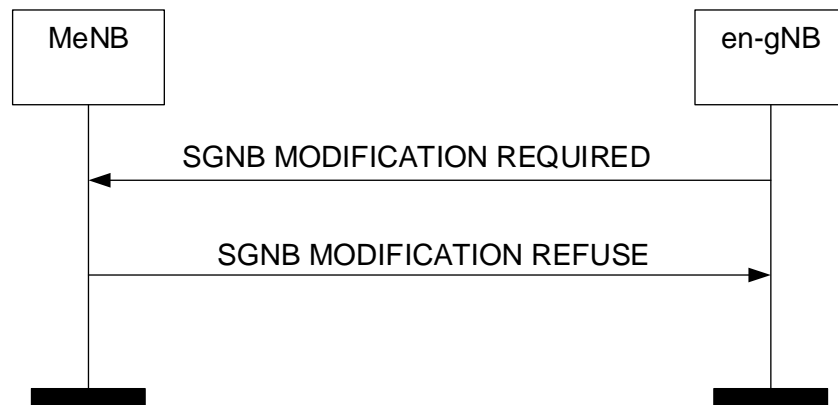


Figure 8.7.7.3-1: SgNB initiated SgNB Modification, unsuccessful operation.

In case the requested modification cannot be performed successfully the MeNB shall respond with the SGNB MODIFICATION REFUSE message to the en-gNB with an appropriate cause value in the *Cause* IE.

The MeNB may also provide configuration information in the *MeNB to SgNB Container* IE.

8.7.7.4 Abnormal Conditions

If the timer $T_{DCoverall}$ expires before the en-gNB has received the SGNB MODIFICATION CONFIRM or the SGNB MODIFICATION REFUSE message, the en-gNB shall regard the requested modification as failed and may take further actions like triggering the SgNB initiated SgNB Release procedure to release all en-gNB resources allocated for the UE.

If the value received in the *E-RAB ID* IE of any of the *E-RABs To Be Released Items* IE is not known at the MeNB, the MeNB shall regard the procedure as failed and may take appropriate actions like triggering the MeNB initiated SgNB Release procedure.

If the en-gNB does not receive for an E-RAB for which the PDCP entity is allocated at the MeNB the *Secondary MeNB UL GTP Tunnel Endpoint at PDCP* IE to the en-gNB in the SGNB MODIFICATION CONFIRM message although the *Secondary SgNB DL GTP Tunnel Endpoint at SCG* IE was provided to the MeNB in the SGNB MODIFICATION REQUIRED message, it shall assume the setup of the secondary X2-U bearer as being failed.

Interaction with the MeNB initiated SgNB Modification Preparation procedure:

If the en-gNB, after having initiated the SgNB initiated SgNB Modification procedure, receives the SGNB MODIFICATION REQUEST message including other IEs than an applicable *SgNB Security Key* IE and/or applicable forwarding addresses or applicable measurement gap pattern or information applicable to release and add the same bearer with different DRB ID, the en-gNB shall

- regard the SgNB initiated SgNB Modification Procedure as being failed;
- stop the $T_{DCoverall}$, which was started to supervise the SgNB initiated SgNB Modification procedure;
- be prepared to receive the SGNB MODIFICATION REFUSE message from the MeNB and;

- continue with the MeNB initiated SgNB Modification Preparation procedure as specified in section 8.7.6.

Interaction with the MeNB initiated handover procedure:

If the MeNB, after having initiated the handover procedure, receives the SGNB MODIFICATION REQUIRED message, the MeNB shall refuse the SgNB modification procedure with an appropriate cause value in the *Cause* IE.

8.7.8 SgNB Change

8.7.8.1 General

This procedure is used by the en-gNB to change to another en-gNB.

The procedure uses UE-associated signalling.

8.7.8.2 Successful Operation

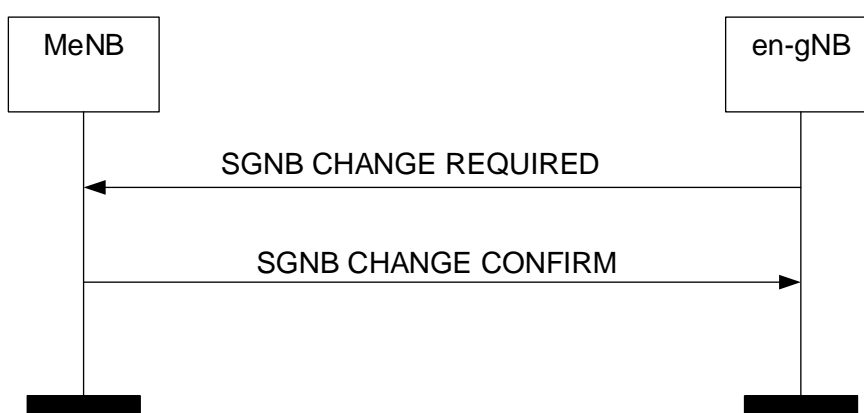


Figure 8.7.8.2-1: SgNB Change, successful operation.

The en-gNB initiates the procedure by sending the SGNB CHANGE REQUIRED message to the MeNB including the *Target SgNB ID Information IE*. When the en-gNB sends the SGNB CHANGE REQUIRED message, it shall start the timer $T_{D\text{Coverall}}$.

The SGNB CHANGE REQUIRED message may contain

- the *SgNB to MeNB Container IE*.

If the MeNB is able to perform the change requested by the en-gNB, the MeNB shall send the SGNB CHANGE CONFIRM message to the en-gNB. For each E-RAB configured with the PDCP entity in the en-gNB, the MeNB may include the *DL Forwarding GTP Tunnel Endpoint IE* and the *UL Forwarding GTP Tunnel Endpoint IE* within the *E-RABs To Be Released Item IE* to indicate that it requests data forwarding of uplink and downlink packets to be performed for that bearer.

The en-gNB may start data forwarding and stop providing user data to the UE and shall stop the timer $T_{D\text{Coverall}}$ upon reception of the SGNB CHANGE CONFIRM message.

8.7.8.3 Unsuccessful Operation

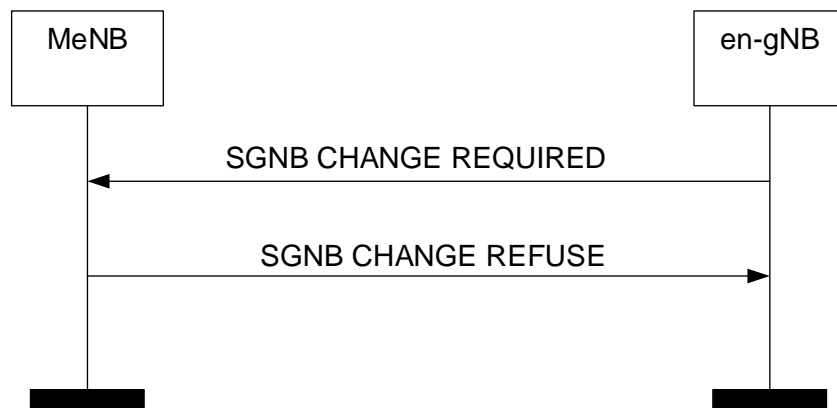


Figure 8.7.8.3-1: SgNB Change, unsuccessful operation.

In case the request change cannot be performed successfully the MeNB shall respond with the SGNB CHANGE REFUSE message to the en-gNB with an appropriate cause value in the *Cause* IE.

8.7.8.4 Abnormal Conditions

If the timer $T_{DCoverall}$ expires before the en-gNB has received the SGNB CHANGE CONFIRM or the SGNB CHANGE REFUSE message, the en-gNB shall regard the requested change as failed and may take further actions like triggering the SgNB initiated SgNB Release procedure to release all en-gNB resources allocated for the UE.

Interaction with the MeNB initiated handover procedure:

If the MeNB, after having initiated the handover procedure, receives the SGNB CHANGE REQUIRED message, the MeNB shall refuse the SgNB change procedure with an appropriate cause value in the *Cause* IE.

8.7.9 MeNB initiated SgNB Release

8.7.9.1 General

The MeNB initiated SgNB Release procedure is triggered by the MeNB to initiate the release of the resources for a specific UE.

The procedure uses UE-associated signalling.

8.7.9.2 Successful Operation

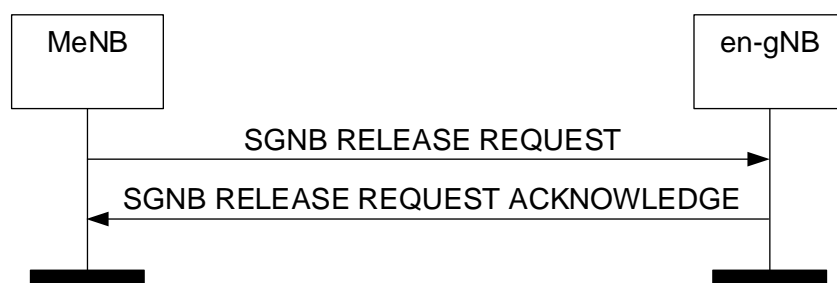


Figure 8.7.9.2-1: MeNB initiated SgNB Release, successful operation

The MeNB initiates the procedure by sending the SGNB RELEASE REQUEST message. Upon reception of the SGNB RELEASE REQUEST message the en-gNB shall stop providing user data to the UE. The *SgNB UE X2AP ID* IE shall be included if it has been obtained from the en-gNB.

If the bearer context in the en-gNB was configured with the PDCP entity in the en-gNB, for E-RAB for which the MeNB requests forwarding of uplink/downlink data, the MeNB includes the *UL Forwarding GTP Tunnel Endpoint/ DL Forwarding GTP Tunnel Endpoint* IE within the *E-RABs To Be Released Item* IE of the SGNB RELEASE REQUEST message to indicate that the en-gNB should perform data forwarding of uplink/downlink packets for that E-RAB.

Upon reception of the SGNB RELEASE REQUEST message containing *UE Context Kept Indicator* IE set to "True", the en-gNB shall, if supported, only initiate the release of the resources related to the UE-associated signalling connection between the MeNB and the en-gNB.

If the en-gNB confirms the request to release en-gNB resources it shall send the SGNB RELEASE REQUEST ACKNOWLEDGE message to the MeNB.

If the *RLC Mode* IE is included for an E-RAB within the *E-RABs Admitted To Be Released List* IE (for E-RABs hosted at the en-gNB) in the SGNB RELEASE REQUEST ACKNOWLEDGE message, it indicates the mode that the en-gNB used for the E-RAB when it was hosted at the en-gNB.

Upon successful completion of the procedure, the MeNB shall start counting time, so that information regarding time since Secondary Node Release may be transferred towards the MME as specified in TS 36.413 [4].

8.7.9.3 Unsuccessful Operation

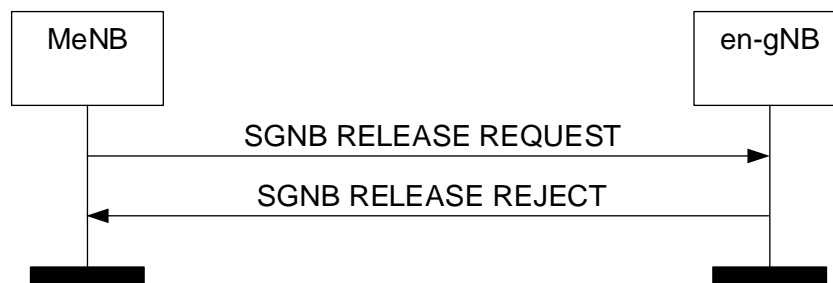


Figure 8.7.9.3-1: MeNB initiated SgNB Release, unsuccessful operation

If the en-gNB cannot confirm the request to release en-gNB resources it shall send the SGNB RELEASE REQUEST REJECT message to the MeNB with an appropriate cause indicated in the *Cause* IE.

8.7.9.4 Abnormal Conditions

If the SGNB RELEASE REQUEST message refer to a context that does not exist, the en-gNB shall ignore the message.

When the MeNB has initiated the procedure and did not include the *SgNB UE X2AP ID* IE the MeNB shall regard the resources for the UE at the en-gNB as being fully released.

Interactions with the UE Context Release procedure:

If the MeNB does not receive the reply from the en-gNB before it has to release the EN-DC connection, or it receives SGNB RELEASE REQUEST REJECT, it may trigger the UE Context Release procedure. If the en-gNB received the UE CONTEXT RELEASE right after receiving the SGNB RELEASE REQUEST (and before or after responding to it), the en-gNB shall consider the related MeNB initiated SgNB Release procedure as being the resolution of abnormal conditions and release the related UE context immediately.

8.7.10 SgNB initiated SgNB Release

8.7.10.1 General

This procedure is triggered by the en-gNB to initiate the release of the resources for a specific UE.

The procedure uses UE-associated signalling.

8.7.10.2 Successful Operation

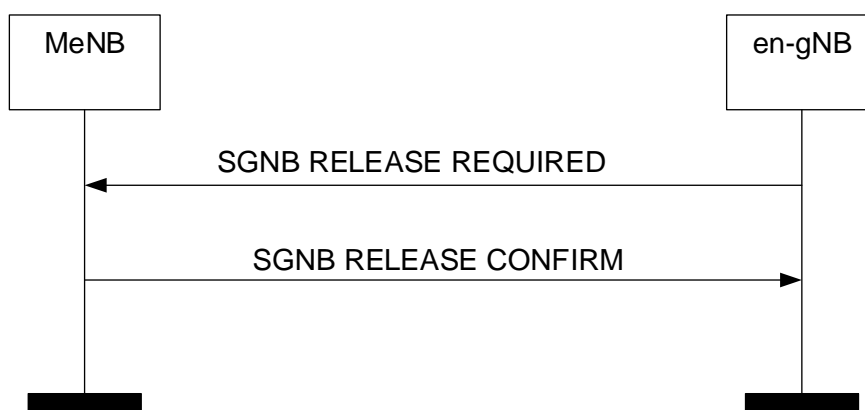


Figure 8.7.10.2-1: SgNB initiated SgNB Release, successful operation.

The en-gNB initiates the procedure by sending the SGNB RELEASE REQUIRED message to the MeNB.

Upon reception of the SGNB RELEASE REQUIRED message, the MeNB replies with the SGNB RELEASE CONFIRM message. For each E-RAB configured with the PDCP entity in the en-gNB, the MeNB may include the *DL Forwarding GTP Tunnel Endpoint IE* and the *UL Forwarding GTP Tunnel Endpoint IE* within the *E-RABs To Be Released Item IE* to indicate that it requests data forwarding of uplink and downlink packets to be performed for that bearer. For each E-RAB configured with the PDCP entity in the MeNB and SCG resources, the MeNB may include the *DL Forwarding GTP Tunnel Endpoint IE* within the *E-RABs To Be Released Item IE* to indicate that it requests data forwarding of downlink packets to be performed for that bearer.

If the *RLC Mode IE* is included for an E-RAB within the *E-RABs To Be Released List IE* (for E-RABs hosted at the en-gNB) in the SGNB RELEASE REQUIRED message, it indicates the mode that the en-gNB used for the E-RAB when it was hosted at the en-gNB.

The en-gNB may start data forwarding and stop providing user data to the UE upon reception of the SGNB RELEASE CONFIRM message.

Upon successful completion of the procedure, the MeNB shall start counting time, so that information regarding time since Secondary Node Release may be transferred towards the MME as specified in TS 36.413 [4].

8.7.10.3 Unsuccessful Operation

Not applicable.

8.7.10.4 Abnormal Conditions

Void.

8.7.11 SgNB Counter Check

8.7.11.1 General

This procedure is initiated by the en-gNB to request the MeNB to execute a counter check procedure to verify the value of the PDCP COUNTs associated with SN terminated bearers.

The procedure uses UE-associated signalling.

8.7.11.2 Successful Operation

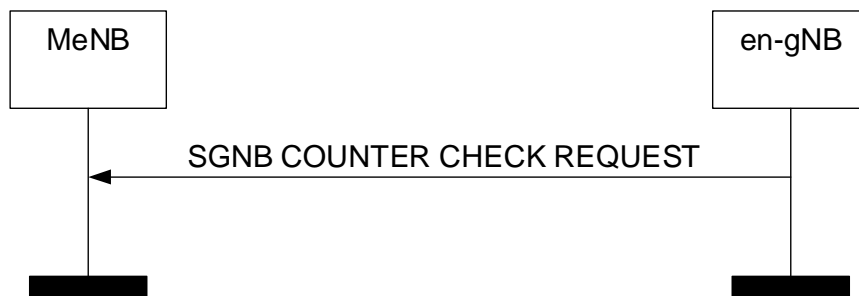


Figure 8.7.11.2-1: SgNB Counter Check procedure, successful operation.

The en-gNB initiates the procedure by sending the SgNB COUNTER CHECK REQUEST message to the MeNB.

Upon reception of the SgNB COUNTER CHECK REQUEST message, the MeNB may perform the RRC counter check procedure as defined in TS 33.401 [18].

8.7.11.3 Unsuccessful Operation

Not applicable.

8.7.11.4 Abnormal Conditions

Not applicable.

8.7.12 RRC Transfer

8.7.12.1 General

The purpose of the RRC Transfer procedure is to deliver a PDCP-C PDU encapsulating an LTE RRC message to the en-gNB so that it may then be forwarded to the UE, or from the en-gNB, if it was received from the UE. Delivery status may also be provided from the en-gNB to the MeNB using the RRC Transfer.

The procedure is also to enable transfer of the NR RRC message container with the NR measurements from the MeNB to the en-gNB, when received from the UE.

The procedure is also to enable transfer of the NR RRC message container with the NR failure information from the MeNB to the en-gNB, when received from the UE.

The procedure uses UE-associated signalling.

8.7.12.2 Successful Operation

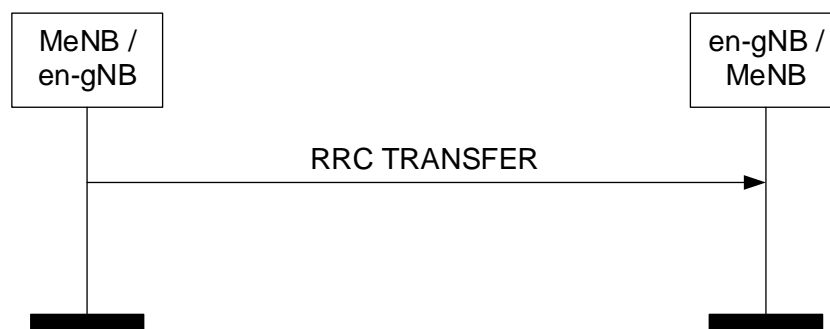


Figure 8.7.12.2-1: RRC Transfer procedure, successful operation.

Either the MeNB initiates the procedure by sending the RRC TRANSFER message to the en-gNB or the en-gNB initiates the procedure by sending the RRC TRANSFER message to the MeNB.

If the en-gNB receives an RRC TRANSFER message which includes neither the *RRC Container IE* in the *Split SRB IE* nor the *RRC container IE* in *NR UE Report IE*, it shall ignore the message. If the en-gNB receives an RRC TRANSFER message with the *Delivery Status IE*, it shall ignore the message. If the en-gNB receives the *RRC Container IE* in the *Split SRB IE*, it shall deliver the contained PDCP-C PDU encapsulating an RRC message to the UE.

If the MeNB receives the *Delivery Status IE* in the *split SRB IE* the MeNB shall consider RRC messages up to the indicated NR PDCP SN as having been successfully delivered (as defined in TS 36.322 [40]) to the UE by the en-gNB.

8.7.12.3 Abnormal Conditions

In case of the split SRBs, the receiving node may ignore the message, if the MeNB has not indicated possibility of RRC transfer at the bearer setup.

8.7.13 Secondary RAT Data Usage Report

8.7.13.1 General

This procedure is initiated by the en-gNB to report secondary RAT data volume.

The procedure uses UE-associated signalling.

8.7.13.2 Successful Operation

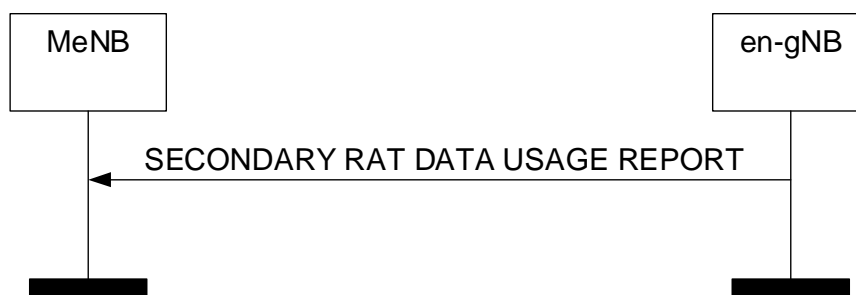


Figure 8.7.13.2-1: Secondary RAT Data Usage Report procedure, successful operation.

The en-gNB initiates the procedure by sending the SECONDARY RAT DATA USAGE REPORT message to the MeNB.

8.7.13.3 Unsuccessful Operation

Not applicable.

8.7.13.4 Abnormal Conditions

Not applicable.

8.7.14 Partial reset of EN-DC

8.7.14.1 General

This procedure is triggered by the en-gNB or the MeNB to initiate the reset of the resources for selected UEs.

The procedure uses non UE-associated signalling.

8.7.14.2 Successful Operation

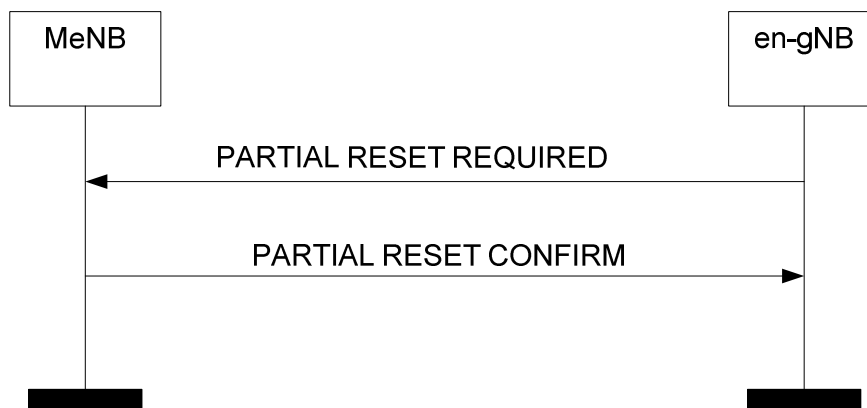


Figure 8.7.14.2-1: en-gNB initiated Partial Reset of EN-DC, successful operation.

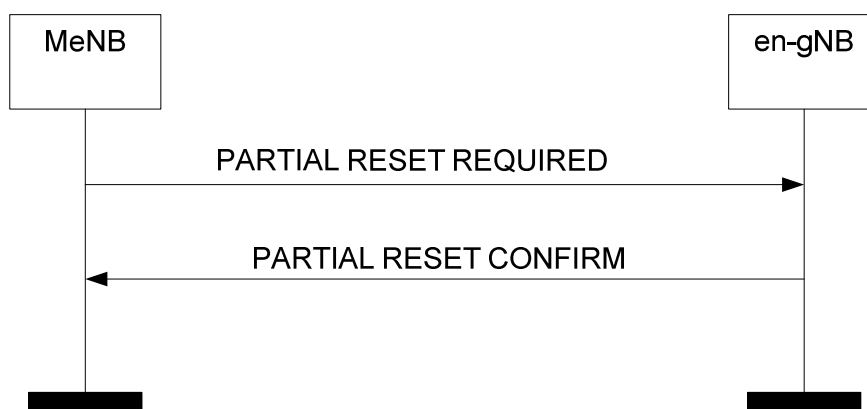


Figure 8.7.14.2-2: eNB initiated Partial Reset of EN-DC, successful operation.

The en-gNB or MeNB initiates the procedure by sending the PARTIAL RESET REQUIRED message to the MeNB or the en-gNB.

In case of the eNB-initiated Partial Reset, at reception of the PARTIAL RESET REQUIRED message, the en-gNB node shall release all allocated resources on X2 and Uu related to the UE association(s) indicated in the PARTIAL RESET REQUIRED message and remove the indicated UE contexts including X2AP ID.

In case of the en-gNB-initiated Partial Reset, at reception of the PARTIAL RESET REQUIRED message, the MeNB may decide to release all allocated resources on X2 and Uu related to the UE association(s) indicated in the PARTIAL RESET REQUIRED message and remove the indicated UE contexts including X2AP ID, or to reconfigure the UEs for MN-terminated MCG bearers.

After the receiving node has released or reconfigured all assigned X2 resources and the UE X2AP IDs for all indicated UE associations which can be used for new UE-associated logical X2-connections over the X2 interface, the receiving node shall respond with the PARTIAL RESET CONFIRM message. The node receiving the request does not need to wait for the release or reconfiguration of radio resources to be completed before returning the PARTIAL RESET CONFIRM message.

The node initiating the procedure shall include the *SgNB UE X2AP ID* IE in the PARTIAL RESET REQUIRED message if it has already been allocated for the UE. The node receiving the request shall use the *SgNB UE X2AP ID* IE (if included) and/or the *MeNB UE SIAP ID* IE (and the *MeNB UE SIAP ID Extension* IE, if included) to identify the UE association(s) to be released. If the *SgNB UE X2AP ID* IE was included in the PARTIAL RESET REQUIRED message, the receiving node shall include it also in the PARTIAL RESET CONFIRM message.

The node receiving the request shall include in the PARTIAL RESET CONFIRM message, for each UE association to be released, the same list of UE-associated logical X2-connections over X2. The list shall be in the same order as received in the PARTIAL RESET REQUIRED message and shall include also unknown UE-associated logical X2-connections.

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the PARTIAL RESET REQUIRED message and the PARTIAL RESET CONFIRM message shall contain the *Interface Instance Indication* IE to identify the corresponding interface instance.

Interactions with other procedures:

If the PARTIAL RESET REQUIRED message is received, any other ongoing procedure (except for a Reset or another Partial Reset of EN-DC procedures) on the same X2 interface related to a UE association, indicated in the PARTIAL RESET REQUIRED message, shall be aborted.

8.7.14.3 Unsuccessful Operation

Not applicable.

8.7.14.4 Abnormal Conditions

Void.

8.7.15 E-UTRA – NR Cell Resource Coordination

8.7.15.1 General

The purpose of the E-UTRA – NR Cell Resource Coordination procedure is to enable coordination of radio resource allocation between an eNB and an en-gNB that are sharing spectrum and whose coverage areas are fully or partially overlapping. During the procedure, the eNB and en-gNB shall exchange their intended resource allocations for data traffic, and, if possible, converge to a shared resource. The procedure is only to be used for the purpose of E-UTRA – NR spectrum sharing.

The procedure uses non-UE-associated signalling.

8.7.15.2 Successful Operation

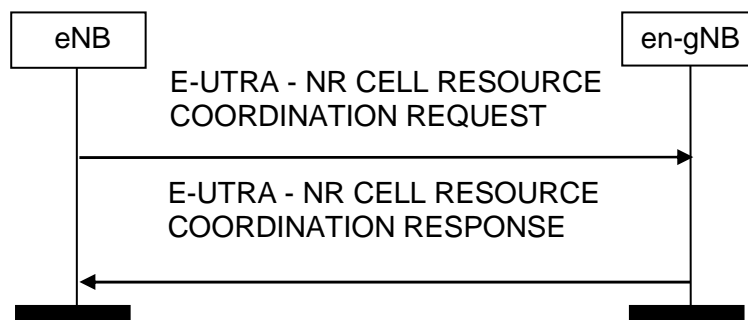


Figure 8.7.15.2-1: eNB-initiated E-UTRA – NR Cell Resource Coordination request, successful operation

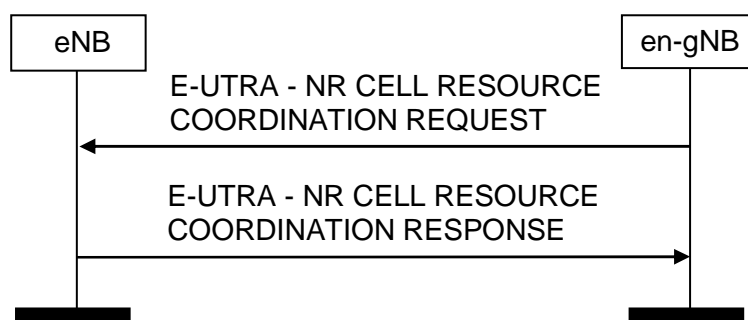


Figure 8.7.15.2-2: en-gNB-initiated E-UTRA – NR Cell Resource Coordination request, successful operation

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the E-UTRA – NR CELL RESOURCES COORDINATION REQUEST message and the E-UTRA – NR CELL RESOURCES COORDINATION RESPONSE message shall contain the *Interface Instance Indication* IE to identify the corresponding interface instance.

eNB initiated E-UTRA – NR Cell Resource Coordination:

An eNB initiates the procedure by sending the E-UTRA – NR CELL RESOURCE COORDINATION REQUEST message to an en-gNB over the X2 interface. The en-gNB extracts the *Data Traffic Resource Indication* IE and it replies by sending the E-UTRA – NR CELL RESOURCE COORDINATION RESPONSE message. The en-gNB shall calculate the full eNB resource allocation by combining the *Data Traffic Resource Indication* IE and the *Protected E-UTRA Resource Indication* IE that were most recently received from the eNB.

In case of conflict between the most recently received *Data Traffic Resource Indication* IE and the most recently received *Protected E-UTRA Resource Indication* IE, the en-gNB shall give priority to the *Protected E-UTRA Resource Indication* IE.

If the *Initiating Node Type* is eNB, then the E-UTRA – NR CELL RESOURCE COORDINATION REQUEST message shall contain at least one *EUTRA Cell ID* in the List of E-UTRA Cells in NR Coordination Request. If the *Initiating Node Type* is en-gNB, then the E-UTRA – NR CELL RESOURCE COORDINATION REQUEST message shall contain at least one NR-Cell ID in the List of NR Cells in NR Coordination Request.

en-gNB initiated E-UTRA – NR Cell Resource Coordination:

An en-gNB initiates the procedure by sending the E-UTRA – NR CELL RESOURCE COORDINATION REQUEST message to an eNB. The eNB replies with the E-UTRA – NR CELL RESOURCE COORDINATION RESPONSE message. The en-gNB shall calculate the full eNB resource allocation by combining the *Data Traffic Resource Indication* IE and the *Protected E-UTRA Resource Indication* IE that were most recently received from the eNB.

In case of conflict between the most recently received *Data Traffic Resource Indication* IE and the most recently received *Protected E-UTRA Resource Indication* IE, the en-gNB shall give priority to the *Protected E-UTRA Resource Indication* IE.

8.7.16 SgNB Activity Notification

8.7.16.1 General

The purpose of the SgNB Activity Notification procedure is to allow an en-gNB to send a notification to an eNB concerning user data traffic activity of already established E-RABs. The procedure uses UE-associated signalling.

8.7.16.2 Successful Operation

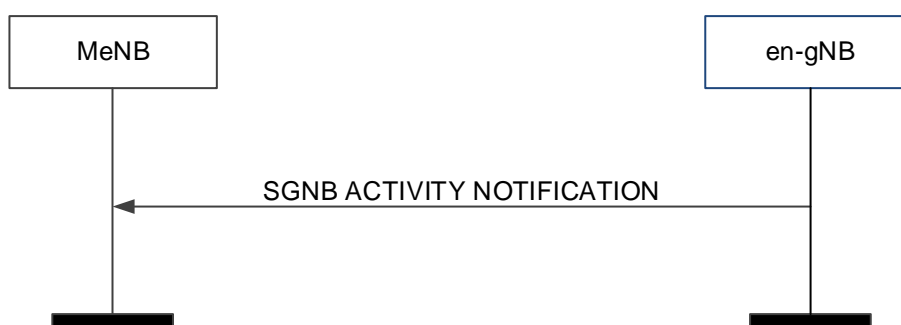


Figure 8.7.16.2-1: Activity Notification procedure, successful operation

The en-gNB initiates the procedure by sending an SGNB ACTIVITY NOTIFICATION message to the MeNB.

The SGNB ACTIVITY NOTIFICATION message may contain notification for UE context level user plane activity in the *UE Context level user plane activity report* IE.

The SGNB ACTIVITY NOTIFICATION message may contain notification for activity of E-RABs.

8.7.16.3 Abnormal Conditions

Void.

8.7.17 gNB Status Indication

8.7.17.1 General

The purpose of the gNB Status Indication procedure is to inform the eNB that the en-gNB is overloaded so that overload reduction actions can be applied. The procedure uses non-UE associated signalling.

8.7.17.2 Successful Operation

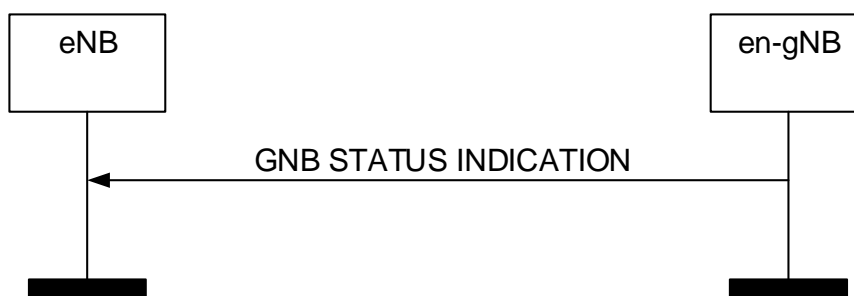


Figure 8.7.17.2-1: gNB Status Indication procedure, successful operation

If the *gNB Overload Information* IE in the GNB STATUS INDICATION message is set to "overloaded", the eNB shall apply overload reduction actions until it receives a subsequent GNB STATUS INDICATION message with *gNB Overload Information* IE set to "not-overloaded".

The detailed overload reduction policy is up to eNB implementation.

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the GNB STATUS INDICATION message shall contain the *Interface Instance Indication* IE to identify the corresponding interface instance.

8.7.17.3 Abnormal Conditions

Void.

8.7.18 EN-DC Configuration Transfer

8.7.18.1 General

The purpose of the EN-DC Configuration Transfer procedure is to transfer the EN-DC SON Configuration container, either from the eNB to the en-gNB or from the en-gNB to the eNB, in the context of en-gNB X2 TNL address discovery as described in TS 36.300 [15].

The procedure uses non UE-associated signalling.

8.7.18.2 Successful Operation

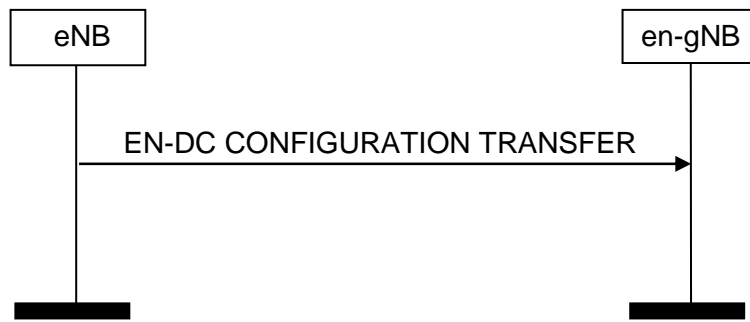


Figure 8.7.18.2-1: eNB initiated EN-DC Configuration Transfer, successful operation

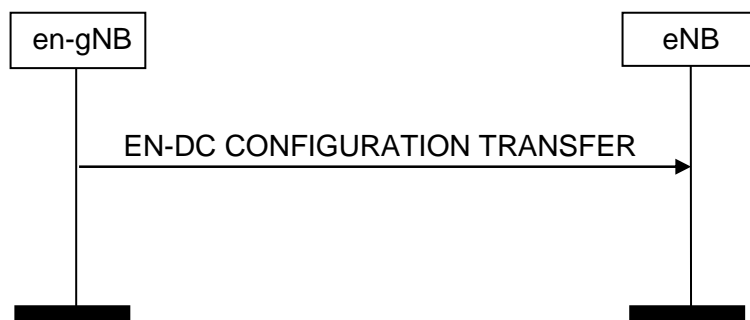


Figure 8.7.18.2-2: en-gNB initiated EN-DC Configuration Transfer, successful operation

The eNB initiates the procedure by sending the EN-DC CONFIGURATION TRANSFER message to an en-gNB.

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

If the en-gNB receives, in the *EN-DC SON Configuration Transfer IE*, the *X2 TNL Configuration Info IE* containing the *eNB X2 Extended Transport Layer Addresses IE*, it may use it as part of its ACL functionality configuration actions, if such ACL functionality is deployed.

In case the *IP-Sec Transport Layer Address IE* is present and the *GTP Transport Layer Addresses IE* within the *eNB X2 Extended Transport Layer Addresses IE* is not empty, GTP traffic is conveyed within an IP-Sec tunnel terminated at the IP-Sec tunnel end point given in by the *IP-Sec Transport Layer Address IE*.

In case the *IP-Sec Transport Layer Address IE* is not present, GTP traffic is terminated at the end points given by the list of addresses in *eNB GTP Transport Layer Addresses IE* within the *eNB X2 Extended Transport Layer Addresses IE*.

In case the *eNB GTP Transport Layer Addresses IE* is empty and the *IP-Sec Transport Layer Address IE* is present, SCTP traffic is conveyed within an IP-Sec tunnel terminated at the IP-Sec tunnel end point given in the *IP-Sec Transport Layer Address IE*, within the *eNB X2 Extended Transport Layer Addresses IE*.

If the en-gNB is configured to use one IPsec tunnel for EN-DC X2 traffic (IPsec star topology) then the traffic to the peer eNB shall be routed through this IPsec tunnel and the *IP-Sec Transport Layer Address IE* shall be ignored.

The en-gNB initiates the procedure by sending the EN-DC CONFIGURATION TRANSFER message to an eNB.

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC CONFIGURATION TRANSFER message shall contain the *Interface Instance Indication IE* to identify the corresponding interface instance.

8.7.18.3 Abnormal Conditions

Void.

8.7.19 Trace Start

8.7.19.1 General

The purpose of the Trace Start procedure is to allow the MeNB to request the en-gNB to initiate a trace session for a UE. The procedure uses UE-associated signalling.

8.7.19.2 Successful Operation



Figure 8.7.19.2-1: Trace Start, successful operation

The Trace Start procedure is initiated by the MeNB sending the TRACE START message to the en-gNB for that specific UE. Upon reception of the TRACE START message, the en-gNB shall initiate the requested trace session as described in TS 32.422 [6].

8.7.19.3 Abnormal Conditions

Void.

8.7.20 Deactivate Trace

8.7.20.1 General

The purpose of the Deactivate Trace procedure is to allow the MeNB to request the en-gNB to stop the trace session for the indicated trace reference. The procedure uses UE-associated signalling.

8.7.20.2 Successful Operation



Figure 8.7.20.2-1: Deactivate Trace, successful operation

The Deactivate Trace procedure is initiated by the MeNB by sending the DEACTIVATE TRACE to the en-gNB for that specific UE. Upon reception of the DEACTIVATE TRACE message, the en-gNB shall stop the trace session for the indicated trace reference in the *E-UTRAN Trace ID* IE.

8.7.20.3 Abnormal Conditions

Void.

9 Elements for X2AP Communication

9.0 General

Sub clauses 9.1 and 9.2 describe the structure of the messages and information elements required for the X2AP protocol in tabular format. Sub clause 9.3 provides the corresponding ASN.1 definition.

The following attributes are used for the tabular description of the messages and information elements: Presence, Range Criticality and Assigned Criticality. Their definition and use can be found in TS 36.413 [4].

NOTE: The messages have been defined in accordance to the guidelines specified in TR 25.921 [30].

9.1 Message Functional Definition and Content

9.1.1 Messages for Basic Mobility Procedures

9.1.1.1 HANDOVER REQUEST

This message is sent by the source eNB to the target eNB to request the preparation of resources for a handover.

Direction: source eNB → target eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|--------------------------|------------------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Old eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the source eNB | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Target Cell ID | M | | E CGI 9.2.14 | | YES | reject |
| GUMMEI | M | | 9.2.16 | | YES | reject |
| UE Context Information | | 1 | | | YES | reject |
| >MME UE S1AP ID | M | | INTEGER (0..2 ³² -1) | MME UE S1AP ID allocated at the MME | – | |
| >UE Security Capabilities | M | | 9.2.29 | | – | |
| >AS Security Information | M | | 9.2.30 | | – | |
| >UE Aggregate Maximum Bit Rate | M | | 9.2.12 | | – | |
| >Subscriber Profile ID for RAT/Frequency priority | O | | 9.2.25 | | – | |
| >E-RABs To Be Setup List | | 1 | | | – | |
| >>E-RABs To Be Setup Item | | 1 .. <maxnoofBearers> | | | EACH | ignore |
| >>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>E-RAB Level QoS Parameters | M | | 9.2.9 | Includes necessary QoS parameters | – | |
| >>>DL Forwarding | O | | 9.2.5 | | – | |
| >>>UL GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | SGW endpoint of the S1 transport bearer. For delivery of UL PDUs. | – | |
| >>>Bearer Type | O | | 9.2.92 | | YES | reject |
| >RRC Context | M | | OCTET STRING | Includes the RRC <i>HandoverPreparationInformation</i> message as defined in subclause 10.2.2 of TS 36.331 [9], or the RRC <i>HandoverPreparationInformation-NB</i> message as defined in 10.6.2 of TS 36.331 [9]. | – | |
| >Handover Restriction List | O | | 9.2.3 | | – | |
| >Location Reporting Information | O | | 9.2.21 | Includes the necessary parameters for location reporting | – | |
| >Management Based MDT Allowed | O | | 9.2.59 | | YES | ignore |
| >Management Based MDT PLMN List | O | | MDT PLMN List 9.2.64 | | YES | ignore |
| >UE Sidelink Aggregate Maximum Bit Rate | O | | 9.2.97 | This IE applies only if the UE is authorized for V2X services. | YES | Ignore |
| UE History Information | M | | 9.2.38 | Same definition as in TS 36.413 [4] | YES | ignore |
| Trace Activation | O | | 9.2.2 | | YES | ignore |
| SRVCC Operation Possible | O | | 9.2.33 | | YES | ignore |
| CSG Membership Status | O | | 9.2.52 | | YES | reject |

| | | | | | | |
|---|---|--|-----------------------------------|---|-----|--------|
| Mobility Information | O | | BIT STRING (SIZE (32)) | Information related to the handover; the source eNB provides it in order to enable later analysis of the conditions that led to a wrong HO. | YES | ignore |
| Masked IMEISV | O | | 9.2.69 | | YES | ignore |
| UE History Information from the UE | O | | OCTET STRING | VisitedCellInfoList contained in the UEInformationResponse message (TS 36.331 [9]) | YES | ignore |
| Expected UE Behaviour | O | | 9.2.70 | | YES | ignore |
| ProSe Authorized | O | | 9.2.78 | | YES | ignore |
| UE Context Reference at the SeNB | O | | | | YES | ignore |
| >Global SeNB ID | M | | Global eNB ID 9.2.22 | | | |
| >SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | | |
| >SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | | |
| Old eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the source eNB | YES | reject |
| V2X Services Authorized | O | | 9.2.93 | | YES | ignore |
| UE Context Reference at the WT | O | | | | YES | ignore |
| >WT ID | M | | 9.2.95 | | | |
| >WT UE XwAP ID | M | | 9.2.96 | | | |
| UE Context Reference at the SgNB | O | | | | YES | ignore |
| >Global en-gNB ID | M | | 9.2.112 | | | |
| >SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the SgNB. | - | |
| NR UE Security Capabilities | O | | 9.2.107 | | YES | ignore |
| Aerial UE subscription information | O | | 9.2.129 | | YES | ignore |
| Subscription Based UE Differentiation Information | O | | 9.2.136 | | YES | ignore |

| Range bound | Explanation |
|-----------------|---|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |
| maxnoofMDTPLMNs | PLMNs in the Management Based MDT PLMN list. Value is 16. |

9.1.1.2 HANDOVER REQUEST ACKNOWLEDGE

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

Direction: target eNB → source eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|------------------------|----------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Old eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the source eNB | YES | ignore |
| New eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the target eNB | YES | ignore |
| E-RABs Admitted List | | 1 | | | YES | ignore |
| >E-RABs Admitted Item | | 1 .. <maxnoofBearers > | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>UL GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of UL PDUs | – | |
| >>DL GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer. used for forwarding of DL PDUs | – | |
| E-RABs Not Admitted List | O | | E-RAB List 9.2.28 | A value for <i>E-RAB ID</i> shall only be present once in <i>E-RABs Admitted List</i> IE and in <i>E-RABs Not Admitted List</i> IE. | YES | ignore |
| Target eNB To Source eNB Transparent Container | M | | OCTET STRING | Includes the RRC E-UTRA Handover Command message as defined in subclause 10.2.2 in TS 36.331 [9] | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| UE Context Kept Indicator | O | | 9.2.85 | | YES | ignore |
| Old eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the source eNB | YES | ignore |
| New eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the target eNB | YES | reject |
| WT UE Context Kept Indicator | O | | UE Context Kept Indicator 9.2.85 | Indicates that the WT has acknowledged to keep the UE context | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.1.3 HANDOVER PREPARATION FAILURE

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

Direction: target eNB → source eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------|----------|-------|--------------------------------|-----------------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Old eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the source eNB | YES | ignore |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| Old eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the source eNB | YES | ignore |

9.1.1.4 SN STATUS TRANSFER

This message is sent by the source eNB to the target eNB to transfer the uplink/downlink PDCP SN and HFN status during a handover or for EN-DC.

Direction: source eNB → target eNB (handover), eNB from which the E-RAB context is transferred → eNB to which the E-RAB context is transferred (RRC connection re-establishment or dual connectivity), MeNB/en-gNB from which the E-RAB context is transferred → en-gNB/MeNB to which the E-RAB context is transferred (EN-DC).

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|-------------------------|--------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| Old eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated for handover at the source eNB and for dual connectivity/EN-DC at the eNB from which the E-RAB context is transferred | YES | reject |
| New eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated for handover at the target eNB and for dual connectivity/EN-DC at the eNB to which the E-RAB context is transferred | YES | reject |
| E-RABs Subject To Status Transfer List | | 1 | | | YES | ignore |
| >E-RABs Subject To Status Transfer Item | | 1.. <maxnoofBearers> | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>Receive Status Of UL PDCP SDUs | O | | BIT STRING (4096) | PDCP Sequence Number = (First Missing SDU Number + bit position) modulo 4096 0: PDCP SDU has not been received. 1: PDCP SDU has been received correctly. | – | |
| >>UL COUNT Value | M | | COUNT Value 9.2.15 | PDCP-SN and Hyper Frame Number of the first missing UL SDU in case of 12 bit long PDCP-SN | – | |
| >>DL COUNT Value | M | | COUNT Value 9.2.15 | PDCP-SN and Hyper frame number that the target eNB/en-gNB should assign for the next DL SDU not having an SN yet in case of 12 bit long PDCP-SN | – | |
| >>Receive Status Of UL PDCP SDUs Extended | O | | BIT STRING (1..16384) | The IE is used in case of 15 bit long PDCP-SN in this release. The first bit indicates the status of the SDU after the First Missing UL PDCP SDU. The N^{th} bit indicates the status of the UL PDCP SDU in position $(N + \text{First Missing SDU Number})$ modulo $(1 + \text{the maximum value of the PDCP-SN})$. 0: PDCP SDU has not been received. 1: PDCP SDU has been received correctly. | YES | ignore |

| | | | | | | |
|--|---|--|--|---|-----|--------|
| >>UL COUNT Value Extended | O | | COUNT Value Extended 9.2.66 | PDCP-SN and Hyper Frame Number of the first missing UL SDU in case of 15 bit long PDCP-SN | YES | ignore |
| >>DL COUNT Value Extended | O | | COUNT Value Extended 9.2.66 | PDCP-SN and Hyper Frame Number that the target eNB/en-gNB should assign for the next DL SDU not having an SN yet in case of 15 bit long PDCP-SN | YES | ignore |
| >>Receive Status Of UL PDCP SDUs for PDCP SN Length 18 | O | | BIT STRING (1..131072) | The IE is used in case of 18 bit long PDCP-SN. The first bit indicates the status of the SDU after the First Missing UL PDCP SDU. The Nth bit indicates the status of the UL PDCP SDU in position (N + First Missing SDU Number) modulo (1 + the maximum value of the PDCP-SN). 0: PDCP SDU has not been received. 1: PDCP SDU has been received correctly. | YES | ignore |
| >>UL COUNT Value for PDCP SN Length 18 | O | | COUNT Value for PDCP SN Length 18 9.2.82 | PDCP-SN and Hyper Frame Number of the first missing UL SDU in case of 18 bit long PDCP-SN | YES | ignore |
| >>DL COUNT Value for PDCP SN Length 18 | O | | COUNT Value for PDCP SN Length 18 9.2.82 | PDCP-SN and Hyper Frame Number that the target eNB/en-gNB should assign for the next DL SDU not having an SN yet in case of 18 bit long PDCP-SN | YES | ignore |
| Old eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated for handover at the source eNB and for dual connectivity/EN-DC at the eNB from which the E-RAB context is transferred. | YES | reject |
| New eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated for handover at the target eNB and for dual connectivity/EN-DC at the eNB to which the E-RAB context is transferred. | YES | reject |
| SgNB UE X2AP ID | O | | en-gNB UE X2AP ID 9.2.100 | Allocated for EN-DC at the SgNB. | YES | ignore |

| Range bound | Explanation |
|----------------|--------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256. |

9.1.1.5 UE CONTEXT RELEASE

This message is sent by the target eNB to the source eNB to indicate that resources can be released.

Direction: target eNB → source eNB (handover), MeNB → SeNB (dual connectivity), MeNB → en-gNB (EN-DC).

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--------------------------------------|----------|-------|-----------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| Old eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated for handover at the source eNB and for dual connectivity at the SeNB. | YES | reject |
| New eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated for handover at the target eNB and for dual connectivity/EN-DC at the MeNB. | YES | reject |
| Old eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated for handover at the source eNB and for dual connectivity at the SeNB. | YES | reject |
| New eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated for handover at the source eNB and for dual connectivity/EN-DC at the MeNB. | YES | reject |
| SIPTO Bearer Deactivation Indication | O | | ENUMERATED (True, ...) | Indicates that SIPTO@LN PDN connection deactivation is needed. | YES | ignore |
| SgNB UE X2AP ID | O | | en-gNB UE X2AP ID 9.2.100 | Allocated for EN-DC at the SgNB. | YES | ignore |

9.1.1.6 HANDOVER CANCEL

This message is sent by the source eNB to the target eNB to cancel an ongoing handover.

Direction: source eNB → target eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------|----------|-------|-----------------------------------|-----------------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| Old eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the source eNB | YES | reject |
| New eNB UE X2AP ID | O | | eNB UE X2AP ID 9.2.24 | Allocated at the target eNB | YES | ignore |
| Cause | M | | 9.2.6 | | YES | ignore |
| Old eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the source eNB | YES | reject |
| New eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the target eNB | YES | ignore |

9.1.2 Messages for global procedures

9.1.2.1 LOAD INFORMATION

This message is sent by an eNB to neighbouring eNBs to transfer load and interference co-ordination information.

Direction: eNB₁ → eNB₂.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|------------------------|---|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| Cell Information | M | | | | YES | ignore |
| >Cell Information Item | | 1 .. <maxCellineNB> | | | EACH | ignore |
| >>Cell ID | M | | ECGI 9.2.14 | Id of the source cell | – | |
| >>UL Interference Overload Indication | O | | 9.2.17 | | – | |
| >>UL High Interference Information | | 0 .. <maxCellineNB> | | | – | |
| >>>Target Cell ID | M | | ECGI 9.2.14 | Id of the cell for which the HII is meant | – | |
| >>>UL High Interference Indication | M | | 9.2.18 | | – | |
| >>Relative Narrowband Tx Power (RNTP) | O | | 9.2.19 | | – | |
| >>ABS Information | O | | 9.2.54 | | YES | ignore |
| >>Invoke Indication | O | | 9.2.55 | | YES | ignore |
| >>Intended UL-DL Configuration | O | | ENUMERATED(sa0, sa1, sa2, sa3, sa4, sa5, sa6,...) | One of the UL-DL configurations defined in TS 36.211 [10]. The UL subframe(s) in the indicated configuration is subset of those in SIB1 UL-DL configuration. | YES | ignore |
| >>Extended UL Interference Overload Info | O | | 9.2.67 | This IE applies to TDD only. | YES | ignore |
| >>CoMP Information | O | | 9.2.74 | | YES | ignore |
| >>Dynamic DL transmission information | O | | 9.2.77 | | YES | ignore |

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

9.1.2.2 ERROR INDICATION

This message is used to indicate that some error has been detected in the eNB/en-gNB.

Direction: eNB₁ → eNB₂ or eNB → en-gNB or en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|-------|-----------------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| Old eNB UE X2AP ID | O | | eNB UE X2AP ID 9.2.24 | Allocated for handover at the source eNB and for dual connectivity at the SeNB or the eNB from which the E-RAB context is transferred. | YES | ignore |
| New eNB UE X2AP ID | O | | eNB UE X2AP ID 9.2.24 | Allocated for handover at the target eNB and for dual connectivity/EN-DC at the MeNB or the eNB to which the E-RAB context is transferred. | YES | ignore |
| Cause | O | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| Old eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated for handover at the source eNB and for dual connectivity at the SeNB or the eNB from which the E-RAB context is transferred. | YES | ignore |
| New eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated for handover at the target eNB and for dual connectivity at the MeNB or the eNB to which the E-RAB context is transferred. | YES | ignore |
| Old en-gNB UE X2AP ID | O | | en-gNB UE X2AP ID 9.2.100 | Allocated for EN-DC at the en-gNB. | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

9.1.2.3 X2 SETUP REQUEST

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

Direction: eNB₁ → eNB₂.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--------------------------------|----------|-----------------------------|--------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Global eNB ID | M | | 9.2.22 | | YES | reject |
| Served Cells | | 1 .. <maxCellineNB> | | Complete list of cells served by the eNB | YES | reject |
| >Served Cell Information | M | | 9.2.8 | | – | |
| > Neighbour Information | | 0 .. <maxnoofNeighbours> | | | – | |
| >>ECGI | M | | ECGI 9.2.14 | E-UTRAN Cell Global Identifier of the neighbour cell | – | |
| >>PCI | M | | INTEGER (0..503, ...) | Physical Cell Identifier of the neighbour cell | – | |
| >>EARFCN | M | | 9.2.26 | DL EARFCN for FDD or EARFCN for TDD | – | |
| >>TAC | O | | OCTET STRING (2) | Tracking Area Code | YES | ignore |
| >>EARFCN Extension | O | | 9.2.65 | DL EARFCN for FDD or EARFCN for TDD. If this IE is present, the value signalled in the EARFCN IE is ignored. | YES | reject |
| >NR Neighbour Information | O | | 9.2.98 | NR neighbour, capable of performing EN-DC with the served E-UTRA cell | YES | ignore |
| GU Group Id List | | 0 .. <maxfPools> | | List of all the pools to which the eNB belongs | GLOBAL | reject |
| >GU Group Id | M | | 9.2.20 | | - | |
| LHN ID | O | | 9.2.83 | | YES | ignore |

| Range bound | Explanation |
|-------------------|---|
| maxCellineNB | Maximum no. cells that can be served by an eNB. Value is 256. |
| maxnoofNeighbours | Maximum no. of neighbour cells associated to a given served cell. Value is 512. |
| maxPools | Maximum no. of pools an eNB can belong to. Value is 16. |

9.1.2.4 X2 SETUP RESPONSE

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

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------------------------|----------|-----------------------------|--------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Global eNB ID | M | | 9.2.22 | | YES | reject |
| Served Cells | | 1 .. <maxCellineNB> | | Complete list of cells served by the eNB | GLOBAL | reject |
| >Served Cell Information | M | | 9.2.8 | | – | |
| >Neighbour Information | | 0 .. <maxnoofNeighbours> | | | – | |
| >>ECGI | M | | ECGI 9.2.14 | E-UTRAN Cell Global Identifier of the neighbour cell | – | |
| >>PCI | M | | INTEGER (0..503, ...) | Physical Cell Identifier of the neighbour cell | – | |
| >>EARFCN | M | | 9.2.26 | DL EARFCN for FDD or EARFCN for TDD | – | |
| >>TAC | O | | OCTET STRING (2) | Tracking Area Code | YES | ignore |
| >>EARFCN Extension | O | | 9.2.65 | DL EARFCN for FDD or EARFCN for TDD. If this IE is present, the value signalled in the EARFCN IE is ignored. | YES | reject |
| >NR Neighbour Information | O | | 9.2.98 | NR neighbour, capable of performing EN-DC with the served E-UTRA cell | YES | ignore |
| GU Group Id List | | 0 .. <maxPools> | | List of all the pools to which the eNB belongs | GLOBAL | reject |
| >GU Group Id | M | | 9.2.20 | | - | |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| LHN ID | O | | 9.2.83 | | YES | ignore |

| Range bound | Explanation |
|-------------------|---|
| maxCellineNB | Maximum no. cells that can be served by an eNB. Value is 256. |
| maxnoofNeighbours | Maximum no. of neighbour cells associated to a given served cell. Value is 512. |
| maxPools | Maximum no. of pools an eNB can belong to. Value is 16. |

9.1.2.5 X2 SETUP FAILURE

This message is sent by the eNB to indicate X2 Setup failure.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Time To Wait | O | | 9.2.32 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |

9.1.2.6 RESET REQUEST

This message is sent from one eNB to another eNB/en-gNB or from en-gNB to an eNB and is used to request the X2 interface between the two eNB or between an eNB and an en-gNB to be reset.

Direction: eNB₁ → eNB₂, eNB → en-gNB, en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

9.1.2.7 RESET RESPONSE

This message is sent by a eNB/en-gNB as a response to a RESET REQUEST message.

Direction: eNB₂ → eNB₁, eNB → en-gNB, en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

9.1.2.8 ENB CONFIGURATION UPDATE

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

Direction: eNB₁ → eNB₂.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--------------------------------|----------|-----------------------------|--------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Served Cells To Add | | 0 .. <maxCellineNB> | | Complete list of added cells served by the eNB | GLOBAL | reject |
| >Served Cell Information | M | | 9.2.8 | | – | |
| > Neighbour Information | | 0 .. <maxnoofNeighbours> | | | – | |
| >>ECGI | M | | ECGI 9.2.14 | E-UTRAN Cell Global Identifier of the neighbour cell | – | |
| >>PCI | M | | INTEGER (0..503, ...) | Physical Cell Identifier of the neighbour cell | – | |
| >>EARFCN | M | | 9.2.26 | DL EARFCN for FDD or EARFCN for TDD | – | |
| >>TAC | O | | OCTET STRING (2) | Tracking Area Code | YES | ignore |
| >>EARFCN Extension | O | | 9.2.65 | DL EARFCN for FDD or EARFCN for TDD. If this IE is present, the value signalled in the EARFCN IE is ignored. | YES | reject |
| >NR Neighbour Information | O | | 9.2.98 | NR neighbour, capable of performing EN-DC with the served E-UTRA cell | YES | ignore |
| Served Cells To Modify | | 0 .. <maxCellineNB> | | Complete list of modified cells served by the eNB | GLOBAL | reject |
| >Old ECGI | M | | ECGI 9.2.14 | Old E-UTRAN Cell Global Identifier | - | |
| >Served Cell Information | M | | 9.2.8 | | – | |
| > Neighbour Information | | 0 .. <maxnoofNeighbours> | | | – | |
| >>ECGI | M | | ECGI 9.2.14 | E-UTRAN Cell Global Identifier of the neighbour cell | – | |
| >>PCI | M | | INTEGER (0..503, ...) | Physical Cell Identifier of the neighbour cell | – | |
| >>EARFCN | M | | 9.2.26 | DL EARFCN for FDD or EARFCN for TDD | – | |
| >>TAC | O | | OCTET STRING (2) | Tracking Area Code | YES | ignore |

| | | | | | | |
|-----------------------------------|---|----------------------|---|---|--------|--------|
| >>EARFCN Extension | O | | 9.2.65 | DL EARFCN for FDD or EARFCN for TDD. If this IE is present, the value signalled in the EARFCN IE is ignored. | YES | reject |
| >NR Neighbour Information | O | | 9.2.98 | NR neighbour, capable of performing EN-DC with the served E-UTRA cell | YES | ignore |
| >Deactivation Indication | O | | ENUMERATED(deactivated, ...) | Indicates that the concerned cell is switched off for energy saving reasons | YES | ignore |
| Served Cells To Delete | | 0 .. <maxCelllineNB> | | Complete list of deleted cells served by the eNB | GLOBAL | reject |
| >Old ECGI | M | | ECGI 9.2.14 | Old E-UTRAN Cell Global Identifier of the cell to be deleted | - | |
| GU Group Id To Add List | | 0 .. <maxPools> | | | GLOBAL | reject |
| >GU Group Id | M | | 9.2.20 | | - | |
| GU Group Id To Delete List | | 0 .. <maxPools> | | | GLOBAL | reject |
| >GU Group Id | M | | 9.2.20 | | - | |
| Coverage Modification List | | 0 .. <maxCelllineNB> | | List of cells with modified coverage | GLOBAL | reject |
| >ECGI | M | | ECGI 9.2.14 | E-UTRAN Cell Global Identifier of the cell to be modified | - | |
| >Cell Coverage State | M | | INTEGER (0..15, ...) | Value '0' indicates that the cell is inactive. Other values Indicates that the cell is active and also indicates the coverage configuration of the concerned cell | - | |
| >Cell Deployment Status Indicator | O | | ENUMERATED(pre-change-notification, ..) | Indicates the Cell Coverage State is planned to be used at the next reconfiguration | | |
| >Cell Replacing Info | C- ifCellDeploymentStatusIndicator Present | | | | | |
| >>Replacing Cells | | 0 .. <maxCelllineNB> | | | | |

| | | | | | | |
|---------|--|--|----------------|---|--|--|
| >>>ECGI | | | ECGI 9.2.14 | E-UTRAN Cell Global Identifier of a cell that may replace all or part of the coverage of the cell to be modified | | |
|---------|--|--|----------------|---|--|--|

| Range bound | Explanation |
|-------------------|--|
| maxCellineNB | Maximum no. cells that can be served by an eNB. Value is 256. |
| maxnoofNeighbours | Maximum no. of neighbour cells associated to a given served cell. Value is 512. |
| maxPools | Maximum no. of pools an eNB can belong to. Value is 16. |

| Condition | Explanation |
|--|--|
| ifCellDeploymentStatusIndicatorPresent | This IE shall be present if the <i>Cell Deployment Status Indicator</i> IE is present. |

9.1.2.9 ENB CONFIGURATION UPDATE ACKNOWLEDGE

This message is sent by an eNB to a peer eNB to acknowledge update of information for a TNL association.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |

9.1.2.10 ENB CONFIGURATION UPDATE FAILURE

This message is sent by an eNB to a peer eNB to indicate eNB Configuration Update Failure.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Time To Wait | O | | 9.2.32 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |

9.1.2.11 RESOURCE STATUS REQUEST

This message is sent by an eNB₁ to neighbouring eNB₂ to initiate the requested measurement according to the parameters given in the message.

Direction: eNB₁ → eNB₂.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|---|----------------------------|---|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| eNB1 Measurement ID | M | | INTEGER (1..4095,...) | Allocated by eNB ₁ | YES | reject |
| eNB2 Measurement ID | C- ifRegistrati onRequest StoporPart ialStoporA dd | | INTEGER (1..4095,...) | Allocated by eNB ₂ | YES | ignore |
| Registration Request | M | | ENUMERAT ED(start, stop, ..., partial stop, add) | Type of request for which the resource status is required. | YES | reject |
| Report Characteristics | O | | BITSTRING (SIZE(32)) | Each position in the bitmap indicates measurement object the eNB ₂ is requested to report. First Bit = PRB Periodic, Second Bit = TNL load Ind Periodic, Third Bit = HW Load Ind Periodic, Fourth Bit = Composite Available Capacity Periodic, this bit should be set to 1 if at least one of the First, Second or Third bits is set to 1, Fifth Bit = ABS Status Periodic, Sixth Bit = RSRP Measurement Report Periodic, Seventh Bit = CSI Report Periodic. Other bits shall be ignored by the eNB ₂ . | YES | reject |
| Cell To Report | | 1 | | Cell ID list to which the request applies. | YES | ignore |
| >Cell To Report Item | | 1 .. <maxCel lineNB> | | | EACH | ignore |
| >>Cell ID | M | | ECGI 9.2.14 | | – | |
| Reporting Periodicity | O | | ENUMERAT ED(1000ms, 2000ms, 5000ms,100 00ms, ...) | Periodicity that can be used for reporting of PRB Periodic, TNL Load Ind Periodic, HW Load Ind Periodic, Composite Available Capacity Periodic or ABS Status Periodic. | YES | ignore |
| Partial Success Indicator | O | | ENUMERAT ED(partial success allowed, ...) | Included if partial success is allowed | YES | ignore |
| Reporting Periodicity of RSRP Measurement Report | O | | ENUMERAT ED(120ms, 240ms, 480ms, 640ms, ...) | Periodicity that can be used for the reporting of RSRP Measurement Report Periodic. | YES | ignore |

| | | | | | | |
|-------------------------------------|---|--|--|--|-----|--------|
| Reporting Periodicity of CSI Report | O | | ENUMERATED(5ms, 10ms, 20ms, 40ms, 80ms, ...) | Periodicity that can be used for the reporting of CSI Report Periodic. | YES | ignore |
|-------------------------------------|---|--|--|--|-----|--------|

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

| Condition | Explanation |
|---|---|
| ifRegistrationRequestStoporPartialStoporAdd | This IE shall be present if the <i>Registration Request</i> IE is set to the value "stop", "partial stop" or "add". |

9.1.2.12 RESOURCE STATUS RESPONSE

This message is sent by the eNB₂ to indicate that the requested measurement, for all or for a subset of the measurement objects included in the measurement is successfully initiated.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-----------------------------|-----------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| eNB1 Measurement ID | M | | INTEGER (1..4095,...) | Allocated by eNB ₁ | YES | reject |
| eNB2 Measurement ID | M | | INTEGER (1..4095,...) | Allocated by eNB ₂ | YES | reject |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| Measurement Initiation Result | | 0..1 | | List of all cells in which measurement objects were requested, included when indicating partial success | YES | ignore |
| >Measurement Initiation Result Item | | 1 .. <maxCellLineNB> | | | EACH | ignore |
| >>Cell ID | M | | ECGI 9.2.14 | | – | |
| >>Measurement Failure Cause List | | 0..1 | | Indicates that eNB ₂ could not initiate the measurement for at least one of the requested measurement objects in the cell | – | |
| >>>Measurement Failure Cause Item | | 1 .. <maxFailedMeasObjects> | | | EACH | ignore |
| >>>>Measurement Failed Report Characteristics | M | | BITSTRING (SIZE(32)) | Each position in the bitmap indicates measurement object that failed to be initiated in the eNB ₂ . First Bit = PRB Periodic, Second Bit = TNL load Ind Periodic, Third Bit = HW Load Ind Periodic, Fourth Bit = Composite Available Capacity Periodic, Fifth Bit = ABS Status Periodic, Sixth Bit = RSRP Measurement Report Periodic, Seventh Bit = CSI Report Periodic. Other bits shall be ignored by the eNB ₁ . | – | |
| >>>>Cause | M | | 9.2.6 | Failure cause for measurement objects for which the measurement cannot be initiated | – | |

| Range bound | Explanation |
|----------------------|---|
| maxFailedMeasObjects | Maximum number of measurement objects that can fail per measurement. Value is 32. |
| maxCellLineNB | Maximum no. cells that can be served by an eNB. Value is 256. |

9.1.2.13 RESOURCE STATUS FAILURE

This message is sent by the eNB₂ to indicate that for none of the requested measurement objects the measurement can be initiated.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|--------------------------------|-----------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| eNB1 Measurement ID | M | | INTEGER (1..4095,...) | Allocated by eNB ₁ | YES | reject |
| eNB2 Measurement ID | M | | INTEGER (1..4095,...) | Allocated by eNB ₂ | YES | reject |
| Cause | M | | 9.2.6 | Ignored by the receiver when the Complete Failure Cause Information IE is included | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| Complete Failure Cause Information | | 0..1 | | Complete list of failure causes for all requested cells | YES | ignore |
| >Complete Failure Cause Information Item | | 1.. <maxCellLineNB> | | | EACH | ignore |
| >>Cell ID | M | | ECGI 9.2.14 | | – | |
| >>Measurement Failure Cause List | | 1 | | | – | |
| >>>Measurement Failure Cause Item | | 1.. <maxFailedMeasurements> | | | EACH | ignore |
| >>>>Measurement Failed Report Characteristics | M | | BITSTRING (SIZE(32)) | Each position in the bitmap indicates measurement object that failed to be initiated in the eNB ₂ . First Bit = PRB Periodic, Second Bit = TNL load Ind Periodic, Third Bit = HW Load Ind Periodic, Fourth Bit = Composite Available Capacity Periodic, Fifth Bit = ABS Status Periodic, Sixth Bit = RSRP Measurement Report Periodic, Seventh Bit = CSI Report Periodic. Other bits shall be ignored by the eNB ₁ . | – | |
| >>>>Cause | M | | 9.2.6 | Failure cause for measurements that cannot be initiated | – | |

| Range bound | Explanation |
|----------------------|---|
| maxCellLineNB | Maximum no. cells that can be served by an eNB. Value is 256. |
| maxFailedMeasObjects | Max number of measurement objects that can fail per measurement. Value is 32. |

9.1.2.14 RESOURCE STATUS UPDATE

This message is sent by eNB₂ to neighbouring eNB₁ to report the results of the requested measurements.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|---------------------|-------------------------------|-------------------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| eNB1 Measurement ID | M | | INTEGER (1..4095,...) | Allocated by eNB ₁ | YES | reject |
| eNB2 Measurement ID | M | | INTEGER (1..4095,...) | Allocated by eNB ₂ | YES | reject |
| Cell Measurement Result | | 1 | | | YES | ignore |
| >Cell Measurement Result Item | | 1 .. <maxCellineNB> | | | EACH | ignore |
| >>Cell ID | M | | ECGI 9.2.14 | | | |
| >>Hardware Load Indicator | O | | 9.2.34 | | | |
| >>S1 TNL Load Indicator | O | | 9.2.35 | | | |
| >>Radio Resource Status | O | | 9.2.37 | | | |
| >>Composite Available Capacity Group | O | | 9.2.44 | | YES | ignore |
| >>ABS Status | O | | 9.2.58 | | YES | ignore |
| >>RSRP Measurement Report List | O | | 9.2.76 | | YES | ignore |
| >>CSI Report | O | | 9.2.79 | | YES | ignore |
| >>Cell Reporting Indicator | O | | ENUMERATED(stop request, ...) | | YES | ignore |

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

9.1.2.15 MOBILITY CHANGE REQUEST

This message is sent by an eNB₁ to neighbouring eNB₂ to initiate adaptation of mobility parameters.

Direction: eNB₁ → eNB₂.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------------------------|----------|-------|--|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| eNB1 Cell ID | M | | ECGI 9.2.14 | | YES | reject |
| eNB2 Cell ID | M | | ECGI 9.2.14 | | YES | reject |
| eNB1 Mobility Parameters | O | | Mobility Parameters Information 9.2.48 | Configuration change in eNB ₁ cell | YES | ignore |
| eNB2 Proposed Mobility Parameters | M | | Mobility Parameters Information 9.2.48 | Proposed configuration change in eNB ₂ cell | YES | reject |
| Cause | M | | 9.2.6 | | YES | reject |

9.1.2.16 MOBILITY CHANGE ACKNOWLEDGE

This message is sent by the eNB₂ to indicate that the eNB₂ Proposed Mobility Parameter proposed by eNB₁ was accepted.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| eNB1 Cell ID | M | | ECGI 9.2.14 | | YES | reject |
| eNB2 Cell ID | M | | ECGI 9.2.14 | | YES | reject |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |

9.1.2.17 MOBILITY CHANGE FAILURE

This message is sent by the eNB₂ to indicate that the eNB₂ Proposed Mobility Parameter proposed by eNB₁ was refused.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| eNB1 Cell ID | M | | ECGI 9.2.14 | | YES | ignore |
| eNB2 Cell ID | M | | ECGI 9.2.14 | | YES | ignore |
| Cause | M | | 9.2.6 | | YES | ignore |
| Mobility Parameters Modification Range | O | | 9.2.49 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |

9.1.2.18 RLF INDICATION

This message is sent by the eNB₂ to indicate an RRC re-establishment attempt or a reception of an RLF Report from a UE that suffered a connection failure at eNB₁.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-------|--|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| Failure cell PCI | M | | INTEGER (0..503, ...) | Physical Cell Identifier | YES | ignore |
| Re-establishment cell ECGI | M | | ECGI 9.2.14 | | YES | ignore |
| C-RNTI | M | | BIT STRING (SIZE (16)) | C-RNTI contained in the RRC Re-establishment Request message (TS 36.331 [9]) | YES | ignore |
| ShortMAC-I | O | | BIT STRING (SIZE (16)) | ShortMAC-I contained in the RRC Re-establishment Request message (TS 36.331 [9]) | YES | ignore |
| UE RLF Report Container | O | | OCTET STRING | <i>RLF-Report-r9</i> IE contained in the <i>UEInformationResponse</i> message (TS 36.331 [9]) | YES | ignore |
| RRC Conn Setup Indicator | O | | ENUMERATED(RRC Conn Setup, ...) | Included if the RLF Report within the <i>UE RLF Report Container</i> IE is retrieved after an RRC connection setup or an incoming successful handover | YES | reject |
| RRC Conn Reestab Indicator | O | | ENUMERATED(reconfigurationFailure, handoverFailure, otherFailure, ...) | The Reestablishment Cause in <i>RRCConnectionReestablishmentRequest</i> message (TS 36.331 [9]) | YES | ignore |
| UE RLF Report Container for extended bands | O | | OCTET STRING | <i>RLF-Report-v9e0</i> IE contained in the <i>UEInformationResponse</i> message (TS 36.331 [9]) | YES | ignore |

9.1.2.19 HANDOVER REPORT

This message is sent by the eNB₁ to report a handover failure event or other critical mobility problem.

Direction: eNB₁ → eNB₂.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|--|-------|--|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| Handover Report Type | M | | ENUMERATED (HO too early, HO to wrong cell, ..., InterRAT ping-pong) | | YES | ignore |
| Handover Cause | M | | Cause 9.2.6 | Indicates handover cause employed for handover from eNB ₂ | YES | ignore |
| Source cell ECGI | M | | ECGI 9.2.14 | ECGI of source cell for handover procedure (in eNB ₂) | YES | ignore |
| Failure cell ECGI | M | | ECGI 9.2.14 | ECGI of target cell for handover procedure (in eNB ₁) | YES | ignore |
| Re-establishment cell ECGI | C- ifHandoverR eportType HoToWrong Cell | | ECGI 9.2.14 | ECGI of cell where UE attempted re- establishment | YES | ignore |
| Target cell in UTRAN | C- ifHandoverR eportType InterRATpin gpong | | OCTET STRING | Encoded according to <i>UTRAN Cell ID</i> in the <i>Last Visited UTRAN Cell Information</i> IE, as defined in in TS 25.413 [24] | YES | ignore |
| Source cell C-RNTI | O | | BIT STRING (SIZE (16)) | C-RNTI allocated at the source eNB (in eNB ₂) contained in the AS-config (TS 36.331 [9]). | YES | ignore |
| Mobility Information | O | | BIT STRING (SIZE (32)) | Information provided in the HANDOVER REQUEST message from eNB ₂ . | YES | ignore |
| UE RLF Report Container | O | | OCTET STRING | The UE RLF Report Container IE received in the RLF INDICATION message. | YES | ignore |
| UE RLF Report Container for extended bands | O | | OCTET STRING | The <i>UE RLF Report Container for extended bands</i> IE received in the RLF INDICATION message. | YES | ignore |

| Condition | Explanation |
|---------------------------------------|---|
| ifHandoverReportType HoToWrongCell | This IE shall be present if the <i>Handover Report Type</i> IE is set to the value "HO to wrong cell" |
| ifHandoverReportType InterRATpingpong | This IE shall be present if the <i>Handover Report Type</i> IE is set to the value "InterRAT ping-pong" |

9.1.2.20 CELL ACTIVATION REQUEST

This message is sent by an eNB to a peer eNB to request a previously switched-off cell(s) to be re-activated.

Direction: eNB₁ → eNB₂.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--------------------------|----------|------------------------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Served Cells To Activate | | 1 .. <maxCellineNB> | | | GLOBAL | reject |
| >ECGI | M | | 9.2.14 | | - | |

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

9.1.2.21 CELL ACTIVATION RESPONSE

This message is sent by an eNB to a peer eNB to indicate that one or more cell(s) previously switched-off has(have) been activated.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|------------------------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Activated Cell List | | 1 .. <maxCellineNB> | | | GLOBAL | ignore |
| >ECGI | M | | 9.2.14 | | - | |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |

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

9.1.2.22 CELL ACTIVATION FAILURE

This message is sent by an eNB to a peer eNB to indicate cell activation failure.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |

9.1.2.23 X2 RELEASE

This message is used to indicate that the signalling connection to an eNB is unavailable.

Direction: eNB₁ → eNB₂.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Global eNB ID | M | | 9.2.22 | | YES | reject |

9.1.2.24 X2AP MESSAGE TRANSFER

This message is used for indirect transport of an X2AP message (except the X2AP MESSAGE TRANSFER message) between two eNBs, and to allow an eNB to perform registration.

Direction: eNB₁ → eNB₂.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------|----------|-------|-----------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| RNL Header | M | | 9.2.68 | | YES | reject |
| X2AP Message | O | | OCTET STRING | Includes any X2AP message except the X2AP MESSAGE TRANSFER message | YES | reject |

9.1.2.25 X2 REMOVAL REQUEST

This message is sent by an eNB to a neighbouring eNB to initiate the removal of the signaling connection.

Direction: eNB₁ → eNB₂.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------------|----------|-------|----------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Global eNB ID | M | | 9.2.22 | | YES | reject |
| X2 Removal Threshold | O | | X2 Benefit Value 9.2.90 | | YES | reject |

9.1.2.26 X2 REMOVAL RESPONSE

This message is sent by an eNB to a neighbouring eNB to acknowledge the initiation of removal of the signaling connection.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Global eNB ID | M | | 9.2.22 | | YES | reject |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |

9.1.2.27 X2 REMOVAL FAILURE

This message is sent by the eNB to indicate that removing the signaling connection cannot be accepted.

Direction: eNB₂ → eNB₁.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |

9.1.2.28 RETRIEVE UE CONTEXT REQUEST

This message is sent by the new eNB to request the old eNB to transfer the UE Context to the new eNB.

Direction: new eNB → old eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------|----------|-------|-----------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| New eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the new eNB | YES | reject |
| New eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the new eNB | YES | reject |
| Resume ID | M | | 9.2.91 | | YES | reject |
| ShortMAC-I | M | | BIT STRING (SIZE (16)) | RRC Resume: Corresponds to the <i>ShortResumeMAC-I</i> in the <i>RRCConnectionResumeRequest</i> message as defined in TS 36.331 [9] RRC Reestablishment: Corresponds to the <i>ShortMAC-I</i> in the <i>RRCConnectionReestablishmentRequest</i> message as defined in TS 36.331 [9]. | YES | reject |
| New E-UTRAN Cell Identifier | M | | BIT STRING (SIZE (28)) | RRC Resume: Corresponds to the <i>cellIdentity</i> within the <i>VarShortResumeMAC-Input</i> as specified in TS 36.331 [9]. RRC Reestablishment: Corresponds to the <i>cellIdentity</i> within the <i>VarShortMAC-Input</i> as specified in TS 36.331 [9]. | YES | reject |
| C-RNTI | O | | BIT STRING (SIZE (16)) | C-RNTI contained in the RRC Re-establishment Request message (TS 36.331 [9]). If this IE is present, the Resume ID IE is ignored | YES | reject |
| Failure cell PCI | O | | INTEGER (0..503, ...) | Physical Cell Identifier | YES | reject |

9.1.2.29 RETRIEVE UE CONTEXT RESPONSE

This message is sent by the old eNB to transfer the UE context to the new eNB.

Direction: old eNB → new eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|-------------------------|----------------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| New eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the new eNB | YES | ignore |
| New eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the new eNB | YES | ignore |
| Old eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the old eNB | YES | ignore |
| Old eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the old eNB | YES | ignore |
| GUMMEI | M | | 9.2.16 | | YES | reject |
| UE Context Information | | 1 | | | YES | reject |
| >MME UE S1AP ID | M | | INTEGER (0..2 ³² - 1) | MME UE S1AP ID allocated at the MME | – | |
| >UE Security Capabilities | M | | 9.2.29 | | – | |
| >AS Security Information | M | | 9.2.30 | | – | |
| >UE Aggregate Maximum Bit Rate | M | | 9.2.12 | | – | |
| >Subscriber Profile ID for RAT/Frequency priority | O | | 9.2.25 | | – | |
| >E-RABs To Be Setup List | | 1 | | | – | |
| >>E-RABs To Be Setup Item | | 1 .. <maxno of Bearers> | | | EACH | ignore |
| >>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>E-RAB Level QoS Parameters | M | | 9.2.9 | Includes necessary QoS parameters | – | |
| >>>Bearer Type | O | | 9.2.92 | | – | |
| >>>UL GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | SGW endpoint of the S1 transport bearer. For delivery of UL PDUs. | YES | reject |
| >>>DL Forwarding | O | | 9.2.5 | | YES | ignore |
| >RRC Context | M | | OCTET STRING | Includes either the RRC Handover Preparation Information message as defined in subclause 10.2.2 of TS 36.331 [9], or the <i>HandoverPreparationInformation-NB</i> message as defined in subclause 10.6.2 of TS 36.331 [9]. | – | |
| >Handover Restriction List | O | | 9.2.3 | | – | |
| >Location Reporting Information | O | | 9.2.21 | Includes the necessary parameters for location reporting | – | |

| | | | | | | |
|---|---|--|-------------------------|--|-----|--------|
| >Management Based MDT Allowed | O | | 9.2.59 | | – | |
| >Management Based MDT PLMN List | O | | MDT PLMN List 9.2.64 | | – | |
| >UE Sidelink Aggregate Maximum Bit Rate | O | | 9.2.97 | This IE applies only if the UE is authorized for V2X services. | YES | ignore |
| Trace Activation | O | | 9.2.2 | | YES | ignore |
| SRVCC Operation Possible | O | | 9.2.33 | | YES | ignore |
| Masked IMEISV | O | | 9.2.69 | | YES | ignore |
| Expected UE Behaviour | O | | 9.2.70 | | YES | ignore |
| ProSe Authorized | O | | 9.2.78 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| V2X Services Authorized | O | | 9.2.93 | | YES | ignore |
| Aerial UE subscription information | O | | 9.2.129 | | YES | ignore |
| Subscription Based UE Differentiation Information | O | | 9.2.136 | | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.2.30 RETRIEVE UE CONTEXT FAILURE

This message is sent by the old eNB to inform the new eNB that the Retrieve UE Context procedure has failed.

Direction: old eNB → new eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------|----------|-------|-----------------------------------|--------------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| New eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the new eNB | YES | ignore |
| New eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the new eNB | YES | ignore |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |

9.1.2.31 EN-DC X2 SETUP REQUEST

This message is sent by an initiating node to a neighbouring node, both nodes able to interact for EN-DC, to transfer the initialization information for a TNL association.

Direction: eNB → en-gNB, en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------------------------|----------|-----------------------------------|-------------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| CHOICE <i>Initiating NodeType</i> | M | | | | | |
| > <i>eNB</i> | | | | | | |
| >>Global eNB ID | M | | 9.2.22 | | YES | reject |
| >>>List of Served E-UTRA Cells | | 1 .. < <i>maxCellineNB</i> > | | Complete list of cells served by the eNB | YES | reject |
| >>>Served E-UTRA Cell Information | M | | Served Cell Information 9.2.8 | | – | |
| >>>NR Neighbour Information | O | | 9.2.98 | NR neighbours | YES | ignore |
| > <i>en-gNB</i> | | | | | | |
| >>Global en-gNB ID | M | | 9.2.112 | | YES | reject |
| >>>List of Served NR Cells | | 1 .. < <i>maxCellinengNB</i> > | | Complete list of cells served by the en-gNB. | YES | reject |
| >>>Served NR Cell Information | M | | 9.2.110 | | – | |
| >>>NR Neighbour Information | O | | 9.2.98 | NR neighbours. | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

| Range bound | Explanation |
|----------------|--|
| maxCellineNB | Maximum no. cells that can be served by an eNB. Value is 256. |
| maxCellinengNB | Maximum no. cells that can be served by an en-gNB. Value is 16384. |

9.1.2.32 EN-DC X2 SETUP RESPONSE

This message is sent by a neighbouring node to an initiating node, both nodes able to interact for EN-DC, to transfer the initialization information for a TNL association.

Direction: eNB → en-gNB, en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------------------------|----------|--------------------------|-------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| CHOICE Responding NodeType | M | | | | | |
| >eNB | | | | | | |
| >>Global eNB ID | M | | 9.2.22 | | YES | reject |
| >>>List of Served E-UTRA Cells | | 1 .. <maxCellineNB> | | Complete list of cells served by the eNB | YES | reject |
| >>>Served E-UTRA Cell Information | M | | Served Cell Information 9.2.8 | | – | |
| >>>NR Neighbour Information | O | | 9.2.98 | NR neighbours | YES | ignore |
| >en-gNB | | | | | | |
| >>Global en-gNB ID | M | | 9.2.112 | | YES | reject |
| >>>List of Served NR Cells | | 1 .. <maxCellinengNB> | | Complete list of cells served by the en-gNB | YES | reject |
| >>>Served NR Cell Information | M | | 9.2.110 | | – | |
| >>>NR Neighbour Information | O | | 9.2.98 | NR neighbours | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

| Range bound | Explanation |
|----------------|--|
| maxCellineNB | Maximum no. cells that can be served by an eNB. Value is 256. |
| maxCellinengNB | Maximum no. cells that can be served by an en-gNB. Value is 16384. |

9.1.2.33 EN-DC X2 SETUP FAILURE

This message is sent by the neighbouring node to indicate EN-DC X2 Setup failure.

Direction: eNB → en-gNB, en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| Time To Wait | O | | 9.2.32 | | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

9.1.2.34 EN-DC CONFIGURATION UPDATE

This message is sent by an initiating node to a peer neighbouring node, both nodes able to interact for EN-DC, to transfer updated information for a TNL association.

Direction: eNB → en-gNB, en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------------|----------|---------------------------|-------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| CHOICE Initiating NodeType | M | | | | | |
| >eNB | | | | | | |
| >>Cell Assistance Information | O | | 9.2.115 | | YES | ignore |
| >>>Served E-UTRA Cells To Add | | 0 .. <maxCellineNB> | | | GLOBAL | reject |
| >>>>Served E-UTRA Cell Information | M | | Served Cell Information 9.2.8 | | - | |
| >>>>NR Neighbour Information | O | | 9.2.98 | NR neighbours | YES | ignore |
| >>>>Served E-UTRA Cells To Modify | | 0 .. <maxCellineNB> | | Complete list of modified cells served by the eNB | GLOBAL | reject |
| >>>>Old ECGI | M | | ECGI 9.2.14 | Old E-UTRAN Cell Global Identifier | - | |
| >>>>Served E-UTRA Cell Information | M | | Served Cell Information 9.2.8 | | - | |
| >>>>NR Neighbour Information | O | | 9.2.98 | NR neighbours | YES | ignore |
| >>>>Served E-UTRA Cells To Delete | | 0 .. <maxCellineNB> | | Complete list of deleted cells served by the eNB | GLOBAL | reject |
| >>>>Old ECGI | M | | ECGI 9.2.14 | Old E-UTRAN Cell Global Identifier of the cell to be deleted | - | |
| >en-gNB | | | | | | |
| >>>>Served NR Cells To Add | | 0 .. <maxCellinen-gNB> | | | GLOBAL | reject |
| >>>>>Served NR Cell Information | M | | 9.2.110 | | - | |
| >>>>>NR Neighbour Information | O | | 9.2.98 | NR neighbours | YES | ignore |
| >>>>>Served NR Cells To Modify | | 0 .. <maxCellinen-gNB> | | | GLOBAL | reject |
| >>>>>Old NR-CGI | M | | NR CGI 9.2.111 | | - | |
| >>>>>Served NR Cell Information | M | | 9.2.110 | | - | |
| >>>>>NR Deactivation Indication | O | | ENUMERATED(deactivated, ...) | Indicates that the concerned NR cell is switched off for energy saving reasons. If this IE is not included, indicates that the concerned cell is activated. | YES | ignore |
| >>>>>NR Neighbour Information | O | | 9.2.98 | NR neighbours | YES | ignore |
| >>>>>Served NR Cells To Delete | | 0 .. <maxCellinen-gNB> | | | GLOBAL | reject |

| | | | | | | |
|-------------------------------|---|--|-------------------|--|-----|--------|
| >>>Old NR-CGI | M | | NR CGI 9.2.111 | | - | |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

| Range bound | Explanation |
|----------------|--|
| maxCellineNB | Maximum no. cells that can be served by an eNB. Value is 256. |
| maxCellinengNB | Maximum no. cells that can be served by an en-gNB. Value is 16384. |

9.1.2.35 EN-DC CONFIGURATION UPDATE ACKNOWLEDGE

This message is sent by a neighbouring node to a peer node, both nodes able to interact for EN-DC, to acknowledge update of information for a TNL association.

Direction: en-gNB → eNB, eNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|--------------------------|-----------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| CHOICE Responding NodeType | M | | | | | |
| >eNB | | | | | | |
| >en-gNB | | | | | | |
| >>List of Served NR Cells | | 0 .. <maxCellinengNB> | | Complete or limited list of cells served by the en-gNB, if requested by the eNB. | | |
| >>>Served NR Cell Information | M | | 9.2.110 | | | |
| >>>NR Neighbour Information | O | | 9.2.98 | NR neighbours. | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

| Range bound | Explanation |
|----------------|--|
| maxCellinengNB | Maximum no. cells that can be served by an en-gNB. Value is 16384. |

9.1.2.36 EN-DC CONFIGURATION UPDATE FAILURE

This message is sent by a neighbouring node to a peer node to indicate EN-DC eNB Configuration Update Failure.

Direction: en-gNB → eNB, eNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| Time To Wait | O | | 9.2.32 | | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

9.1.2.37 EN-DC CELL ACTIVATION REQUEST

This message is sent by an eNB to a peer en-gNB to request a previously switched-off cell(s) to be re-activated.

Direction: eNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|-----------------------------------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Served NR Cells To Activate | | 1 | | | GLOBAL | reject |
| >Served NR Cells To Activate Item | | 1 .. < <i>maxCellinengNB</i> > | | | | |
| >>NR CGI | M | | 9.2.111 | | - | |
| Activation ID | M | | INTEGER (0..255) | Allocated by the eNB | YES | reject |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

| Range bound | Explanation |
|----------------|--|
| maxCellinengNB | Maximum no. cells that can be served by an en-gNB. Value is 16384. |

9.1.2.38 EN-DC CELL ACTIVATION RESPONSE

This message is sent by an en-gNB to a peer eNB to indicate that one or more cell(s) previously switched-off has (have) been activated.

Direction: en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------------------------|----------|-----------------------------------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Activated NR Cell List | | 1 | | | GLOBAL | ignore |
| >Activated NR Cell Item | | 1 .. < <i>maxCellinengNB</i> > | | | | |
| >>NR CGI | M | | 9.2.111 | | - | |
| Activation ID | M | | INTEGER (0..255) | Allocated by the eNB | YES | reject |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

| Range bound | Explanation |
|----------------|--|
| maxCellinengNB | Maximum no. cells that can be served by an en-gNB. Value is 16384. |

9.1.2.39 EN-DC CELL ACTIVATION FAILURE

This message is sent by an en-gNB to a peer eNB to indicate cell activation failure.

Direction: en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Activation ID | M | | INTEGER (0..255) | Allocated by the eNB | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

9.1.2.40 EN-DC X2 REMOVAL REQUEST

This message is sent by an initiating node to a neighbouring node to initiate the removal of the signaling connection.

Direction: eNB → en-gNB, en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------------|----------|-------|----------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| CHOICE <i>Initiating Node Type</i> | M | | | | | |
| > <i>eNB</i> | | | | | | |
| >>Global eNB ID | M | | 9.2.22 | | YES | reject |
| > <i>en-gNB</i> | | | | | | |
| >>Global en-gNB ID | M | | 9.2.112 | | | |
| X2 Removal Threshold | O | | X2 Benefit Value 9.2.90 | | YES | reject |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

9.1.2.41 EN-DC X2 REMOVAL RESPONSE

This message is sent by an initiating node to a neighbouring node to acknowledge the initiation of removal of the signaling connection.

Direction: eNB → en-gNB, en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| CHOICE <i>Initiating Node Type</i> | M | | | | | |
| > <i>eNB</i> | | | | | | |
| >>Global eNB ID | M | | 9.2.22 | | YES | reject |
| > <i>en-gNB</i> | | | | | | |
| >>Global en-gNB ID | M | | 9.2.112 | | YES | reject |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

9.1.2.42 EN-DC X2 REMOVAL FAILURE

This message is sent by the initiating node to indicate that removing the signaling connection cannot be accepted.

Direction: eNB → en-gNB, en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

9.1.2.43 DATA FORWARDING ADDRESS INDICATION

This message is sent by the new eNB to indicate to the old eNB forwarding addresses for each E-RAB for which it admits data forwarding.

Direction: new eNB → old eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|------------------------------|-----------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| New eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the new eNB | YES | ignore |
| New eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the new eNB | YES | ignore |
| Old eNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the old eNB | YES | ignore |
| Old eNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the old eNB | YES | ignore |
| E-RABs Data Forwarding Address List | | 1 | | | YES | ignore |
| > E-RABs Data Forwarding Address Item | | 1 .. <maxnoofBearers > | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>DL GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | – | |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.2.44 EN-DC CONFIGURATION TRANSFER

This message is sent by an eNB in order to transfer the EN-DC SON Configuration container to an en-gNB, or it is sent by an en-gNB in order to transfer the EN-DC SON Configuration container to an eNB.

Direction: eNB → en-gNB or en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------------------------|----------|-------|-----------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| EN-DC SON Configuration Transfer | O | | OCTET STRING | Contains the <i>EN-DC SON Configuration Transfer</i> IE as defined in TS 36.413 [4]. | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

9.1.3 Messages for Dual Connectivity Procedures

9.1.3.1 SENB ADDITION REQUEST

This message is sent by the MeNB to the SeNB to request the preparation of resources for dual connectivity operation for a specific UE

Direction: MeNB → SeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------------|---------------------|--------------------------|---|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | reject |
| UE Security Capabilities | C-ifSCGBearerOption | | 9.2.29 | | YES | reject |
| SeNB Security Key | C-ifSCGBearerOption | | 9.2.72 | The S-KeNB which is provided by the MeNB, see TS 33.401 [18]. | YES | reject |
| SeNB UE Aggregate Maximum Bit Rate | M | | UE Aggregate Maximum Bit Rate 9.2.12 | The UE Aggregate Maximum Bit Rate is split into MeNB UE Aggregate Maximum Bit Rate and SeNB UE Aggregate Maximum Bit Rate which are enforced by MeNB and SeNB respectively. | YES | reject |
| Serving PLMN | O | | PLMN Identity 9.2.4 | The serving PLMN of the SCG in the SeNB. | YES | ignore |
| E-RABs To Be Added List | | 1 | | | YES | reject |
| >E-RABs To Be Added Item | | 1 .. <maxnoofBearers> | | | EACH | reject |
| >>CHOICE Bearer Option | M | | | | | |
| >>>SCG Bearer | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>E-RAB Level QoS Parameters | M | | 9.2.9 | Includes necessary QoS parameters | – | |
| >>>>DL Forwarding | O | | 9.2.5 | | – | |
| >>>>S1 UL GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | SGW endpoint of the S1 transport bearer. For delivery of UL PDUs. | – | |
| >>>>Correlation ID | O | | Correlation ID 9.2.84 | | – | |
| >>>>SIPTO Correlation ID | O | | Correlation ID 9.2.84 | | – | |
| >>>>Bearer Type | O | | 9.2.92 | | YES | reject |
| >>>>Split Bearer | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>E-RAB Level QoS Parameters | M | | 9.2.9 | Includes necessary QoS parameters | – | |
| >>>>MeNB GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2 transport bearer. For delivery of UL PDUs. | – | |
| MeNB to SeNB Container | M | | OCTET STRING | Includes the SCG-ConfigInfo message as defined in TS 36.331 [9] | YES | reject |
| CSG Membership Status | O | | 9.2.52 | | YES | reject |
| SeNB UE X2AP ID | O | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | reject |

| | | | | | | |
|---------------------------|---|--|--------------------------------|-----------------------|-----|--------|
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | reject |
| Expected UE Behaviour | O | | 9.2.70 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

| Condition | Explanation |
|-------------------|---|
| ifSCGBearerOption | This IE shall be present if the <i>Bearer Option</i> IE is set to the value "SCG bearer". |

9.1.3.2 SENB ADDITION REQUEST ACKNOWLEDGE

This message is sent by the SeNB to confirm the MeNB about the SeNB addition preparation.

Direction: SeNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|--------------------------|--------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | reject |
| E-RABs Admitted To Be Added List | | 1 | | | YES | ignore |
| >E-RABs Admitted To Be Added Item | | 1 .. <maxnoofBearers> | | | EACH | ignore |
| >>CHOICE Bearer Option | M | | | | | |
| >>>SCG Bearer | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>S1 DL GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | SeNB endpoint of the S1 transport bearer. For delivery of DL PDUs. | – | |
| >>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | – | |
| >>>>UL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of UL PDUs | – | |
| >>>Split Bearer | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>SeNB GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | Endpoint of the X2 transport bearer at the SeNB. | – | |
| E-RABs Not Admitted List | O | | E-RAB List 9.2.28 | A value for <i>E-RAB ID</i> shall only be present once in <i>E-RABs Admitted List</i> IE and in <i>E-RABs Not Admitted List</i> IE. | YES | ignore |
| SeNB to MeNB Container | M | | OCTET STRING | Includes the SCG-Config message as defined in TS 36.331 [9] | YES | reject |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| GW Transport Layer Address | O | | BIT STRING (1..160, ...) | Indicating GW Transport Layer Address. | YES | ignore |
| SIPTO L-GW Transport Layer Address | O | | BIT STRING (1..160, ...) | Indicating SIPTO L-GW Transport Layer Address. | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | reject |
| Tunnel Information for BBF | O | | Tunnel Information 9.2.89 | Indicating eNB's Local IP Address assigned by the broadband access provider, UDP port Number. | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.3.3 SENB ADDITION REQUEST REJECT

This message is sent by the SeNB to inform the MeNB that the SeNB Addition Preparation has failed.

Direction: SeNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|-----------------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | reject |

9.1.3.4 SENB RECONFIGURATION COMPLETE

This message is sent by the MeNB to the SeNB to indicate whether the configuration requested by the SeNB was applied by the UE.

Direction: MeNB → SeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-------|-----------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | reject |
| Response Information | M | | | | YES | ignore |
| >CHOICE <i>Response Type</i> | M | | | | | |
| >> <i>Configuration successfully applied</i> | | | | | | |
| >>>MeNB to SeNB Container | O | | OCTET STRING | Includes the SCG- <i>ConfigInfo</i> message as defined in TS 36.331 [9] | - | |
| >> <i>Configuration rejected by the MeNB</i> | | | | | | |
| >>>Cause | M | | 9.2.6 | | - | |
| >>>MeNB to SeNB Container | O | | OCTET STRING | Includes the SCG- <i>ConfigInfo</i> message as defined in TS 36.331 [9] | - | |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | reject |

9.1.3.5 SENB MODIFICATION REQUEST

This message is sent by the MeNB to the SeNB to request the preparation to modify SeNB resources for a specific UE.

Direction: MeNB → SeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|------------------------------------|--------------------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| SCG Change Indication | O | | 9.2.73 | | YES | ignore |
| Serving PLMN | O | | PLMN Identity 9.2.4 | The serving PLMN of the SCG in the SeNB. | YES | ignore |
| UE Context Information | | <i>0..1</i> | | | YES | reject |
| >UE Security Capabilities | O | | 9.2.29 | | – | |
| >SeNB Security Key | O | | 9.2.72 | | – | |
| >SeNB UE Aggregate Maximum Bit Rate | O | | UE Aggregate Maximum Bit Rate 9.2.12 | | – | |
| >E-RABs To Be Added List | | <i>0..1</i> | | | – | |
| >>E-RABs To Be Added Item | | <i>1 .. <maxnoofBearers></i> | | | EACH | ignore |
| >>>CHOICE <i>Bearer Option</i> | M | | | | | |
| >>>>SCG <i>Bearer</i> | | | | | | |
| >>>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>>E-RAB Level QoS Parameters | M | | 9.2.9 | Includes necessary QoS parameters | – | |
| >>>>>DL Forwarding | O | | 9.2.5 | | – | |
| >>>>>S1 UL GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | SGW endpoint of the S1 transport bearer. For delivery of UL PDUs. | – | |
| >>>>>Correlation ID | O | | Correlation ID 9.2.84 | | – | |
| >>>>>SIPTO Correlation ID | O | | Correlation ID 9.2.84 | | – | |
| >>>>>Bearer Type | O | | 9.2.92 | | YES | reject |
| >>>>>Split <i>Bearer</i> | | | | | | |
| >>>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>>E-RAB Level QoS Parameters | M | | 9.2.9 | Includes necessary QoS parameters | – | |
| >>>>>MeNB GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2 transport bearer. For delivery of UL PDUs. | – | |
| >E-RABs To Be Modified List | | <i>0..1</i> | | | – | |
| >>E-RABs To Be Modified Item | | <i>1 .. <maxnoofBearers></i> | | | EACH | ignore |
| >>>CHOICE <i>Bearer Option</i> | M | | | | | |
| >>>>SCG <i>Bearer</i> | | | | | | |
| >>>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>>E-RAB Level QoS Parameters | O | | 9.2.9 | Includes QoS parameters to be modified | – | |

| | | | | | | |
|---------------------------------------|---|-----------------------|--------------------------------|--|------|--------|
| >>>>S1 UL GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | SGW endpoint of the S1 transport bearer. For delivery of UL PDUs. | – | |
| >>>> <i>Split Bearer</i> | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>E-RAB Level QoS Parameters | O | | 9.2.9 | Includes QoS parameters to be modified | – | |
| >>>>MeNB GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2 transport bearer. For delivery of UL PDUs. | – | |
| >E-RABs To Be Released List | | 0..1 | | | – | |
| >>E-RABs To Be Released Item | | 1 .. <maxnoofBearers> | | | EACH | ignore |
| >>>CHOICE Bearer Option | M | | | | | |
| >>>>SCG Bearer | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | – | |
| >>>>UL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer. used for forwarding of UL PDUs | – | |
| >>>> <i>Split Bearer</i> | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | – | |
| MeNB to SeNB Container | O | | OCTET STRING | Includes the SCG-ConfigInfo message as defined in TS 36.331 [9] | YES | ignore |
| CSG Membership Status | O | | 9.2.52 | | YES | reject |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | reject |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.3.6 SENB MODIFICATION REQUEST ACKNOWLEDGE

This message is sent by the SeNB to confirm the MeNB's request to modify the SeNB resources for a specific UE.

Direction: SeNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-----------------------------|---------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | ignore |
| SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | ignore |
| E-RABs Admitted List | | 0..1 | | | YES | ignore |
| >E-RABs Admitted To Be Added List | | 1 | | | – | |
| >>E-RABs Admitted To Be Added Item | | 1.. <maxnoofBearers > | | | EACH | ignore |
| >>>CHOICE <i>Bearer Option</i> | M | | | | | |
| >>>>SCG <i>Bearer</i> | | | | | | |
| >>>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>>S1 DL GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | SeNB endpoint of the S1 transport bearer. For delivery of DL PDUs. | – | |
| >>>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | – | |
| >>>>>UL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of UL PDUs | – | |
| >>>>>Split <i>Bearer</i> | | | | | | |
| >>>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>>SeNB GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | Endpoint of the X2 transport bearer at the SeNB. | – | |
| >E-RABs Admitted To Be Modified List | | 0..1 | | | – | |
| >>E-RABs Admitted To Be Modified Item | | 1.. <maxnoofBearers > | | | EACH | ignore |
| >>>CHOICE <i>Bearer Option</i> | M | | | | | |
| >>>>SCG <i>Bearer</i> | | | | | | |
| >>>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>>S1 DL GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | SeNB endpoint of the S1 transport bearer. For delivery of DL PDUs. | – | |
| >>>>>Split <i>Bearer</i> | | | | | | |
| >>>>>E-RAB ID | M | | 9.2.23 | | – | |

| | | | | | | |
|---------------------------------------|---|-----------------------------|--------------------------------|--|------|--------|
| >>>>SeNB GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Endpoint of the X2 transport bearer at the SeNB. | – | |
| >E-RABs Admitted To Be Released List | | 0..1 | | | – | |
| >>E-RABs Admitted To Be Released Item | | 1.. <maxnoofBearers > | | | EACH | ignore |
| >>>CHOICE Bearer Option | M | | | | | |
| >>>>SCG Bearer | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>Split Bearer | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| E-RABs Not Admitted List | O | | E-RAB List 9.2.28 | A value for <i>E-RAB ID</i> shall only be present once in <i>E-RABs Admitted List IE</i> and in <i>E-RABs Not Admitted List IE</i> . | YES | ignore |
| SeNB to MeNB Container | O | | OCTET STRING | Includes the <i>SCG-Config</i> message as defined in TS 36.331 [9] | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | ignore |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | Ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.3.7 SENB MODIFICATION REQUEST REJECT

This message is sent by the SeNB to inform the MeNB that the MeNB initiated SeNB Modification Preparation has failed.

Direction: SeNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|-----------------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | ignore |
| SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | ignore |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | ignore |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | ignore |

9.1.3.8 SENB MODIFICATION REQUIRED

This message is sent by the SeNB to the MeNB to request the modification of SeNB resources for a specific UE.

Direction: SeNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------------------|----------|--------------------------|-----------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| SCG Change Indication | O | | 9.2.73 | | YES | ignore |
| E-RABs To Be Released List | | 0..1 | | | YES | ignore |
| >E-RABs To Be Released Item | | 1 .. <maxnoofBearers> | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>Cause | M | | 9.2.6 | | – | |
| SeNB to MeNB Container | O | | OCTET STRING | Includes the SCG-Config message as defined in TS 36.331 [9] | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | reject |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.3.9 SENB MODIFICATION CONFIRM

This message is sent by the MeNB to inform the SeNB about the successful modification.

Direction: MeNB → SeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|--------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | ignore |
| SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | ignore |
| MeNB to SeNB Container | O | | OCTET STRING | Includes the SCG- <i>ConfigInfo</i> message as defined in TS 36.331 [9] | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | ignore |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | ignore |

9.1.3.10 SENB MODIFICATION REFUSE

This message is sent by the MeNB to inform the SeNB that the SeNB initiated SeNB Modification has failed.

Direction: MeNB → SeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|--------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | ignore |
| SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | ignore |
| Cause | M | | 9.2.6 | | YES | ignore |
| MeNB to SeNB Container | O | | OCTET STRING | Includes the SCG- <i>ConfigInfo</i> message as defined in TS 36.331 [9] | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | ignore |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | ignore |

9.1.3.11 SENB RELEASE REQUEST

This message is sent by the MeNB to the SeNB to request the release of resources.

Direction: MeNB → SeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|------------------------|--------------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID | O | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | reject |
| Cause | O | | 9.2.6 | | YES | ignore |
| E-RABs To Be Released List | | 0..1 | | | YES | ignore |
| > E-RABs To Be Released Item | | 1 .. <maxnoofBearers > | | | EACH | ignore |
| >>CHOICE <i>Bearer Option</i> | M | | | | | |
| >>>SCG <i>Bearer</i> | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>UL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of UL PDUs | – | |
| >>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer. used for forwarding of DL PDUs | – | |
| >>>> <i>Split Bearer</i> | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer. used for forwarding of DL PDUs | – | |
| UE Context Kept Indicator | O | | 9.2.85 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | reject |
| MakeBeforeBreak Indicator | O | | ENUMERATED (True, ...) | | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.3.12 SENB RELEASE REQUIRED

This message is sent by the SeNB to request the release of all resources for a specific UE at the SeNB.

Direction: SeNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|-----------------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | reject |

9.1.3.13 SENB RELEASE CONFIRM

This message is sent by the MeNB to confirm the release of all resources for a specific UE at the SeNB.

Direction: MeNB → SeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-------------------------------------|--------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | ignore |
| SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | ignore |
| E-RABs to be Released List | | <i>0..1</i> | | | YES | ignore |
| >E-RABs To Be Released Item | | <i>1 .. <maxnoofBearers ></i> | | | – | |
| >>CHOICE Bearer Option | M | | | | | |
| >>>SCG Bearer | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>UL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of UL PDUs | – | |
| >>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | – | |
| >>>Split Bearer | | | | | | |
| >>>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | – | |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | ignore |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.3.14 SENB COUNTER CHECK REQUEST

This message is sent by the SeNB to request the verification of the value of the PDCP COUNTs associated with SCG bearers established in the SeNB.

Direction: SeNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|------------------------|--------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | ignore |
| SeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the SeNB | YES | ignore |
| E-RABs Subject to Counter Check List | | 1 | | | YES | ignore |
| >E-RABs Subject to Counter Check Item | | 1 .. <maxnoofBearers > | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | - | |
| >>UL COUNT | M | INTEGER(0..4294967295) | | Indicates the value of uplink COUNT associated to this E-RAB. | - | |
| >>DL COUNT | M | INTEGER(0..4294967295) | | Indicates the value of downlink COUNT associated to this E-RAB. | - | |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | ignore |
| SeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the SeNB | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.4 Messages for E-UTRAN-NR Dual Connectivity Procedures

9.1.4.1 SGNB ADDITION REQUEST

This message is sent by the MeNB to the en-gNB to request the preparation of resources for EN-DC operation for a specific UE

Direction: MeNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|--------------------------------------|------------------------------|---|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | reject |
| NR UE Security Capabilities | M | | 9.2.107 | | YES | reject |
| SgNB Security Key | M | | 9.2.101 | The S-KgNB which is provided by the MeNB, see TS 33.401 [18]. | YES | reject |
| SgNB UE Aggregate Maximum Bit Rate | M | | UE Aggregate Maximum Bit Rate 9.2.12 | The UE Aggregate Maximum Bit Rate is split into MeNB UE Aggregate Maximum Bit Rate and SgNB UE Aggregate Maximum Bit Rate which are enforced by MeNB and en-gNB respectively. | YES | reject |
| Selected PLMN | O | | PLMN Identity 9.2.4 | The selected PLMN of the SCG in the en-gNB. | YES | ignore |
| Handover Restriction List | O | | 9.2.3 | | YES | ignore |
| E-RABs To Be Added List | | 1 | | | YES | reject |
| >E-RABs To Be Added Item | | 1 .. <maxnoofBeare rs> | | | EACH | reject |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>DRB ID | M | | 9.2.122 | | – | |
| >>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>CHOICE Resource Configuration | M | | | | | |
| >>>PDCP present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "present". | | |
| >>>>Full E-RAB Level QoS Parameters | M | | E-RAB Level QoS Parameters 9.2.9 | Includes the E-RAB level QoS parameters as received on S1-MME. | – | |
| >>>>Maximum MCG admissible E-RAB Level QoS Parameters | C- ifMCGand SCGpresent _GBR | | GBR QoS Information 9.2.10 | Includes the GBR QoS Information admissible by the MCG. | – | |
| >>>>DL Forwarding | O | | 9.2.5 | | – | |
| >>>>MeNB DL GTP Tunnel Endpoint at MCG | C- ifMCGpres ent | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2-U transport bearer at MCG. For delivery of DL PDCP PDUs. | – | |
| >>>>S1 UL GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | SGW endpoint of the S1-U transport bearer. For delivery of UL PDUs from the en-gNB. | – | |

| | | | | | | |
|---|----------------------------------|--|--------------------------------------|--|-----|--------|
| >>>>RLC Mode | O | | RLC Mode 9.2.119 | Indicates the RLC mode at the MeNB for PDCP transfer to en-gNB. | YES | ignore |
| >>>>Bearer Type | O | | 9.2.92 | | YES | ignore |
| >>>PDCP not present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "not present". | | |
| >>>>Requested SCG E-RAB Level QoS Parameters | M | | E-RAB Level QoS Parameters 9.2.9 | Includes E-RAB level QoS parameters requested to be provided by the SCG. | – | |
| >>>>MeNB UL GTP Tunnel Endpoint at PDCP | M | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2-U transport bearer. For delivery of UL PDCP PDUs. | – | |
| >>>>Secondary MeNB UL GTP Tunnel Endpoint at PDCP | O | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2-U transport bearer. For delivery of UL PDCP PDUs in case of PDCP duplication. | – | |
| >>>>RLC Mode | M | | RLC Mode 9.2.119 | Indicates the RLC mode to be used in the assisting node. | – | |
| >>>>UL Configuration | C- ifMCGand SCGprese nt | | 9.2.118 | Information about UL usage in the en-gNB. | – | |
| >>>>UL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Indicates the PDCP SN length of the bearer for the UL. | YES | ignore |
| >>>>DL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Indicates the PDCP SN length of the bearer for the DL. | YES | ignore |
| >>>>Duplication activation | O | | 9.2.137 | Indicated the initial status of PDCP duplication. | YES | ignore |
| MeNB to SgNB Container | M | | OCTET STRING | Includes the CG-ConfigInfo message as defined in TS 38.331 [31]. | YES | reject |
| SgNB UE X2AP ID | O | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| Expected UE Behaviour | O | | 9.2.70 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | reject |
| Requested split SRBs | O | | ENUMERATED (srb1, srb2, srb1&2, ...) | Indicates that resources for Split SRB are requested. | YES | reject |
| MeNB Resource Coordination Information | O | | 9.2.116 | Information used to coordinate resources utilisation between MeNB and en-gNB. | YES | ignore |

| | | | | | | |
|--|---|--|---|---|-----|--------|
| SGNB Addition Trigger Indication | O | | ENUMERATED (SN change, inter-eNB HO, intra-eNB HO, ...) | This IE indicates the trigger for SGNB Addition procedure. | YES | reject |
| Subscriber Profile ID for RAT/Frequency priority | O | | 9.2.25 | | YES | ignore |
| MeNB Cell ID | M | | E-UTRAN Cell ID 9.2.14 | Indicates the cell ID for PCell in MeNB. | YES | reject |
| Desired Activity Notification Level | O | | 9.2.141 | | YES | ignore |
| Trace Activation | O | | 9.2.2 | | YES | ignore |
| Location Information at SgNB reporting | O | | ENUMERATED (pscell, ...) | Indicates that the user's location information is to be provided. | YES | ignore |
| Masked IMEISV | O | | 9.2.69 | | YES | ignore |

| Range bound | Explanation |
|----------------|--------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256. |

| Condition | Explanation |
|--------------------------|--|
| ifMCGandSCGpresent | This IE shall be present if, for the E-RAB requested to be added, the <i>MCG resources</i> and <i>SCG resources</i> IEs in the <i>EN-DC Resource Configuration</i> IE are set to the value "present". |
| ifMCGpresent | This IE shall be present if, for the E-RAB requested to be added, the <i>MCG resources</i> IE in the <i>EN-DC Resource Configuration</i> IE is set to the value "present". |
| C-ifMCGandSCGpresent_GBR | This IE shall be present if, for the E-RAB requested to be added, the <i>MCG resources</i> and <i>SCG resources</i> IEs in the <i>EN-DC Resource Configuration</i> IE are set to the value "present", and <i>GBR QoS Information</i> IE is present in <i>Full E-RAB Level QoS Parameters</i> IE. |

9.1.4.2 SGNB ADDITION REQUEST ACKNOWLEDGE

This message is sent by the en-gNB to confirm the MeNB about the SgNB addition preparation.

Direction: en-gNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|---------------------------------|--------------------------|---|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| E-RABs Admitted To Be Added List | | 1 | | | YES | ignore |
| >E-RABs Admitted To Be Added Item | | 1 .. <maxnoofBearers> | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>CHOICE Resource Configuration | M | | | | | |
| >>>PDCP present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "present". | | |
| >>>>S1 DL GTP Tunnel Endpoint at the SgNB | M | | GTP Tunnel Endpoint 9.2.1 | en-gNB endpoint of the S1 transport bearer. For delivery of DL PDUs. | – | |
| >>>>SgNB UL GTP Tunnel Endpoint at PDCP | C-ifMCGpresent | | GTP Tunnel Endpoint 9.2.1 | en-gNB endpoint of the X2-U transport bearer at PDCP. For delivery of UL PDCP PDUs. | – | |
| >>>>RLC Mode | C-ifMCGpresent | | RLC Mode 9.2.119 | Indicates the RLC mode. | – | |
| >>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | – | |
| >>>>UL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of UL PDUs | – | |
| >>>>Requested MCG E-RAB Level QoS Parameters | C-ifMCGandSCGpresent_GBRpresent | | E-RAB Level QoS Parameters 9.2.9 | Includes E-RAB level QoS parameters requested to be provided by the MCG. | – | |
| >>>>UL Configuration | C-ifMCGandSCGpresent | | 9.2.118 | Information about UL usage in the MeNB. | – | |
| >>>>UL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Indicates the PDCP SN length of the bearer for the UL. | YES | ignore |
| >>>>DL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Indicates the PDCP SN length of the bearer for the DL. | YES | ignore |

| | | | | | | |
|--|---|--|--------------------------------------|--|-----|--------|
| >>>PDCP not present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "not present". | | |
| >>>>SgNB DL GTP Tunnel Endpoint at SCG | M | | GTP Tunnel Endpoint 9.2.1 | SgNB endpoint of the X2-U transport bearer at the SCG. For delivery of DL PDCP PDUs. | – | |
| >>>>Secondary SgNB DL GTP Tunnel Endpoint at SCG | O | | GTP Tunnel Endpoint 9.2.1 | SgNB endpoint of the X2-U transport bearer at the SCG. For delivery of DL PDCP PDUs in case of PDCP duplication | – | |
| >>>>LCID | O | | 9.2.138 | LCID for the primary path in case of PDCP duplication | YES | ignore |
| E-RABs Not Admitted List | O | | E-RAB List 9.2.28 | A value for E-RAB ID shall only be present once in E-RABs Admitted List IE and in E-RABs Not Admitted List IE. | YES | ignore |
| SgNB to MeNB Container | M | | OCTET STRING | Includes the CG-Config message as defined in TS 38.331[31]. | YES | reject |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |
| Admitted split SRBs | O | | ENUMERATED (srb1, srb2, srb1&2, ...) | Indicates admitted SRBs | YES | reject |
| SgNB Resource Coordination Information | O | | 9.2.117 | Information used to coordinate resources utilisation between en-gNB and MeNB. | YES | ignore |
| RRC config indication | O | | 9.2.132 | Indicates the type of RRC configuration used at the en-gNB. | YES | reject |
| Location Information at SgNB | O | | 9.2.142 | Contains information to support localisation of the UE | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

| Condition | Explanation |
|--------------------|---|
| ifMCGpresent | This IE shall be present if, for the E-RAB admitted to be added, the MCG resources IE in the EN-DC Resource Configuration IE is set to the value "present". |
| ifMCGandSCGpresent | This IE shall be present if, for the E-RAB admitted to be added, the MCG resources and SCG resources IEs in the EN-DC Resource Configuration IE are set to the value "present". |

| | |
|---------------------------------|--|
| C-ifMCGandSCGpresent_GBRpresent | This IE shall be present if, for the E-RAB admitted to be added, the <i>MCG resources</i> and <i>SCG resources</i> IEs in the <i>EN-DC Resource Configuration</i> IE are set to the value "present", and the <i>GBR QoS Information</i> IE is present in the <i>Requested MCG E-RAB Level QoS Parameters</i> IE. |
|---------------------------------|--|

9.1.4.3 SGNB ADDITION REQUEST REJECT

This message is sent by the en-gNB to inform the MeNB that the SgNB Addition Preparation has failed.

Direction: en-gNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|-----------------------------------|--------------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | O | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | reject |

9.1.4.4 SGNB RECONFIGURATION COMPLETE

This message is sent by the MeNB to the en-gNB to indicate whether the configuration requested by the en-gNB was applied by the UE.

Direction: MeNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-------|-----------------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| Response Information | M | | | | YES | ignore |
| >CHOICE <i>Response Type</i> | M | | | | | |
| >> <i>Configuration successfully applied</i> | | | | | | |
| >>>MeNB to SgNB Container | O | | OCTET STRING | Includes the NR <i>RRCReconfiguration Complete</i> message as defined in TS 38.331 [31]. | - | |
| >> <i>Configuration rejected</i> | | | | | | |
| >>>Cause | M | | 9.2.6 | | - | |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |

9.1.4.5 SGNB MODIFICATION REQUEST

This message is sent by the MeNB to the en-gNB to request the preparation to modify en-gNB resources for a specific UE, to query for the current SCG configuration, or to provide the S-RLF-related information to the en-gNB.

Direction: MeNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------------------------|------------------------------------|---|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| Selected PLMN | O | | PLMN Identity 9.2.4 | The selected PLMN of the SCG in the en-gNB. | YES | ignore |
| Handover Restriction List | O | | 9.2.3 | | YES | ignore |
| SCG Configuration Query | O | | 9.2.103 | | YES | ignore |
| UE Context Information | | <i>0..1</i> | | | YES | reject |
| >NR UE Security Capabilities | O | | 9.2.107 | | – | |
| >SgNB Security Key | O | | 9.2.101 | | – | |
| >SgNB UE Aggregate Maximum Bit Rate | O | | UE Aggregate Maximum Bit Rate 9.2.12 | | – | |
| >E-RABs To Be Added List | | <i>0..1</i> | | | – | |
| >>E-RABs To Be Added Item | | <i>1 .. <maxnoofBearers></i> | | | EACH | ignore |
| >>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>DRB ID | M | | 9.2.122 | | – | |
| >>>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>>CHOICE Resource Configuration | M | | | | | |
| >>>>PDCP present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "present". | – | |
| >>>>Full E-RAB Level QoS Parameters | M | | E-RAB Level QoS Parameters 9.2.9 | Includes E-RAB level QoS parameters as received on S1-MME. | – | |
| >>>>Maximum MCG admissible E-RAB Level QoS Parameters | C- ifMCGand SCGpresent_GBR | | GBR QoS Information 9.2.10 | Includes the GBR QoS Information admissible by the MCG. | – | |
| >>>>DL Forwarding | O | | 9.2.5 | | – | |
| >>>>MeNB DL GTP Tunnel Endpoint at MCG | C- ifMCGpresent | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2-U transport bearer at MCG. For delivery of DL PDCP PDUs. | – | |
| >>>>S1 UL GTP Tunnel Endpoint | M | | GTP Tunnel Endpoint 9.2.1 | SGW endpoint of the S1-U transport bearer. For delivery of UL PDUs from the en-gNB. | – | |

| | | | | | | |
|--|------------------------------|-------------------------|---|--|------|--------|
| >>>>>RLC Mode | O | | RLC Mode 9.2.119 | Indicates the RLC mode at the MeNB for PDCP transfer to en-gNB. | YES | ignore |
| >>>>>Bearer Type | O | | 9.2.92 | | YES | ignore |
| >>>>>PDCP not present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "present". | | |
| >>>>>Requested SCG E-RAB Level QoS Parameters | M | | E-RAB Level QoS Parameters 9.2.9 | Includes necessary E-RAB level QoS parameters requested to be provided by the SCG. | – | |
| >>>>>MeNB UL GTP Tunnel Endpoint at PDCP | M | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2-U transport bearer. For delivery of UL PDCP PDUs. | – | |
| >>>>>Secondary MeNB UL GTP Tunnel Endpoint at PDCP | O | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2-U transport bearer. For delivery of UL PDCP PDUs in case of PDCP duplication. | – | |
| >>>>>RLC Mode | M | | RLC Mode 9.2.119 | Indicates the RLC mode to be used in the assisting node. | – | |
| >>>>>UL Configuration | C- ifMCGand SCGpresent | | 9.2.118 | Information about UL usage in the en-gNB. | – | |
| >>>>>UL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Indicates the PDCP SN length of the bearer for the UL. | YES | ignore |
| >>>>>DL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Indicates the PDCP SN length of the bearer for the DL. | YES | ignore |
| >>>>>Duplication activation | O | | 9.2.137 | Indicated the initial status of PDCP duplication. | YES | ignore |
| >E-RABs To Be Modified List | | 0..1 | | | – | |
| >>E-RABs To Be Modified Item | | 1.. <maxnoofBearers> | | | EACH | ignore |
| >>>E-RAB ID | M | | 9.2.23 | | – | |
| >>>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>>CHOICE Resource Configuration | M | | | | | |
| >>>>>PDCP present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "present". | | |

| | | | | | | |
|--|---|----------------------|--------------------------------------|--|------|--------|
| >>>>>Full E-RAB Level QoS Parameters | O | | E-RAB Level QoS Parameters 9.2.9 | Includes E-RAB level QoS parameters to be modified as received on S1-MME | – | |
| >>>>>Maximum MCG admissible E-RAB Level QoS Parameters | O | | GBR QoS Information 9.2.10 | Includes the GBR QoS information admissible by the MCG | – | |
| >>>>>MeNB GTP Tunnel Endpoint at MCG | O | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2-U transport bearer at MCG. For delivery of DL PDCP PDUs. | – | |
| >>>>>S1 UL GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | SGW endpoint of the S1-U transport bearer. For delivery of UL PDUs from the en-gNB. | – | |
| >>>>>RLC Status | O | | 9.2.131 | Indicates the RLC has been re-established.. | | |
| >>>>>PDCP not present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "not present". | | |
| >>>>>Requested SCG E-RAB Level QoS Parameters | O | | E-RAB Level QoS Parameters 9.2.9 | Includes E-RAB level QoS parameters requested to be provided by the SCG. | – | |
| >>>>>MeNB UL GTP Tunnel Endpoint at PDCP | O | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2-U transport bearer. For delivery of UL PDCP PDUs. | – | |
| >>>>>UL Configuration | O | | 9.2.118 | Information about UL usage in the en-gNB. | – | |
| >>>>>UL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Shall be ignored by the en-gNB if received. | YES | ignore |
| >>>>>DL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Shall be ignored by the en-gNB if received. | YES | ignore |
| >>>>>Secondary MeNB UL GTP Tunnel Endpoint at PDCP | O | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2-U transport bearer. For delivery of UL PDCP PDUs in case of PDCP duplication. | YES | ignore |
| >E-RABs To Be Released List | | 0..1 | | | – | |
| >>E-RABs To Be Released Item | | 1 .. <maxnoofBeares> | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>>CHOICE Resource Configuration | M | | | | | |

| | | | | | | |
|---|---|--|--------------------------------------|--|-----|--------|
| >>>>PDCP present in SN | | | | This choice tag is used if the <i>PDCP at SgNB</i> IE in the <i>EN-DC Resource Configuration</i> IE is set to the value "present". | | |
| >>>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | - | |
| >>>>>UL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer. used for forwarding of UL PDUs | - | |
| >>>>PDCP not present in SN | | | | This choice tag is used if the <i>PDCP at SgNB</i> IE in the <i>EN-DC Resource Configuration</i> IE is set to the value "not present". | | |
| >Subscriber Profile ID for RAT/Frequency priority | O | | 9.2.25 | | - | |
| MeNB to SgNB Container | O | | OCTET STRING | Includes the <i>CG-ConfigInfo</i> message as defined in TS 38.331 [31]. | YES | reject |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |
| MeNB Resource Coordination Information | O | | 9.2.116 | Information used to coordinate resources utilisation between MeNB and en-gNB. | YES | ignore |
| Requested split SRBs | O | | ENUMERATED (srb1, srb2, srb1&2, ...) | Indicates that resources for Split SRB are requested. | YES | ignore |
| Requested split SRBs release | O | | ENUMERATED (srb1, srb2, srb1&2, ...) | Indicates that resources for Split SRB are requested to be released. | YES | ignore |
| Desired Activity Notification Level | O | | 9.2.141 | | YES | ignore |
| Location Information at SgNB reporting | O | | ENUMERATED (pscell, ...) | Indicates that the user's location information is to be provided. | YES | ignore |
| MeNB Cell ID | O | | E-CGI 9.2.14 | Indicates the cell ID for PCell in MeNB. | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

| Condition | Explanation |
|--------------------|---|
| ifMCGandSCGpresent | This IE shall be present if, for the E-RAB requested to be added, the <i>MCG resources</i> and <i>SCG resources</i> IEs in the <i>EN-DC Resource Configuration</i> IE are set to the value "present". |

| | |
|--------------------------|--|
| ifMCGpresent | This IE shall be present if, for the E-RAB requested to be added, the <i>MCG resources</i> IE in the <i>EN-DC Resource Configuration</i> IE is set to the value "present". |
| C-ifMCGandSCGpresent_GBR | This IE shall be present if, for the E-RAB requested to be added, the <i>MCG resources</i> and <i>SCG resources</i> IEs in the <i>EN-DC Resource Configuration</i> IE are set to the value "present", and <i>GBR QoS Information</i> IE is present in <i>Full E-RAB Level QoS Parameters</i> IE. |

9.1.4.6 SGNB MODIFICATION REQUEST ACKNOWLEDGE

This message is sent by the en-gNB to confirm the MeNB's request to modify the en-gNB resources for a specific UE.

Direction: en-gNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|---------------------------------|-------------------------|---|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | ignore |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | ignore |
| E-RABs Admitted To Be Added List | | 0..1 | | | YES | ignore |
| >E-RABs Admitted To Be Added Item | | 1.. <maxnoofBearers> | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>CHOICE Resource Configuration | M | | | | | |
| >>>PDCP present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "present". | | |
| >>>>S1 DL GTP Tunnel Endpoint at the SgNB | M | | GTP Tunnel Endpoint 9.2.1 | SgNB endpoint of the S1 transport bearer. For delivery of DL PDUs. | – | |
| >>>>SgNB UL GTP Tunnel Endpoint at PDCP | C-ifMCGpresent | | GTP Tunnel Endpoint 9.2.1 | SgNB endpoint of the X2-U transport bearer at PDCP. For delivery of UL PDCP PDUs. | – | |
| >>>>RLC Mode | C-ifMCGpresent | | RLC Mode 9.2.119 | Indicates the RLC mode to be used at the assisting node. | – | |
| >>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | – | |
| >>>>UL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of UL PDUs | – | |
| >>>>Requested MCG E-RAB Level QoS Parameters | C-ifMCGandSCGpresent_GBRpresent | | E-RAB Level QoS Parameters 9.2.9 | Includes E-RAB level QoS parameters requested to be provided by the MCG. | – | |
| >>>>UL Configuration | C-ifMCGandSCGpresent | | 9.2.118 | Information about UL usage in the MeNB. | – | |
| >>>>UL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Indicates the PDCP SN length of the bearer for the UL. | YES | ignore |
| >>>>DL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Indicates the PDCP SN length of the bearer for the DL. | YES | ignore |
| >>>PDCP not present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "not present". | | |

| | | | | | | |
|--|---|-----------------------|--------------------------------------|--|------|--------|
| >>>>SgNB DL GTP Tunnel Endpoint at SCG | M | | GTP Tunnel Endpoint 9.2.1 | Endpoint of the X2-U transport bearer at the SCG. For delivery of DL PDCP PDUs. | – | |
| >>>>Secondary SgNB DL GTP Tunnel Endpoint at SCG | O | | GTP Tunnel Endpoint 9.2.1 | Endpoint of the X2-U transport bearer at the SCG. For delivery of DL PDCP PDUs in case of PDCP duplication. | – | |
| >>>>LCID | O | | 9.2.138 | LCID for the primary path in case of PDCP duplication configured. | YES | ignore |
| E-RABs Admitted To Be Modified List | | 0..1 | | | YES | ignore |
| >E-RABs Admitted To Be Modified Item | | 1 .. <maxnoofBearers> | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>CHOICE Resource Configuration | M | | | | | |
| >>>PDCP present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "present". | | |
| >>>>S1 DL GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | SgNB endpoint of the S1 transport bearer. For delivery of DL PDUs. | – | |
| >>>>SgNB UL GTP Tunnel Endpoint at PDCP | O | | GTP Tunnel Endpoint 9.2.1 | SgNB endpoint of the X2-U transport bearer at PDCP. For delivery of UL PDCP PDUs. | – | |
| >>>>Requested MCG E-RAB Level QoS Parameters | O | | E-RAB Level QoS Parameters 9.2.9 | Includes E-RAB level QoS parameters requested to be provided by the MCG. | – | |
| >>>>UL Configuration | O | | 9.2.118 | Information about UL usage in the MeNB. | – | |
| >>>>UL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Shall be ignored by the MeNB if received. | YES | ignore |
| >>>>DL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Shall be ignored by the MeNB if received. | YES | ignore |
| >>>PDCP not present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "not present". | | |
| >>>>SgNB DL GTP Tunnel Endpoint at SCG | O | | GTP Tunnel Endpoint 9.2.1 | SgNB endpoint of the X2-U transport bearer at the SCG. For delivery of DL PDCP PDUs. | – | |

| | | | | | | |
|--|---|-------------------------|--------------------------------------|---|------|--------|
| >>>>Secondary SgNB DL GTP Tunnel Endpoint at SCG | O | | GTP Tunnel Endpoint 9.2.1 | Endpoint of the X2-U transport bearer at the SCG. For delivery of DL PDCP PDUs in case of PDCP duplication. | YES | ignore |
| >>>>RLC Status | O | | 9.2.131 | Indicates the RLC has been re-established. | YES | ignore |
| E-RABs Admitted To Be Released List | | 0..1 | | | YES | ignore |
| >E-RABs Admitted To Be Released Item | | 1.. <maxnoofBearers> | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>CHOICE Resource Configuration | M | | | Note: no further information contained in the IE container | | |
| E-RABs Not Admitted List | O | | E-RAB List 9.2.28 | A value for <i>E-RAB ID</i> shall only be present once in <i>E-RABs Admitted List</i> IE and in <i>E-RABs Not Admitted List</i> IE. | YES | ignore |
| SgNB to MeNB Container | O | | OCTET STRING | Includes the NR CG-Config message as defined in TS 38.331 [31]. | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | ignore |
| SgNB Resource Coordination Information | O | | 9.2.117 | Information used to coordinate resources utilisation between en-gNB and MeNB. | YES | ignore |
| Admitted split SRBs | O | | ENUMERATED (srb1, srb2, srb1&2, ...) | Indicates admitted SRBs | YES | ignore |
| Admitted split SRBs release | O | | ENUMERATED (srb1, srb2, srb1&2, ...) | Indicates admitted SRBs release | YES | ignore |
| RRC config indication | O | | 9.2.132 | Indicates the type of RRC configuration used at the en-gNB. | YES | reject |
| Location Information at SgNB | O | | 9.2.142 | Contains information to support localisation of the UE | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

| Condition | Explanation |
|--------------------|--|
| ifMCGandSCGpresent | This IE shall be present if, for the E-RAB admitted to be added, the <i>MCG resources</i> and <i>SCG resources</i> IEs in the <i>EN-DC Resource Configuration</i> IE are set to the value "present". |
| ifMCGpresent | This IE shall be present if, for the E-RAB admitted to be added, the <i>MCG resources</i> IE in the <i>EN-DC Resource Configuration</i> IE is set to the value "present". |

| | |
|---------------------------------|--|
| C-ifMCGandSCGpresent_GBRpresent | This IE shall be present if, for the E-RAB admitted to be added, the <i>MCG resources</i> and <i>SCG resources</i> IEs in the <i>EN-DC Resource Configuration</i> IE are set to the value "present", and the <i>GBR QoS Information</i> IE is present in the <i>Requested MCG E-RAB Level QoS Parameters</i> IE. |
|---------------------------------|--|

9.1.4.7 SGNB MODIFICATION REQUEST REJECT

This message is sent by the en-gNB to inform the MeNB that the MeNB initiated SgNB Modification Preparation has failed.

Direction: en-gNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|-----------------------------------|--------------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | ignore |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | ignore |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | ignore |

9.1.4.8 SGNB MODIFICATION REQUIRED

This message is sent by the en-gNB to the MeNB to request the modification of en-gNB resources for a specific UE.

Direction: en-gNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|------------------------------|---|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| PDCP Change Indication | O | | 9.2.109 | | YES | ignore |
| E-RABs To Be Released List | | 0..1 | | | YES | ignore |
| >E-RABs To Be Released Item | | 1 .. <maxnoofBeare rs> | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>Cause | M | | 9.2.6 | | – | |
| >>RLC Mode | O | | RLC Mode 9.2.119 | Indicates the RLC mode at the en-gNB for PDCP transfer to MeNB. | YES | ignore |
| SgNB to MeNB Container | O | | OCTET STRING | Includes the NR CG-Config message as defined in TS 38.331 [31]. | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |
| E-RABs To Be Modified List | | 0..1 | | | YES | ignore |
| >E-RABs To Be Modified Item | | 1 .. <maxnoofBeare rs> | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>CHOICE Resource Configuration | M | | | | | |
| >>>PDCP present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "present". | | |
| >>>>Requested MCG E-RAB Level QoS Parameters | O | | E-RAB Level QoS Parameters 9.2.9 | Includes E-RAB level QoS parameters requested to be provided by the MCG. | – | |
| >>>>UL Configuration | O | | 9.2.118 | Information about UL usage in the MeNB. | – | |
| >>>>UL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Shall be ignored by the MeNB if received. | YES | ignore |
| >>>>DL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Shall be ignored by the MeNB if received. | YES | ignore |

| | | | | | | |
|--|---|--|---------------------------|--|-----|--------|
| >>>>SgNB UL GTP Tunnel Endpoint at PDCP | O | | GTP Tunnel Endpoint 9.2.1 | SgNB endpoint of the X2-U transport bearer at PDCP. For delivery of UL PDCP PDUs. | – | |
| >>>>S1 DL GTP Tunnel Endpoint at the SgNB | O | | GTP Tunnel Endpoint 9.2.1 | en-gNB endpoint of the S1 transport bearer. For delivery of DL PDUs. | – | |
| >>>>New DRB ID Request | O | | ENUMERATED (True, ...) | | YES | ignore |
| >>>>PDCP not present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "not present". | | |
| >>>>SgNB DL GTP Tunnel Endpoint at SCG | O | | GTP Tunnel Endpoint 9.2.1 | SgNB endpoint of the X2-U transport bearer at the SCG. For delivery of DL PDCP PDUs. | – | |
| >>>>Secondary SgNB DL GTP Tunnel Endpoint at SCG | O | | GTP Tunnel Endpoint 9.2.1 | SgNB endpoint of the X2-U transport bearer at the SCG. For delivery of DL PDCP PDUs for PDCP duplication. | – | |
| >>>>RLC Status | O | | 9.2.131 | Indicates the RLC has been re-established.. | | |
| >>>>LCID | O | | 9.2.138 | Indicate the LCID of the primary path in case of PDCP duplication | YES | ignore |
| SgNB Resource Coordination Information | O | | 9.2.117 | Information used to coordinate resources utilisation between the en-gNB and the MeNB. | YES | ignore |
| RRC config indication | O | | 9.2.132 | Indicates the type of RRC configuration used at the en-gNB. | YES | reject |
| Location Information at SgNB | O | | 9.2.142 | Contains information to support localisation of the UE | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.4.9 SGNB MODIFICATION CONFIRM

This message is sent by the MeNB to inform the en-gNB about the successful modification.

Direction: MeNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|-------------------------|---|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | ignore |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | ignore |
| E-RABs Admitted To Be Modified List | | 0..1 | | | YES | ignore |
| >E-RABs Admitted To Be Modified Item | | 1.. <maxnoofBearers> | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>CHOICE Resource Configuration | M | | | | | |
| >>>PDCP not present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "not present". | | |
| >>>>Secondary MeNB UL GTP Tunnel Endpoint at PDCP | O | | GTP Tunnel Endpoint 9.2.1 | MeNB endpoint of the X2-U transport bearer at the PDCP. For delivery of UL PDCP PDUs for PDCP duplication. | – | |
| >>>>UL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Shall be ignored by the en-gNB if received. | YES | ignore |
| >>>>DL PDCP SN Length | O | | PDCP SN Length 9.2.133 | Shall be ignored by the en-gNB if received. | YES | ignore |
| MeNB to SgNB Container | O | | OCTET STRING | Includes the NR RRCReconfigurationComplete message as defined in TS 38.331 [31]. | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | ignore |
| MeNB Resource Coordination Information | O | | 9.2.116 | Information used to coordinate resources utilisation between the MeNB and the en-gNB. | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.4.10 SGNB MODIFICATION REFUSE

This message is sent by the MeNB to inform the en-gNB that the SgNB initiated SgNB Modification has failed.

Direction: MeNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|-----------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | ignore |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | ignore |
| Cause | M | | 9.2.6 | | YES | ignore |
| MeNB to SgNB Container | O | | OCTET STRING | Includes the <i>CG-ConfigInfo</i> message as defined in TS 38.331 [31]. | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | ignore |

9.1.4.11 SGNB RELEASE REQUEST

This message is sent by the MeNB to the en-gNB to request the release of resources.

Direction: MeNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------------------|----------|------------------------------|---|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | O | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| E-RABs To Be Released List | | 0..1 | | | YES | ignore |
| >E-RABs To Be Released Item | | 1 .. <maxnoofBearers > | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>CHOICE Resource Configuration | M | | | | | |
| >>>PDCP present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "present". | | |
| >>>>UL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of UL PDUs | – | |
| >>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer. used for forwarding of DL PDUs | – | |
| >>>>PDCP not present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "not present". | | |
| UE Context Kept Indicator | O | | 9.2.85 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | reject |

| | | | | | | |
|------------------------|---|--|--------------|--|-----|--------|
| MeNB to SgNB Container | O | | OCTET STRING | Includes the CG-ConfigInfo message as defined in TS 38.331 [31]. | YES | reject |
|------------------------|---|--|--------------|--|-----|--------|

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.4.12 SGNB RELEASE REQUEST ACKNOWLEDGE

This message is sent by the en-gNB to the MeNB to confirm the request to release en-gNB resources.

Direction: en-gNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|------------------------------|-----------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | ignore |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | reject |
| E-RABs Admitted To Be Released List | | 0..1 | | | YES | ignore |
| >E-RABs Admitted To Be Released Item | | 1 .. <maxnoofBearers > | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>RLC Mode | M | | RLC Mode 9.2.119 | Indicates the RLC mode at the en-gNB for PDCP transfer to MeNB. | – | |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.4.13 SGNB RELEASE REQUEST REJECT

This message is sent by the en-gNB to the MeNB to reject the request to release en-gNB resources.

Direction: en-gNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|-----------------------------------|--------------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | ignore |
| SgNB UE X2AP ID | O | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | ignore |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | reject |

9.1.4.14 SGNB RELEASE REQUIRED

This message is sent by the en-gNB to request the release of all resources for a specific UE at the en-gNB.

Direction: en-gNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------------------|----------|------------------------------|-----------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | reject |
| E-RABs To Be Released List | | 0..1 | | | YES | ignore |
| >E-RABs To Be Released Item | | 1 .. <maxnoofBearers > | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>RLC Mode | M | | RLC Mode 9.2.119 | Indicates the RLC mode at the en-gNB for PDCP transfer to MeNB. | – | |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.4.15 SGNB RELEASE CONFIRM

This message is sent by the MeNB to confirm the release of all resources for a specific UE at the en-gNB.

Direction: MeNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------------------|----------|-----------------------------|--------------------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | ignore |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | ignore |
| E-RABs to be Released List | | 0..1 | | | YES | ignore |
| >E-RABs To Be Released Item | | 1.. <maxnoofBearers > | | | – | |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>CHOICE Resource Configuration | M | | | | | |
| >>>PDCP present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "present". | | |
| >>>>UL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of UL PDUs | – | |
| >>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | – | |
| >>>PDCP not present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "not present". | | |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.4.16 SGNB COUNTER CHECK REQUEST

This message is sent by the en-gNB to request the verification of the value of the PDCP COUNTs associated with the bearers established in the en-gNB.

Direction: en-gNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|------------------------|--------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| E-RABs Subject to Counter Check List | | 1 | | | YES | ignore |
| >E-RABs Subject to Counter Check Item | | 1 .. <maxnoofBearers > | | | EACH | ignore |
| >>E-RAB ID | M | | 9.2.23 | | - | |
| >>UL COUNT | M | INTEGER(0..4294967295) | | Indicates the value of uplink COUNT associated to this E-RAB. | - | |
| >>DL COUNT | M | INTEGER(0..4294967295) | | Indicates the value of downlink COUNT associated to this E-RAB. | - | |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.4.17 SGNB CHANGE REQUIRED

This message is sent by the en-gNB to the MeNB to request the change of en-gNB for a specific UE.

Direction: en-gNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------------------|----------|-------|-----------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| Target SgNB ID Information | M | | 9.2.102 | | YES | reject |
| Cause | M | | 9.2.6 | | YES | ignore |
| SgNB to MeNB Container | O | | OCTET STRING | Includes the <i>CG-Config</i> message as defined in TS 38.331 [31]. | YES | reject |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | reject |

9.1.4.18 SGNB CHANGE CONFIRM

This message is sent by the MeNB to inform the en-gNB about the successful change.

Direction: MeNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------------------|----------|------------------------|--------------------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | ignore |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | ignore |
| E-RABs to be Released List | | 0..1 | | | YES | ignore |
| >E-RABs To Be Released Item | | 1 .. <maxnoofBearers > | | | – | |
| >>E-RAB ID | M | | 9.2.23 | | – | |
| >>EN-DC Resource Configuration | M | | EN-DC Resource Configuration 9.2.108 | Indicates the PDCP and Lower Layer MCG/SCG configuration. | – | |
| >>CHOICE Resource Configuration | M | | | | | |
| >>>PDCP present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "present". | | |
| >>>>UL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of UL PDUs | – | |
| >>>>DL Forwarding GTP Tunnel Endpoint | O | | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | – | |
| >>>PDCP not present in SN | | | | This choice tag is used if the PDCP at SgNB IE in the EN-DC Resource Configuration IE is set to the value "not present". | | |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB | YES | ignore |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.4.19 SGNB CHANGE REFUSE

This message is sent by the MeNB to inform the en-gNB that the SgNB initiated SgNB Change has failed.

Direction: MeNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|-----------------------------------|--------------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | ignore |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | ignore |
| Cause | M | | 9.2.6 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.7 | | YES | ignore |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | reject |

9.1.4.20 SECONDARY RAT DATA USAGE REPORT

This message is sent by the en-gNB to report data volumes for secondary RAT.

Direction: en-gNB → MeNB

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------------|----------|-------|-----------------------------------|--------------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB | YES | reject |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| Secondary RAT Usage Report List | M | | 9.2.120 | | YES | reject |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | reject |

9.1.4.21 RRC TRANSFER

This message is sent by the MeNB to the en-gNB or by the en-gNB to the MeNB to transfer an RRC message.

Direction: MeNB → en-gNB or en-gNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------------|-----------------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| Split SRB | | <i>0..1</i> | | | | |
| >RRC Container | O | | OCTET STRING | Contains a PDCP-C PDU encapsulating an RRC message as defined in subclause 6.2.1 of TS 36.331 [9] and ciphered with the key of the MeNB | YES | reject |
| >SRB Type | M | | ENUMERATED (srb1, srb2, ...) | The SRB type | YES | reject |
| >Delivery Status | O | | 9.2.104 | DL RRC delivery status of split SRB | YES | reject |
| NR UE Report | | <i>0..1</i> | | | | |
| >RRC Container | M | | OCTET STRING | Includes the UL-DCCH-Message as defined in subclause 6.2.1 of TS 38.331 [31] containing the <i>MeasurementReport</i> message or <i>FailureInformation</i> message. | YES | reject |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | reject |

9.1.4.22 PARTIAL RESET REQUIRED

This message is sent by an initiating node to a neighbouring node, both nodes able to interact for EN-DC, to release all the resources for selected UEs.

Direction: en-gNB → MeNB, MeNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|---------------------------------|-----------------------------------|--------------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| UEs to be Reset List | | <i>1</i> | | | YES | reject |
| >UEs To Be Reset Item | | <i>1 .. <maxnoof UEs></i> | | | | |
| >>MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | | |
| >>SgNB UE X2AP ID | O | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | | |
| >>MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | | |
| Cause | M | | 9.2.6 | | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

| Range bound | Explanation |
|-------------|------------------------------------|
| maxnoofUEs | Maximum no. of UEs. Value is 8192. |

9.1.4.23 PARTIAL RESET CONFIRM

This message is sent by an initiating node to a neighbouring node, both nodes able to interact for EN-DC, to confirm the release all the resources for selected UEs.

Direction: en-gNB → MeNB, MeNB → en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-----------------------------------|-----------------------------------|--------------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| UEs Admitted to be Reset List | | 1 | | | YES | reject |
| >UEs Admitted To Be Reset Item | | 1 .. <maxnoof UEs in eng NBDU> | | | | |
| >>MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | | |
| >>SgNB UE X2AP ID | O | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | | |
| >>MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | | |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

| Range bound | Explanation |
|---------------------|------------------------------------|
| maxnoofUEsinengNBDU | Maximum no. of UEs. Value is 8192. |

9.1.4.24 E-UTRA – NR CELL RESOURCE COORDINATION REQUEST

Direction: eNB → en-gNB, en-gNB → eNB.

This message is sent by a neighbouring eNB to a peer en-gNB or by a neighbouring en-gNB to a peer eNB, both nodes able to interact for EN-DC, to express the desired resource allocation for data traffic, for the sake of E-UTRA - NR Cell Resource Coordination.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|---|---------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| CHOICE <i>Initiating Node Type</i> | M | | | | - | |
| >eNB | | | | | | |
| >>Data Traffic Resource Indication | M | | 9.2.126 | Indicates resource allocations for data traffic. | YES | reject |
| >>Spectrum Sharing Group ID | M | | INTEGER (1..maxCellineNB) | Indicates the E-UTRA cells involved in resource coordination with the NR cells affiliated with the same Spectrum Sharing Group ID . | YES | reject |
| >>List of E-UTRA Cells in E-UTRA Coordination Request | | 0 .. <maxCellineNB | | List of applicable E-UTRA cells. | YES | reject |
| >>>EUTRA Cell ID | M | | ECGI 9.2.14 | | - | |
| >en-gNB | | | | | | |
| >>Data Traffic Resource Indication | M | | 9.2.126 | Indicates resource allocations for data traffic. | YES | reject |
| >>List of E-UTRA Cells in NR Coordination Request | | 1 .. <maxCellineNB | | List of applicable E-UTRA cells | YES | reject |
| >>>EUTRA Cell ID | M | | ECGI 9.2.14 | | - | |
| >>Spectrum Sharing Group ID | M | | INTEGER (1..maxCellineNB) | Indicates the NR cells involved in resource coordination with the E-UTRA cells affiliated with the same Spectrum Sharing Group ID . | YES | reject |
| >>List of NR Cells in NR Coordination Request | | 0 .. <maxnoNRcellsSpectrumSharingwithE-UTRA | | List of applicable NR cells | YES | reject |
| >>>NR-Cell ID | M | | NR-CGI 9.2.105 | | - | |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

| Range bound | Explanation |
|---------------------------------------|---|
| maxCellineNB | Maximum no. of E-UTRA cells in eNB. Value is 256. |
| maxnoNRcellsSpectrumSharingwithE-UTRA | Maximum no. of NR cells affiliated to a Spectrum Sharing Group ID involved in cell resource coordination with a number of E-UTRA cells affiliated with the same Spectrum Sharing Group ID. Value is 64. |

9.1.4.25 E-UTRA – NR CELL RESOURCE COORDINATION RESPONSE

This message is sent by a neighbouring eNB to a peer en-gNB or by a neighbouring en-gNB to a peer eNB, both nodes able to interact for EN-DC, as a response to the E-UTRA – NR CELL RESOURCE COORDINATION REQUEST.

Direction: eNB → en-gNB, en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|---|---------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| CHOICE Responding NodeType | M | | | | - | |
| >eNB | | | | | | |
| >>Data Traffic Resource Indication | M | | 9.2.126 | Indicates resource allocations for data traffic. | YES | reject |
| >>Spectrum Sharing Group ID | M | | INTEGER (1..maxCellineNB) | Indicates the E-UTRA cells involved in resource coordination with the NR cells affiliated with the same <i>Spectrum Sharing Group ID</i> . | YES | reject |
| >>>List of E-UTRA Cells in E-UTRA Coordination Response | | 0 .. <maxCellineNB | | List of applicable E-UTRA cells | YES | reject |
| >>>EUTRA Cell ID | M | | ECGI 9.2.14 | | - | |
| >en-gNB | | | | | | |
| >>Data Traffic Resource Indication | M | | 9.2.126 | Indicates resource allocations for data traffic. | YES | reject |
| >>Spectrum Sharing Group ID | M | | INTEGER (1..maxCellineNB) | Indicates the NR cells involved in resource coordination with the E-UTRA cells affiliated with the same <i>Spectrum Sharing Group ID</i> . | YES | reject |
| >>>List of NR Cells in NR Coordination Response | | 0 .. <maxnoNRcellsSpectrumSharingwithE-UTRA | | List of applicable NR cells | YES | reject |
| >>>NR Cell ID | M | | NR-CGI 9.2.105 | | - | |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

| Range bound | Explanation |
|---------------------------------------|---|
| maxCellineNB | Maximum no. of E-UTRA cells in eNB. Value is 256. |
| maxnoNRcellsSpectrumSharingwithE-UTRA | Maximum no. of NR cells affiliated to a Spectrum Sharing Group ID involved in cell resource coordination with a number of E-UTRA cells affiliated with the same Spectrum Sharing Group ID. Value is 64. |

9.1.4.26 SGNB ACTIVITY NOTIFICATION

This message is sent by the en-gNB to inform the MeNB that resources for E-RABs controlled by the en-gNB have not been used or are in use again.

Direction: en-gNB → MeNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|----------------------------------|---|--------------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | reject |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| UE Context level user plane activity report | O | | User plane traffic activity report 9.2.130 | | YES | ignore |
| E-RAB Activity Notify Item List | | <i>0..<maxnoofBearers></i> | | | EACH | ignore |
| >E-RAB ID | M | | 9.2.23 | | – | |
| >User plane traffic activity report | M | | 9.2.130 | | – | |
| MeNB UE X2AP ID Extension | O | | Extended eNB UE X2AP ID 9.2.86 | Allocated at the MeNB. | YES | reject |

| Range bound | Explanation |
|----------------|-------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256 |

9.1.4.27 GNB STATUS INDICATION

This message is sent by the en-gNB to indicate to the eNB its status of overload.

Direction: en-gNB → eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|-------|--|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.13 | | YES | ignore |
| gNB Overload Information | M | | ENUMERATED (overloaded, not-overloaded, ...) | | YES | ignore |
| Interface Instance Indication | O | | 9.2.143 | | YES | reject |

9.1.4.28 TRACE START

This message is sent by the MeNB to initiate a trace session for a UE.

Direction: MeNB → en-gNB

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------|----------|-------|------------------------------|--------------------------|-------------|----------------------|
| Message Type | M | | 9.3.1.1 | | YES | ignore |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| Trace Activation | M | | 9.2.2 | | YES | ignore |

9.1.4.29 DEACTIVATE TRACE

This message is sent by the MeNB to deactivate a trace session.

Direction: MeNB → en-gNB

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------|----------|-------|------------------------------|---|-------------|----------------------|
| Message Type | M | | 9.3.1.1 | | YES | ignore |
| MeNB UE X2AP ID | M | | eNB UE X2AP ID 9.2.24 | Allocated at the MeNB. | YES | reject |
| SgNB UE X2AP ID | M | | en-gNB UE X2AP ID 9.2.100 | Allocated at the en-gNB. | YES | reject |
| E-UTRAN Trace ID | M | | OCTET STRING (SIZE(8)) | As per E-UTRAN Trace ID in <i>Trace Activation</i> IE | YES | ignore |

9.2 Information Element definitions

9.2.0 General

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

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

9.2.1 GTP Tunnel Endpoint

The *GTP Tunnel Endpoint* IE identifies an X2 transport bearer or the S-GW endpoint of the S1 transport bearer associated to an E-RAB. It contains a Transport Layer Address and a GTP Tunnel Endpoint Identifier. The Transport Layer Address is an IP address to be used for the X2 user plane transport (see TS 36.424 [8]) or for the S1 user plane transport (see TS 36.414 [19]). The GTP Tunnel Endpoint Identifier is to be used for the user plane transport.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------------|---|-------------|----------------------|
| Transport Layer Address | M | | BIT STRING (1..160, ...) | For details on the Transport Layer Address, see TS 36.424 [8], TS 36.414 [19] | – | |
| GTP TEID | M | | OCTET STRING (4) | For details and range, see TS 29.281 [26] | – | |

9.2.2 Trace Activation

Defines parameters related to 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 TS 32.422 [6] (leftmost 6 octets, with PLMN information coded as in 9.2.4), and Trace Recording Session Reference defined in TS 32.422 [6] (last 2 octets) | – | |
| Interfaces To Trace | M | | BIT STRING (8) | Each position in the bitmap represents a eNB interface: first bit =S1-MME, second bit =X2, third bit =Uu, fourth bit = F1-C, fifth bit = E1. Other bits reserved for future use. Value '1' indicates 'should be traced'. Value '0' indicates 'should not be traced'. | – | |
| Trace Depth | M | | ENUMERATED(minimum, medium, maximum, MinimumWithoutVend orSpecificExtension, MediumWithoutVend orSpecificExtension, MaximumWithoutVen dorSpecificExtension, ...) | Defined in TS 32.421 [7] | – | |
| Trace Collection Entity IP Address | M | | BIT STRING (1..160,...) | For details on the Transport Layer Address, see TS 36.424 [8], TS 36.414 [19] | – | |
| MDT Configuration | O | | 9.2.56 | | YES | ignore |
| UE Application layer measurement configuration | O | | 9.2.121 | | YES | ignore |

9.2.3 Handover Restriction List

This IE defines roaming or access restrictions for subsequent mobility action for which the eNB provides information about the target of the mobility action towards the UE, e.g., handover and CCO, or for SCG selection during dual connectivity operation.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|---|---|---|-------------|----------------------|
| Serving PLMN | M | | PLMN Identity 9.2.4 | | – | |
| Equivalent PLMNs | | <i>0..<maxnoof EPLMNs></i> | | Allowed PLMNs in addition to Serving PLMN. This list corresponds to the list of "equivalent PLMNs list" as defined in TS 24.301 [14]. This list is part of the roaming restriction information. Roaming restrictions apply to PLMNs other than the serving PLMN and Equivalent PLMNs. | – | |
| >PLMN Identity | M | | 9.2.4 | | – | |
| Forbidden TAs | | <i>0..<maxnoof EPLMNsPlusOne></i> | | intra E-UTRAN roaming restrictions | – | |
| >PLMN Identity | M | | 9.2.4 | The PLMN of forbidden TACs | – | |
| >Forbidden TACs | | <i>1..<maxnoof ForbTACs></i> | | | – | |
| >>TAC | M | | OCTET STRING(2) | The forbidden TAC | – | |
| Forbidden LAs | | <i>0..<maxnoof EPLMNsPlusOne></i> | | inter-3GPP RAT roaming restrictions | – | |
| >PLMN Identity | M | | 9.2.4 | | – | |
| >Forbidden LACs | | <i>1..<maxnoof ForbLACs></i> | | | – | |
| >>LAC | M | | OCTET STRING(2) | | – | |
| Forbidden inter RATs | O | | ENUMERATED(ALL, GERAN, UTRAN, CDMA2000, ..., GERAN and UTRAN, CDMA2000 and UTRAN) | inter-3GPP and 3GPP2 RAT access restrictions. "ALL" means that all RATs mentioned in the enumeration of this IE are restricted. | – | |
| NR restriction in EPS as secondary RAT | O | | ENUMERATED(NR restricted in EPS as Secondary RAT, ...) | Restriction to use NR when the NR is used as secondary RAT in EN-DC. | YES | ignore |

| | | | | | | |
|---------------------------------------|---|--|--|--|-----|--------|
| Core Network Type Restrictions | | <i>0..<maxnoofEPLMNsPlusOne></i> | | Includes any of the Serving PLMN or any PLMN of the Equivalent PLMNs listed in the <i>Mobility Restriction List</i> IE for which core network type restriction applies as specified in TS 23.501 [38]. | YES | ignore |
| >PLMN Identity | M | | 9.2.4 | | | |
| >Core Network Type | M | | ENUMERATED (5GCForbidden, ..., EPCForbidden) | The indication indicates whether the UE is restricted to connect to 5GC or to EPC for this PLMN. | | |
| NR Restriction in 5GS | O | | ENUMERATED(NRrestrictedin5GS, ...) | Restriction to use NR when the NR connects to 5GS. | YES | ignore |
| Last NG-RAN PLMN Identity | O | | 9.2.4 | Indicates the NG-RAN PLMN from where the UE formerly handed over to EPS and which is preferred in case of subsequent mobility to 5GS. | YES | ignore |

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

9.2.4 PLMN Identity

This information element indicates the PLMN Identity.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|-----------------------|---|
| PLMN Identity | M | | OCTET STRING (3) | <ul style="list-style-type: none"> - digits 0 to 9, encoded 0000 to 1001, - 1111 used as filler digit, two digits per octet, - bits 4 to 1 of octet n encoding digit 2n-1 - bits 8 to 5 of octet n encoding digit 2n <p>-The PLMN identity consists of 3 digits from MCC followed by either</p> <ul style="list-style-type: none"> -a filler digit plus 2 digits from MNC (in case of 2 digit MNC) or -3 digits from MNC (in case of a 3 digit MNC). |

9.2.5 DL Forwarding

This element indicates that the E-RAB is proposed for forwarding of downlink packets.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|---|-----------------------|
| DL Forwarding | M | | ENUMERATED (DL forwarding proposed, ...) | |

9.2.6 Cause

The purpose of the cause information element is to indicate the reason for a particular event for the whole protocol.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-----------------------------|----------|-------|---|-----------------------|
| CHOICE Cause Group | M | | | |
| >Radio Network Layer | | | | |
| >>Radio Network Layer Cause | M | | <p>ENUMERATED (Handover Desirable for Radio Reasons, Time Critical Handover, Resource Optimisation Handover, Reduce Load in Serving Cell, Partial Handover, Unknown New eNB UE X2AP ID, Unknown Old eNB UE X2AP ID, Unknown Pair of UE X2AP ID, HO Target not Allowed, TX2RELOCoverall Expiry, TRELOCprep Expiry, Cell not Available, No Radio Resources Available in Target Cell, Invalid MME Group ID, Unknown MME Code, Encryption And/Or Integrity Protection Algorithms Not Supported, ReportCharacteristicsEmpty, NoReportPeriodicity, ExistingMeasurementID, Unknown eNB Measurement ID, Measurement Temporarily not Available, Unspecified,...,Load Balancing, Handover Optimisation, Value out of allowed range, Multiple E-RAB ID instances, Switch Off Ongoing, Not supported QCI value, Measurement not supported for the object, TDcoverall Expiry, TDcprep Expiry, Action Desirable for Radio Reasons, Reduce Load, Resource Optimisation, Time Critical action, Target not Allowed, No Radio Resources Available, Invalid QoS combination, Encryption Algorithms Not Supported, Procedure cancelled, RRM purpose, Improve user bit rate, User Inactivity, Radio Connection With UE Lost, Failure in the Radio Interface Procedure, Bearer Option not Supported, MCG Mobility, SCG Mobility, Count reaches max value, Unknown Old en-gNB UE X2AP ID, PDCP Overload)</p> | |
| >Transport Layer | | | | |
| >>Transport Layer Cause | M | | <p>ENUMERATED (Transport Resource Unavailable, Unspecified,...)</p> | |
| >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,Unspecified,Abstract Syntax Error (Falsely Constructed Message),...) | |
| > <i>Misc</i> | | | | |
| >>Miscellaneous Cause | M | | ENUMERATED (Control Processing Overload, Hardware Failure,O&M Intervention,Not enough User Plane Processing Resources,Unspecified,...) | |

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

| Radio Network Layer cause | Meaning |
|---|--|
| Cell not Available | The concerned cell is not available. |
| Handover Desirable for Radio Reasons | The reason for requesting handover is radio related. |
| Handover Target not Allowed | Handover to the indicated target cell is not allowed for the UE in question |
| Invalid MME Group ID | The target eNB doesn't belong to the same pool area of the source eNB i.e. S1 handovers should be attempted instead. |
| No Radio Resources Available in Target Cell | The target cell doesn't have sufficient radio resources available. |
| Partial Handover | Provides a reason for the handover cancellation. The target eNB did not admit all E-RABs included in the HANDOVER REQUEST and the source eNB estimated service continuity for the UE would be better by not proceeding with handover towards this particular target eNB. |
| Reduce Load in Serving Cell | Load in serving cell needs to be reduced. When applied to handover preparation, it indicates the handover is triggered due to load balancing. |
| Resource Optimisation Handover | The reason for requesting handover is to improve the load distribution with the neighbour cells. |
| Time Critical Handover | Handover is requested for time critical reason i.e. this cause value is reserved to represent all critical cases where the connection is likely to be dropped if handover is not performed. |
| $T_{X2RELOCoverall}$ Expiry | The reason for the action is expiry of timer $T_{X2RELOCoverall}$. |
| $T_{RELOCprep}$ Expiry | Handover Preparation procedure is cancelled when timer $T_{RELOCprep}$ expires. |
| Unknown MME Code | The target eNB belongs to the same pool area of the source eNB and recognizes the MME Group ID. However, the MME Code is unknown to the target eNB. |
| Unknown New eNB UE X2AP ID | The action failed because the New eNB UE X2AP ID or the MeNB UE X2AP ID is unknown. |
| Unknown Old eNB UE X2AP ID | The action failed because the Old eNB UE X2AP ID or the SeNB UE X2AP ID is unknown. |
| Unknown Pair of UE X2AP ID | The action failed because the pair of UE X2 AP IDs is unknown. |
| Encryption And/Or Integrity Protection Algorithms Not Supported | The target eNB is unable to support any of the encryption and/or integrity protection algorithms supported by the UE, or the en-gNB is unable to support any of the NR encryption and/or integrity protection algorithms supported by the UE for EN-DC operation. |
| ReportCharacteristicsEmpty | The action failed because there is no characteristic reported. |
| NoReportPeriodicity | The action failed because the periodicity is not defined. |
| ExistingMeasurementID | The action failed because measurement-ID is already used. |
| Unknown eNB Measurement ID | The action failed because some eNB Measurement-ID is unknown. |
| Measurement Temporarily not Available | The eNB can temporarily not provide the requested measurement object. |
| Load Balancing | The reason for mobility settings change is load balancing. |
| Handover Optimisation | The reason for mobility settings change is handover optimisation. |
| Value out of allowed range | The action failed because the proposed Handover Trigger parameter change in the eNB ₂ Proposed Mobility Parameters IE is too low or too high. |
| Multiple E-RAB ID Instances | The action failed because multiple instances of the same E-RAB had been provided to the eNB. |
| Switch Off Ongoing | The reason for the action is an ongoing switch off i.e. the concerned cell will be switched off after offloading and not be available. It aides the receiving eNB in taking subsequent actions, e.g. selecting the target cell for subsequent handovers. |
| Not supported QCI value | The action failed because the requested QCI is not supported. |
| Unspecified | Sent when none of the above cause values applies but still the cause is Radio Network Layer related. |
| Measurement not Supported For The Object | At least one of the concerned cell(s) does not support the requested measurement. |
| $T_{DCoverall}$ Expiry | The reason for the action is expiry of timer $T_{DCoverall}$. |
| T_{DCprep} Expiry | The reason for the action is expiry of timer T_{DCprep} . |
| Action Desirable for Radio Reasons | The reason for requesting the action is radio related. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| Reduce Load | Load in the cell(group) served by the requesting node needs to be reduced. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |

| | |
|--|--|
| Resource Optimisation | The reason for requesting this action is to improve the load distribution with the neighbour cells. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| Time Critical action | The action is requested for time critical reason i.e. this cause value is reserved to represent all critical cases where radio resources are likely to be dropped if the requested action is not performed. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| Target not Allowed | Requested action towards the indicated target cell is not allowed for the UE in question. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| No Radio Resources Available | The cell(s) in the requested node don't have sufficient radio resources available. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| Invalid QoS combination | The action was failed because of invalid QoS combination. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| Encryption Algorithms Not Supported | The requested eNB is unable to support any of the encryption algorithms supported by the UE. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| Procedure cancelled | The sending node cancelled the procedure due to other urgent actions to be performed. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| RRM purpose | The procedure is initiated due to node internal RRM purposes. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| Improve User Bit Rate | The reason for requesting this action is to improve the user bit rate. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| User Inactivity | The action is requested due to user inactivity on all E-RABs, e.g., S1 is requested to be released in order to optimise the radio resources; or SeNB/en-gNB didn't see activity on the DRB recently. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| Radio Connection With UE Lost | The action is requested due to losing the radio connection to the UE. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| Failure in the Radio Interface Procedure | Radio interface procedure has failed. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| Bearer Option not Supported | The requested bearer option is not supported by the sending node. In the current version of this specification applicable for Dual Connectivity and EN-DC only. |
| MCG Mobility | The procedure is initiated due to mobility related at MCG radio resource. |
| SCG Mobility | The procedure is initiated due to mobility related at SCG radio resource. |
| Count reaches max value | Indicates the PDCP COUNT for UL or DL reached the max value and the bearer may be released. |
| Unknown Old en-gNB UE X2AP ID | The action failed because the Old en-gNB UE X2AP ID or the SeNB UE X2AP ID is unknown. |
| PDCP Overload | The procedure is initiated due to PDCP resource limitation. |

| Transport Network Layer cause | Meaning |
|--------------------------------------|---|
| Transport resource unavailable | The required transport resources are not available. |
| Unspecified | Sent when none of the above cause values applies but still the cause is Transport Network Layer related |

| Protocol cause | Meaning |
|---|--|
| Abstract Syntax Error (Reject) | The received message included an abstract syntax error and the concerned criticality indicated "reject" (see sub clause 10.3 of TS 36.413 [4]). |
| Abstract Syntax Error (Ignore and Notify) | The received message included an abstract syntax error and the concerned criticality indicated "ignore and notify" (see sub clause 10.3 of TS 36.413 [4]). |
| Abstract syntax error (falsely constructed message) | The received message contained IEs or IE groups in wrong order or with too many occurrences (see sub clause 10.3 of TS 36.413 [4]). |
| Message not Compatible with Receiver State | The received message was not compatible with the receiver state (see sub clause 10.4 of TS 36.413 [4]). |
| Semantic Error | The received message included a semantic error (see sub clause 10.4 of TS 36.413 [4]). |
| Transfer Syntax Error | The received message included a transfer syntax error (see sub clause 10.2 of TS 36.413 [4]). |
| Unspecified | Sent when none of the above cause values applies but still the cause is Protocol related |

| Miscellaneous cause | Meaning |
|--|---|
| Control Processing Overload | eNB control processing overload |
| Hardware Failure | eNB hardware failure |
| Not enough User Plane Processing Resources | eNB has insufficient user plane processing resources available. |
| O&M Intervention | Operation and Maintenance intervention related to eNB equipment |
| Unspecified | 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 or Protocol |

9.2.7 Criticality Diagnostics

The *Criticality Diagnostics* IE is sent by the eNB/en-gNB 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.

| 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 | | <i>0..<maxNrOfErrors></i> | | |
| >IE Criticality | M | | ENUMERATED(reject, ignore, notify) | The IE Criticality is used for reporting the criticality of the triggering IE. The value "ignore" shall not be used. |
| >IE ID | M | | INTEGER (0..65535) | The IE ID of the not understood or missing IE |
| >Type Of Error | M | | ENUMERATED(not understood, missing, ...) | |

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

9.2.8 Served Cell Information

This IE contains cell configuration information of a cell that a neighbour eNB may need for the X2 AP interface.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|--------------------------------------|--|--|-------------|----------------------|
| PCI | M | | INTEGER (0..503, ...) | Physical Cell ID | – | |
| Cell ID | M | | ECCI 9.2.14 | | – | |
| TAC | M | | OCTET STRING(2) | Tracking Area Code | – | |
| Broadcast PLMNs | | <i>1..<maxnoof BPLMNs></i> | | Broadcast PLMNs | – | |
| >PLMN Identity | M | | 9.2.4 | | – | |
| CHOICE <i>EUTRA-Mode-Info</i> | M | | | | – | |
| > <i>FDD</i> | | | | | | |
| >> FDD Info | | 1 | | | – | |
| >>>UL EARFCN | M | | EARFCN 9.2.26 | Corresponds to N _{UL} in TS 36.104 [16] for E-UTRA operating bands for which it is defined; ignored for E-UTRA operating bands for which N _{UL} is not defined | – | |
| >>>DL EARFCN | M | | EARFCN 9.2.26 | Corresponds to N _{DL} in TS 36.104 [16] | – | |
| >>>UL Transmission Bandwidth | M | | Transmission Bandwidth 9.2.27 | Same as DL Transmission Bandwidth in this release; ignored in case UL EARFCN value is ignored | – | |
| >>>DL Transmission Bandwidth | M | | Transmission Bandwidth 9.2.27 | | – | |
| >>>UL EARFCN Extension | O | | EARFCN Extension 9.2.65 | If this IE is present, the value signalled in the <i>UL EARFCN</i> IE is ignored. | YES | reject |
| >>>DL EARFCN Extension | O | | EARFCN Extension 9.2.65 | If this IE is present, the value signalled in the <i>DL EARFCN</i> IE is ignored. | YES | reject |
| >>>Offset of NB-IoT Channel Number to DL EARFCN | O | | Offset of NB-IoT Channel Number to EARFCN 9.2.94 | Corresponds to M _{DL} in TS 36.104 [16] | YES | reject |
| >>>Offset of NB-IoT Channel Number to UL EARFCN | O | | Offset of NB-IoT Channel Number to EARFCN 9.2.94 | Corresponds to M _{UL} in TS 36.104 [16] | YES | reject |
| >>>NRS-NSSS- PowerOffset | O | | ENUMERATED (-3, 0, 3, ...) | NRS to NSSS power ratio, as defined in TS6.213 [11]. | YES | Ignore |

| | | | | | | |
|--|---|---|--|---|-----|--------|
| >>>NSSS-NumOccasionDifferentPrecoder | O | | ENUMERATED (2, 4, 8, ...) | The number of consecutive NSSS occasions that use different precoders for NSSS transmission, as defined in TS6.213 [11]. | YES | ignore |
| >TDD | | | | | – | |
| >>TDD Info | | 1 | | | – | |
| >>>EARFCN | M | | 9.2.26 | Corresponds to N_{DL}/N_{UL} in TS 36.104 [16] | – | |
| >>>Transmission Bandwidth | M | | Transmission Bandwidth 9.2.27 | | – | |
| >>>Subframe Assignment | M | | ENUMERATED (sa0, sa1, sa2, sa3, sa4, sa5, sa6,...) | Uplink-downlink subframe configuration information defined in TS 36.211 [10]. In NB-IOT, sa0 and sa6 are not applicable. | – | |
| >>>Special Subframe Info | | 1 | | Special subframe configuration information defined in TS 36.211 [10] | – | |
| >>>>Special Subframe Patterns | M | | ENUMERATED (ssp0, ssp1, ssp2, ssp3, ssp4, ssp5, ssp6, ssp7, ssp8, ...) | | – | |
| >>>>Cyclic Prefix DL | M | | ENUMERATED (Normal, Extended,...) | | – | |
| >>>>Cyclic Prefix UL | M | | ENUMERATED (Normal, Extended,...) | | – | |
| >>>>Additional Special Subframe Info | O | | | Special subframe configuration information defined in TS 36.211 [10]. Only for newly defined configuration of special subframe from Release 11. | YES | ignore |
| >>>>Additional Special Subframe Patterns | M | | ENUMERATED (ssp0, ssp1, ssp2, ssp3, ssp4, ssp5, ssp6, ssp7, ssp8, ssp9, ...) | | – | |
| >>>>Cyclic Prefix DL | M | | ENUMERATED (Normal, Extended,...) | | – | |

| | | | | | | |
|--|---|--|--|---|--------|--------|
| >>>>Cyclic Prefix UL | M | | ENUMERATED (Normal, Extended,...) | | – | |
| >>>EARFCN Extension | O | | 9.2.65 | If this IE is present, the value signalled in the <i>EARFCN</i> IE is ignored. | YES | reject |
| >>>Additional Special Subframe Extension Info | O | | | Special subframe configuration information defined in TS 36.211 [10]. Only for newly defined configuration of special subframe from Release 14. | YES | ignore |
| >>>>Additional Special Subframe Patterns Extension | M | | ENUMERATED (ssp10, ...) | | – | |
| >>>>Cyclic Prefix DL | M | | ENUMERATED (Normal, Extended,...) | | – | |
| >>>>Cyclic Prefix UL | M | | ENUMERATED (Normal, Extended,...) | | – | |
| >>>Offset of NB-IoT Channel Number to DL EARFCN | O | | Offset of NB-IoT Channel Number to EARFCN 9.2.94 | Corresponds to M_{DL} in TS 36.104 [16] | YES | reject |
| >>>NB-IoT UL DL Alignment Offset | O | | NB-IoT UL DL Alignment Offset 9.2.144 | Corresponds to the TDD-UL-DL-AlignmentOffset -NB in TS 36.331 [9]. | YES | reject |
| Number of Antenna Ports | O | | 9.2.43 | | YES | ignore |
| PRACH Configuration | O | | PRACH Configuration 9.2.50 | | YES | ignore |
| MBSFN Subframe Info | | <i>0..<maxnoof MBSFN></i> | | MBSFN subframe defined in TS 36.331 [9] | GLOBAL | ignore |
| >Radioframe Allocation Period | M | | ENUMERATED (n1, n2, n4, n8, n16, n32, ...) | | – | |
| >Radioframe Allocation Offset | M | | INTEGER (0..7, ...) | | – | |
| >Subframe Allocation | M | | 9.2.51 | | – | |
| CSG ID | O | | 9.2.53 | | YES | ignore |
| MBMS Service Area Identity List | | <i>0..<maxnoof MBMSServiceAreaIdentities ></i> | | Supported MBMS Service Area Identities in the cell | GLOBAL | ignore |
| >MBMS Service Area Identity | | | OCTET STRING(2) | MBMS Service Area Identities as defined in TS 23.003 [29] | | |
| MultibandInfoList | O | | 9.2.60 | | YES | ignore |

| | | | | | | |
|---|---|------------------------------------|---|--|-----|--------|
| FreqBandIndicatorPriority | O | | ENUMERATED (not-broadcasted, broadcasted, ...) | This IE indicates that the eNodeB supports <i>FreqBandIndicationPriority</i> , and whether <i>FreqBandIndicatorPriority</i> is broadcasted in SIB 1 (see TS 36.331 [9]) | YES | ignore |
| BandwidthReducedSI | O | | ENUMERATED (scheduled, ...) | This IE indicates that the <i>SystemInformationBlockType1-BR</i> is scheduled in the cell (see TS 36.331 [9]) | YES | ignore |
| Protected E-UTRA Resource Indication | O | | 9.2.125 | This IE indicates which E-UTRA control/reference signal resources are protected and are not subject to E-UTRA - NR Cell Resource Coordination. | YES | ignore |
| Broadcast PLMN Identity Info List E-UTRA | | <i>0..<maxnoof BPLMNs-1></i> | | This IE corresponds to the <i>cellAccessRelatedInfo</i> IE in <i>SIB1</i> as specified in TS 36.331 [9]. The PLMN Identities and associated information contained in this IE shall be provided in the same order as broadcast in <i>SIB1</i> . | YES | ignore |
| >Broadcast PLMNs | | <i>1..<maxnoof BPLMNs></i> | | | – | |
| >>PLMN Identity | M | | 9.2.4 | | – | |
| >TAC | M | | OCTET STRING(2) | | – | |
| >E-UTRA Cell Identity | M | | BIT STRING (28) | | – | |

| Range bound | Explanation |
|----------------------------------|--|
| maxnoofBPLMNs | Maximum no. of Broadcast PLMN Ids. Value is 6. |
| maxnoofMBSFN | Maximum no. of MBSFN frame allocation with different offset. Value is 8. |
| maxnoofMBMSServiceAreaIdentities | Maximum no. of MBMS Service Area Identities. Value is 256. |
| maxnoofBPLMNs-1 | Maximum no. of extended broadcast PLMN Ids minus 1. Value is 5. |

9.2.9 E-RAB Level QoS Parameters

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

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------------------------|----------|-------|--------------------------|--|-------------|----------------------|
| QCI | M | | INTEGER (0..255) | QoS Class Identifier defined in TS 23.401 [12]. Logical range and coding specified in TS 23.203 [13]. | – | |
| Allocation and Retention Priority | M | | 9.2.31 | | – | |
| GBR QoS Information | O | | 9.2.10 | This IE applies to GBR bearers only and shall be ignored otherwise. | – | |
| Downlink Maximum Packet Loss Rate | O | | Packet Loss Rate 9.2.124 | This IE applies only to bearers with specific QCI (see TS 23.401 [12]) and indicates the maximum allowed packet loss rate for downlink as specified in TS 23.401 [12]. | YES | ignore |
| Uplink Maximum Packet Loss Rate | O | | Packet Loss Rate 9.2.124 | This IE applies only to bearers with specific QCI (see TS 23.401 [12]) and indicates the maximum allowed packet loss rate for uplink as specified in TS 23.401 [12]. | YES | ignore |

9.2.10 GBR QoS Information

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

NOTE: For LTE DC, the SeNB regards the *GBR QoS Information* IE as an E-RAB level parameter also for E-RABs configured with the split bearer option, although for the split bearer option the bitrates signalled by the MeNB are typically not equal to the bitrates signalled by the MME for that E-RAB (see TS 36.300 [15]).

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-------|--------------------------|---|-------------|----------------------|
| E-RAB Maximum Bit Rate Downlink | M | | Bit Rate 9.2.11 | Maximum Bit Rate in DL (i.e. from EPC to E-UTRAN) for the bearer. Details in TS 23.401 [12]. If the <i>Extended E-RAB Maximum Bit Rate Downlink</i> IE is included, the <i>E-RAB Maximum Bit Rate Downlink</i> IE shall be ignored. | – | |
| E-RAB Maximum Bit Rate Uplink | M | | Bit Rate 9.2.11 | Maximum Bit Rate in UL (i.e. from E-UTRAN to EPC) for the bearer. Details in TS 23.401 [12]. If the <i>Extended E-RAB Maximum Bit Rate Uplink</i> IE is included, the <i>E-RAB Maximum Bit Rate Uplink</i> IE shall be ignored. | – | |
| E-RAB Guaranteed Bit Rate Downlink | M | | Bit Rate 9.2.11 | Guaranteed Bit Rate (provided that there is data to deliver) in DL (i.e. from EPC to E-UTRAN) for the bearer. Details in TS 23.401 [12]. If the <i>Extended E-RAB Guaranteed Bit Rate Downlink</i> IE is included, the <i>E-RAB Guaranteed Bit Rate Downlink</i> IE shall be ignored. | – | |
| E-RAB Guaranteed Bit Rate Uplink | M | | Bit Rate 9.2.11 | Guaranteed Bit Rate (provided that there is data to deliver) in UL (i.e. from E-UTRAN to EPC) for the bearer. Details in TS 23.401 [12]. If the <i>Extended E-RAB Guaranteed Bit Rate Uplink</i> IE is included, the <i>E-RAB Guaranteed Bit Rate Uplink</i> IE shall be ignored. | – | |
| Extended E-RAB Maximum Bit Rate Downlink | O | | Extended Bit Rate 9.2.99 | Maximum Bit Rate in DL (i.e. from EPC to E-UTRAN) for the bearer. Details in TS 23.401 [12]. | – | |

| | | | | | | |
|---|---|--|--------------------------|--|---|--|
| Extended E-RAB Maximum Bit Rate Uplink | O | | Extended Bit Rate 9.2.99 | Maximum Bit Rate in UL (i.e. from E-UTRAN to EPC) for the bearer. Details in TS 23.401 [12]. | – | |
| Extended E-RAB Guaranteed Bit Rate Downlink | O | | Extended Bit Rate 9.2.99 | Guaranteed Bit Rate (provided that there is data to deliver) in DL (i.e. from EPC to E-UTRAN) for the bearer. Details in TS 23.401 [12]. | – | |
| Extended E-RAB Guaranteed Bit Rate Uplink | O | | Extended Bit Rate 9.2.99 | Guaranteed Bit Rate (provided that there is data to deliver) in UL (i.e. from E-UTRAN to EPC) for the bearer. Details in TS 23.401 [12]. | – | |

9.2.11 Bit Rate

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

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

9.2.12 UE Aggregate Maximum Bit Rate

On Handover Aggregate Maximum Bitrate is transferred to the target eNB. In Dual Connectivity, UE Aggregate Maximum Bit Rate is split into MeNB UE Aggregate Maximum Bit Rate and SeNB UE Aggregate Maximum Bit Rate which are enforced by MeNB and SeNB respectively as specified in TS 36.300 [15]. The UE Aggregate Maximum Bitrate is applicable for all Non-GBR bearers per UE which is defined for the Downlink and the Uplink direction and provided by the MME to the eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|-------|--------------------------|--|-------------|----------------------|
| UE Aggregate Maximum Bit Rate Downlink | M | | Bit Rate 9.2.11 | If the <i>Extended UE Aggregate Maximum Bit Rate Downlink</i> IE is included, the <i>UE Aggregate Maximum Bit Rate Downlink</i> IE shall be ignored. | – | |
| UE Aggregate Maximum Bit Rate Uplink | M | | Bit Rate 9.2.11 | If the <i>Extended UE Aggregate Maximum Bit Rate Uplink</i> IE is included, the <i>UE Aggregate Maximum Bit Rate Uplink</i> IE shall be ignored. | – | |
| Extended UE Aggregate Maximum Bit Rate Downlink | O | | Extended Bit Rate 9.2.99 | UE Aggregate Maximum Bit Rate in DL. Details in TS 23.401 [12]. | – | |
| Extended UE Aggregate Maximum Bit Rate Uplink | O | | Extended Bit Rate 9.2.99 | UE Aggregate Maximum Bit Rate in UL. Details in TS 23.401 [12]. | – | |

9.2.13 Message Type

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

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------|----------|-------|--|-----------------------|
| Procedure Code | M | | INTEGER (0..255) | |
| Type of Message | M | | CHOICE (Initiating Message, Successful Outcome, Unsuccessful Outcome, ...) | |

9.2.14 ECGI

The E-UTRAN Cell Global Identifier (ECGI) is used to globally identify a cell (see TS 36.401 [2]).

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|---|-------------|----------------------|
| PLMN Identity | M | | 9.2.4 | | – | |
| E-UTRAN Cell Identifier | M | | BIT STRING (28) | The leftmost bits of the <i>E-UTRAN Cell Identifier</i> IE value correspond to the value of the <i>eNB ID</i> IE contained in the <i>Global eNB ID</i> IE (defined in section 9.2.22) identifying the eNB that controls the cell. | – | |

9.2.15 COUNT Value

This information element indicates the 12 bit PDCP sequence number and the corresponding 20 bit Hyper frame number.

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

9.2.16 GUMMEI

This information element indicates the globally unique MME identity.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| GU Group Id | M | | 9.2.20 | | – | |
| MME code | M | | OCTET STRING (1) | | – | |

9.2.17 UL Interference Overload Indication

This IE provides, per PRB, a report on interference overload. The interaction between the indication of UL Interference Overload and UL High Interference is implementation specific.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---|----------|--------------------------------|--|---|
| UL Interference Overload Indication List | | <i>1..<maxnoofPRBs ></i> | | |
| >UL Interference Overload Indication | M | | ENUMERATED (high interference, medium interference, low interference, ...) | Each PRB is identified by its position in the list: the first element in the list corresponds to PRB 0, the second to PRB 1, etc. |

| Range bound | Explanation |
|-------------|---|
| maxnoofPRBs | Maximum no. Physical Resource Blocks. Value is 110. |

9.2.18 UL High Interference Indication

This IE provides, per PRB, a 2 level report on interference sensitivity. The interaction between the indication of UL Overload and UL High Interference is implementation specific.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|--------------------------|--|
| HII | M | | BIT STRING (1..110, ...) | Each position in the bitmap represents a PRB (first bit=PRB 0 and so on), for which value "1" indicates 'high interference sensitivity' and value "0" indicates 'low interference sensitivity'. The maximum number of Physical Resource Blocks is 110. |

9.2.19 Relative Narrowband Tx Power (RNTP)

This IE provides an indication on DL power restriction per PRB or per subframe per PRB (Enhanced RNTP) in a cell and other information needed by a neighbour eNB for interference aware scheduling.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------------------|----------|-------|--|--|-------------|----------------------|
| RNTP Per PRB | M | | BIT STRING (6..110, ...) | Each position in the bitmap represents a n_{PRB} value (i.e. first bit=PRB 0 and so on), for which the bit value represents $RNTP(n_{PRB})$, defined in TS 36.213 [11]. Value 0 indicates "Tx not exceeding RNTP threshold". Value 1 indicates "no promise on the Tx power is given". The IE is ignored if the <i>Enhanced RNTP</i> IE is included. | – | |
| RNTP Threshold | M | | ENUMERATED (-∞, -11, -10, -9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, ...) | $RNTP_{threshold}$ is defined in TS 36.213 [11]. | – | |
| Number Of Cell-specific Antenna Ports | M | | ENUMERATED (1, 2, 4, ...) | P (number of antenna ports for cell-specific reference signals) defined in TS 36.211 [10] | – | |
| P_B | M | | INTEGER (0..3, ...) | P_B is defined in TS 36.213 [11]. | – | |
| PDCCH Interference Impact | M | | INTEGER (0..4, ...) | Measured by Predicted Number Of Occupied PDCCH OFDM Symbols (see TS 36.211 [10]). Value 0 means "no prediction is available". | – | |
| Enhanced RNTP | O | | | | YES | ignore |

| | | | | | | |
|----------------------------|---|------|--|---|--|--|
| >Enhanced RNTP Bitmap | M | | BIT STRING (12..8800, ...) | <p>Each position in the bitmap represents a PRB in a subframe; value "00" indicates "Tx not exceeding RNTP Threshold", value "01" indicates "Tx not exceeding RNTP High Power Threshold", value "11" indicates that "no promise on the Tx power is given". Value "10" is ignored by the receiver.</p> <p>Each position is applicable only in positions corresponding to DL subframes.</p> <p>The first 2 bits correspond to PRB 0 of the first subframe for which the IE is valid, the following 2 bits correspond to PRB 1 of the first subframe for which the IE is valid, and so on.</p> <p>The bit string may span across multiple contiguous subframes (maximum 40).</p> <p>The length of the bit string is an integer multiple of $2 \times N_{RB}^{DL}$.</p> <p>N_{RB}^{DL} is defined in TS 36.211 [10].</p> <p>The Enhanced RNTP pattern is continuously repeated.</p> | | |
| >RNTP High Power Threshold | M | | ENUMERATE D (-∞, -11, -10, -9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, ...) | Defined as the $RNTP_{threshold}$ in TS 36.213 [11]. | | |
| >Enhanced RNTP Start Time | | 0..1 | | | | |
| >>Start SFN | M | | INTEGER (0..1023, ...) | SFN of the radio frame containing the first subframe when the <i>Enhanced RNTP</i> IE is valid. | | |
| >>>Start Subframe Number | M | | INTEGER (0..9, ...) | Subframe number, within the radio frame indicated by the <i>Start SFN</i> IE, of the first subframe when the <i>Enhanced RNTP</i> IE is valid. | | |

9.2.20 GU Group Id

The *GU Group Id* IE is the globally unique group id corresponding to a pool area.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| PLMN Id | M | | PLMN Identity 9.2.4 | | – | |
| MME Group Id | M | | OCTET STRING(2) | | – | |

9.2.21 Location Reporting Information

This information element indicates how the location information should be reported.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------|----------|-------|--|-----------------------|-------------|----------------------|
| Event | M | | ENUMERATED (Change of serving cell, ...) | | – | |
| Report Area | M | | ENUMERATED (ECGI, ...) | | – | |

9.2.22 Global eNB ID

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

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------------------|----------|-------|-----------------------|---|-------------|----------------------|
| PLMN Identity | M | | 9.2.4 | | – | |
| CHOICE <i>eNB ID</i> | M | | | | – | |
| > <i>Macro eNB ID</i> | M | | BIT STRING (20) | Equal to the 20 leftmost bits of the value of the <i>E-UTRAN Cell Identifier</i> IE contained in the <i>ECGI</i> IE (see section 9.2.14) identifying each cell controlled by the eNB | – | |
| > <i>Home eNB ID</i> | M | | BIT STRING (28) | Equal to the value of the <i>E-UTRAN Cell Identifier</i> IE contained in the <i>ECGI</i> IE (see section 9.2.14) identifying the cell controlled by the eNB | – | |
| > <i>Short Macro eNB ID</i> | M | | BIT STRING (SIZE(18)) | Equal to the 18 leftmost bits of the value of the <i>E-UTRAN Cell Identifier</i> IE contained in the <i>ECGI</i> IE (see section 9.2.14) identifying each cell controlled by the eNB. | – | |
| > <i>Long Macro eNB ID</i> | M | | BIT STRING (SIZE(21)) | Equal to the 21 leftmost bits of the value of the <i>E-UTRAN Cell Identifier</i> IE contained in the <i>ECGI</i> IE (see section 9.2.14) identifying each cell controlled by the eNB. | – | |

9.2.23 E-RAB ID

This IE uniquely identifies an E-RAB for a UE.

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

9.2.24 eNB UE X2AP ID

This information element, combined with the eNB UE X2AP ID Extension when present regardless its value, uniquely identifies an UE over the X2 interface within an eNB.

The usage of this IE is defined in TS 36.401 [2].

NOTE: If X2-C signalling transport is shared among multiple interface instances, the value of the eNB UE X2AP ID, combined with the eNB UE X2AP ID Extension, if applicable, is allocated so that it can be associated with an X2-C interface instance.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------|----------|-------|-----------------------|-----------------------|
| eNB UE X2AP ID | M | | INTEGER (0..4095) | |

9.2.25 Subscriber Profile ID for RAT/Frequency priority

The *Subscriber Profile ID* IE for RAT/Frequency Selection Priority is used to define camp priorities in Idle mode and to control inter-RAT/inter-frequency handover in Active mode (TS 36.300 [15]).

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

9.2.26 EARFCN

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

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---------------|----------|-------|---------------------------|---|
| EARFCN | M | | INTEGER (0..maxEARFCN) | The relation between EARFCN and carrier frequency (in MHz) are defined in TS 36.104 [16]. |

| Range bound | Explanation |
|-------------|---|
| maxEARFCN | Maximum value of EARFCNs. Value is 65535. |

9.2.27 Transmission Bandwidth

The *Transmission Bandwidth* IE is used to indicate the UL or DL transmission bandwidth expressed in units of resource blocks "N_{RB}" (TS 36.104 [16]). The values bw1, bw6, bw15, bw25, bw50, bw75, bw100 correspond to the number of resource blocks "N_{RB}" 6, 15, 25, 50, 75, 100.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------------|----------|-------|---|-----------------------|
| Transmission Bandwidth | M | | ENUMERATED (bw6, bw15, bw25, bw50, bw75, bw100,... , bw1) | |

9.2.28 E-RAB List

The IE contains a list of E-RAB identities with a cause value. It is used for example to indicate not admitted bearers.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------|----------|---------------------|-----------------------|-----------------------|-------------|----------------------|
| E-RAB List Item | | 1..<maxnoofBearers> | | | EACH | ignore |
| >E-RAB ID | M | | 9.2.23 | | – | |
| >Cause | M | | 9.2.6 | | – | |

| Range bound | Explanation |
|----------------|--------------------------------------|
| maxnoofBearers | Maximum no. of E-RABs. Value is 256. |

9.2.29 UE Security Capabilities

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

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---------------------------------|----------|-------|-------------------------|---|
| 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, "third bit" - 128-EEA3, other bits reserved for future use. Value '1' indicates support and value "0" indicates no support of the algorithm. Algorithms are defined in TS 33.401 [18]. |
| Integrity Protection Algorithms | M | | BIT STRING (16, ...) | Each position in the bitmap represents an integrity protection algorithm: all bits equal to 0" - UE supports no other algorithm than EIA0 (TS 33.401 [18]) "first bit" - 128-EIA1, "second bit" - 128-EIA2, "third bit" - 128-EIA3, other bits reserved for future use. Value '1' indicates support and value "0" indicates no support of the algorithm. Algorithms are defined in TS 33.401 [18]. |

9.2.30 AS Security Information

The *AS Security Information* IE is used to generate the key material to be used for AS security with the UE.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------------|----------|-------|-----------------------|--|
| Key eNodeB Star | M | | BIT STRING (256) | KeNB* defined in TS 33.401 [18]. If the target cell belongs to multiple frequency bands, the source eNB selects the DL-EARFCN for KeNB* calculation as specified in section 10.3 of TS 36.331 [9]. |
| Next Hop Chaining Count | M | | INTEGER (0..7) | Next Hop Chaining Count (NCC) defined in TS 33.401 [18] |

9.2.31 Allocation and Retention Priority

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

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------------------|----------|-------|---|--|
| Priority Level | M | | INTEGER (0..15) | Desc.: This IE should be understood as "priority of allocation and retention" (see TS 23.401 [12]). Usage: Value 15 means "no priority". Values between 1 and 14 are ordered in decreasing order of priority, i.e. 1 is the highest and 14 the lowest. Value 0 shall be treated as a logical error if received. |
| Pre-emption Capability | M | | ENUMERATED(sh all not trigger pre-emption, may trigger pre-emption) | Desc.: This IE indicates the pre-emption capability of the request on other E-RABs Usage: The E-RAB shall not pre-empt other E-RABs or, the E-RAB may pre-empt other E-RABs The Pre-emption Capability indicator applies to the allocation of resources for an E-RAB and as such it provides the trigger to the pre-emption procedures/processes of the eNB. |
| Pre-emption Vulnerability | M | | ENUMERATED(not pre-emptable, pre-emptable) | Desc.: This IE indicates the vulnerability of the E-RAB to pre-emption of other E-RABs. Usage: The E-RAB shall not be pre-empted by other E-RABs or the E-RAB may be pre-empted by other RABs. Pre-emption Vulnerability indicator applies for the entire duration of the E-RAB, unless modified, and as such indicates whether the E-RAB is a target of the pre-emption procedures/processes of the eNB. |

9.2.32 Time To Wait

This IE defines the minimum allowed waiting times.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|--|-----------------------|
| Time To Wait | M | | ENUMERATED(1s, 2s, 5s, 10s, 20s, 60s, ...) | |

9.2.33 SRVCC Operation Possible

The IE indicates that both the UE and the MME are SRVCC-capable. E-UTRAN behaviour on reception of this is specified in TS 23.216 [20].

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

9.2.34 Hardware Load Indicator

The *Hardware Load Indicator* IE indicates the status of the Hardware Load experienced by the cell.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------------------|----------|-------|-----------------------|-----------------------|
| DL Hardware Load Indicator | M | | Load Indicator 9.2.36 | |
| UL Hardware Load Indicator | M | | Load Indicator 9.2.36 | |

9.2.35 S1 TNL Load Indicator

The *S1 TNL Load Indicator* IE indicates the status of the S1 Transport Network Load experienced by the cell.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------------|----------|-------|-----------------------|-----------------------|
| DL S1TNL Load Indicator | M | | Load Indicator 9.2.36 | |
| UL S1TNL Load Indicator | M | | Load Indicator 9.2.36 | |

9.2.36 Load Indicator

The *Load Indicator* IE indicates the status of Load.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------|----------|-------|---|-----------------------|
| Load Indicator | M | | ENUMERATED (LowLoad, MediumLoad, HighLoad, Overload, ...) | |

9.2.37 Radio Resource Status

The *Radio Resource Status* IE indicates the usage of the PRBs for all traffic in Downlink and Uplink (TS 36.314 [22], TS 23.203 [13]) and the usage of PDCCH CCEs for Downlink and Uplink scheduling.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------------------|----------|-------|-----------------------|-----------------------|
| DL GBR PRB usage | M | | INTEGER (0..100) | |
| UL GBR PRB usage | M | | INTEGER (0..100) | |
| DL non-GBR PRB usage | M | | INTEGER (0..100) | |
| UL non-GBR PRB usage | M | | INTEGER (0..100) | |
| DL Total PRB usage | M | | INTEGER (0..100) | |
| UL Total PRB usage | M | | INTEGER (0..100) | |
| DL scheduling PDCCH CCE usage | O | | INTEGER (0..100) | |
| UL scheduling PDCCH CCE usage | O | | INTEGER (0..100) | |

9.2.38 UE History Information

The *UE History Information* IE contains information about cells that a UE has been served by in active state prior to the target cell. The overall mechanism is described in TS 36.300 [15].

NOTE: The definition of this IE is aligned with the definition of the *UE History Information* IE in TS 36.413 [4].

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--------------------------------|----------|--------------------------------|-----------------------|--|-------------|----------------------|
| Last Visited Cell List | | <i>1..<maxnoofCells></i> | | Most recent information is added to the top of this list | - | |
| >Last Visited Cell Information | M | | 9.2.39 | | - | |

| Range bound | Explanation |
|--------------|--|
| maxnoofCells | Maximum number of last visited cell information records that can be reported in the IE. Value is 16. |

9.2.39 Last Visited Cell Information

The Last Visited Cell Information may contain cell specific information.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|-------|-----------------------|--|-------------|----------------------|
| CHOICE <i>Last Visited Cell Information</i> | M | | | | - | |
| > <i>E-UTRAN Cell</i> | | | | | - | |
| >>Last Visited E-UTRAN Cell Information | M | | 9.2.40 | | - | |
| > <i>UTRAN Cell</i> | | | | | - | |
| >>Last Visited UTRAN Cell Information | M | | OCTET STRING | Defined in TS 25.413 [24] | | |
| > <i>GERAN Cell</i> | | | | | - | |
| >>Last Visited GERAN Cell Information | M | | 9.2.41 | | - | |
| > <i>NG-RAN Cell</i> | | | | | - | |
| >>Last Visited NG-RAN Cell Information | M | | OCTET STRING | Defined in TS 38.413 [39]. (see subclause 9.3.1.97). | | |

9.2.40 Last Visited E-UTRAN Cell Information

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

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|-------|-----------------------|---|-------------|----------------------|
| Global Cell ID | M | | E CGI 9.2.14 | | - | |
| Cell Type | M | | 9.2.42 | | - | |
| Time UE stayed in Cell | M | | INTEGER (0..4095) | The duration of the time the UE stayed in the cell in seconds. If the UE stays in a cell more than 4095s, this IE is set to 4095. | - | |
| Time UE stayed in Cell Enhanced Granularity | O | | INTEGER (0..40950) | The duration of the time the UE stayed in the cell in 1/10 seconds. If the UE stays in a cell more than 4095s, this IE is set to 40950. | YES | ignore |
| HO Cause Value | O | | Cause 9.2.6 | The cause for the handover from the E-UTRAN cell. | YES | ignore |

9.2.41 Last Visited GERAN Cell Information

The Last Visited Cell Information for GERAN is currently undefined.

NOTE: If in later Releases this is defined, the choice type may be extended with the actual GERAN specific information.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| CHOICE <i>Last Visited GERAN Cell Information</i> | M | | | | - | |
| >Undefined | M | | NULL | | - | |

9.2.42 Cell Type

The cell type provides the cell coverage area.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------|----------|-------|--|-----------------------|-------------|----------------------|
| Cell Size | M | | ENUMERATED (verysmall, small, medium, large, ...) | | - | |

9.2.43 Number of Antenna Ports

The *Number of Antenna Ports* IE is used to indicate the number of cell specific antenna ports.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------------|----------|-------|--------------------------------|---|
| Number of Antenna Ports | | | ENUMERATED (an1, an2, an4,...) | an1 = One antenna port an2 = Two antenna ports an4 = Four antenna ports |

9.2.44 Composite Available Capacity Group

The *Composite Available Capacity Group* IE indicates the overall available resource level in the cell in Downlink and Uplink.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------------------|----------|-------|-------------------------------------|-----------------------|-------------|----------------------|
| Composite Available Capacity Downlink | M | | Composite Available Capacity 9.2.45 | For the Downlink | - | |
| Composite Available Capacity Uplink | M | | Composite Available Capacity 9.2.45 | For the Uplink | - | |

9.2.45 Composite Available Capacity

The *Composite Available Capacity* IE indicates the overall available resource level in the cell in either Downlink or Uplink.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|-----------------------|---|-------------|----------------------|
| Cell Capacity Class Value | O | | 9.2.46 | | - | |
| Capacity Value | M | | 9.2.47 | '0' indicates no resource is available, Measured on a linear scale. | - | |

9.2.46 Cell Capacity Class Value

The *Cell Capacity Class Value* IE indicates the value that classifies the cell capacity with regards to the other cells. The *Cell Capacity Class Value* IE only indicates resources that are configured for traffic purposes.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|-----------------------|--|-------------|----------------------|
| Cell Capacity Class Value | M | | INTEGER (1..100,...) | Value 1 shall indicate the minimum cell capacity, and 100 shall indicate the maximum cell capacity. There should be a linear relation between cell capacity and Cell Capacity Class Value. | - | |

9.2.47 Capacity Value

The *Capacity Value* IE indicates the amount of resources that are available relative to the total E-UTRAN resources. The capacity value should be measured and reported so that the minimum E-UTRAN resource usage of existing services is reserved according to implementation. The *Capacity Value* IE can be weighted according to the ratio of cell capacity class values, if available.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------|----------|-------|-----------------------|--|-------------|----------------------|
| Capacity Value | M | | INTEGER (0..100) | Value 0 shall indicate no available capacity, and 100 shall indicate maximum available capacity . Capacity Value should be measured on a linear scale. | - | |

9.2.48 Mobility Parameters Information

The *Mobility Parameters Information* IE contains the change of the Handover Trigger as compared to its current value. The Handover Trigger corresponds to the threshold at which a cell initialises the handover preparation procedure towards a specific neighbour cell. Positive value of the change means the handover is proposed to take place later.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------------|----------|-------|-----------------------|--|
| Handover Trigger Change | M | | INTEGER (-20..20) | The actual value is IE value * 0.5 dB. |

9.2.49 Mobility Parameters Modification Range

The *Mobility Parameters Modification Range* IE contains the range of *Handover Trigger Change* values permitted by the eNB₂ at the moment the MOBILITY CHANGE FAILURE message is sent.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------------------------|----------|-------|-----------------------|--|
| Handover Trigger Change Lower Limit | M | | INTEGER (-20..20) | The actual value is IE value * 0.5 dB. |
| Handover Trigger Change Upper Limit | M | | INTEGER (-20..20) | The actual value is IE value * 0.5 dB. |

9.2.50 PRACH Configuration

This IE indicates the PRACH resources used in neighbor cell.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------------------------|----------|-------|-----------------------|---|-------------|----------------------|
| RootSequenceIndex | M | | INTEGER (0..837) | See section 5.7.2. in TS 36.211 [10] | – | |
| ZeroCorrelationZoneConfiguration | M | | INTEGER (0..15) | See section 5.7.2. in TS 36.211 [10] | – | |
| HighSpeedFlag | M | | BOOLEAN | TRUE corresponds to Restricted set and FALSE to Unrestricted set. See section 5.7.2 in TS 36.211 [10] | – | |
| PRACH-FrequencyOffset | M | | INTEGER (0..94) | See section 5.7.1 of TS 36.211 [10] | – | |
| PRACH-ConfigurationIndex | O | | INTEGER (0..63) | Mandatory for TDD, shall not be present for FDD. See section 5.7.1. in TS 36.211 [10] | – | |

9.2.51 Subframe Allocation

The *Subframe Allocation* IE is used to indicate the subframes that are allocated for MBSFN within the radio frame allocation period as defined in TS 36.331 [9].

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-----------------------------------|----------|-------|-----------------------|-----------------------|
| CHOICE <i>Subframe Allocation</i> | M | | | |
| > <i>Oneframe</i> | M | | BITSTRING (SIZE(6)) | |
| > <i>Fourframes</i> | M | | BITSTRING (SIZE(24)) | |

9.2.52 CSG Membership Status

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

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

9.2.53 CSG ID

This element indicates the identifier of the Closed Subscriber Group.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------|----------|-------|---------------------------|-----------------------|-------------|----------------------|
| CSG ID | M | | BIT STRING (SIZE (27)) | | - | |

9.2.54 ABS Information

This IE provides information about which sub frames the sending eNB is configuring as almost blank subframes and which subset of almost blank subframes are recommended for configuring measurements towards the UE. Almost blank subframes are subframes with reduced power on some physical channels and/or reduced activity.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---|----------|-------|---------------------------|---|
| CHOICE ABS Information | M | | | |
| > <i>FDD</i> | | | | |
| >>ABS Pattern Info | M | | BIT STRING (SIZE(40)) | Each position in the bitmap represents a DL subframe, for which value "1" indicates 'ABS' and value "0" indicates 'non ABS'. The first position of the ABS pattern corresponds to subframe 0 in a radio frame where <i>SFN</i> = 0. The ABS pattern is continuously repeated in all radio frames. The maximum number of subframes is 40. |
| >>Number Of Cell-specific Antenna Ports | M | | ENUMERATED (1, 2, 4, ...) | <i>P</i> (number of antenna ports for cell-specific reference signals) defined in TS 36.211 [10] |
| >>Measurement Subset | M | | BIT STRING (SIZE(40)) | Indicates a subset of the ABS Pattern Info above, and is used to configure specific measurements towards the UE. |
| > <i>TDD</i> | | | | |
| >>ABS Pattern Info | M | | BIT STRING (1..70, ...) | Each position in the bitmap represents a subframe. Value "1" indicates 'ABS' and value "0" indicates 'non ABS' which is applicable only in positions corresponding to the DL direction. The maximum number of subframes depends on UL/DL subframe configuration. The maximum number of subframes is 20 for UL/DL subframe configuration 1~5; 60 for UL/DL subframe configuration 6; 70 for UL/DL subframe configuration 0. UL/DL subframe configuration defined in TS 36.211 [10]. The first position of the ABS pattern corresponds to subframe 0 in a radio frame where <i>SFN</i> = 0. The ABS pattern is continuously repeated in all radio frames, and restarted each time <i>SFN</i> = 0. |
| >>Number Of Cell-specific Antenna Ports | M | | ENUMERATED (1, 2, 4, ...) | <i>P</i> (number of antenna ports for cell-specific reference signals) defined in TS 36.211 [10] |
| >>Measurement Subset | M | | BIT STRING (1..70, ...) | Indicates a subset of the ABS Pattern Info above, and is used to configure specific measurements towards the UE |

| | | | | |
|-----------------------|---|--|------|--|
| > <i>ABS Inactive</i> | M | | NULL | Indicates that interference coordination by means of almost blank sub frames is not active |
|-----------------------|---|--|------|--|

9.2.55 Invoke Indication

This IE provides an indication about which type of information the sending eNB would like the receiving eNB to send back.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------|----------|-------|--|-----------------------|
| Invoke Indication | M | | ENUMERATED (ABS Information, ..., Start NAICS Information, Stop NAICS Information) | |

9.2.56 MDT Configuration

The IE defines the MDT configuration parameters.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--------------------------|-----------------|----------------------------|---|--|-------------|----------------------|
| MDT Activation | M | | ENUMERATED(Immediate MDT only, Immediate MDT and Trace, ...) | | – | |
| CHOICE Area Scope of MDT | M | | | | – | |
| >Cell Based | | | | | – | |
| >>Cell ID List for MDT | | 1..<maxno ofCellIDfor MDT> | | | – | |
| >>>ECGI | M | | 9.2.14 | | – | |
| >TA Based | | | | | – | |
| >>TA List for MDT | | 1..<maxno ofTAforMDT> | | | – | |
| >>>TAC | M | | OCTET STRING (2) | Tracking Area Code. The TAI is derived using the current serving PLMN. | – | |
| >PLMN Wide | | | NULL | | – | |
| >TAI based | | | | | | |
| >>TAI List for MDT | | 1..<maxno ofTAforMDT> | | | | |
| >>>TAC | M | | OCTET STRING (2) | Tracking Area Code | | |
| >>>PLMN Identity | M | | 9.2.4 | | | |
| Measurements to Activate | M | | BITSTRING (SIZE(8)) | Each position in the bitmap indicates a MDT measurement, as defined in TS 37.320 [25]. First Bit = M1, Second Bit = M2, Third Bit = M3, Fourth Bit = M4, Fifth Bit = M5, Sixth Bit = logging of M1 from event triggered measurement reports according to existing RRM configuration. Seventh Bit = M6, Eighth Bit = M7. Value "1" indicates "activate" and value "0" indicates "do not activate". | – | |
| M1 Reporting Trigger | M | | ENUMERATED (periodic, A2event-triggered, ..., A2event-triggered periodic) | This IE shall be ignored if the <i>Measurements to Activate</i> IE has the first bit set to "0". | – | |
| M1 Threshold Event A2 | C-ifM1A2trigger | | | Included in case of event-triggered or event-triggered periodic reporting for measurement M1 | – | |
| >CHOICE Threshold | M | | | | – | |
| >>RSRP | | | | | – | |
| >>>Threshold RSRP | M | | INTEGER (0..97) | This IE is defined in TS 36.331 [9]. | – | |
| >>RSRQ | | | | | – | |
| >>>Threshold RSRQ | M | | INTEGER (0..34) | This IE is defined in TS 36.331 [9]. | – | |

| | | | | | | |
|-------------------------------------|------------------|--|--|---|-----|--------|
| M1 Periodic reporting | C-ifperiodic MDT | | | Included in case of periodic or event-triggered periodic reporting for measurement M1 | – | |
| >Report interval | M | | ENUMERATED (ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, min1, min6, min12, min30, min60) | This IE is defined in TS 36.331 [9]. | – | |
| >Report amount | M | | ENUMERATED (1, 2, 4, 8, 16, 32, 64, infinity) | Number of reports | – | |
| M3 Configuration | C-ifM3 | | 9.2.61 | | YES | ignore |
| M4 Configuration | C-ifM4 | | 9.2.62 | | YES | ignore |
| M5 Configuration | C-ifM5 | | 9.2.63 | | YES | ignore |
| MDT Location Information | O | | BITSTRING(SIZE(8)) | Each position in the bitmap represents requested location information as defined in TS 37.320 [31]. First Bit = GNSS Second Bit = E-CID information. Other bits are reserved for future use and are ignored if received. Value "1" indicates "activate" and value "0" indicates "do not activate". The eNB shall ignore the first bit unless the <i>Measurements to Activate</i> IE has the first bit or the sixth bit set to "1". | YES | ignore |
| Signalling based MDT PLMN List | O | | MDT PLMN List 9.2.64 | | YES | ignore |
| M6 Configuration | C-ifM6 | | 9.2.87 | | YES | ignore |
| M7 Configuration | C-ifM7 | | 9.2.88 | | YES | ignore |
| Bluetooth Measurement Configuration | O | | 9.2.134 | | YES | ignore |
| WLAN Measurement Configuration | O | | 9.2.135 | | YES | ignore |

| Range bound | Explanation |
|---------------------|--|
| maxnoofCellIDforMDT | Maximum no. of Cell ID subject for MDT scope. Value is 32. |
| maxnoofTAforMDT | Maximum no. of TA subject for MDT scope. Value is 8. |

| Condition | Explanation |
|---------------|--|
| ifM1A2trigger | This IE shall be present if the <i>Measurements to Activate</i> IE has the first bit set to "1" and the <i>M1 Reporting Trigger</i> IE is set to "A2event-triggered" or to "A2event-triggered periodic". |
| ifperiodicMDT | This IE shall be present if the <i>M1 Reporting Trigger</i> IE is set to "periodic" or to "A2event-triggered periodic". |
| ifM3 | This IE shall be present if the <i>Measurements to Activate</i> IE has the third bit set to "1". |
| ifM4 | This IE shall be present if the <i>Measurements to Activate</i> IE has the fourth bit set to "1". |
| ifM5 | This IE shall be present if the <i>Measurements to Activate</i> IE has the fifth bit set to "1". |
| ifM6 | This IE shall be present if the <i>Measurements to Activate</i> IE has the seventh bit set to "1". |
| ifM7 | This IE shall be present if the <i>Measurements to Activate</i> IE has the eighth bit set to "1". |

9.2.57 Void

9.2.58 ABS Status

The *ABS Status* IE is used to aid the eNB designating ABS to evaluate the need for modification of the ABS pattern.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--------------------------------------|----------|-------|-----------------------|---|
| DL ABS status | M | | INTEGER (0..100) | Percentage of used ABS resources. The numerator of the percentage calculation consists of resource blocks within the ABS indicated in the <i>Usable ABS Pattern Info</i> IE allocated by the eNB ₂ for DL traffic needing protection by ABS from inter-cell interference for DL scheduling, or allocated by the eNB ₂ for other reasons (e.g. some control channels). The denominator of the percentage calculation is the total quantity of resource blocks within the ABS indicated in the <i>Usable ABS Pattern Info</i> IE. |
| CHOICE <i>Usable ABS Information</i> | M | | – | – |
| > <i>FDD</i> | | | – | – |
| >>Usable ABS Pattern Info | M | | BIT STRING (SIZE(40)) | Each position in the bitmap represents a subframe, for which value "1" indicates 'ABS that has been designated as protected from inter-cell interference by the eNB ₁ , and available to serve this purpose for DL scheduling in the eNB ₂ ' and value "0" is used for all other subframes. The pattern represented by the bitmap is a subset of, or the same as, the corresponding <i>ABS Pattern Info</i> IE conveyed in the LOAD INFORMATION message from the eNB ₁ . |
| > <i>TDD</i> | | | – | – |
| >>Usable ABS Pattern Info | M | | BIT STRING (1..70) | Each position in the bitmap represents a subframe, for which value "1" indicates 'ABS that has been designated as protected from inter-cell interference by the eNB ₁ , and available to serve this purpose for DL scheduling in the eNB ₂ ' and value "0" is used for all other subframes. The pattern represented by the bitmap is a subset of, or the same as, the corresponding <i>ABS Pattern Info</i> IE conveyed in the LOAD INFORMATION message from the eNB ₁ . |

9.2.59 Management Based MDT Allowed

This information element is used by the eNB to allow selection of the UE for management based MDT as described in TS 32.422 [6].

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

9.2.60 MultibandInfoList

The *MultibandInfoList* IE contains the additional frequency band indicators that a cell belongs to listed in decreasing order of preference, see TS 36.331 [9].

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------------------|------------------------|---|-------------|----------------------|
| BandInfo | | 1..<maxnoofBands> | | | – | |
| >FrequencyBandIndicator | M | | INTEGER (1.. 256, ...) | E-UTRA operating band as defined in TS 36.101 [42, table 5.5-1] | – | |

| Range bound | Explanation |
|--------------|--|
| maxnoofBands | Maximum number of frequency bands that a cell belongs to. The value is 16. |

9.2.61 M3 Configuration

This IE defines the parameters for M3 measurement collection.

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

9.2.62 M4 Configuration

This IE defines the parameters for M4 measurement collection.

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

9.2.63 M5 Configuration

This IE defines the parameters for M5 measurement collection.

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

9.2.64 MDT PLMN List

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

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------------|----------|------------------------------|-----------------------|-----------------------|
| MDT PLMN List | | 1..<maxnoof MDTPLMNs > | | |
| >PLMN Identity | M | | 9.2.4 | |

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

9.2.65 EARFCN Extension

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

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------|----------|-------|--|---|
| EARFCN Extension | M | | INTEGER (maxEARFCN+1 .. newmaxEARFCN, ...) | The relation between EARFCN and carrier frequency (in MHz) are defined in TS 36.104 [16]. |

| Range bound | Explanation |
|--------------|--|
| maxEARFCN | Maximum value of EARFCNs. Value is 65535. |
| newmaxEARFCN | New maximum value of EARFCNs. Value is 262143. |

9.2.66 COUNT Value Extended

This information element indicates the 15 bit long PDCP SN and the corresponding 17 bit long Hyper Frame Number.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------|----------|-------|------------------------|-----------------------|-------------|----------------------|
| PDCP-SN Extended | M | | INTEGER (0..32767) | | - | |
| HFN Modified | M | | INTEGER (0..131071) | | - | |

9.2.67 Extended UL Interference Overload Info

This IE provides report on interference overload for the set of subframes that are subject to UL-DL subframe reconfiguration. This IE applies to TDD only.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--|----------|-------|---|---|
| Associated Subframes | M | | BITSTRING (SIZE(5)) | The set of subframe(s) to which the Extended UL interference overload indication is applicable. The bitmap from the least significant bit position to the most significant bit position represents subframes #{3, 4, 7, 8, 9} in a radio frame. Value "1" in a bit position indicates that the Extended UL interference overload indication is applicable to the corresponding subframe; and value "0" indicates otherwise. |
| Extended UL Interference Overload Indication | M | | UL Interference Overload Indication 9.2.17 | |

9.2.68 RNL Header

The *RNL Header* IE indicates the target eNB ID and source eNB ID.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------|----------|-------|-------------------------|-----------------------|-------------|----------------------|
| Source eNB ID | M | | Global eNB ID 9.2.22 | | - | |
| Target eNB ID | O | | Global eNB ID 9.2.22 | | - | |

9.2.69 Masked IMEISV

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

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|--------------------------|--|
| Masked IMEISV | M | | BIT STRING (SIZE(64)) | Coded as the International Mobile station Equipment Identity and Software Version Number (IMEISV) defined in TS 23.003 [29] with the last 4 digits of the SNR masked by setting the corresponding bits to 1. |

9.2.70 Expected UE Behaviour

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

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--------------------------------|----------|-------|---|--|
| Expected UE Activity Behaviour | M | | 9.2.71 | |
| Expected HO Interval | O | | ENUMERATED (sec15, sec30, sec60, sec90, sec120, sec180, long-time, ...) | Indicates the expected time interval between inter-eNB handovers. If "long-time" is included, the interval between inter-eNB handovers is expected to be longer than 180 seconds. |

9.2.71 Expected UE Activity Behaviour

Indicates information about the expected "UE activity behaviour" as defined in TS 23.401 [12].

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---|----------|-------|--|--|
| Expected Activity Period | O | | INTEGER (1..30 40 50 60 80 100 120 150 180 181, ...) | If this IE is set to "181" the expected activity time is longer than 180 seconds. The remaining values indicate the expected activity time in [seconds]. |
| Expected Idle Period | O | | INTEGER (1..30 40 50 60 80 100 120 150 180 181, ...) | If this IE is set to "181" the expected idle time is longer than 180 seconds. The remaining values indicate the expected idle time in [seconds]. |
| Source of UE Activity Behaviour Information | O | | ENUMERATED (subscription information, statistics, ...) | If "subscription information" is indicated, the information contained in the <i>Expected Activity Period</i> IE and the <i>Expected Idle Period</i> IE, if present, is derived from subscription information. If "statistics" is indicated, the information contained in the <i>Expected Activity Period</i> IE and the <i>Expected Idle Period</i> IE, if present, is derived from statistical information. |

9.2.72 SeNB Security Key

The *SeNB Security Key* IE is used to apply security in the SeNB as defined in TS 33.401 [18].

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------|----------|-------|------------------------|---|
| SeNB Security Key | M | | BIT STRING (SIZE(256)) | The S-KeNB which is provided by the MeNB, see TS 33.401 [18]. |

9.2.73 SCG Change Indication

The *SCG Change Indication* IE is either used to request the SeNB to prepare the SCG Change in the SeNB or to request the MeNB to initiate the SCG Change towards the UE (see TS 36.300 [15]).

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-----------------------|----------|-------|--|-----------------------|
| SCG Change Indication | M | | ENUMERATED (PDCPCountWrapAround, PSCellChange, other, ...) | |

9.2.74 CoMP Information

This IE provides the list of CoMP hypothesis sets, where each CoMP hypothesis set is the collection of CoMP hypothesis(es) of one or multiple cells and each CoMP hypothesis set is associated with a benefit metric.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------------------|----------|------------------------------------|--------------------------|---|
| CoMP Information Item | | 1 .. <maxnoofCoMPHypothesisSet> | | |
| >CoMP Hypothesis Set | M | | 9.2.75 | |
| >Benefit Metric | M | | INTEGER (-101..100, ...) | Value -100 indicates the maximum cost, and 100 indicates the maximum benefit. Value -101 indicates unknown benefit. Values from -100 to 100 should be calculated on a linear scale. |
| CoMP Information Start Time | | 0..1 | | |
| >Start SFN | M | | INTEGER (0..1023, ...) | SFN of the radio frame containing the first subframe when the <i>CoMP Information</i> IE is valid. |
| >Start Subframe Number | M | | INTEGER (0..9, ...) | Subframe number, within the radio frame indicated by the <i>Start SFN</i> IE, of the first subframe when the <i>CoMP Information</i> IE is valid. |

| Range bound | Explanation |
|--------------------------|---|
| maxnoofCoMPHypothesisSet | Maximum number of CoMP Hypothesis sets. The value is 256. |

9.2.75 CoMP Hypothesis Set

This IE provides a set of CoMP hypotheses. A CoMP hypothesis is hypothetical PRB-specific resource allocation information for a cell.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--------------------------|----------|-----------------------|------------------------------|--|
| CoMP Hypothesis Set Item | | 1..<maxnoofCoMPCells> | | |
| >Cell ID | M | | ECGI 9.2.14 | ID of the cell for which the <i>CoMP Hypothesis</i> IE is applied. |
| >CoMP Hypothesis | M | | BIT STRING (6..4400, ...) | Each position in the bitmap represents a PRB in a subframe, for which value "1" indicates 'interference protected resource' and value "0" indicates 'resource with no utilization constraints,' which is applicable only in positions corresponding to the DL direction. The first bit corresponds to PRB 0 of the first subframe for which the IE is valid, the second bit corresponds to PRB 1 of the first subframe for which the IE is valid, and so on. The bit string may span across multiple contiguous subframes. The length of the bit string is an integer (maximum 40) multiple of N_{RB}^{DL} . N_{RB}^{DL} is defined in TS 36.211 [10]. The CoMP hypothesis pattern is continuously repeated. |

| Range bound | Explanation |
|------------------|--|
| maxnoofCoMPCells | Maximum number of cells in a CoMP hypothesis set. Value is 32. |

9.2.76 RSRP Measurement Report List

This IE provides RSRP measurement reports of UEs served by the sending eNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------------------|----------|-------------------------|--------------------------|---|
| RSRP Measurement Report Item | | 1 .. <maxUEReport> | | |
| >RSRP Measurement Result | | 1 .. <maxCellReport> | | |
| >>RSRP Cell ID | M | | ECGI 9.2.14 | ID of the cell on which the RSRP is measured. |
| >>RSRP Measured | M | | INTEGER (0..97, ...) | Measured RSRP. Defined in TS 36.331 [9]. |
| >UE ID | O | | BIT STRING (SIZE(16)) | ID assigned by eNB ₂ for the UE. |

| Range bound | Explanation |
|---------------|---|
| maxUEReport | Maximum number of UE measurement reports. Value is 128. |
| maxCellReport | Maximum number of reported cells. The value is 9. |

9.2.77 Dynamic DL transmission information

This IE contains assistance information for DL interference mitigation.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--------------------------|----------|------------------|---|---|
| CHOICE NAICS Information | M | | | |
| >NAICS Active | | | | |
| >>Transmission Modes | O | | BIT STRING (SIZE(8)) | The set bits indicate some or all transmission modes: 1, 2, 3, 4, 6, 8, 9, 10, as defined in TS 36.213 [23, 7.1]. The first/ leftmost bit is for transmission mode 1, the second bit is for transmission mode 2, and so on. |
| >>P_B | O | | INTEGER (0..3) | See TS 36.213 [23, Table 5.2-1] |
| >>P_A_list | | 0 .. <maxnoofPA> | | |
| >>>P_A | M | | ENUMERATED (dB-6, dB-4dot77, dB-3, dB-1dot77, dB0, dB1, dB2, dB3,...) | See P _A TS 36.213 [23, 5.2]. Value dB-6 corresponds to -6 dB, dB-4dot77 corresponds to -4.77 dB etc. |
| >NAICS Inactive | | | NULL | |

| Range bound | Explanation |
|-------------|---|
| maxnoofPA | Maximum no of P _A values that can be configured. Value is 3. |

9.2.78 ProSe Authorized

This IE provides information on the authorization status of the UE for ProSe service(s).

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

9.2.79 CSI Report

This IE provides CSI reports of UEs served by the cell for which the information is provided.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------------------------|----------|-----------------------------|------------------------------------|---|
| CSI Report per Cell | | 1 .. <maxUEReport> | | |
| >UE ID | M | | BIT STRING (SIZE(16)) | ID assigned by eNB ₂ for the UE. |
| >>CSI Report per CSI Process | | 1 .. <maxCSIProcess > | | |
| >>>CSI Process Configuration Index | M | | INTEGER (1..7, ...) | Indicates one of the possible CSI Process configurations in the serving cell. |
| >>>CSI Report per CSI Process Item | | 1.. <maxCSIReport> | | |
| >>>>RI | M | | INTEGER (1..8, ...) | The RI corresponding to the CQI being reported for this CSI process item. Value defined in TS 36.213 [11]. |
| >>>>Wideband CQI | M | | 9.2.80 | |
| >>>>Subband Size | M | | ENUMERATED (2, 3, 4, 6, 8, ...) | Corresponds to a value of subband size k defined in TS 36.213 [11] for the system bandwidth N_{RB}^{DL} . |
| >>>>Subband CQI List | | 0 .. <maxSubband> | | |
| >>>>>Subband CQI | M | | 9.2.81 | |
| >>>>>Subband Index | M | | INTEGER (0..27, ...) | |

| Range bound | Explanation |
|---------------|--|
| maxUEReport | Maximum number of UE. Value is 128. |
| maxCSIProcess | Maximum number of CSI processes per UE. The value is 4. |
| maxCSIReport | Maximum number of CSI Reports per CSI Process. The value is 2. |
| maxSubband | Maximum number of subbands. The value is 14. |

9.2.80 Wideband CQI

This IE indicates the Wideband CQI as defined in TS 36.213 [11].

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---------------------------------------|----------|-------|-----------------------|----------------------------------|
| Wideband CQI Codeword 0 | M | | INTEGER (0..15, ...) | Value defined in TS 36.213 [11]. |
| CHOICE <i>Wideband CQI Codeword 1</i> | O | | | |
| >4-bit CQI | M | | INTEGER (0..15, ...) | Value defined in TS 36.213 [11]. |
| >3-bit spatial differential CQI | M | | INTEGER (0..7, ...) | Value defined in TS 36.213 [11]. |

9.2.81 Subband CQI

This IE indicates the Subband CQI as defined in TS 36.213 [11].

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|--------------------------------------|----------|-------|-----------------------|----------------------------------|
| CHOICE <i>Subband CQI Codeword 0</i> | M | | | |
| >4-bit CQI | M | | INTEGER (0..15, ...) | Value defined in TS 36.213 [11]. |
| >2-bit Subband differential CQI | M | | INTEGER (0..3, ...) | Value defined in TS 36.213 [11]. |
| >2-bit differential CQI | M | | INTEGER (0..3, ...) | Value defined in TS 36.213 [11]. |
| CHOICE <i>Subband CQI Codeword 1</i> | O | | | |
| >4-bit CQI | M | | INTEGER (0..15, ...) | Value defined in TS 36.213 [11]. |
| >3-bit spatial differential CQI | M | | INTEGER (0..7, ...) | Value defined in TS 36.213 [11]. |
| >2-bit Subband differential CQI | M | | INTEGER (0..3, ...) | Value defined in TS 36.213 [11]. |
| >2-bit differential CQI | M | | INTEGER (0..3, ...) | Value defined in TS 36.213 [11]. |

9.2.82 COUNT Value for PDCP SN Length 18

This information element indicates the 18 bit long PDCP SN and the corresponding 14 bit long Hyper Frame Number.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| PDCP-SN Length 18 | M | | INTEGER (0..262143) | | – | |
| HFN for PDCP-SN Length 18 | M | | INTEGER (0..16383) | | – | |

9.2.83 LHN ID

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

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-----------------------|----------|-------|-------------------------------|------------------------------------|
| Local Home Network ID | M | | OCTET STRING (SIZE (32..256)) | Identifies the Local Home Network. |

9.2.84 Correlation ID

This information element is the GTP Tunnel Endpoint Identifier or GRE key to be used for the user plane transport between eNB and the L-GW described in TS 23.401 [12].

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------|----------|-------|------------------------|-----------------------|
| Correlation ID | M | | OCTET STRING (SIZE(4)) | |

9.2.85 UE Context Kept Indicator

This IE indicates that the UE Context at the SeNB is kept in case of inter-MeNB handover without SeNB/SgNB Change procedure, as specified in TS 36.300 [15] or TS37.340 [32].

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------------------|----------|-------|------------------------|-----------------------|
| UE Context Kept Indicator | M | | ENUMERATED (True, ...) | |

9.2.86 eNB UE X2AP ID Extension

This information element combined with the eNB UE X2AP ID uniquely identifies an UE over the X2 interface within an eNB. If the setup of an UE associated signalling connection was initiated including the eNB UE X2AP ID Extension, the eNB UE X2AP ID Extension shall be used by both peers for the life-time of the respective UE-associated signalling connection.

The usage of this IE is defined in TS 36.401 [2].

NOTE: If X2-C signalling transport is shared among multiple interface instances, the value of the eNB UE X2AP ID, combined with the eNB UE X2AP ID Extension, is allocated so that it can be associated with an X2-C interface instance.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--------------------------|----------|-------|--------------------------|-----------------------|
| eNB UE X2AP ID Extension | M | | INTEGER (0..4095,...) | |

9.2.87 M6 Configuration

This IE defines the parameters for M6 measurement collection.

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

| Condition | Explanation |
|-----------|--|
| ifUL | This IE shall be present if the <i>M6 Links to log</i> IE is set to "uplink" or to "both-uplink-and-downlink". |

9.2.88 M7 Configuration

This IE defines the parameters for M7 measurement collection.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------------|----------|-------|---|-----------------------|
| M7 Collection Period | M | | INTEGER (1..60, ...) | Unit: minutes |
| M7 Links to log | M | | ENUMERATED(uplink, downlink, both-uplink-and-downlink, ...) | |

9.2.89 Tunnel Information

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

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------------|----------|-------|--------------------------|---|
| Transport Layer Address | M | | BIT STRING (1..160, ...) | eNB's Transport Layer Address. |
| UDP Port Numbers | O | | OCTET STRING (SIZE(2)) | UDP Port Numbers if NAT/NAPT is deployed in the BBF access network. |

9.2.90 X2 Benefit Value

The *X2 Benefit Value* IE indicates the quantified benefit of the signalling connection.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------|----------|-------|-----------------------|--|
| X2 Benefit Value | M | | INTEGER (1..8, ...) | Value 1 indicates low benefit, and 8 indicates high benefit. |

9.2.91 Resume ID

The *Resume ID* IE is used to address a suspended UE Context within an eNB.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|----------------------------------|----------|-------|------------------------|---|
| CHOICE <i>Resume ID</i> | M | | | |
| > <i>Resume ID not truncated</i> | | | | |
| >>Resume ID not truncated | M | | BIT STRING (SIZE (40)) | 40 bit Resume Identity contained in the RRCConnection ResumeRequest message (TS 36.331 [9]). The 20 most significant bits refer to the eNB ID of the eNB that allocated the Resume ID, the 20 least significant bits identify the UE Context stored at the eNB that allocated the Resume ID. |
| > <i>Resume ID truncated</i> | | | | |
| >>Resume ID truncated | M | | BIT STRING (SIZE (24)) | 24 bit Resume Identity contained in the RRCConnection ResumeRequest message (TS 36.331 [9]). The 12 most significant bits refer to the 12 least significant bits of the eNB ID of the eNB that allocated the Resume ID. The 12 least significant bits refer to the 12 least significant bits that identify the UE Context stored at the eNB that allocated the Resume ID. |

9.2.92 Bearer Type

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

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|--------------------------|-----------------------|
| Bearer Type | M | | ENUMERATED (non IP, ...) | |

9.2.93 V2X Services Authorized

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

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

9.2.94 Offset of NB-IoT Channel Number to EARFCN

This IE is used to indicate the offset of the NB-IoT Channel Number to the EARFCN (TS 36.104 [16]).

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---|----------|-------|--|-----------------------|
| Offset of NB-IoT Channel Number to EARFCN | M | | ENUMERATED (-10,-9,-8,-7,-6,-5,-4,-3,-2,-1,-0.5,0,1,2,3,4,5,6,7,8,9,..., -8.5, -4.5, 3.5, 7.5) | |

9.2.95 WT ID

This IE is used to identify a WT.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--------------------------|----------|-------|-----------------------|-----------------------|
| CHOICE <i>WT ID Type</i> | M | | | |
| > <i>WT ID Type 1</i> | | | | |
| >>PLMN ID | M | | PLMN Identity 9.2.4 | |
| >>Short WT ID | M | | BIT STRING (24) | |
| > <i>WT ID Type 2</i> | | | | |
| >>Long WT ID | M | | BIT STRING (48) | |

9.2.96 WT UE XwAP ID

The WT UE XwAP ID is allocated by the WT and uniquely identifies a UE over the Xw interface.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|------------------------|-----------------------|
| WT UE XwAP ID | M | | OCTET STRING (SIZE(3)) | |

9.2.97 UE Sidelink Aggregate Maximum Bit Rate

This IE indicates the aggregate maximum bit rate for all radio bearers per UE in the sidelink for V2X services.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--|----------|-------|-----------------------|--|
| UE Sidelink Aggregate Maximum Bit Rate | M | | Bit Rate 9.2.11 | Value 0 shall be considered as a logical error by the receiving eNB. |

9.2.98 NR Neighbour Information

This IE contains cell configuration information of NR cells that a neighbour node may need for the X2 AP interface.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--------------------------------------|----------|--------------------------------|---------------------------------|--|-------------|----------------------|
| NR Neighbour Information | | 1 .. <maxnoofNR Neighbours> | | | – | |
| >NR Neighbour Information | | | | | | |
| >>NRPCI | M | | INTEGER (0..1007) | NR Physical Cell ID | – | |
| >>>NR CGI | M | | 9.2.111 | | – | |
| >>>5GS-TAC | O | | OCTET STRING (3) | Broadcast 5GS Tracking Area Code | – | |
| >>>>Configured TAC | O | | OCTET STRING (2) | This is the TAC configured in the en-gNB, different from the 5GS TAC broadcast in the NR cell and enables application of Roaming and Access Restrictions for EN-DC as specified in TS 37.340 [32]. | – | |
| >>>>Measurement Timing Configuration | M | | OCTET STRING | Contains the MeasurementTimingConfiguration inter-node message for the neighbour cell, as defined in TS 38.331 [31]. | – | |
| >>>>CHOICE NR-Neighbour-Mode-Info | M | | | | – | |
| >>>>>FDD | | | | | | |
| >>>>>>FDD Info | | 1 | | | – | |
| >>>>>>>UL ARFCNReqInfo | M | | NR ARFCN Frequency Info 9.2.106 | | – | |
| >>>>>>>DL ARFCNReqInfo | M | | NR ARFCN Frequency Info 9.2.106 | | – | |
| >>>>>>>TDD | | | | | | |
| >>>>>>>>TDD Info | | 1 | | | – | |
| >>>>>>>>>ARFCNNRF reqInfo | M | | NR ARFCN Frequency Info 9.2.106 | | – | |

| Range bound | Explanation |
|---------------------|---|
| maxnoofNRNeighbours | Maximum no. of neighbour NR cells associated to a given served cell. Value is 1024. |

9.2.99 Extended Bit Rate

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

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------|----------|-------|--|-----------------------|
| Extended Bit Rate | | | INTEGER (10,000,000,001..4,000,000,000,...) | The unit is: bit/s |

9.2.100 en-gNB UE X2AP ID

This information element uniquely identifies an UE over the X2 interface within an en-gNB.

The usage of this IE is defined in TS 36.401 [2].

NOTE: If X2-C signalling transport is shared among multiple interface instances, the value of the en-gNB UE X2AP ID is allocated so that it can be associated with an X2-C interface instance.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------|----------|-------|------------------------------|-----------------------|
| en-gNB UE X2AP ID | M | | INTEGER (0.. $2^{32}-1$) | |

9.2.101 SgNB Security Key

The *SgNB Security Key* IE is used to apply security in the en-gNB as defined in TS 33.401 [18].

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------|----------|-------|---------------------------|---|
| SgNB Security Key | M | | BIT STRING (SIZE(256)) | The S-KgNB which is provided by the MeNB, see TS 33.401 [18]. |

9.2.102 Target SgNB ID Information

This IE contains the target SgNB ID used by MeNB to find the target en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------|----------|-------|-----------------------------|-----------------------|-------------|----------------------|
| Target SgNB ID | M | | Global en-gNB ID 9.2.112 | | | |

9.2.103 SCG Configuration Query

The *SCG Configuration Query* IE is used to request the en-gNB to provide current SCG configuration.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------------|----------|-------|------------------------|-----------------------|
| SCG Configuration Query | M | | ENUMERATED (True, ...) | |

9.2.104 Delivery Status

This IE defines the Delivery Status IE of RRC Transfer message.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-----------------------|---------------------------------|---|-------------|----------------------|
| Highest successfully delivered NR PDCP Sequence Number | M | 0..2 ¹² -1 | INTEGER (0..2 ¹² -1) | Highest successfully delivered NR PDCP SN, as defined in 38.323 [33]. | – | |

9.2.105 Void

Void

9.2.106 NR Frequency Info

The NR Frequency Info defines the carrier frequency and bands used in a cell for a given direction (UL or DL) in FDD or for both UL and DL directions in TDD.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|--|----------|-------------------------|-------------------------|---|
| NRARFCN | M | | INTEGER (0..maxNRARFCN) | RF Reference Frequency as defined in TS 38.104 [37] section 5.4.2.1. The frequency provided in this IE identifies the absolute frequency position of the reference resource block (Common RB 0) of the carrier. Its lowest subcarrier is also known as Point A. |
| Frequency Band List | | 1 | | |
| >Frequency Band Item | | 1..<maxnoofNrCellBands> | | |
| >>NR Frequency Band | M | | INTEGER (1..1024, ...) | Primary NR Operating Band as defined in TS38.104 [37] section 5.4.2.3. The value 1 corresponds to n1, value 2 corresponds to NR operating band n2, etc. |
| >>Supported SUL band List | | 0..<maxnoofNrCellBands> | | |
| >>>Supported SUL band Item | M | | INTEGER (1..1024, ...) | Supplementary NR Operating Band as defined in TS 38.104 [37] section 5.4.2.3 that can be used for SUL duplex mode as per TS 38.101-1 table 5.2.-1. The value 80 corresponds to NR operating band n80, value 81 corresponds to NR operating band n81, etc. |
| SUL Information | O | | 9.2.123 | |

| Range bound | Explanation |
|--------------------|--|
| maxNRARFCN | Maximum value of NRARFCNs. Value is 3279165. |
| maxnoofNrCellBands | Maximum no. of frequency bands supported for a NR cell. Value is 32. |

9.2.107 NR UE Security Capabilities

This IE defines the supported algorithms for encryption and integrity protection in NR as defined in TS 33.401 [18].

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------------------------|----------|-------|-------------------------------|---|
| NR Encryption Algorithms | M | | BIT STRING (SIZE(16, ...)) | Each position in the bitmap represents an encryption algorithm: "all bits equal to 0" – UE supports no other NR algorithm than NEA0, "first bit" – 128-NEA1, "second bit" – 128-NEA2, "third bit" – 128-NEA3, other bits reserved for future use. Value '1' indicates support and value '0' indicates no support of the algorithm. Algorithms are defined in TS 33.401 [18]. |
| NR Integrity Protection Algorithms | M | | BIT STRING (SIZE(16, ...)) | Each position in the bitmap represents an integrity protection algorithm: "all bits equal to 0" – UE supports no other NR algorithm than NIA0, "first bit" – 128-NIA1, "second bit" – 128-NIA2, "third bit" – 128-NIA3, other bits reserved for future use. Value '1' indicates support and value '0' indicates no support of the algorithm. Algorithms are defined in TS 33.401 [18]. |

9.2.108 EN-DC Resource Configuration

This IE contains the EN-DC resource configuration for an E-RAB, indicating the presence of PDCP at the en-gNB and Lower Layers at MCG and SCG.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------|----------|-------|---|-----------------------|-------------|----------------------|
| PDCP at SgNB | M | | ENUMERATED ED (present, not present) | | – | |
| MCG resources | M | | ENUMERATED ED (present, not present) | | – | |
| SCG resources | M | | ENUMERATED ED (present, not present) | | – | |

9.2.109 PDCP Change Indication

The *PDCP Change Indication* IE is used to require the MeNB to either initiate the security key update or to perform PDCP data recovery towards the UE (see TS 37.340 [15]).

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------------|----------|-------|--|---|
| PDCP Change Indication | M | | ENUMERATED (S-KgNB update required, PDCP data recovery required, ...) | The value of S-KgNB update required indicates that the security key in en-gNB needs to be updated. The value of PDCP data recovery required indicates that MeNB needs to perform PDCP data recovery. |

9.2.110 Served NR Cell Information

This IE contains cell configuration information of an NR cell that a neighbour eNB may need for the X2 AP interface.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|------------------------------|-----------------------------------|---|-------------|----------------------|
| NR-PCI | M | | INTEGER (0..1007) | NR Physical Cell ID | – | |
| Cell ID | M | | NR CGI 9.2.111 | | – | |
| 5GS-TAC | O | | OCTET STRING (3) | Broadcast 5GS Tracking Area Code | – | |
| Configured TAC | O | | OCTET STRING (2) | This is the TAC configured in the en-gNB, different from the 5GS TAC broadcast in the NR cell and enables application of Roaming and Access Restrictions for EN-DC as specified in TS 37.340 [32]. | – | |
| Served PLMNs | | 1..<max noofBP LMNs> | | Broadcast PLMNs. If more than maxnoofBPLMNs are needed for NR, they are provided by the <i>Additional PLMNs</i> IE. | – | |
| >PLMN Identity | M | | 9.2.4 | | – | |
| CHOICE <i>NR-Mode-Info</i> | M | | | | – | |
| >FDD | | | | | | |
| >>FDD Info | | 1 | | | – | |
| >>>UL FreqInfo | M | | NR Frequency Info 9.2.106 | | – | |
| >>>DL FreqInfo | M | | NR Frequency Info 9.2.106 | | – | |
| >>>UL Transmission Bandwidth | M | | NR Transmission Bandwidth 9.2.114 | | – | |
| >>>DL Transmission Bandwidth | M | | NR Transmission Bandwidth 9.2.114 | | – | |
| >TDD | | | | | | |
| >>TDD Info | | 1 | | | – | |
| >>>NRFreqInfo | M | | NR Frequency Info 9.2.106 | | – | |
| >>>Transmission Bandwidth | M | | NR Transmission Bandwidth 9.2.114 | | – | |
| Measurement Timing Configuration | M | | OCTET STRING | Contains the <i>MeasurementTimingConfiguration</i> inter-node message for the served cell, as defined in TS 38.331 [31]. | – | |
| Additional PLMNs | | 0..<max noofAdditionalPLMNs> | | Additional PLMNs in addition to the Served PLMNs | YES | reject |
| >PLMN Identity | M | | 9.2.4 | | – | |
| Broadcast PLMN Identity Info List NR | | 0..<max noofext BPLMNs-1> | | This IE corresponds to the <i>PLMN-IdentityInfoList</i> IE in <i>SIB1</i> as specified in TS 38.331 [31]. The PLMN Identities and associated information contained in this IE shall be provided in the same order as broadcast in <i>SIB1</i> . | YES | ignore |

| | | | | | | |
|----------------------------|---|--------------------------------------|-----------------------|--|---|--|
| >Broadcast PLMNs | | <i>1..<max noofext BPLMNs></i> | | | – | |
| >>PLMN Identity | M | | 9.2.4 | | – | |
| >5GS-TAC | O | | OCTET STRING (3) | | – | |
| >NR Cell Identity | M | | BIT STRING (SIZE(36)) | | – | |

| Range bound | Explanation |
|------------------------|--|
| maxnoofBPLMNs | Maximum no. of broadcast PLMN Ids. Value is 6. |
| maxnoofAdditionalPLMNs | Maximum no. additional PLMN Ids. Value is 6. |
| maxnoofextBPLMNs | Maximum no. of extended broadcast PLMN Ids. Value is 12. |
| maxnoofextBPLMNs-1 | Maximum no. of extended broadcast PLMN Ids minus 1. Value is 11. |

9.2.111 NR CGI

The NR Cell Global Identifier (NR CGI) is used to globally identify an NR cell (see TS 38.401 [34]).

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------|----------|-------|-----------------------|--|
| PLMN Identity | M | | 9.2.4 | |
| NR Cell Identity | M | | BIT STRING (36) | The leftmost bits of the <i>NR Cell Identity</i> IE value correspond to the value of the <i>en-gNB ID</i> IE contained in the <i>Global en-gNB ID</i> IE (defined in section 9.2.112) identifying the en-gNB that controls the cell. |

9.2.112 Global en-gNB ID

This IE is used to globally identify an en-gNB (see TS 37.340 [32]).

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------------|----------|-------|---------------------------|---|
| PLMN Identity | M | | 9.2.4 | |
| CHOICE <i>en-gNB ID</i> | M | | | |
| > <i>en-gNB ID</i> | | | | |
| >>en-gNB ID | M | | BIT STRING (SIZE(22..32)) | Equal to the leftmost bits of the <i>NR Cell Identity</i> IE contained in the <i>NR CGI</i> IE of each cell served by the en-gNB. |

9.2.113 Void

9.2.114 NR Transmission Bandwidth

The *NR Transmission Bandwidth* IE is used to indicate the UL or DL transmission bandwidth.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---------------|----------|-------|--|--|
| NR SCS | M | | ENUMERATED (scs15, scs30, scs60, scs120, ...) | The values scs15, scs30, scs60 and scs120 corresponds to the sub carrier spacing in TS 38.104 [37]. |
| NR NRB | M | | ENUMERATED (nrb11, nrb18, nrb24, nrb25, nrb31, nrb32, nrb38, nrb51, nrb52, nrb65, nrb66, nrb78, nrb79, nrb93, nrb106, nrb107, nrb121, nrb132, nrb133, nrb135, nrb160, nrb162, nrb189, nrb216, nrb217, nrb245, nrb264, nrb270, nrb273, ...) | This IE is used to indicate the UL or DL transmission bandwidth expressed in units of resource blocks "N _{RB} " (TS 38.104 [37]). The values nrb11, nrb18, etc. correspond to the number of resource blocks "N _{RB} " 11, 18, etc. |

9.2.115 Cell Assistance Information

The *Cell Assistance Information* IE is used by the eNB to request information about NR cells.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|--|----------|---------------------------|------------------------------------|--|
| CHOICE Cell Assistance Type | M | | | This IE may be refined. |
| >Limited List | | | | |
| >>List of Requested NR Cells | | 1 .. < maxCel linengN B > | | Included when the eNB requests a limited list of served NR cells. |
| >>>NR CGI | M | | 9.2.111 | NR cell for which served NR cell information is requested. |
| >Full List | | | | |
| >>Complete Information Request Indicator | M | | ENUMERATED (allServedNRCells, ...) | Included when the eNB requests the complete list of served NR cells. |

| Range bound | Explanation |
|----------------|--|
| maxCellinengNB | Maximum no. cells that can be served by an en-gNB. Value is 16384. |

9.2.116 MeNB Resource Coordination Information

The *MeNB Resource Coordination Information* IE is LTE resource allocation at MeNB and used at the en-gNB to coordinate resource utilisation between the MeNB and the en-gNB.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description | Criticality | Assigned Criticality |
|-----------------------------|----------|-------|------------------------------|--|-------------|----------------------|
| EUTRA Cell ID | M | | ECGI 9.2.14 | This IE indicates the PCell. | – | |
| UL Coordination Information | M | | BIT STRING (6..4400, ...) | <p>Each position in the bitmap represents a PRB pair in a subframe; value "0" indicates "PCell resource not intended to be used for transmission by the sending node", value "1" indicates "PCell resource intended to be used for transmission by the sending node". The bit string spans from the first PRB pair of the first represented subframe to the last PRB pair of the same subframe and then moves to the following PRBs in the following subframes in the same order. Each position is applicable only in positions corresponding to UL subframes.</p> <p>The bit string may span across multiple contiguous subframes (maximum 40). The first position of the <i>UL Coordination Information</i> corresponds to subframe 0 in a radio frame where $SFN = 0$. The length of the bit string is an integer multiple of N_{RB}^{UL}.</p> <p>N_{RB}^{UL} is defined in TS 36.211 [10].</p> <p>The UL Coordination Information is continuously repeated.</p> | – | |

| | | | | | | |
|--|---|--|---------------------------|---|-----|--------|
| DL Coordination Information | O | | BIT STRING (6..4400, ...) | <p>Each position in the bitmap represents a PRB pair in a subframe; value "0" indicates "PCell resource not intended to be used for transmission by the sending node", value "1" indicates "PCell resource intended to be used for transmission by the sending node". The bit string spans from the first PRB pair of the first represented subframe to the last PRB pair of the same subframe and then moves to the following PRBs in the following subframes in the same order. Each position is applicable only in positions corresponding to DL subframes.</p> <p>The bit string may span across multiple contiguous subframes (maximum 40). The first position of the <i>DL Coordination Information</i> corresponds to the receiving node's subframe 0 in a receiving node's radio frame where $SFN = 0$.</p> <p>The length of the bit string is an integer multiple of N_{RB}^{DL}.</p> <p>N_{RB}^{DL} is defined in TS 36.211 [10].</p> <p>The DL Coordination Information is continuously repeated.</p> | – | |
| NR CGI | O | | 9.2.111 | This IE indicates the assumed PSCell. | YES | ignore |
| MeNB Coordination Assistance Information | O | | 9.2.139 | | YES | reject |

9.2.117 SgNB Resource Coordination Information

The *SgNB Resource Coordination Information* IE indicates resources within the bandwidth of the PCell which are not available for use by the MeNB and is used at the MeNB to coordinate resource utilisation between the en-gNB and the MeNB.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description | Criticality | Assigned Criticality |
|-----------------------------|----------|-------|---------------------------|---|-------------|----------------------|
| NR CGI | M | | 9.2.111 | This IE indicates the PSCell. | – | |
| UL Coordination Information | M | | BIT STRING (6..4400, ...) | <p>Each position in the bitmap represents a PRB pair in a subframe; value "0" indicates "PCell resource not intended to be used for transmission by the sending node", value "1" indicates "PCell resource intended to be used for transmission by the sending node". The bit string spans from the first PRB pair of the first represented subframe to the last PRB pair of the same subframe and then moves to the following PRBs in the following subframes in the same order. Each position is applicable only in positions corresponding to UL subframes.</p> <p>The bit string may span across multiple contiguous subframes (maximum 40). The first position of the <i>UL Coordination Information</i> corresponds to the receiving node's subframe 0 in a receiving node's radio frame where $SFN = 0$.</p> <p>The length of the bit string is an integer multiple of N_{RB}^{UL}. N_{RB}^{UL} is defined in TS 36.211 [10]. The UL Coordination Information is continuously repeated.</p> | – | |

| | | | | | | |
|--|---|--|---------------------------|---|-----|--------|
| DL Coordination Information | O | | BIT STRING (6..4400, ...) | <p>Each position in the bitmap represents a PRB pair in a subframe; value "0" indicates "PCell resource not intended to be used for transmission by the sending node", value "1" indicates "PCell resource intended to be used for transmission by the sending node". The bit string spans from the first PRB pair of the first represented subframe to the last PRB pair of the same subframe and then moves to the following PRBs in the following subframes in the same order. Each position is applicable only in positions corresponding to DL subframes.</p> <p>The bit string may span across multiple contiguous subframes (maximum 40). The first position of the <i>DL Coordination Information</i> corresponds to the receiving node's subframe 0 in a receiving node's radio frame where $SFN = 0$.</p> <p>The length of the bit string is an integer multiple of N_{RB}^{DL}.</p> <p>N_{RB}^{DL} is defined in TS 36.211 [10].</p> <p>The DL Coordination Information is continuously repeated.</p> | – | |
| EUTRA Cell ID | O | | ECGI 9.2.14 | Reference cell for <i>UL Coordination Information IE</i> and <i>DL Coordination Information IE</i> . | YES | ignore |
| SgNB Coordination Assistance Information | O | | 9.2.140 | | YES | reject |

9.2.118 UL Configuration

This IE indicates how the UL PDCP is configured for the assisting node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------------|----------|-------|---|---|
| UL UE Configuration | M | | ENUMERATED (no-data, shared, only, ...) | Indicates how the UE uses the UL at the assisting node. |

9.2.119 RLC Mode

The *RLC Mode* IE indicates the RLC Mode used for an E-RAB.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---------------|----------|-------|---|-----------------------|
| RLC Mode | M | | ENUMERATED (RLC-AM, RLC-UM-Bidirectional, RLC-UM-Unidirectional-UL, RLC-UM-Unidirectional-DL, ...) | |

9.2.120 Secondary RAT Usage Report List

This IE provides information on the NR resources used with EN-DC as specified in TS 37.340 [32].

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------------------|----------|-----------------------------|---------------------------------|--|-------------|----------------------|
| Secondary RAT usage report Item | | 1 .. <maxno ofbearers > | | | EACH | reject |
| >E-RAB ID | M | | 9.2.23 | | - | |
| >Secondary RAT Type | M | | ENUMERATED (nR, ...) | | - | |
| >E-RAB Usage Report List | | 1 | | | - | |
| >>E-RAB Usage Report Item | | 1.. <maxno oftime periods > | | | EACH | ignore |
| >>>Start timestamp | M | | OCTET STRING (SIZE(4)) | UTC time encoded in the same format as the first four octets of the 64-bit timestamp format as defined in section 6 of IETF RFC 5905 [35]. It indicates the start time of the collecting period of the included <i>Usage Count UL</i> IE and <i>Usage Count DL</i> IE. | - | |
| >>>End timestamp | M | | OCTET STRING (SIZE(4)) | UTC time encoded in the same format as the first four octets of the 64-bit timestamp format as defined in section 6 of IETF RFC 5905 [35]. It indicates the end time of the collecting period of the included <i>Usage Count UL</i> IE and <i>Usage Count DL</i> IE. | - | |
| >>>Usage count UL | M | | INTEGER (0..2 ⁶⁴ -1) | The unit is: octets. | - | |
| >>>Usage count DL | M | | INTEGER (0..2 ⁶⁴ -1) | The unit is: octets. | - | |

| Range bound | Explanation |
|--------------------|--|
| maxnoofbearers | Maximum no. of E-RABs. Value is 256. |
| maxnooftimeperiods | Maximum no. of time reporting periods. Value is 2. |

9.2.121 UE Application layer measurement configuration

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

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|-----------------------------------|---|---|-------------|----------------------|
| Container for application layer measurement configuration | M | | Octet string (1..1000) | Indicates application layer measurement configuration, see Annex L in [36]. | - | |
| CHOICE <i>Area Scope of QMC</i> | M | | | | - | |
| > <i>Cell based</i> | | | | | | |
| >> Cell ID List for QMC | | 1 .. <maxno of CellID for QMC> | | | | |
| >>>E-CGI | M | | 9.2.1.38 | | - | |
| > <i>TA based</i> | | | | | | |
| >> TA List for QMC | | 1 .. <maxno of TA for QMC> | | | | |
| >>>TAC | M | | 9.2.3.7 | The TAI is derived using the current serving PLMN. | - | |
| > <i>TAI based</i> | | | | | - | |
| >> TAI List for QMC | | 1 .. <maxno of TA for QMC> | | | - | |
| >>>TAI | M | | 9.2.3.16 | | - | |
| > <i>PLMN area based</i> | | | | | | |
| >> PLMN List for QMC | | 1 .. <maxno of PLMN for QMC> | | | | |
| >>>PLMN Identity | M | | 9.2.3.8 | | - | |
| Service Type | M | | ENUMERATED (QMC for streaming service, QMC for MTSI service, ...) | This IE indicates the service type of UE application layer measurements. | - | |

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

9.2.122 DRB ID

This information element uniquely identifies a DRB over the X2 interface within an en-gNB.

The usage of this IE is defined in TS 36.331 [9].

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|-----------------------|-----------------------|
| DRB ID | M | | INTEGER (1..32) | |

9.2.123 SUL Information

This IE provides information about the SUL carrier.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------------------|----------|-------|-----------------------------------|---|
| SUL ARFCN | M | | INTEGER (0..maxNRARFCN) | RF Reference Frequency as defined in TS 38.104 [37] section 5.4.2.1. The frequency provided in this IE identifies the absolute frequency position of the reference resource block (Common RB 0) of the SUL carrier. Its lowest subcarrier is also known as Point A. |
| SUL Transmission Bandwidth | M | | NR Transmission Bandwidth 9.2.114 | |

| Range bound | Explanation |
|-------------|--|
| maxNRARFCN | Maximum value of NRARFCNs. Value is 3279165. |

9.2.124 Packet Loss Rate

This IE indicates the packet loss rate.

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

9.2.125 Protected E-UTRA Resource Indication

This IE indicates the resources allocated for E-UTRA DL and UL reference and control signals (hereby referred to as protected resources). This information is used in the process of E-UTRA – NR Cell Resource Coordination.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|---------------------------------------|---|---|-------------|----------------------|
| Activation SFN | M | | INTEGER (0..1023) | Indicates from which SFN of the receiving node the resource allocation is valid. | | |
| Protected Resource List | | 1 | | The protected resource pattern is continuously repeated, and it is valid until stated otherwise or until replaced by a new pattern. The pattern does not apply in reserved subframes. | YES | ignore |
| >Protected Resource List Item | | 1..<maxnoofProtectedResourcePatterns> | | Each item describes one transmission pattern. A pattern may comprise several control signals. | - | |
| >>Resource Type | M | | ENUMERATED (downlinknonCRS,CRS,uplink...) | Indicates whether the protected resource is E-UTRA DL non-CRS, E-UTRA CRS or E-UTRA UL. | - | |

| | | | | | | |
|---|----------|--|---------------------------------|---|--|--|
| <p>>>Intra-PRB Protected Resource Footprint</p> | <p>M</p> | | <p>BIT STRING (84, ...)</p> | <p>The bitmap of REs occupied by the protected signal within one PRB. Each position in the bitmap represents an RE in one PRB; value "0" indicates "resource not protected", value "1" indicates "resource protected ". The first bit of the string corresponds to the RE with the smallest time and frequency index in the PRB, where the indexing first goes into the frequency domain. The length of the bit string equals the product of N_{RB}^{SC} and the length of PRB in time dimension, measured in REs. N_{RB}^{SC} is defined in TS 36.211 [10]. The intra-PRB pattern consisting of all "1"s is equivalent to PRB-level granularity.</p> | | |
|---|----------|--|---------------------------------|---|--|--|

| | | | | | | |
|--|----------|--|--------------------------------|---|----------|--|
| <p>>>Protected Footprint Frequency Pattern</p> | <p>M</p> | | <p>BIT STRING(6..110, ...)</p> | <p>The bit string indicates in which PRBs inside carrier bandwidth the Intra-PRB Protected Resource Footprint applies. How often in time dimension this frequency pattern applies, depends on time periodicity of Intra-PRB Protected Resource Footprint. The first bit of the bit string corresponds to the PRB occupying the lowest subcarrier frequencies of the carrier bandwidth, where the indexing first goes into the frequency domain. Each position in the string represents a PRB; value "0" indicates " Intra-PRB Protected Resource Footprint does not appear in PRB", value "1" indicates "Intra-PRB Protected Resource Footprint appears in PRB". The length of the bit string equals the number of PRBs in the carrier bandwidth.</p> | <p>-</p> | |
| <p>>>Protected Footprint Time Pattern</p> | <p>M</p> | | | <p>The description of time periodicity of the Intra-PRB Protected Resource Footprint.</p> | | |

| | | | | | | |
|---|---|--|----------------------|---|---|--|
| >>>Protected Footprint Time-periodicity | M | | INTEGER(1..320, ...) | Periodicity with which the periodic Intra-PRB Protected Resource Footprint repeats in time-dimension (1= every PRB (i.e. slot), 2=every other PRB (i.e. slot) etc. | - | |
| >>>Protected Footprint Start Time | M | | INTEGER(1..20, ...) | The time-position of the PRB inside the frame in which the periodic Intra-PRB Protected Resource Footprint appears for the first time. The value "1" corresponds to the receiving node's slot 0 in subframe 0 in the receiving node's radio frame where SFN = Activation SFN. | - | |
| MBSFN Control Region Length | O | | INTEGER(0..3) | Length of control region in MBSFN subframes. Expressed in REs, in the time dimension. | | |
| PDCCH Region Length | M | | INTEGER(1..3) | Length of PDCCH region in regular subframes. Expressed in REs, in the time dimension. | | |

| Range bound | Explanation |
|----------------------------------|---|
| maxnoofProtectedResourcePatterns | Maximum no. protected resource patterns. Value is 16. |

9.2.126 Data Traffic Resource Indication

This IE indicates the intended data traffic resource allocation for E-UTRA - NR Cell Resource Coordination.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------------|----------|-------|--------------------------------|--|-------------|----------------------|
| Activation SFN | M | | INTEGER (0..1023) | Indicates from which SFN of the receiving node the agreement is valid. | | |
| CHOICE <i>Shared Resource Type</i> | M | | | | - | |
| >UL Only Sharing | | | | | | |
| >>UL Resource Bitmap | M | | Data Traffic Resources 9.2.127 | | - | |
| >UL and DL Sharing | | | | | | |
| >>CHOICE <i>UL Resources</i> | M | | | | | |
| >>>Unchanged | | | NULL | | | |
| >>>Changed | | | | | | |
| >>>>UL Resource Bitmap | M | | Data Traffic Resources 9.2.127 | | | |
| >>CHOICE <i>DL Resources</i> | M | | | | | |
| >>>Unchanged | | | NULL | | | |
| >>>Changed | | | | | | |
| >>>>DL Resource Bitmap | M | | Data Traffic Resources 9.2.127 | | | |
| Reserved Subframe Pattern | O | | 9.2.128 | Indicates subframes in which the resource allocation does not hold. | | |

9.2.127 Data Traffic Resources

The *Data Traffic Resources* IE indicates the intended data traffic resource allocation for E-UTRA - NR Cell Resource Coordination.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------------|----------|-------|--------------------------|--|
| Data Traffic Resources | M | | BIT STRING (6..17600) | The indication of resources allocated to E-UTRA PDSCH/PUSCH. Each position in the bit string represents a PRB pair in a subframe; value "0" indicates "resource not intended to be used for transmission", value "1" indicates "resource intended to be used for transmission ". The first bit of the bit string corresponds to the PRB pair occupying the lowest subcarrier frequencies of the carrier, where the indexing first goes into the frequency domain. The bit string may span across multiple contiguous subframes. The first position of the Data Traffic Resources corresponds to the receiving node's subframe 0 in a receiving node's radio frame where SFN = Activation SFN. The length of the bit string is an integer multiple of N_{RB}^{DL} or N_{RB}^{UL}, defined in TS 36.211 [10]. |

9.2.128 Reserved Subframe Pattern

The *Reserved Subframe Pattern* IE indicates the pattern of subframes in which the *Protected E-UTRA Resource Indication* and *Data Traffic Resource Indication* do not hold.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------------------|----------|-------|----------------------------------|--|
| Subframe Type | M | | ENUMERATED(MBSFN,non-MBSFN, ...) | Indicates what type of non-regular subframes the <i>Reserved Subframe Pattern</i> refers to (e.g. MBSFN). |
| Reserved Subframe Pattern | M | | BIT STRING (10..160) | Each position in the bitmap represents a subframe. Value '0' indicates "regular subframe". Value '1' indicates "reserved subframe". For MBSFN subframes, the exception refers only to the non-control region of the subframe. The bit string may span across multiple contiguous subframes. The first position of the Subframe Configuration IE corresponds to the receiving node's subframe 0 in a receiving node's radio frame where SFN = Activation SFN. The IE is ignored if received by the eNB. |
| MBSFN Control Region Length | O | | INTEGER(0..3) | Length of control region in MBSFN subframes. Expressed in REs, in the time dimension. |

9.2.129 Aerial UE subscription information

This information element is used by the eNB to know if the UE is allowed to use aerial UE function, refer to TS 23.401[12].

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

9.2.130 User plane traffic activity report

This IE is used to indicate user plane traffic activity.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------------------------|----------|-------|--|--|
| User plane traffic activity report | M | | ENUMERATED (inactive, re-activated, ...) | "re-activated" shall be only set after "inactive" has been reported for the concerned reporting object |

9.2.131 RLC Status

This IE indicates about the RLC configuration change included in the container towards the UE.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------------------|----------|-------|---------------------------------|---|
| Reestablishment Indication | O | | ENUMERATED (reestablished, ...) | Indicates that following the change of the radio status, the RLC has been re-established. |

9.2.132 RRC config indication

This IE is used to indicate the type of RRC configuration used at the en-gNB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------------|----------|-------|---|-----------------------|
| RRC config indication | M | | ENUMERATED (full config, delta config, ...) | |

9.2.133 PDCP SN Length

The *PDCP SN Length* IE is used to indicate the PDCP SN length configuration of the bearer.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|----------------|----------|-------|----------------------------------|--|
| PDCP SN Length | M | | ENUMERATED (12bits, 18bits, ...) | This IE indicates the PDCP sequence number size. |

9.2.134 Bluetooth Measurement Configuration

This IE defines the parameters for Bluetooth measurement collection.

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

| Range bound | Explanation |
|----------------------|--|
| maxnoofBluetoothname | Maximum no. of Bluetooth local name used for Bluetooth measurement collection, the maximum value is 4. |

9.2.135 WLAN Measurement Configuration

This IE defines the parameters for WLAN measurement collection.

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

| Range bound | Explanation |
|-----------------|--|
| maxnoofWLANname | Maximum no. of WLAN SSID used for WLAN measurement collection, the maximum value is 4. |

9.2.136 Subscription Based UE Differentiation Information

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

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

9.2.137 Duplication activation

The *Duplication Activation* IE indicates whether UL PDCP Duplication is activated or not.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------------|----------|-------|------------------------------------|-----------------------|
| Duplication Activation | M | | ENUMERATED (Active, Inactive, ...) | |

9.2.138 LCID

This IE uniquely identifies a LCID for the associated DRB.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|-----------------------|--|
| LCID | M | | INTEGER (1..32, ...) | Corresponds to the <i>LogicalChannelIdentity</i> defined in TS 38.331 [8]. |

9.2.139 MeNB Coordination Assistance Information

The *MeNB Coordination Assistance Information* IE is provided by the MeNB and used by the SgNB to determine further coordination of resource utilisation between the en-gNB and the MeNB.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|--|----------|-------|--|--|
| MeNB Coordination Assistance Information | M | | ENUMERATED(Coordination Not Required, ...) | The absence of this IE indicates that the resource coordination is required. |

9.2.140 SgNB Coordination Assistance Information

The *SgNB Coordination Assistance Information* IE is provided by the SgNB and used by the MeNB to determine further coordination of resource utilisation between the en-gNB and the MeNB.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|--|----------|-------|--|--|
| SgNB Coordination Assistance Information | M | | ENUMERATED(Coordination Not Required, ...) | The absence of this IE indicates that the resource coordination is required. |

9.2.141 Desired Activity Notification Level

This IE contains information on which level activity notification shall be performed.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------------------------|----------|-------|---|-----------------------|
| Desired Activity Notification Level | O | | ENUMERATED (None, E-RAB, UE-level, ...) | |

9.2.142 Location Information at SgNB

The *Location Information at SgNB* IE enables the SgNB to provide the MeNB with information that supports localisation of the UE.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| PSCell ID | M | | NR CGI 9.2.111 | PSCell of the UE | – | |

9.2.143 Interface Instance Indication

The Interface Instance Indication identifies the interface instance the X2AP message is destined for.

NOTE: The Interface Instance Indication is allocated so that it can be associated with an X2-C interface instance. The Interface Instance Indication may identify more than one interface instance.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------------------|----------|-------|-----------------------|-----------------------|
| Interface Instance Indication | M | | INTEGER (0..255, ...) | |

9.2.144 NB-IoT UL DL Alignment Offset

This IE is used to indicate the offset between the UL carrier frequency center with respect to DL carrier frequency center.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------------------|----------|-------|--------------------------------|-----------------------|
| NB-IoT UL DL Alignment Offset | M | | ENUMERATED (-7.5, 0, 7.5, ...) | Unit: kHz |

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

9.3.1 General

X2AP ASN.1 definition conforms to ITU-T Rec. X.680 [27] and ITU-T Rec. X.681 [28].

Sub clause 9.3 presents the Abstract Syntax of the X2AP protocol with ASN.1. In case there is contradiction between the ASN.1 definition in this sub clause and the tabular format in sub clause 9.1 and 9.2, the ASN.1 shall take precedence, except for the definition of conditions for the presence of conditional elements, in which the tabular format shall take precedence.

The ASN.1 definition specifies the structure and content of X2AP messages. X2AP messages can contain any IEs specified in the object set definitions for that message without the order or number of occurrence being restricted by ASN.1. However, for this version of the standard, a sending entity shall construct an X2AP message according to the PDU definitions module and with the following additional rules:

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

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

If an X2AP message that is not constructed as defined above is received, this shall be considered as Abstract Syntax Error, and the message shall be handled as defined for Abstract Syntax Error in clause 10.

9.3.2 Usage of Private Message Mechanism for Non-standard Use

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

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

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

9.3.3 Elementary Procedure Definitions

-- ASN1START

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

X2AP-PDU-Descriptions {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) x2ap (2) version1 (1) x2ap-PDU-Descriptions (0) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    ProcedureCode

FROM X2AP-CommonDataTypes

    CellActivationRequest,
    CellActivationResponse,
    CellActivationFailure,
    ENBConfigurationUpdate,
    ENBConfigurationUpdateAcknowledge,
    ENBConfigurationUpdateFailure,
    ErrorIndication,
    HandoverCancel,
    HandoverReport,
    HandoverPreparationFailure,
    HandoverRequest,
    HandoverRequestAcknowledge,
    LoadInformation,
    PrivateMessage,
    ResetRequest,
    ResetResponse,
    ResourceStatusFailure,
    ResourceStatusRequest,
    ResourceStatusResponse,
    ResourceStatusUpdate,
    RLFIndication,
    SNStatusTransfer,
    UEContextRelease,
    X2SetupFailure,
    X2SetupRequest,
    X2SetupResponse,
    MobilityChangeRequest,
    MobilityChangeAcknowledge,
```

MobilityChangeFailure,
X2Release,
X2APMessageTransfer,
SeNBAdditionRequest,
SeNBAdditionRequestAcknowledge,
SeNBAdditionRequestReject,
SeNBReconfigurationComplete,
SeNBModificationRequest,
SeNBModificationRequestAcknowledge,
SeNBModificationRequestReject,
SeNBModificationRequired,
SeNBModificationConfirm,
SeNBModificationRefuse,
SeNBReleaseRequest,
SeNBReleaseRequired,
SeNBReleaseConfirm,
SeNBCounterCheckRequest,
X2RemovalFailure,
X2RemovalRequest,
X2RemovalResponse,
RetrieveUEContextRequest,
RetrieveUEContextResponse,
RetrieveUEContextFailure,
SgNBAdditionRequest,
SgNBAdditionRequestAcknowledge,
SgNBAdditionRequestReject,
SgNBReconfigurationComplete,
SgNBModificationRequest,
SgNBModificationRequestAcknowledge,
SgNBModificationRequestReject,
SgNBModificationRequired,
SgNBModificationConfirm,
SgNBModificationRefuse,
SgNBReleaseRequest,
SgNBReleaseRequestAcknowledge,
SgNBReleaseRequestReject,
SgNBReleaseRequired,
SgNBReleaseConfirm,
SgNBCounterCheckRequest,
SgNBChangeRequired,
SgNBChangeConfirm,
SgNBChangeRefuse,
RRCTransfer,
ENDCX2SetupRequest,
ENDCX2SetupResponse,
ENDCX2SetupFailure,
ENDCConfigurationUpdate,
ENDCConfigurationUpdateAcknowledge,
ENDCConfigurationUpdateFailure,
SecondaryRATDataUsageReport,
ENDCCellActivationRequest,
ENDCCellActivationResponse,
ENDCCellActivationFailure,
ENDCPartialResetRequired,

ENDCPartialResetConfirm,
EUTRANRCellResourceCoordinationRequest,
EUTRANRCellResourceCoordinationResponse,
SgNBActivityNotification,
ENDCX2RemovalRequest,
ENDCX2RemovalResponse,
ENDCX2RemovalFailure,
DataForwardingAddressIndication,
GNBStatusIndication,
ENDCConfigurationTransfer,
DeactivateTrace,
TraceStart

FROM X2AP-PDU-Contents

id-cellActivation,
id-eNBConfigurationUpdate,
id-errorIndication,
id-handoverCancel,
id-handoverReport,
id-handoverPreparation,

id-loadIndication,
id-privateMessage,
id-reset,

id-resourceStatusReporting,
id-resourceStatusReportingInitiation,
id-rLFIndication,
id-snStatusTransfer,
id-uEContextRelease,
id-x2Setup,
id-mobilitySettingsChange,
id-x2Release,
id-x2APMessageTransfer,
id-seNBAdditionPreparation,
id-seNBReconfigurationCompletion,
id-meNBinitiatedSeNBModificationPreparation,
id-seNBinitiatedSeNBModification,
id-meNBinitiatedSeNBRelease,
id-seNBinitiatedSeNBRelease,
id-seNBCounterCheck,
id-x2Removal,
id-retrieveUEContext,
id-sgNBAdditionPreparation,
id-sgNBReconfigurationCompletion,
id-meNBinitiatedSgNBModificationPreparation,
id-sgNBinitiatedSgNBModification,
id-meNBinitiatedSgNBRelease,
id-sgNBinitiatedSgNBRelease,
id-sgNBChange,
id-sgNBCounterCheck,
id-rRCTransfer,

```

id-endcX2Setup,
id-endcConfigurationUpdate,
id-secondaryRATDataUsageReport,
id-endcCellActivation,
id-endcPartialReset,
id-eUTRANRCellResourceCoordination,
id-SgNBActivityNotification,
id-endcX2Removal,
id-dataForwardingAddressIndication,
id-gNBStatusIndication,
id-endcConfigurationTransfer,
id-deactivateTrace,
id-traceStart

FROM X2AP-Constants;

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

X2AP-ELEMENTARY-PROCEDURE ::= CLASS {
    &InitiatingMessage          ,
    &SuccessfulOutcome          OPTIONAL,
    &UnsuccessfulOutcome        OPTIONAL,
    &procedureCode              ProcedureCode UNIQUE,
    &criticality                 Criticality   DEFAULT ignore
}
WITH SYNTAX {
    INITIATING MESSAGE          &InitiatingMessage
    [SUCCESSFUL OUTCOME         &SuccessfulOutcome]
    [UNSUCCESSFUL OUTCOME       &UnsuccessfulOutcome]
    PROCEDURE CODE              &procedureCode
    [CRITICALITY                &criticality]
}

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

X2AP-PDU ::= CHOICE {
    initiatingMessage    InitiatingMessage,
    successfulOutcome    SuccessfulOutcome,
    unsuccessfulOutcome  UnsuccessfulOutcome,
    ...
}

InitiatingMessage ::= SEQUENCE {
    procedureCode    X2AP-ELEMENTARY-PROCEDURE.&procedureCode    ({X2AP-ELEMENTARY-PROCEDURES}),

```

```

    criticality      X2AP-ELEMENTARY-PROCEDURE.&criticality      ( {X2AP-ELEMENTARY-PROCEDURES} {@procedureCode} ),
    value           X2AP-ELEMENTARY-PROCEDURE.&InitiatingMessage ( {X2AP-ELEMENTARY-PROCEDURES} {@procedureCode} )
}

SuccessfulOutcome ::= SEQUENCE {
    procedureCode   X2AP-ELEMENTARY-PROCEDURE.&procedureCode   ( {X2AP-ELEMENTARY-PROCEDURES} ),
    criticality     X2AP-ELEMENTARY-PROCEDURE.&criticality     ( {X2AP-ELEMENTARY-PROCEDURES} {@procedureCode} ),
    value          X2AP-ELEMENTARY-PROCEDURE.&SuccessfulOutcome ( {X2AP-ELEMENTARY-PROCEDURES} {@procedureCode} )
}

UnsuccessfulOutcome ::= SEQUENCE {
    procedureCode   X2AP-ELEMENTARY-PROCEDURE.&procedureCode   ( {X2AP-ELEMENTARY-PROCEDURES} ),
    criticality     X2AP-ELEMENTARY-PROCEDURE.&criticality     ( {X2AP-ELEMENTARY-PROCEDURES} {@procedureCode} ),
    value          X2AP-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome ( {X2AP-ELEMENTARY-PROCEDURES} {@procedureCode} )
}

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

X2AP-ELEMENTARY-PROCEDURES X2AP-ELEMENTARY-PROCEDURE ::= {
    X2AP-ELEMENTARY-PROCEDURES-CLASS-1      |
    X2AP-ELEMENTARY-PROCEDURES-CLASS-2      ,
    ...
}

X2AP-ELEMENTARY-PROCEDURES-CLASS-1 X2AP-ELEMENTARY-PROCEDURE ::= {
    handoverPreparation
    reset
    x2Setup
    resourceStatusReportingInitiation
    eNBConfigurationUpdate
    mobilitySettingsChange
    cellActivation
    seNBAdditionPreparation
    meNBinitiatedSeNBModificationPreparation
    seNBinitiatedSeNBModification
    seNBinitiatedSeNBRelease
    x2Removal
    retrieveUEContext
    sgNBAdditionPreparation
    meNBinitiatedSgNBModificationPreparation
    sgNBinitiatedSgNBModification
    meNBinitiatedSgNBRelease
    sgNBinitiatedSgNBRelease
    sgNBChange
    endcX2Setup
    endcConfigurationUpdate
    endcCellActivation
    endcPartialReset
    eUTRANRCellResourceCoordination
    endcX2Removal
}

```



```

}
...
X2AP-ELEMENTARY-PROCEDURES-CLASS-2 X2AP-ELEMENTARY-PROCEDURE ::= {
    snStatusTransfer
    ueContextRelease
    handoverCancel
    errorIndication
    resourceStatusReporting
    loadIndication
    privateMessage
    rLFIndication
    handoverReport
    x2Release
    x2APMessageTransfer
    seNBReconfigurationCompletion
    meNBinitiatedSeNBRelease
    seNBCounterCheck
    sgNBReconfigurationCompletion
    sgNBCounterCheck
    rRCTransfer
    secondaryRATDataUsageReport
    sgNBActivityNotification
    dataForwardingAddressIndication
    gNBStatusIndication
    endcConfigurationTransfer
    deactivateTrace
    traceStart
    ...
}

-- *****
--
-- Interface Elementary Procedures
--
-- *****

handoverPreparation X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      HandoverRequest
    SUCCESSFUL OUTCOME      HandoverRequestAcknowledge
    UNSUCCESSFUL OUTCOME    HandoverPreparationFailure
    PROCEDURE CODE          id-handoverPreparation
    CRITICALITY              reject
}

snStatusTransfer X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      SNStatusTransfer
    PROCEDURE CODE          id-snStatusTransfer
    CRITICALITY              ignore
}

ueContextRelease X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UEContextRelease

```

```
    PROCEDURE CODE          id-uEContextRelease
    CRITICALITY             ignore
}

handoverCancel X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      HandoverCancel
    PROCEDURE CODE          id-handoverCancel
    CRITICALITY             ignore
}

handoverReport X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      HandoverReport
    PROCEDURE CODE          id-handoverReport
    CRITICALITY             ignore
}

errorIndication X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ErrorIndication
    PROCEDURE CODE          id-errorIndication
    CRITICALITY             ignore
}

reset X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ResetRequest
    SUCCESSFUL OUTCOME      ResetResponse
    PROCEDURE CODE          id-reset
    CRITICALITY             reject
}

x2Setup X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      X2SetupRequest
    SUCCESSFUL OUTCOME      X2SetupResponse
    UNSUCCESSFUL OUTCOME    X2SetupFailure
    PROCEDURE CODE          id-x2Setup
    CRITICALITY             reject
}

loadIndication X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      LoadInformation
    PROCEDURE CODE          id-loadIndication
    CRITICALITY             ignore
}

eNBConfigurationUpdate X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENBConfigurationUpdate
    SUCCESSFUL OUTCOME      ENBConfigurationUpdateAcknowledge
    UNSUCCESSFUL OUTCOME    ENBConfigurationUpdateFailure
    PROCEDURE CODE          id-eNBConfigurationUpdate
    CRITICALITY             reject
}

resourceStatusReportingInitiation X2AP-ELEMENTARY-PROCEDURE ::= {
```

```

    INITIATING MESSAGE      ResourceStatusRequest
    SUCCESSFUL OUTCOME      ResourceStatusResponse
    UNSUCCESSFUL OUTCOME    ResourceStatusFailure
    PROCEDURE CODE          id-resourceStatusReportingInitiation
    CRITICALITY             reject
}

resourceStatusReporting X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ResourceStatusUpdate
    PROCEDURE CODE          id-resourceStatusReporting
    CRITICALITY             ignore
}

rLFIndication X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      RLFIndication
    PROCEDURE CODE          id-rLFIndication
    CRITICALITY             ignore
}

privateMessage X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PrivateMessage
    PROCEDURE CODE          id-privateMessage
    CRITICALITY             ignore
}

mobilitySettingsChange X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MobilityChangeRequest
    SUCCESSFUL OUTCOME      MobilityChangeAcknowledge
    UNSUCCESSFUL OUTCOME    MobilityChangeFailure
    PROCEDURE CODE          id-mobilitySettingsChange
    CRITICALITY             reject
}

cellActivation X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      CellActivationRequest
    SUCCESSFUL OUTCOME      CellActivationResponse
    UNSUCCESSFUL OUTCOME    CellActivationFailure
    PROCEDURE CODE          id-cellActivation
    CRITICALITY             reject
}

x2Release X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      X2Release
    PROCEDURE CODE          id-x2Release
    CRITICALITY             reject
}

x2APMessageTransfer X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      X2APMessageTransfer
    PROCEDURE CODE          id-x2APMessageTransfer
    CRITICALITY             reject
}

senBAdditionPreparation X2AP-ELEMENTARY-PROCEDURE ::= {

```

```

INITIATING MESSAGE      SeNBAdditionRequest
SUCCESSFUL OUTCOME      SeNBAdditionRequestAcknowledge
UNSUCCESSFUL OUTCOME    SeNBAdditionRequestReject
PROCEDURE CODE          id-seNBAdditionPreparation
CRITICALITY             reject
}

seNBReconfigurationCompletion  X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      SeNBReconfigurationComplete
  PROCEDURE CODE          id-seNBReconfigurationCompletion
  CRITICALITY             ignore
}

meNBInitiatedSeNBModificationPreparation  X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      SeNBModificationRequest
  SUCCESSFUL OUTCOME      SeNBModificationRequestAcknowledge
  UNSUCCESSFUL OUTCOME    SeNBModificationRequestReject
  PROCEDURE CODE          id-meNBInitiatedSeNBModificationPreparation
  CRITICALITY             reject
}

seNBInitiatedSeNBModification  X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      SeNBModificationRequired
  SUCCESSFUL OUTCOME      SeNBModificationConfirm
  UNSUCCESSFUL OUTCOME    SeNBModificationRefuse
  PROCEDURE CODE          id-seNBInitiatedSeNBModification
  CRITICALITY             reject
}

meNBInitiatedSeNBRelease      X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      SeNBReleaseRequest
  PROCEDURE CODE          id-meNBInitiatedSeNBRelease
  CRITICALITY             ignore
}

seNBInitiatedSeNBRelease      X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      SeNBReleaseRequired
  SUCCESSFUL OUTCOME      SeNBReleaseConfirm
  PROCEDURE CODE          id-seNBInitiatedSeNBRelease
  CRITICALITY             reject
}

seNBCounterCheck  X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      SeNBCounterCheckRequest
  PROCEDURE CODE          id-seNBCounterCheck
  CRITICALITY             reject
}

x2Removal  X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      X2RemovalRequest
  SUCCESSFUL OUTCOME      X2RemovalResponse
  UNSUCCESSFUL OUTCOME    X2RemovalFailure
  PROCEDURE CODE          id-x2Removal
  CRITICALITY             reject
}

```

```

}

retrieveUEContext    X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      RetrieveUEContextRequest
    SUCCESSFUL OUTCOME      RetrieveUEContextResponse
    UNSUCCESSFUL OUTCOME    RetrieveUEContextFailure
    PROCEDURE CODE          id-retrieveUEContext
    CRITICALITY              reject
}

sgNBAdditionPreparation    X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      SgNBAdditionRequest
    SUCCESSFUL OUTCOME      SgNBAdditionRequestAcknowledge
    UNSUCCESSFUL OUTCOME    SgNBAdditionRequestReject
    PROCEDURE CODE          id-sgNBAdditionPreparation
    CRITICALITY              reject
}

sgNBReconfigurationCompletion    X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      SgNBReconfigurationComplete
    PROCEDURE CODE          id-sgNBReconfigurationCompletion
    CRITICALITY              ignore
}

meNBinitiatedSgNBModificationPreparation    X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      SgNBModificationRequest
    SUCCESSFUL OUTCOME      SgNBModificationRequestAcknowledge
    UNSUCCESSFUL OUTCOME    SgNBModificationRequestReject
    PROCEDURE CODE          id-meNBinitiatedSgNBModificationPreparation
    CRITICALITY              reject
}

sgNBinitiatedSgNBModification    X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      SgNBModificationRequired
    SUCCESSFUL OUTCOME      SgNBModificationConfirm
    UNSUCCESSFUL OUTCOME    SgNBModificationRefuse
    PROCEDURE CODE          id-sgNBinitiatedSgNBModification
    CRITICALITY              reject
}

meNBinitiatedSgNBRelease    X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      SgNBReleaseRequest
    SUCCESSFUL OUTCOME      SgNBReleaseRequestAcknowledge
    UNSUCCESSFUL OUTCOME    SgNBReleaseRequestReject
    PROCEDURE CODE          id-meNBinitiatedSgNBRelease
    CRITICALITY              ignore
}

sgNBinitiatedSgNBRelease    X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      SgNBReleaseRequired
    SUCCESSFUL OUTCOME      SgNBReleaseConfirm
    PROCEDURE CODE          id-sgNBinitiatedSgNBRelease
    CRITICALITY              reject
}

```

```
sgNBCounterCheck X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      SgNBCounterCheckRequest
  PROCEDURE CODE          id-sgNBCounterCheck
  CRITICALITY             reject
}

sgNBChange X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      SgNBChangeRequired
  SUCCESSFUL OUTCOME      SgNBChangeConfirm
  UNSUCCESSFUL OUTCOME    SgNBChangeRefuse
  PROCEDURE CODE          id-sgNBChange
  CRITICALITY             reject
}

rRCTransfer X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      RRCTransfer
  PROCEDURE CODE          id-rRCTransfer
  CRITICALITY             reject
}

endcX2Setup X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      ENDCX2SetupRequest
  SUCCESSFUL OUTCOME      ENDCX2SetupResponse
  UNSUCCESSFUL OUTCOME    ENDCX2SetupFailure
  PROCEDURE CODE          id-endcX2Setup
  CRITICALITY             reject
}

endcConfigurationUpdate X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      ENDCConfigurationUpdate
  SUCCESSFUL OUTCOME      ENDCConfigurationUpdateAcknowledge
  UNSUCCESSFUL OUTCOME    ENDCConfigurationUpdateFailure
  PROCEDURE CODE          id-endcConfigurationUpdate
  CRITICALITY             reject
}

secondaryRATDataUsageReport X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      SecondaryRATDataUsageReport
  PROCEDURE CODE          id-secondaryRATDataUsageReport
  CRITICALITY             reject
}

endcCellActivation X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      ENDCCellActivationRequest
  SUCCESSFUL OUTCOME      ENDCCellActivationResponse
  UNSUCCESSFUL OUTCOME    ENDCCellActivationFailure
  PROCEDURE CODE          id-endcCellActivation
  CRITICALITY             reject
}

endcPartialReset X2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      ENDCPartialResetRequired
```

```

    SUCCESSFUL OUTCOME      ENDCPartialResetConfirm
    PROCEDURE CODE          id-encdPartialReset
    CRITICALITY              reject
}

eUTRANRCellResourceCoordination X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      EUTRANRCellResourceCoordinationRequest
    SUCCESSFUL OUTCOME      EUTRANRCellResourceCoordinationResponse
    PROCEDURE CODE          id-eUTRANRCellResourceCoordination
    CRITICALITY              reject
}

sgNBActivityNotification     X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      SgNBActivityNotification
    PROCEDURE CODE          id-SgNBActivityNotification
    CRITICALITY              reject
}

endcX2Removal X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENDCX2RemovalRequest
    SUCCESSFUL OUTCOME      ENDCX2RemovalResponse
    UNSUCCESSFUL OUTCOME    ENDCX2RemovalFailure
    PROCEDURE CODE          id-endcX2Removal
    CRITICALITY              reject
}

dataForwardingAddressIndication X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DataForwardingAddressIndication
    PROCEDURE CODE          id-dataForwardingAddressIndication
    CRITICALITY              ignore
}

gnNBStatusIndication        X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      GNBStatusIndication
    PROCEDURE CODE          id-gNBStatusIndication
    CRITICALITY              ignore
}

endcConfigurationTransfer   X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENDCConfigurationTransfer
    PROCEDURE CODE          id-endcConfigurationTransfer
    CRITICALITY              ignore
}

deactivateTrace X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DeactivateTrace
    PROCEDURE CODE          id-deactivateTrace
    CRITICALITY              ignore
}

traceStart X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      TraceStart
    PROCEDURE CODE          id-traceStart
}

```

```

    CRITICALITY          ignore
}
END
-- ASN1STOP

```

9.3.4 PDU Definitions

```

-- ASN1START
-- *****
--
-- PDU definitions for X2AP.
--
-- *****

X2AP-PDU-Contents {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) x2ap (2) version1 (1) x2ap-PDU-Contents (1) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    ABSInformation,
    ABS-Status,
    AS-SecurityInformation,
    BearerType,
    Cause,
    CompositeAvailableCapacityGroup,
    Correlation-ID,
    COUNTvalue,
    CellReportingIndicator,
    AerialUESubscriptionInformation,
    CriticalityDiagnostics,
    CRNTI,
    CSGMembershipStatus,
    CSG-Id,
    DeactivationIndication,
    DL-Forwarding,
    DynamicDLTransmissionInformation,
    ECGI,
    E-RAB-ID,
    E-RAB-Level-QoS-Parameters,
    E-RAB-List,
    EUTRANTraceID,
    GlobalENB-ID,

```


GTPtunnelEndpoint,
GUGroupIDList,
GUMMEI,
HandoverReportType,
HandoverRestrictionList,
Masked-IMEISV,
InvokeIndication,
LocationReportingInformation,
MDT-Configuration,
ManagementBasedMDTAllowed,
MDTPLMNList,
Neighbour-Information,
PCI,
PDCP-SN,
PLMN-Identity,
ReceiveStatusofULPDCPSDUs,
Registration-Request,
RelativeNarrowbandTxPower,
RadioResourceStatus,
RLC-Status,
RRCConnReestabIndicator,
RRCConnSetupIndicator,
UE-RLF-Report-Container,
UEAppLayerMeasConfig,
RRC-Context,
ServedCell-Information,
ServedCells,
ShortMAC-I,
SRVCCOperationPossible,
SubscriberProfileIDforRFP,
TargetCellInUTRAN,
TargeteNBtoSource-eNBTransparentContainer,
TimeToWait,
TraceActivation,
TraceDepth,
TransportLayerAddress,
UEAggregateMaximumBitRate,
UE-HistoryInformation,
UE-HistoryInformationFromTheUE,
UE-S1AP-ID,
UESecurityCapabilities,
UEsToBeResetList,
UE-X2AP-ID,
UL-HighInterferenceIndicationInfo,
UL-InterferenceOverloadIndication,
HWLoadIndicator,
S1TNLLoadIndicator,
Measurement-ID,
ReportCharacteristics,
MobilityParametersInformation,
MobilityParametersModificationRange,
ReceiveStatusOfULPDCPSDUsExtended,
COUNTValueExtended,
SubframeAssignment,

ExtendedULInterferenceOverloadInfo,
ExpectedUEBehaviour,
SeNBSecurityKey,
MeNBtoSeNBContainer,
SeNBtoMeNBContainer,
SCGChangeIndication,
CoMPInformation,
ReportingPeriodicityRSRPMR,
RSRPMRList,
UE-RLF-Report-Container-for-extended-bands,
ProSeAuthorized,
CoverageModificationList,
ReportingPeriodicityCSIR,
CSIReportList,
ReceiveStatusOfULPDCPSDUsPDCP-SNlength18,
COUNTvaluePDCP-SNlength18,
LHN-ID,
UE-ContextKeptIndicator,
UE-X2AP-ID-Extension,
SIPTOBearerDeactivationIndication,
TunnelInformation,
V2XServicesAuthorized,
X2BenefitValue,
ResumeID,
EUTRANCellIdentifier,
MakeBeforeBreakIndicator,
WTID,
WT-UE-XwAP-ID,
UESidelinkAggregateMaximumBitRate,
SgNBSecurityKey,
MeNBtoSgNBContainer,
SgNBtoMeNBContainer,
SplitSRBs,
RRCContainer,
SRBType,
GlobalGNB-ID,
GNB-ID,
SCGConfigurationQuery,
SplitSRB,
NRUeReport,
EN-DC-ResourceConfiguration,
TAC,
NRFreqInfo,
NRCGI,
NRPCI,
NRUESecurityCapabilities,
PDCPChangeIndication,
ULConfiguration,
SgNB-UE-X2AP-ID,
SecondaryRATUsageReportList,
ActivationID,
MeNBResourceCoordinationInformation,
SgNBResourceCoordinationInformation,
NR-TxBW,

BroadcastPLMNs-Item,
AdditionalPLMNs-Item,
RLCMode,
GBR-QoSInformation,
DRB-ID,
FiveGS-TAC,
SULInformation,
Packet-LossRate,
ResourceType,
DataTrafficResourceIndication,
SpectrumSharingGroupID,
RRC-Config-Ind,
SgNB-Addition-Trigger-Ind,
UserPlaneTrafficActivityReport,
ERABActivityNotifyItemList,
PDCPSnLength,
Subscription-Based-UE-DifferentiationInfo,
LCID,
DuplicationActivation,
GNBOverloadInformation,
NewDRBIDrequest,
DesiredActNotificationLevel,
LocationInformationSgNB,
LocationInformationSgNBReporting,
EndcSONConfigurationTransfer,
NRNeighbour-Information,
InterfaceInstanceIndication,
BPLMN-ID-Info-NR

FROM X2AP-IEs

PrivateIE-Container{},
ProtocolExtensionContainer{},
ProtocolIE-Container{},
ProtocolIE-ContainerList{},
ProtocolIE-ContainerPair{},
ProtocolIE-ContainerPairList{},
ProtocolIE-Single-Container{},
X2AP-PRIVATE-IES,
X2AP-PROTOCOL-EXTENSION,
X2AP-PROTOCOL-IES,
X2AP-PROTOCOL-IES-PAIR

FROM X2AP-Containers

id-ABSInformation,
id-ActivatedCellList,
id-BearerType,
id-Cause,
id-CellInformation,
id-CellInformation-Item,
id-CellMeasurementResult,
id-CellMeasurementResult-Item,
id-CellToReport,

id-CellToReport-Item,
id-CompositeAvailableCapacityGroup,
id-AerialUESubscriptionInformation,
id-CriticalityDiagnostics,
id-DeactivationIndication,
id-DynamicDLTransmissionInformation,
id-E-RABs-Admitted-Item,
id-E-RABs-Admitted-List,
id-E-RABs-NotAdmitted-List,
id-E-RABs-SubjectToStatusTransfer-List,
id-E-RABs-SubjectToStatusTransfer-Item,
id-E-RABs-ToBeSetup-Item,
id-GlobalENB-ID,
id-GUGroupIDList,
id-GUGroupIDToAddList,
id-GUGroupIDToDeleteList,
id-GUMMEI-ID,
id-Masked-IMEISV,
id-InvokeIndication,
id-New-eNB-UE-X2AP-ID,
id-Old-eNB-UE-X2AP-ID,
id-Registration-Request,
id-ReportingPeriodicity,
id-RLC-Status,
id-ServedCells,
id-ServedCellsToActivate,
id-ServedCellsToAdd,
id-ServedCellsToModify,
id-ServedCellsToDelete,
id-SRVCCOperationPossible,
id-TargetCell-ID,
id-TargeteNBtoSource-eNBTransparentContainer,
id-TimeToWait,
id-TraceActivation,
id-UE-ContextInformation,
id-UE-HistoryInformation,
id-UE-X2AP-ID,
id-Measurement-ID,
id-ReportCharacteristics,
id-ENB1-Measurement-ID,
id-ENB2-Measurement-ID,
id-ENB1-Cell-ID,
id-ENB2-Cell-ID,
id-ENB2-Proposed-Mobility-Parameters,
id-ENB1-Mobility-Parameters,
id-ENB2-Mobility-Parameters-Modification-Range,
id-FailureCellPCI,
id-Re-establishmentCellECGI,
id-FailureCellCRNTI,
id-ShortMAC-I,
id-SourceCellECGI,
id-FailureCellECGI,
id-HandoverReportType,
id-UE-RLF-Report-Container,

id-PartialSuccessIndicator,
id-MeasurementInitiationResult-List,
id-MeasurementInitiationResult-Item,
id-MeasurementFailureCause-Item,
id-CompleteFailureCauseInformation-List,
id-CompleteFailureCauseInformation-Item,
id-CSGMembershipStatus,
id-CSG-Id,
id-MDTConfiguration,
id-ManagementBasedMDTAllowed,
id-ABS-Status,
id-RRCCConnSetupIndicator,
id-RRCCConnReestabIndicator,
id-TargetCellInUTRAN,
id-MobilityInformation,
id-SourceCellCRNTI,
id-ManagementBasedMDTPLMNList,
id-ReceiveStatusOfULPDCPSDUsExtended,
id-ULCOUNTValueExtended,
id-DLCOUNTValueExtended,
id-IntendedULDLConfiguration,
id-ExtendedULInterferenceOverloadInfo,
id-RNL-Header,
id-x2APMessage,
id-UE-HistoryInformationFromTheUE,
id-ExpectedUEBehaviour,
id-MeNB-UE-X2AP-ID,
id-SeNB-UE-X2AP-ID,
id-UE-SecurityCapabilities,
id-SeNBSecurityKey,
id-SeNBUEAggregateMaximumBitRate,
id-ServingPLMN,
id-E-RABs-ToBeAdded-List,
id-E-RABs-ToBeAdded-Item,
id-MeNBtoSeNBContainer,
id-E-RABs-Admitted-ToBeAdded-List,
id-E-RABs-Admitted-ToBeAdded-Item,
id-SeNBtoMeNBContainer,
id-ResponseInformationSeNBReconfComp,
id-UE-ContextInformationSeNBModReq,
id-E-RABs-ToBeAdded-ModReqItem,
id-E-RABs-ToBeModified-ModReqItem,
id-E-RABs-ToBeReleased-ModReqItem,
id-E-RABs-Admitted-ToBeAdded-ModAckList,
id-E-RABs-Admitted-ToBeModified-ModAckList,
id-E-RABs-Admitted-ToBeReleased-ModAckList,
id-E-RABs-Admitted-ToBeAdded-ModAckItem,
id-E-RABs-Admitted-ToBeModified-ModAckItem,
id-E-RABs-Admitted-ToBeReleased-ModAckItem,
id-SCGChangeIndication,
id-E-RABs-ToBeReleased-ModReqd,
id-E-RABs-ToBeReleased-ModReqdItem,
id-E-RABs-ToBeReleased-List-RelReq,
id-E-RABs-ToBeReleased-RelReqItem,

id-E-RABs-ToBeReleased-List-RelConf,
id-E-RABs-ToBeReleased-RelConfItem,
id-E-RABs-SubjectToCounterCheck-List,
id-E-RABs-SubjectToCounterCheckItem,
id-CoMPInformation,
id-ReportingPeriodicityRSRPMR,
id-RSRPMList,
id-UE-RLF-Report-Container-for-extended-bands,
id-ProSeAuthorized,
id-CoverageModificationList,
id-ReportingPeriodicityCSIR,
id-CSIRReportList,
id-ReceiveStatusOfULPDCPSDUsPDCP-SNlength18,
id-ULCOUNTValuePDCP-SNlength18,
id-DLCOUNTValuePDCP-SNlength18,
id-LHN-ID,
id-Correlation-ID,
id-SIPTO-Correlation-ID,
id-UE-ContextReferenceAtSeNB,
id-UE-ContextReferenceAtWT,
id-UE-ContextKeptIndicator,
id-UEs-ToBeReset,
id-UEs-Admitted-ToBeReset,
id-WT-UE-ContextKeptIndicator,
id-New-eNB-UE-X2AP-ID-Extension,
id-Old-eNB-UE-X2AP-ID-Extension,
id-MeNB-UE-X2AP-ID-Extension,
id-SeNB-UE-X2AP-ID-Extension,
id-SIPTO-BearerDeactivationIndication,
id-Tunnel-Information-for-BBF,
id-SIPTO-L-GW-TransportLayerAddress,
id-GW-TransportLayerAddress,
id-X2RemovalThreshold,
id-CellReportingIndicator,
id-V2XServicesAuthorized,
id-resumeID,
id-UE-ContextInformationRetrieve,
id-E-RABs-ToBeSetupRetrieve-Item,
id-NewEUTRANCellIdentifier,
id-MakeBeforeBreakIndicator,
id-UESidelinkAggregateMaximumBitRate,
id-uL-GTPtunnelEndpoint,
id-SgNBSecurityKey,
id-SgNBUEAggregateMaximumBitRate,
id-E-RABs-ToBeAdded-SgNBAddReqList,
id-MeNBtoSgNBContainer,
id-SgNB-UE-X2AP-ID,
id-RequestedSplitSRBs,
id-E-RABs-ToBeAdded-SgNBAddReq-Item,
id-E-RABs-Admitted-ToBeAdded-SgNBAddReqAckList,
id-SgNBtoMeNBContainer,
id-AdmittedSplitSRBs,
id-E-RABs-Admitted-ToBeAdded-SgNBAddReqAck-Item,
id-ResponseInformationSgNBReconfComp,

id-UE-ContextInformation-SgNBModReq,
id-E-RABs-ToBeAdded-SgNBModReq-Item,
id-E-RABs-ToBeModified-SgNBModReq-Item,
id-E-RABs-ToBeReleased-SgNBModReq-Item,
id-E-RABs-Admitted-ToBeAdded-SgNBModAckList,
id-E-RABs-Admitted-ToBeModified-SgNBModAckList,
id-E-RABs-Admitted-ToBeReleased-SgNBModAckList,
id-E-RABs-Admitted-ToBeAdded-SgNBModAck-Item,
id-E-RABs-Admitted-ToBeModified-SgNBModAck-Item,
id-E-RABs-Admitted-ToBeReleased-SgNBModAck-Item,
id-E-RABs-Admitted-ToBeReleased-SgNBRelReqAckList,
id-E-RABs-Admitted-ToBeReleased-SgNBRelReqAck-Item,
id-E-RABs-ToBeReleased-SgNBModReqdList,
id-E-RABs-ToBeModified-SgNBModReqdList,
id-E-RABs-ToBeReleased-SgNBModReqd-Item,
id-E-RABs-ToBeModified-SgNBModReqd-Item,
id-E-RABs-ToBeReleased-SgNBChaConfList,
id-E-RABs-ToBeReleased-SgNBChaConf-Item,
id-E-RABs-ToBeReleased-SgNBRelReqList,
id-E-RABs-ToBeReleased-SgNBRelReq-Item,
id-E-RABs-ToBeReleased-SgNBRelConfList,
id-E-RABs-ToBeReleased-SgNBRelConf-Item,
id-E-RABs-ToBeReleased-SgNBRelReqdList,
id-E-RABs-ToBeReleased-SgNBRelReqd-Item,
id-E-RABs-SubjectToSgNBCounterCheck-List,
id-E-RABs-SubjectToSgNBCounterCheck-Item,
id-Target-SgNB-ID,
id-RRCContainer,
id-SRBType,
id-HandoverRestrictionList,
id-SCGConfigurationQuery,
id-SplitSRB,
id-NRUEReport,
id-InitiatingNodeType-EndcX2Setup,
id-InitiatingNodeType-EndcConfigUpdate,
id-RespondingNodeType-EndcX2Setup,
id-RespondingNodeType-EndcConfigUpdate,
id-NRUESecurityCapabilities,
id-PDCPChangeIndication,
id-ServedEUTRAcellsENDCX2ManagementList,
id-ServedEUTRAcellsToModifyListENDCConfUpd,
id-ServedEUTRAcellsToDeleteListENDCConfUpd,
id-ServedNRcellsToModifyListENDCConfUpd,
id-ServedNRcellsToDeleteListENDCConfUpd,
id-CellAssistanceInformation,
id-Globalen-gNB-ID,
id-ServedNRcellsENDCX2ManagementList,
id-Old-SgNB-UE-X2AP-ID,
id-UE-ContextReferenceAtSgNB,
id-SecondaryRATUsageReportList,
id-ActivationID,
id-ServedNRCellsToActivate,
id-ActivatedNRCellList,
id-MeNBResourceCoordinationInformation,

id-SgNBResourceCoordinationInformation,
id-UEAppLayerMeasConfig,
id-SelectedPLMN,
id-SubscriberProfileIDforRFP,
id-InitiatingNodeType-EutranrCellResourceCoordination,
id-RespondingNodeType-EutranrCellResourceCoordination,
id-DataTrafficResourceIndication,
id-SpectrumSharingGroupID,
id-ListofEUTRACellsinEUTRACoordinationReq,
id-ListofEUTRACellsinEUTRACoordinationResp,
id-ListofEUTRACellsinNRCoordinationReq,
id-ListofNRCellsinNRCoordinationReq,
id-ListofNRCellsinNRCoordinationResp,
id-RRConfigIndication,
id-SGNB-Addition-Trigger-Ind,
id-RequestedSplitSRBsrelease,
id-AdmittedSplitSRBsrelease,
id-E-RABs-AdmittedToBeModified-SgNBModConfList,
id-E-RABs-AdmittedToBeModified-SgNBModConf-Item,
id-UEContextLevelUserPlaneActivity,
id-ERABActivityNotifyItemList,
id-MeNBCell-ID,
id-InitiatingNodeType-EndcX2Removal,
id-RespondingNodeType-EndcX2Removal,
id-uLpDCPSnLength,
id-dL-Forwarding,
id-E-RABs-DataForwardingAddress-List,
id-E-RABs-DataForwardingAddress-Item,
id-Subscription-Based-UE-DifferentiationInfo,
id-RLCMode-transferred,
id-dLPDCPSnLength,
id-secondarysgNBDLGTPEIDatPDCP,
id-secondarymeNBULGTPEIDatPDCP,
id-lCID,
id-duplicationActivation,
id-GNBOverloadInformation,
id-new-drb-ID-req,
id-NRNeighbourInfoToModify,
id-DesiredActNotificationLevel,
id-LocationInformationSgNB,
id-LocationInformationSgNBReporting,
id-endcSONConfigurationTransfer,
id-EUTRANTraceID,
id-additionalPLMNs-Item,
id-InterfaceInstanceIndication,
id-BPLMN-ID-Info-NR,

maxCellineNB,
maxnoofBearers,
maxnoofPDCP-SN,
maxFailedMeasObjects,
maxnoofCellIDforMDT,
maxnoofTAforMDT,


```

maxCellInengNB,
maxnoofCellIDforQMC,
maxnoofTAforQMC,
maxnoofPLMNforQMC,
maxnoofProtectedResourcePatterns,
maxnoNRcellsSpectrumSharingWithE-UTRA,
maxnoofNrCellBands

FROM X2AP-Constants;

-- *****
--
-- HANDOVER REQUEST
--
-- *****

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

HandoverRequest-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Old-eNB-UE-X2AP-ID          CRITICALITY reject TYPE UE-X2AP-ID          PRESENCE mandatory} |
    { ID id-Cause                       CRITICALITY ignore TYPE Cause                PRESENCE mandatory} |
    { ID id-TargetCell-ID               CRITICALITY reject TYPE ECGI                PRESENCE mandatory} |
    { ID id-GUMMEI-ID                   CRITICALITY reject TYPE GUMMEI                PRESENCE mandatory} |
    { ID id-UE-ContextInformation       CRITICALITY reject TYPE UE-ContextInformation PRESENCE mandatory} |
    { ID id-UE-HistoryInformation       CRITICALITY ignore TYPE UE-HistoryInformation PRESENCE mandatory} |
    { ID id-TraceActivation              CRITICALITY ignore TYPE TraceActivation        PRESENCE optional} |
    { ID id-SRVCCOperationPossible      CRITICALITY ignore TYPE SRVCCOperationPossible PRESENCE optional} |
    { ID id-CSGMembershipStatus         CRITICALITY reject TYPE CSGMembershipStatus    PRESENCE optional} |
    { ID id-MobilityInformation         CRITICALITY ignore TYPE MobilityInformation    PRESENCE optional} |
    { ID id-Masked-IMEISV               CRITICALITY ignore TYPE Masked-IMEISV          PRESENCE optional} |
    { ID id-UE-HistoryInformationFromTheUE CRITICALITY ignore TYPE UE-HistoryInformationFromTheUE PRESENCE optional} |
    { ID id-ExpectedUEBehaviour         CRITICALITY ignore TYPE ExpectedUEBehaviour    PRESENCE optional} |
    { ID id-ProSeAuthorized              CRITICALITY ignore TYPE ProSeAuthorized        PRESENCE optional} |
    { ID id-UE-ContextReferenceAtSeNB   CRITICALITY ignore TYPE UE-ContextReferenceAtSeNB PRESENCE optional} |
    { ID id-Old-eNB-UE-X2AP-ID-Extension CRITICALITY reject TYPE UE-X2AP-ID-Extension    PRESENCE optional} |
    { ID id-V2XServicesAuthorized       CRITICALITY ignore TYPE V2XServicesAuthorized    PRESENCE optional} |
    { ID id-UE-ContextReferenceAtWT     CRITICALITY ignore TYPE UE-ContextReferenceAtWT    PRESENCE optional} |
    { ID id-NRUESecurityCapabilities    CRITICALITY ignore TYPE NRUESecurityCapabilities PRESENCE optional} |
    { ID id-UE-ContextReferenceAtSgNB   CRITICALITY ignore TYPE UE-ContextReferenceAtSgNB PRESENCE optional} |
    { ID id-AerialUEsubscriptionInformation CRITICALITY ignore TYPE AerialUEsubscriptionInformation PRESENCE optional} |
    { ID id-Subscription-Based-UE-DifferentiationInfo CRITICALITY ignore TYPE Subscription-Based-UE-DifferentiationInfo PRESENCE optional},
    ...
}

UE-ContextInformation ::= SEQUENCE {
    mME-UE-SlAP-ID          UE-SlAP-ID,
    uESecurityCapabilities  UESecurityCapabilities,
    aS-SecurityInformation  AS-SecurityInformation,
    uEAggregateMaximumBitRate UEAggregateMaximumBitRate,
    subscriberProfileIDforRFP  SubscriberProfileIDforRFP  OPTIONAL,
    e-RABs-ToBeSetup-List    E-RABs-ToBeSetup-List,

```

```

    rRC-Context                RRC-Context,
    handoverRestrictionList    HandoverRestrictionList    OPTIONAL,
    locationReportingInformation LocationReportingInformation    OPTIONAL,
    iE-Extensions              ProtocolExtensionContainer { {UE-ContextInformation-ExtIEs} } OPTIONAL,
    ...
}

UE-ContextInformation-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
{ ID id-ManagementBasedMDTallowed          CRITICALITY ignore EXTENSION ManagementBasedMDTallowed          PRESENCE optional }|
{ ID id-ManagementBasedMDTPLMNList         CRITICALITY ignore EXTENSION MDTPLMNList                 PRESENCE optional }|
{ ID id-UESidelinkAggregateMaximumBitRate   CRITICALITY ignore EXTENSION UESidelinkAggregateMaximumBitRate PRESENCE optional},
    ...
}

E-RABs-ToBeSetup-List ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeSetup-ItemIEs} }

E-RABs-ToBeSetup-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-ToBeSetup-Item          CRITICALITY ignore          TYPE E-RABs-ToBeSetup-Item PRESENCE mandatory },
    ...
}

E-RABs-ToBeSetup-Item ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,
    e-RAB-Level-QoS-Parameters E-RAB-Level-QoS-Parameters,
    dL-Forwarding            DL-Forwarding                                OPTIONAL,
    uL-GTPTunnelEndpoint     GTPtunnelEndpoint,
    iE-Extensions            ProtocolExtensionContainer { {E-RABs-ToBeSetup-ItemExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeSetup-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-BearerType          CRITICALITY reject EXTENSION BearerType          PRESENCE optional},
    ...
}

MobilityInformation ::= BIT STRING (SIZE(32))

UE-ContextReferenceAtSeNB ::= SEQUENCE {
    source-GlobalSeNB-ID      GlobaleNB-ID,
    seNB-UE-X2AP-ID           UE-X2AP-ID,
    seNB-UE-X2AP-ID-Extension UE-X2AP-ID-Extension,
    iE-Extensions              ProtocolExtensionContainer { {UE-ContextReferenceAtSeNB-ItemExtIEs} } OPTIONAL,
    ...
}

UE-ContextReferenceAtSeNB-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

UE-ContextReferenceAtWT ::= SEQUENCE {
    wTID                WTID,
    wT-UE-XwAP-ID       WT-UE-XwAP-ID,
    iE-Extensions        ProtocolExtensionContainer { {UE-ContextReferenceAtWT-ItemExtIEs} } OPTIONAL,
    ...
}

```

```

}

UE-ContextReferenceAtWT-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

UE-ContextReferenceAtSgNB ::= SEQUENCE {
  source-GlobalSgNB-ID          GlobalGNB-ID,
  sgNB-UE-X2AP-ID              SgNB-UE-X2AP-ID,
  iE-Extensions                 ProtocolExtensionContainer { {UE-ContextReferenceAtSgNB-ItemExtIEs} } OPTIONAL,
  ...
}

UE-ContextReferenceAtSgNB-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- HANDOVER REQUEST ACKNOWLEDGE
--
-- *****

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

HandoverRequestAcknowledge-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-Old-eNB-UE-X2AP-ID          CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-New-eNB-UE-X2AP-ID          CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-E-RABs-Admitted-List        CRITICALITY ignore TYPE E-RABs-Admitted-List    PRESENCE mandatory}|
  { ID id-E-RABs-NotAdmitted-List     CRITICALITY ignore TYPE E-RAB-List        PRESENCE optional}|
  { ID id-TargeteNBtoSource-eNBTransparentContainer CRITICALITY ignore TYPE TargeteNBtoSource-eNBTransparentContainer PRESENCE mandatory}|
  { ID id-CriticalityDiagnostics       CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional}|
  { ID id-UE-ContextKeptIndicator      CRITICALITY ignore TYPE UE-ContextKeptIndicator PRESENCE optional}|
  { ID id-SeNB-UE-X2AP-ID-Extension    CRITICALITY ignore TYPE UE-X2AP-ID-Extension PRESENCE optional}--
The id-SeNB-UE-X2AP-ID-Extension shall not be sent shall not be sent and shall be ignored, if received.--|
  { ID id-Old-eNB-UE-X2AP-ID-Extension CRITICALITY ignore TYPE UE-X2AP-ID-Extension PRESENCE optional}|
  { ID id-New-eNB-UE-X2AP-ID-Extension CRITICALITY reject TYPE UE-X2AP-ID-Extension PRESENCE optional}|
  { ID id-WT-UE-ContextKeptIndicator   CRITICALITY ignore TYPE UE-ContextKeptIndicator PRESENCE optional},
  ...
}

E-RABs-Admitted-List ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-Admitted-ItemIEs} }

E-RABs-Admitted-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-Admitted-Item CRITICALITY ignore TYPE E-RABs-Admitted-Item PRESENCE mandatory }
}

E-RABs-Admitted-Item ::= SEQUENCE {
  e-RAB-ID          E-RAB-ID,
  uL-GTP-TunnelEndpoint GTPtunnelEndpoint          OPTIONAL,
  dL-GTP-TunnelEndpoint GTPtunnelEndpoint          OPTIONAL,

```

```

    iE-Extensions          ProtocolExtensionContainer { {E-RABs-Admitted-Item-ExtIEs} } OPTIONAL,
    ...
}

E-RABs-Admitted-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- HANOVER PREPARATION FAILURE
--
-- *****

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

HandoverPreparationFailure-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Old-eNB-UE-X2AP-ID          CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-Cause                        CRITICALITY ignore TYPE Cause          PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics        CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional}|
    { ID id-Old-eNB-UE-X2AP-ID-Extension CRITICALITY ignore TYPE UE-X2AP-ID-Extension PRESENCE optional},
    ...
}

-- *****
--
-- HANOVER REPORT
--
-- *****

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

HandoverReport-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-HandoverReportType          CRITICALITY ignore TYPE HandoverReportType          PRESENCE mandatory}|
    { ID id-Cause                        CRITICALITY ignore TYPE Cause          PRESENCE mandatory}|
    { ID id-SourceCellECGI               CRITICALITY ignore TYPE ECGI          PRESENCE mandatory}|
    { ID id-FailureCellECGI              CRITICALITY ignore TYPE ECGI          PRESENCE mandatory}|
    { ID id-Re-establishmentCellECGI     CRITICALITY ignore TYPE ECGI          PRESENCE conditional} -
- The IE shall be present if the Handover Report Type IE is set to "HO to Wrong Cell" -- |
    { ID id-TargetCellInUTRAN           CRITICALITY ignore TYPE TargetCellInUTRAN          PRESENCE conditional} -
- The IE shall be present if the Handover Report Type IE is set to "InterRAT ping-pong" --|
    { ID id-SourceCellCRNTI             CRITICALITY ignore TYPE CRNTI          PRESENCE optional}|
    { ID id-MobilityInformation          CRITICALITY ignore TYPE MobilityInformation          PRESENCE optional}|
    { ID id-UE-RLF-Report-Container      CRITICALITY ignore TYPE UE-RLF-Report-Container      PRESENCE optional}|
    { ID id-UE-RLF-Report-Container-for-extended-bands CRITICALITY ignore TYPE UE-RLF-Report-Container-for-extended-bands PRESENCE optional},
    ...
}

```

```

-- *****
--
-- SN STATUS TRANSFER
--
-- *****

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

SNStatusTransfer-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Old-eNB-UE-X2AP-ID                CRITICALITY reject TYPE UE-X2AP-ID                PRESENCE mandatory}|
    { ID id-New-eNB-UE-X2AP-ID                CRITICALITY reject TYPE UE-X2AP-ID                PRESENCE mandatory}|
    { ID id-E-RABs-SubjectToStatusTransfer-List CRITICALITY ignore TYPE E-RABs-SubjectToStatusTransfer-List PRESENCE mandatory}|
    { ID id-Old-eNB-UE-X2AP-ID-Extension      CRITICALITY reject TYPE UE-X2AP-ID-Extension      PRESENCE optional}|
    { ID id-New-eNB-UE-X2AP-ID-Extension      CRITICALITY reject TYPE UE-X2AP-ID-Extension      PRESENCE optional}|
    { ID id-SgNB-UE-X2AP-ID                   CRITICALITY ignore TYPE SgNB-UE-X2AP-ID                   PRESENCE optional},
    ...
}

E-RABs-SubjectToStatusTransfer-List ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-SubjectToStatusTransfer-ItemIEs} }

E-RABs-SubjectToStatusTransfer-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-SubjectToStatusTransfer-Item CRITICALITY ignore TYPE E-RABs-SubjectToStatusTransfer-Item PRESENCE mandatory }
}

E-RABs-SubjectToStatusTransfer-Item ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,

    receiveStatusOfULPDCPSDUs      ReceiveStatusOfULPDCPSDUs      OPTIONAL,
    uL-COUNTvalue                  COUNTvalue,
    dL-COUNTvalue                  COUNTvalue,
    iE-Extensions                  ProtocolExtensionContainer { {E-RABs-SubjectToStatusTransfer-ItemExtIEs} } OPTIONAL,
    ...
}

E-RABs-SubjectToStatusTransfer-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-ReceiveStatusOfULPDCPSDUsExtended CRITICALITY ignore EXTENSION ReceiveStatusOfULPDCPSDUsExtended PRESENCE optional}|
    { ID id-ULCOUNTValueExtended            CRITICALITY ignore EXTENSION COUNTValueExtended PRESENCE optional}|
    { ID id-DLCOUNTValueExtended             CRITICALITY ignore EXTENSION COUNTValueExtended PRESENCE optional}|
    { ID id-ReceiveStatusOfULPDCPSDUsPDCP-SNlength18 CRITICALITY ignore EXTENSION ReceiveStatusOfULPDCPSDUsPDCP-SNlength18 PRESENCE optional}|
    { ID id-ULCOUNTValuePDCP-SNlength18    CRITICALITY ignore EXTENSION COUNTValuePDCP-SNlength18 PRESENCE optional}|
    { ID id-DLCOUNTValuePDCP-SNlength18     CRITICALITY ignore EXTENSION COUNTValuePDCP-SNlength18 PRESENCE optional},
    ...
}

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

```

```

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

UEContextRelease-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Old-eNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-New-eNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-Old-eNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional}|
    { ID id-New-eNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional}|
    { ID id-SIPTO-BearerDeactivationIndication CRITICALITY ignore TYPE SIPTOBearerDeactivationIndication PRESENCE optional}|
    { ID id-SgNB-UE-X2AP-ID            CRITICALITY ignore  TYPE SgNB-UE-X2AP-ID     PRESENCE optional},
    ...
}

-- *****
--
-- HANDOVER CANCEL
--
-- *****

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

HandoverCancel-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Old-eNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-New-eNB-UE-X2AP-ID          CRITICALITY ignore  TYPE UE-X2AP-ID          PRESENCE optional}|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause               PRESENCE mandatory}|
    { ID id-Old-eNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional}|
    { ID id-New-eNB-UE-X2AP-ID-Extension CRITICALITY ignore  TYPE UE-X2AP-ID-Extension PRESENCE optional},
    ...
}

-- *****
--
-- ERROR INDICATION
--
-- *****

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

ErrorIndication-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Old-eNB-UE-X2AP-ID          CRITICALITY ignore  TYPE UE-X2AP-ID          PRESENCE optional}|
    { ID id-New-eNB-UE-X2AP-ID          CRITICALITY ignore  TYPE UE-X2AP-ID          PRESENCE optional}|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause               PRESENCE optional}|
    { ID id-CriticalityDiagnostics       CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional}|
    { ID id-Old-eNB-UE-X2AP-ID-Extension CRITICALITY ignore  TYPE UE-X2AP-ID-Extension PRESENCE optional}|
}

```

```

    { ID id-New-eNB-UE-X2AP-ID-Extension      CRITICALITY ignore TYPE UE-X2AP-ID-Extension      PRESENCE optional }|
    { ID id-Old-SgNB-UE-X2AP-ID              CRITICALITY ignore TYPE SgNB-UE-X2AP-ID          PRESENCE optional }|
    { ID id-InterfaceInstanceIndication      CRITICALITY reject  TYPE InterfaceInstanceIndication  PRESENCE optional },
    ...
}

-- *****
--
-- RESET REQUEST
--
-- *****

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

ResetRequest-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Cause                CRITICALITY ignore TYPE Cause                PRESENCE mandatory }|
    { ID id-InterfaceInstanceIndication  CRITICALITY reject  TYPE InterfaceInstanceIndication  PRESENCE optional },
    ...
}

-- *****
--
-- RESET RESPONSE
--
-- *****

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

ResetResponse-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-CriticalityDiagnostics  CRITICALITY ignore TYPE CriticalityDiagnostics  PRESENCE optional }|
    { ID id-InterfaceInstanceIndication  CRITICALITY reject  TYPE InterfaceInstanceIndication  PRESENCE optional },
    ...
}

-- *****
--
-- X2 SETUP REQUEST
--
-- *****

X2SetupRequest ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{X2SetupRequest-IEs}},
    ...
}

X2SetupRequest-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-GlobalENB-ID          CRITICALITY reject  TYPE GlobalENB-ID          PRESENCE mandatory }|
    { ID id-ServedCells           CRITICALITY reject  TYPE ServedCells           PRESENCE mandatory }|

```

```

    { ID id-GUGroupIDList          CRITICALITY reject  TYPE GUGroupIDList          PRESENCE optional}|
    { ID id-LHN-ID                  CRITICALITY ignore  TYPE LHN-ID                  PRESENCE optional},
...
}

-- *****
--
-- X2 SETUP RESPONSE
--
-- *****

X2SetupResponse ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{X2SetupResponse-IEs}},
    ...
}

X2SetupResponse-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-GlobalENB-ID          CRITICALITY reject  TYPE GlobalENB-ID          PRESENCE mandatory}|
    { ID id-ServedCells           CRITICALITY reject  TYPE ServedCells           PRESENCE mandatory}|
    { ID id-GUGroupIDList         CRITICALITY reject  TYPE GUGroupIDList         PRESENCE optional}|
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional}|
    { ID id-LHN-ID                CRITICALITY ignore  TYPE LHN-ID                PRESENCE optional},
    ...
}

-- *****
--
-- X2 SETUP FAILURE
--
-- *****

X2SetupFailure ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{X2SetupFailure-IEs}},
    ...
}

X2SetupFailure-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Cause                  CRITICALITY ignore  TYPE Cause                  PRESENCE mandatory} |
    { ID id-TimeToWait            CRITICALITY ignore  TYPE TimeToWait            PRESENCE optional} |
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional },
    ...
}

-- *****
--
-- LOAD INFORMATION
--

```



```

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

LoadInformation-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-CellInformation          CRITICALITY ignore  TYPE CellInformation-List          PRESENCE mandatory } ,
    ...
}

CellInformation-List ::= SEQUENCE (SIZE (1..maxCelllineNB)) OF ProtocolIE-Single-Container { {CellInformation-ItemIEs} }

CellInformation-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-CellInformation-Item      CRITICALITY ignore  TYPE CellInformation-Item      PRESENCE mandatory }
}

CellInformation-Item ::= SEQUENCE {
    cell-ID                ECGI,
    ul-InterferenceOverloadIndication      UL-InterferenceOverloadIndication          OPTIONAL,
    ul-HighInterferenceIndicationInfo      UL-HighInterferenceIndicationInfo          OPTIONAL,
    relativeNarrowbandTxPower              RelativeNarrowbandTxPower                    OPTIONAL,
    iE-Extensions                        ProtocolExtensionContainer { {CellInformation-Item-ExtIEs} }  OPTIONAL,
    ...
}

CellInformation-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-ABSInformation              CRITICALITY ignore  EXTENSION ABSInformation          PRESENCE optional }|
    { ID id-InvokeIndication            CRITICALITY ignore  EXTENSION InvokeIndication        PRESENCE optional }|
    { ID id-IntendedULDLConfiguration    CRITICALITY ignore  EXTENSION SubframeAssignment      PRESENCE optional }|
    { ID id-ExtendedULInterferenceOverloadInfo  CRITICALITY ignore  EXTENSION ExtendedULInterferenceOverloadInfo  PRESENCE optional }|
    { ID id-CoMPInformation              CRITICALITY ignore  EXTENSION CoMPInformation          PRESENCE optional }|
    { ID id-DynamicDLTransmissionInformation  CRITICALITY ignore  EXTENSION DynamicDLTransmissionInformation  PRESENCE optional },
    ...
}

-- *****
--
-- ENB CONFIGURATION UPDATE
--
-- *****

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

ENBConfigurationUpdate-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-ServedCellsToAdd            CRITICALITY reject  TYPE ServedCells                  PRESENCE optional }|
    { ID id-ServedCellsToModify         CRITICALITY reject  TYPE ServedCellsToModify          PRESENCE optional }|
    { ID id-ServedCellsToDelete         CRITICALITY reject  TYPE Old-ECGIs                    PRESENCE optional }|
    { ID id-GUGroupIDToAddList          CRITICALITY reject  TYPE GUGroupIDList                PRESENCE optional }|
    { ID id-GUGroupIDToDeleteList       CRITICALITY reject  TYPE GUGroupIDList                PRESENCE optional }|
}

```

```

    { ID id-CoverageModificationList    CRITICALITY reject  TYPE CoverageModificationList    PRESENCE optional},
    ...
}

ServedCellsToModify ::= SEQUENCE (SIZE (1..maxCelllineNB)) OF ServedCellsToModify-Item

ServedCellsToModify-Item ::= SEQUENCE {
    old-ecgi                ECGI,
    servedCellInfo          ServedCell-Information,
    neighbour-Info          Neighbour-Information OPTIONAL,
    iE-Extensions           ProtocolExtensionContainer { {ServedCellsToModify-Item-ExtIEs} } OPTIONAL,
    ...
}

ServedCellsToModify-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-DeactivationIndication      CRITICALITY ignore  EXTENSION DeactivationIndication      PRESENCE optional }|
    { ID id-NRNeighbourInfoToModify     CRITICALITY ignore  EXTENSION NRNeighbour-Information     PRESENCE optional },
    ...
}

Old-ECGIs ::= SEQUENCE (SIZE (1..maxCelllineNB)) OF ECGI

-- *****
--
-- ENB CONFIGURATION UPDATE ACKNOWLEDGE
--
-- *****

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

ENBConfigurationUpdateAcknowledge-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics          PRESENCE optional},
    ...
}

-- *****
--
-- ENB CONFIGURATION UPDATE FAILURE
--
-- *****

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

ENBConfigurationUpdateFailure-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Cause                CRITICALITY ignore  TYPE Cause                PRESENCE mandatory}|
    { ID id-TimeToWait           CRITICALITY ignore  TYPE TimeToWait           PRESENCE optional}|
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional},

```

```

}
...
}

-- *****
--
-- RESOURCE STATUS REQUEST
--
-- *****

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

ResourceStatusRequest-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-ENB1-Measurement-ID      CRITICALITY reject  TYPE Measurement-ID      PRESENCE mandatory}|
    { ID id-ENB2-Measurement-ID      CRITICALITY ignore  TYPE Measurement-ID      PRESENCE conditional}|-- The IE shall be present if
the Registration Request IE is set to "Stop", "Partial stop" or to "Add"--
    { ID id-Registration-Request     CRITICALITY reject  TYPE Registration-Request PRESENCE mandatory}|
    { ID id-ReportCharacteristics    CRITICALITY reject  TYPE ReportCharacteristics PRESENCE optional}|
    { ID id-CellToReport              CRITICALITY ignore  TYPE CellToReport-List   PRESENCE mandatory}|
    { ID id-ReportingPeriodicity     CRITICALITY ignore  TYPE ReportingPeriodicity PRESENCE optional}|
    { ID id-PartialSuccessIndicator  CRITICALITY ignore  TYPE PartialSuccessIndicator PRESENCE optional}|
    { ID id-ReportingPeriodicityRSRPMR CRITICALITY ignore  TYPE ReportingPeriodicityRSRPMR PRESENCE optional}|
    { ID id-ReportingPeriodicityCSIR  CRITICALITY ignore  TYPE ReportingPeriodicityCSIR PRESENCE optional},
    ...
}

CellToReport-List ::= SEQUENCE (SIZE (1..maxCelllineNB)) OF ProtocolIE-Single-Container { {CellToReport-ItemIEs} }

CellToReport-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-CellToReport-Item  CRITICALITY ignore  TYPE CellToReport-Item  PRESENCE mandatory}
}

CellToReport-Item ::= SEQUENCE {
    cell-ID                ECGI,
    iE-Extensions          ProtocolExtensionContainer { {CellToReport-Item-ExtIEs} } OPTIONAL,
    ...
}

CellToReport-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ReportingPeriodicity ::= ENUMERATED {
    one-thousand-ms,
    two-thousand-ms,
    five-thousand-ms,
    ten-thousand-ms,
    ...
}

```

```

}

PartialSuccessIndicator ::= ENUMERATED {
    partial-success-allowed,
    ...
}

-- *****
--
-- RESOURCE STATUS RESPONSE
--
-- *****

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

ResourceStatusResponse-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-ENB1-Measurement-ID          CRITICALITY reject  TYPE Measurement-ID          PRESENCE mandatory} |
    { ID id-ENB2-Measurement-ID          CRITICALITY reject  TYPE Measurement-ID          PRESENCE mandatory} |
    { ID id-CriticalityDiagnostics        CRITICALITY ignore   TYPE CriticalityDiagnostics    PRESENCE optional} |
    { ID id-MeasurementInitiationResult-List CRITICALITY ignore   TYPE MeasurementInitiationResult-List PRESENCE optional},
    ...
}

MeasurementInitiationResult-List ::= SEQUENCE (SIZE (1..maxCellineNB)) OF ProtocolIE-Single-Container { {MeasurementInitiationResult-ItemIEs} }

MeasurementInitiationResult-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeasurementInitiationResult-Item CRITICALITY ignore TYPE MeasurementInitiationResult-Item PRESENCE mandatory}
}

MeasurementInitiationResult-Item ::= SEQUENCE {
    cell-ID          ECGI,
    measurementFailureCause-List MeasurementFailureCause-List OPTIONAL,
    iE-Extensions    ProtocolExtensionContainer { {MeasurementInitiationResult-Item-ExtIEs} } OPTIONAL,
    ...
}

MeasurementInitiationResult-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

MeasurementFailureCause-List ::= SEQUENCE (SIZE (1..maxFailedMeasObjects)) OF ProtocolIE-Single-Container { {MeasurementFailureCause-ItemIEs} }

MeasurementFailureCause-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeasurementFailureCause-Item CRITICALITY ignore TYPE MeasurementFailureCause-Item PRESENCE mandatory}
}

MeasurementFailureCause-Item ::= SEQUENCE {
    measurementFailedReportCharacteristics ReportCharacteristics,
    cause Cause,
    iE-Extensions ProtocolExtensionContainer { {MeasurementFailureCause-Item-ExtIEs} } OPTIONAL,
}

```

```

}
...
MeasurementFailureCause-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
}
...
-- *****
--
-- RESOURCE STATUS FAILURE
--
-- *****

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

ResourceStatusFailure-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-ENB1-Measurement-ID          CRITICALITY reject  TYPE Measurement-ID          PRESENCE mandatory} |
    { ID id-ENB2-Measurement-ID          CRITICALITY reject  TYPE Measurement-ID          PRESENCE mandatory} |
    { ID id-Cause                        CRITICALITY ignore   TYPE Cause                    PRESENCE mandatory} |
    { ID id-CriticalityDiagnostics        CRITICALITY ignore   TYPE CriticalityDiagnostics  PRESENCE optional} |
    { ID id-CompleteFailureCauseInformation-List  CRITICALITY ignore   TYPE CompleteFailureCauseInformation-List  PRESENCE optional},
    ...
}

CompleteFailureCauseInformation-List ::= SEQUENCE (SIZE (1..maxCelllineNB)) OF ProtocolIE-Single-Container { {CompleteFailureCauseInformation-ItemIEs} }

CompleteFailureCauseInformation-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-CompleteFailureCauseInformation-Item  CRITICALITY ignore  TYPE CompleteFailureCauseInformation-Item  PRESENCE mandatory}
}

CompleteFailureCauseInformation-Item ::= SEQUENCE {
    cell-ID                ECGI,
    measurementFailureCause-List  MeasurementFailureCause-List,
    iE-Extensions          ProtocolExtensionContainer { {CompleteFailureCauseInformation-Item-ExtIEs} } OPTIONAL,
    ...
}

CompleteFailureCauseInformation-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
}
...
-- *****
--
-- RESOURCE STATUS UPDATE
--
-- *****

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

```

```

}

ResourceStatusUpdate-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-ENB1-Measurement-ID      CRITICALITY reject  TYPE Measurement-ID      PRESENCE mandatory}|
  { ID id-ENB2-Measurement-ID      CRITICALITY reject  TYPE Measurement-ID      PRESENCE mandatory}|
  { ID id-CellMeasurementResult    CRITICALITY ignore  TYPE CellMeasurementResult-List  PRESENCE mandatory},
  ...
}

CellMeasurementResult-List ::= SEQUENCE (SIZE (1..maxCellLineNB)) OF ProtocolIE-Single-Container { {CellMeasurementResult-ItemIEs} }

CellMeasurementResult-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-CellMeasurementResult-Item  CRITICALITY ignore  TYPE CellMeasurementResult-Item  PRESENCE mandatory}
}

CellMeasurementResult-Item ::= SEQUENCE {
  cell-ID                ECGI,
  hWLoadIndicator        HWLoadIndicator  OPTIONAL,
  s1TNNLLoadIndicator    S1TNNLLoadIndicator  OPTIONAL,
  radioResourceStatus    RadioResourceStatus  OPTIONAL,
  iE-Extensions          ProtocolExtensionContainer { {CellMeasurementResult-Item-ExtIEs} }  OPTIONAL,
  ...
}

CellMeasurementResult-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-CompositeAvailableCapacityGroup  CRITICALITY ignore  EXTENSION CompositeAvailableCapacityGroup  PRESENCE optional}|
  { ID id-Abs-Status                        CRITICALITY ignore  EXTENSION Abs-Status                        PRESENCE optional}|
  { ID id-RSRPMList                        CRITICALITY ignore  EXTENSION RSRPMList                        PRESENCE optional}|
  { ID id-CSIReportList                    CRITICALITY ignore  EXTENSION CSIReportList                    PRESENCE optional}|
  { ID id-CellReportingIndicator           CRITICALITY ignore  EXTENSION CellReportingIndicator           PRESENCE optional},
  ...
}

-- *****
--
-- PRIVATE MESSAGE
--
-- *****

PrivateMessage ::= SEQUENCE {
  privateIEs      PrivateIE-Container {{PrivateMessage-IEs}},
  ...
}

PrivateMessage-IEs X2AP-PRIVATE-IES ::= {
  ...
}

-- *****
--
-- MOBILITY CHANGE REQUEST
--
-- *****

```

```

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

MobilityChangeRequest-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-ENB1-Cell-ID          CRITICALITY reject  TYPE ECGI          PRESENCE mandatory}|
    { ID id-ENB2-Cell-ID          CRITICALITY reject  TYPE ECGI          PRESENCE mandatory}|
    { ID id-ENB1-Mobility-Parameters CRITICALITY ignore TYPE MobilityParametersInformation PRESENCE optional}|
    { ID id-ENB2-Proposed-Mobility-Parameters CRITICALITY reject TYPE MobilityParametersInformation PRESENCE mandatory}|
    { ID id-Cause                  CRITICALITY reject  TYPE Cause          PRESENCE mandatory},
    ...
}

-- *****
--
-- MOBILITY CHANGE ACKNOWLEDGE
--
-- *****

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

MobilityChangeAcknowledge-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-ENB1-Cell-ID          CRITICALITY reject  TYPE ECGI          PRESENCE mandatory}|
    { ID id-ENB2-Cell-ID          CRITICALITY reject  TYPE ECGI          PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional},
    ...
}

-- *****
--
-- MOBILITY CHANGE FAILURE
--
-- *****

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

MobilityChangeFailure-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-ENB1-Cell-ID          CRITICALITY ignore TYPE ECGI          PRESENCE mandatory}|
    { ID id-ENB2-Cell-ID          CRITICALITY ignore TYPE ECGI          PRESENCE mandatory}|
    { ID id-Cause                  CRITICALITY ignore TYPE Cause          PRESENCE mandatory}|
    { ID id-ENB2-Mobility-Parameters-Modification-Range CRITICALITY ignore TYPE MobilityParametersModificationRange PRESENCE optional}|
    { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional},
    ...
}

```

```

-- *****
--
-- RADIO LINK FAILURE INDICATION
--
-- *****

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

RLFIndication-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-FailureCellPCI          CRITICALITY ignore TYPE PCI          PRESENCE mandatory} |
    { ID id-Re-establishmentCellECGI CRITICALITY ignore TYPE ECGI          PRESENCE mandatory} |
    { ID id-FailureCellCRNTI       CRITICALITY ignore TYPE CRNTI          PRESENCE mandatory} |
    { ID id-ShortMAC-I             CRITICALITY ignore TYPE ShortMAC-I       PRESENCE optional} |
    { ID id-UE-RLF-Report-Container CRITICALITY ignore TYPE UE-RLF-Report-Container PRESENCE optional} |
    { ID id-RRCCConnSetupIndicator CRITICALITY reject TYPE RRCCConnSetupIndicator PRESENCE optional} |
    { ID id-RRCCConnReestabIndicator CRITICALITY ignore TYPE RRCCConnReestabIndicator PRESENCE optional} |
    { ID id-UE-RLF-Report-Container-for-extended-bands CRITICALITY ignore TYPE UE-RLF-Report-Container-for-extended-bands PRESENCE optional},
    ...
}

-- *****
--
-- CELL ACTIVATION REQUEST
--
-- *****

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

CellActivationRequest-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-ServedCellsToActivate   CRITICALITY reject TYPE ServedCellsToActivate PRESENCE mandatory},
    ...
}

ServedCellsToActivate ::= SEQUENCE (SIZE (1..maxCelllineNB)) OF ServedCellsToActivate-Item

ServedCellsToActivate-Item ::= SEQUENCE {
    ecgi              ECGI,
    iE-Extensions    ProtocolExtensionContainer { {ServedCellsToActivate-Item-ExtIEs} } OPTIONAL,
    ...
}

ServedCellsToActivate-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--

```



```

-- CELL ACTIVATION RESPONSE
--
-- *****

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

CellActivationResponse-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-ActivatedCellList      CRITICALITY ignore TYPE ActivatedCellList      PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional},
    ...
}

ActivatedCellList ::= SEQUENCE (SIZE (1..maxCellineNB)) OF ActivatedCellList-Item

ActivatedCellList-Item ::= SEQUENCE {
    ecgi                ECGI,
    iE-Extensions       ProtocolExtensionContainer { {ActivatedCellList-Item-ExtIEs} } OPTIONAL,
    ...
}

ActivatedCellList-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

--*****
--
-- CELL ACTIVATION FAILURE
--
-- *****

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

CellActivationFailure-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Cause                CRITICALITY ignore TYPE Cause                PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional },
    ...
}

-- *****
--
-- X2 RELEASE
--
-- *****

X2Release ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{X2Release-IEs}},
    ...
}

```

```

X2Release-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-GlobalENB-ID          CRITICALITY reject  TYPE GlobalENB-ID          PRESENCE mandatory},
  ...
}

-- *****
--
-- X2AP MESSAGE TRANSFER
--
-- *****

X2APMessageTransfer ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container    {{X2APMessageTransfer-IEs}},
  ...
}

X2APMessageTransfer-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-RNL-Header CRITICALITY reject  TYPE RNL-Header          PRESENCE mandatory}|
  { ID id-x2APMessage CRITICALITY reject  TYPE X2AP-Message          PRESENCE optional},
  ...
}

RNL-Header ::= SEQUENCE {
  source-GlobalENB-ID GlobalENB-ID,
  target-GlobalENB-ID GlobalENB-ID      OPTIONAL,
  iE-Extensions          ProtocolExtensionContainer { {RNL-Header-Item-ExtIEs} } OPTIONAL,
  ...
}

RNL-Header-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

X2AP-Message ::= OCTET STRING

-- *****
--
-- SENB ADDITION REQUEST
--
-- *****

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

SenBAdditionRequest-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-UE-SecurityCapabilities  CRITICALITY reject  TYPE UESecurityCapabilities PRESENCE conditional}|
  -- This IE shall be present if the Bearer Option IE is set to the value "SCG bearer" --
  { ID id-SenBSecurityKey          CRITICALITY reject  TYPE SenBSecurityKey      PRESENCE conditional}|
  -- This IE shall be present if the Bearer Option IE is set to the value "SCG bearer" --
  { ID id-SenBUEAggregateMaximumBitRate CRITICALITY reject  TYPE UEAggregateMaximumBitRate PRESENCE mandatory}|
}

```

```

    { ID id-ServingPLMN                CRITICALITY ignore  TYPE PLMN-Identity                PRESENCE optional}|
    { ID id-E-RABs-ToBeAdded-List      CRITICALITY reject  TYPE E-RABs-ToBeAdded-List        PRESENCE mandatory}|
    { ID id-MeNBtoSeNBContainer        CRITICALITY reject  TYPE MeNBtoSeNBContainer          PRESENCE mandatory}|
    { ID id-CSGMembershipStatus        CRITICALITY reject  TYPE CSGMembershipStatus          PRESENCE optional}|
    { ID id-SeNB-UE-X2AP-ID            CRITICALITY reject  TYPE UE-X2AP-ID                  PRESENCE optional}|
    { ID id-SeNB-UE-X2AP-ID-Extension  CRITICALITY reject  TYPE UE-X2AP-ID-Extension        PRESENCE optional}|
    { ID id-ExpectedUEBehaviour        CRITICALITY ignore  TYPE ExpectedUEBehaviour          PRESENCE optional}|
    { ID id-MeNB-UE-X2AP-ID-Extension  CRITICALITY reject  TYPE UE-X2AP-ID-Extension        PRESENCE optional},
    ...
}

E-RABs-ToBeAdded-List ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeAdded-ItemIEs} }

E-RABs-ToBeAdded-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-ToBeAdded-Item      CRITICALITY reject  TYPE E-RABs-ToBeAdded-Item        PRESENCE mandatory},
    ...
}

E-RABs-ToBeAdded-Item ::= CHOICE {
    sCG-Bearer          E-RABs-ToBeAdded-Item-SCG-Bearer,
    split-Bearer       E-RABs-ToBeAdded-Item-Split-Bearer,
    ...
}

E-RABs-ToBeAdded-Item-SCG-Bearer ::= SEQUENCE {
    e-RAB-ID            E-RAB-ID,
    e-RAB-Level-QoS-Parameters  E-RAB-Level-QoS-Parameters,
    dL-Forwarding      DL-Forwarding                                OPTIONAL,
    s1-UL-GTPTunnelEndpoint  GTPtunnelEndpoint,
    iE-Extensions      ProtocolExtensionContainer { {E-RABs-ToBeAdded-Item-SCG-BearerExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeAdded-Item-SCG-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-Correlation-ID            CRITICALITY ignore  EXTENSION Correlation-ID        PRESENCE optional}|
    { ID id-SIPTO-Correlation-ID      CRITICALITY ignore  EXTENSION Correlation-ID        PRESENCE optional}|
    { ID id-BearerType                CRITICALITY ignore  EXTENSION BearerType            PRESENCE optional},
    ...
}

E-RABs-ToBeAdded-Item-Split-Bearer ::= SEQUENCE {
    e-RAB-ID            E-RAB-ID,
    e-RAB-Level-QoS-Parameters  E-RAB-Level-QoS-Parameters,
    meNB-GTPTunnelEndpoint  GTPtunnelEndpoint,
    iE-Extensions      ProtocolExtensionContainer { {E-RABs-ToBeAdded-Item-Split-BearerExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeAdded-Item-Split-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--

```

```

-- SENB ADDITION REQUEST ACKNOWLEDGE
--
-- *****
SeNBAdditionRequestAcknowledge ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{SeNBAdditionRequestAcknowledge-IEs}},
    ...
}

SeNBAdditionRequestAcknowledge-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID                CRITICALITY reject  TYPE UE-X2AP-ID                PRESENCE mandatory} |
    { ID id-SeNB-UE-X2AP-ID                CRITICALITY reject  TYPE UE-X2AP-ID                PRESENCE mandatory} |
    { ID id-E-RABs-Admitted-ToBeAdded-List CRITICALITY ignore  TYPE E-RABs-Admitted-ToBeAdded-List PRESENCE mandatory} |
    { ID id-E-RABs-NotAdmitted-List        CRITICALITY ignore  TYPE E-RAB-List                PRESENCE optional} |
    { ID id-SenBtoMeNBContainer            CRITICALITY reject  TYPE SenBtoMeNBContainer       PRESENCE mandatory} |
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional} |
    { ID id-GW-TransportLayerAddress        CRITICALITY ignore  TYPE TransportLayerAddress      PRESENCE optional} |
    { ID id-SIPTO-L-GW-TransportLayerAddress CRITICALITY ignore  TYPE TransportLayerAddress      PRESENCE optional} |
    { ID id-MeNB-UE-X2AP-ID-Extension       CRITICALITY reject  TYPE UE-X2AP-ID-Extension       PRESENCE optional} |
    { ID id-SeNB-UE-X2AP-ID-Extension       CRITICALITY reject  TYPE UE-X2AP-ID-Extension       PRESENCE optional} |
    { ID id-Tunnel-Information-for-BBF      CRITICALITY ignore  TYPE TunnelInformation           PRESENCE optional},
    ...
}

E-RABs-Admitted-ToBeAdded-List ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-Admitted-ToBeAdded-ItemIEs} }

E-RABs-Admitted-ToBeAdded-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-Admitted-ToBeAdded-Item CRITICALITY ignore  TYPE E-RABs-Admitted-ToBeAdded-Item PRESENCE mandatory}
}

E-RABs-Admitted-ToBeAdded-Item ::= CHOICE {
    sCG-Bearer      E-RABs-Admitted-ToBeAdded-Item-SCG-Bearer,
    split-Bearer    E-RABs-Admitted-ToBeAdded-Item-Split-Bearer,
    ...
}

E-RABs-Admitted-ToBeAdded-Item-SCG-Bearer ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,
    s1-DL-GTPtunnelEndpoint GTPtunnelEndpoint,
    dL-Forwarding-GTPtunnelEndpoint GTPtunnelEndpoint OPTIONAL,
    uL-Forwarding-GTPtunnelEndpoint GTPtunnelEndpoint OPTIONAL,
    iE-Extensions           ProtocolExtensionContainer { {E-RABs-Admitted-ToBeAdded-Item-SCG-BearerExtIEs} } OPTIONAL,
    ...
}

E-RABs-Admitted-ToBeAdded-Item-SCG-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABs-Admitted-ToBeAdded-Item-Split-Bearer ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,
    seNB-GTPtunnelEndpoint  GTPtunnelEndpoint,
    iE-Extensions           ProtocolExtensionContainer { {E-RABs-Admitted-ToBeAdded-Item-Split-BearerExtIEs} } OPTIONAL,
    ...
}

```

```

}
E-RABs-Admitted-ToBeAdded-Item-Split-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}
-- *****
--
-- SENB ADDITION REQUEST REJECT
--
-- *****

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

SeNBAdditionRequestReject-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory} |
  { ID id-SeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory} |
  { ID id-Cause                    CRITICALITY ignore  TYPE Cause                PRESENCE mandatory} |
  { ID id-CriticalityDiagnostics    CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional} |
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional} |
  { ID id-SeNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional} ,
  ...
}
-- *****
--
-- SENB RECONFIGURATION COMPLETE
--
-- *****

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

SeNBReconfigurationComplete-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory} |
  { ID id-SeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory} |
  { ID id-ResponseInformationSeNBReconfComp CRITICALITY ignore  TYPE ResponseInformationSeNBReconfComp PRESENCE mandatory} |
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional} |
  { ID id-SeNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional} ,
  ...
}

ResponseInformationSeNBReconfComp ::= CHOICE {
  success          ResponseInformationSeNBReconfComp-SuccessItem,
  reject-by-MeNB   ResponseInformationSeNBReconfComp-RejectByMeNBItem,
  ...
}

ResponseInformationSeNBReconfComp-SuccessItem ::= SEQUENCE {

```

```

    meNBtoSeNBContainer      MeNBtoSeNBContainer OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { {ResponseInformationSeNBReconfComp-SuccessItemExtIEs} } OPTIONAL,
    ...
}

ResponseInformationSeNBReconfComp-SuccessItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ResponseInformationSeNBReconfComp-RejectByMeNBItem ::= SEQUENCE {
    cause                    Cause,
    meNBtoSeNBContainer      MeNBtoSeNBContainer                                OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { {ResponseInformationSeNBReconfComp-RejectByMeNBItemExtIEs} } OPTIONAL,
    ...
}

ResponseInformationSeNBReconfComp-RejectByMeNBItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- SENB MODIFICATION REQUEST
--
-- *****

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

SeNBModificationRequest-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory} |
    { ID id-SeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory} |
    { ID id-Cause                    CRITICALITY ignore TYPE Cause              PRESENCE mandatory} |
    { ID id-SCGChangeIndication      CRITICALITY ignore TYPE SCGChangeIndication PRESENCE optional} |
    { ID id-ServingPLMN              CRITICALITY ignore TYPE PLMN-Identity       PRESENCE optional} |
    { ID id-UE-ContextInformationSeNBModReq CRITICALITY reject TYPE UE-ContextInformationSeNBModReq PRESENCE optional} |
    { ID id-MeNBtoSeNBContainer      CRITICALITY ignore TYPE MeNBtoSeNBContainer PRESENCE optional} |
    { ID id-CSGMembershipStatus      CRITICALITY reject TYPE CSGMembershipStatus PRESENCE optional} |
    { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject TYPE UE-X2AP-ID-Extension PRESENCE optional} |
    { ID id-SeNB-UE-X2AP-ID-Extension CRITICALITY reject TYPE UE-X2AP-ID-Extension PRESENCE optional},
    ...
}

UE-ContextInformationSeNBModReq ::= SEQUENCE {
    uE-SecurityCapabilities          UESecurityCapabilities                                OPTIONAL,
    seNB-SecurityKey                 SeNBSecurityKey                                    OPTIONAL,
    seNBUEAggregateMaximumBitRate    UEAggregateMaximumBitRate                            OPTIONAL,
    e-RABs-ToBeAdded                 E-RABs-ToBeAdded-List-ModReq                        OPTIONAL,
    e-RABs-ToBeModified              E-RABs-ToBeModified-List-ModReq                      OPTIONAL,
    e-RABs-ToBeReleased              E-RABs-ToBeReleased-List-ModReq                    OPTIONAL,
    iE-Extensions                    ProtocolExtensionContainer { {UE-ContextInformationSeNBModReqExtIEs} } OPTIONAL,
    ...
}

```

```

}
UE-ContextInformationSenBModReqExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}
E-RABs-ToBeAdded-List-ModReq ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeAdded-ModReqItemIEs} }
E-RABs-ToBeAdded-ModReqItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-ToBeAdded-ModReqItem CRITICALITY ignore TYPE E-RABs-ToBeAdded-ModReqItem PRESENCE mandatory},
  ...
}
E-RABs-ToBeAdded-ModReqItem ::= CHOICE {
  sCG-Bearer E-RABs-ToBeAdded-ModReqItem-SCG-Bearer,
  split-Bearer E-RABs-ToBeAdded-ModReqItem-Split-Bearer,
  ...
}
E-RABs-ToBeAdded-ModReqItem-SCG-Bearer ::= SEQUENCE {
  e-RAB-ID E-RAB-ID,
  e-RAB-Level-QoS-Parameters E-RAB-Level-QoS-Parameters,
  dL-Forwarding DL-Forwarding OPTIONAL,
  s1-UL-GTPTunnelEndpoint GTPTunnelEndpoint,
  iE-Extensions ProtocolExtensionContainer { {E-RABs-ToBeAdded-ModReqItem-SCG-BearerExtIEs} } OPTIONAL,
  ...
}
E-RABs-ToBeAdded-ModReqItem-SCG-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-Correlation-ID CRITICALITY ignore EXTENSION Correlation-ID PRESENCE optional}|
  { ID id-SIPTO-Correlation-ID CRITICALITY ignore EXTENSION Correlation-ID PRESENCE optional}|
  { ID id-BearerType CRITICALITY ignore EXTENSION BearerType PRESENCE optional},
  ...
}
E-RABs-ToBeAdded-ModReqItem-Split-Bearer ::= SEQUENCE {
  e-RAB-ID E-RAB-ID,
  e-RAB-Level-QoS-Parameters E-RAB-Level-QoS-Parameters,
  meNB-GTPTunnelEndpoint GTPTunnelEndpoint,
  iE-Extensions ProtocolExtensionContainer { {E-RABs-ToBeAdded-ModReqItem-Split-BearerExtIEs} } OPTIONAL,
  ...
}
E-RABs-ToBeAdded-ModReqItem-Split-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}
E-RABs-ToBeModified-List-ModReq ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeModified-ModReqItemIEs} }
E-RABs-ToBeModified-ModReqItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-ToBeModified-ModReqItem CRITICALITY ignore TYPE E-RABs-ToBeModified-ModReqItem PRESENCE mandatory},
  ...
}

```

```

E-RABs-ToBeModified-ModReqItem ::= CHOICE {
    sCG-Bearer      E-RABs-ToBeModified-ModReqItem-SCG-Bearer,
    split-Bearer   E-RABs-ToBeModified-ModReqItem-Split-Bearer,
    ...
}

E-RABs-ToBeModified-ModReqItem-SCG-Bearer ::= SEQUENCE {
    e-RAB-ID          E-RAB-ID,
    e-RAB-Level-QoS-Parameters  E-RAB-Level-QoS-Parameters OPTIONAL,
    s1-UL-GTPTunnelEndpoint  GTPTunnelEndpoint OPTIONAL,
    iE-Extensions    ProtocolExtensionContainer { {E-RABs-ToBeModified-ModReqItem-SCG-BearerExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeModified-ModReqItem-SCG-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABs-ToBeModified-ModReqItem-Split-Bearer ::= SEQUENCE {
    e-RAB-ID          E-RAB-ID,
    e-RAB-Level-QoS-Parameters  E-RAB-Level-QoS-Parameters OPTIONAL,
    meNB-GTPTunnelEndpoint  GTPTunnelEndpoint OPTIONAL,
    iE-Extensions    ProtocolExtensionContainer { {E-RABs-ToBeModified-ModReqItem-Split-BearerExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeModified-ModReqItem-Split-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABs-ToBeReleased-List-ModReq ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeReleased-ModReqItemIEs} }

E-RABs-ToBeReleased-ModReqItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-ToBeReleased-ModReqItem CRITICALITY ignore TYPE E-RABs-ToBeReleased-ModReqItem PRESENCE mandatory},
    ...
}

E-RABs-ToBeReleased-ModReqItem ::= CHOICE {
    sCG-Bearer      E-RABs-ToBeReleased-ModReqItem-SCG-Bearer,
    split-Bearer   E-RABs-ToBeReleased-ModReqItem-Split-Bearer,
    ...
}

E-RABs-ToBeReleased-ModReqItem-SCG-Bearer ::= SEQUENCE {
    e-RAB-ID          E-RAB-ID,
    dL-Forwarding-GTPTunnelEndpoint  GTPTunnelEndpoint OPTIONAL,
    uL-Forwarding-GTPTunnelEndpoint  GTPTunnelEndpoint OPTIONAL,
    iE-Extensions    ProtocolExtensionContainer { {E-RABs-ToBeReleased-ModReqItem-SCG-BearerExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeReleased-ModReqItem-SCG-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

```



```

}

E-RABs-ToBeReleased-ModReqItem-Split-Bearer ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,
    dL-Forwarding-GTPTunnelEndpoint    GTPTunnelEndpoint OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {E-RABs-ToBeReleased-ModReqItem-Split-BearerExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeReleased-ModReqItem-Split-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- SENB MODIFICATION REQUEST ACKNOWLEDGE
--
-- *****

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

SenBModificationRequestAcknowledge-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID                CRITICALITY ignore TYPE UE-X2AP-ID PRESENCE mandatory} |
    { ID id-SenB-UE-X2AP-ID                CRITICALITY ignore TYPE UE-X2AP-ID PRESENCE mandatory} |
    { ID id-E-RABs-Admitted-ToBeAdded-ModAckList CRITICALITY ignore TYPE E-RABs-Admitted-ToBeAdded-ModAckList PRESENCE optional} |
    { ID id-E-RABs-Admitted-ToBeModified-ModAckList CRITICALITY ignore TYPE E-RABs-Admitted-ToBeModified-ModAckList PRESENCE optional} |
    { ID id-E-RABs-Admitted-ToBeReleased-ModAckList CRITICALITY ignore TYPE E-RABs-Admitted-ToBeReleased-ModAckList PRESENCE optional} |
    { ID id-E-RABs-NotAdmitted-List        CRITICALITY ignore TYPE E-RAB-List PRESENCE optional} |
    { ID id-SenBtoMeNBContainer            CRITICALITY ignore TYPE SenBtoMeNBContainer PRESENCE optional} |
    { ID id-CriticalityDiagnostics         CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional} |
    { ID id-MeNB-UE-X2AP-ID-Extension     CRITICALITY ignore TYPE UE-X2AP-ID-Extension PRESENCE optional} |
    { ID id-SenB-UE-X2AP-ID-Extension     CRITICALITY ignore TYPE UE-X2AP-ID-Extension PRESENCE optional} |
    ...
}

E-RABs-Admitted-ToBeAdded-ModAckList ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-Admitted-ToBeAdded-ModAckItemIEs} }

E-RABs-Admitted-ToBeAdded-ModAckItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-Admitted-ToBeAdded-ModAckItem CRITICALITY ignore TYPE E-RABs-Admitted-ToBeAdded-ModAckItem PRESENCE mandatory}
}

E-RABs-Admitted-ToBeAdded-ModAckItem ::= CHOICE {
    sCG-Bearer      E-RABs-Admitted-ToBeAdded-ModAckItem-SCG-Bearer,
    split-Bearer    E-RABs-Admitted-ToBeAdded-ModAckItem-Split-Bearer,
    ...
}

E-RABs-Admitted-ToBeAdded-ModAckItem-SCG-Bearer ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,
    s1-DL-GTPTunnelEndpoint    GTPTunnelEndpoint,

```

```

    dL-Forwarding-GTPTunnelEndpoint      GTPtunnelEndpoint      OPTIONAL,
    uL-Forwarding-GTPTunnelEndpoint      GTPtunnelEndpoint      OPTIONAL,
    iE-Extensions                          ProtocolExtensionContainer { {E-RABs-Admitted-ToBeAdded-ModAckItem-SCG-BearerExtIEs} } OPTIONAL,
    ...
}

E-RABs-Admitted-ToBeAdded-ModAckItem-SCG-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABs-Admitted-ToBeAdded-ModAckItem-Split-Bearer ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,
    seNB-GTPTunnelEndpoint  GTPtunnelEndpoint,
    iE-Extensions           ProtocolExtensionContainer { {E-RABs-Admitted-ToBeAdded-ModAckItem-Split-BearerExtIEs} } OPTIONAL,
    ...
}

E-RABs-Admitted-ToBeAdded-ModAckItem-Split-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABs-Admitted-ToBeModified-ModAckList ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-Admitted-ToBeModified-ModAckItemIEs} }

E-RABs-Admitted-ToBeModified-ModAckItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-Admitted-ToBeModified-ModAckItem      CRITICALITY ignore   TYPE E-RABs-Admitted-ToBeModified-ModAckItem PRESENCE mandatory}
}

E-RABs-Admitted-ToBeModified-ModAckItem ::= CHOICE {
    sCG-Bearer      E-RABs-Admitted-ToBeModified-ModAckItem-SCG-Bearer,
    split-Bearer    E-RABs-Admitted-ToBeModified-ModAckItem-Split-Bearer,
    ...
}

E-RABs-Admitted-ToBeModified-ModAckItem-SCG-Bearer ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,
    s1-DL-GTPTunnelEndpoint GTPtunnelEndpoint      OPTIONAL,
    iE-Extensions           ProtocolExtensionContainer { {E-RABs-Admitted-ToBeModified-ModAckItem-SCG-BearerExtIEs} } OPTIONAL,
    ...
}

E-RABs-Admitted-ToBeModified-ModAckItem-SCG-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABs-Admitted-ToBeModified-ModAckItem-Split-Bearer ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,
    seNB-GTPTunnelEndpoint  GTPtunnelEndpoint      OPTIONAL,
    iE-Extensions           ProtocolExtensionContainer { {E-RABs-Admitted-ToBeModified-ModAckItem-Split-BearerExtIEs} } OPTIONAL,
    ...
}

E-RABs-Admitted-ToBeModified-ModAckItem-Split-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```
E-RABs-Admitted-ToBeReleased-ModAckList ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-Admitted-ToBeReleased-ModAckItemIEs} }
```

```
E-RABs-Admitted-ToBeReleased-ModAckItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-Admitted-ToBeReleased-ModAckItem      CRITICALITY ignore  TYPE E-RABs-Admitted-ToReleased-ModAckItem  PRESENCE mandatory}
}
```

```
E-RABs-Admitted-ToReleased-ModAckItem ::= CHOICE {
  sCG-Bearer      E-RABs-Admitted-ToBeReleased-ModAckItem-SCG-Bearer,
  split-Bearer    E-RABs-Admitted-ToBeReleased-ModAckItem-Split-Bearer,
  ...
}
```

```
E-RABs-Admitted-ToBeReleased-ModAckItem-SCG-Bearer ::= SEQUENCE {
  e-RAB-ID          E-RAB-ID,
  iE-Extensions    ProtocolExtensionContainer { {E-RABs-Admitted-ToBeReleased-ModAckItem-SCG-BearerExtIEs} } OPTIONAL,
  ...
}
```

```
E-RABs-Admitted-ToBeReleased-ModAckItem-SCG-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}
```

```
E-RABs-Admitted-ToBeReleased-ModAckItem-Split-Bearer ::= SEQUENCE {
  e-RAB-ID          E-RAB-ID,
  iE-Extensions    ProtocolExtensionContainer { {E-RABs-Admitted-ToBeReleased-ModAckItem-Split-BearerExtIEs} } OPTIONAL,
  ...
}
```

```
E-RABs-Admitted-ToBeReleased-ModAckItem-Split-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}
```

```
-- *****
--
-- SENB MODIFICATION REQUEST REJECT
--
-- *****
```

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

```
SenBModificationRequestReject-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY ignore  TYPE UE-X2AP-ID          PRESENCE mandatory} |
  { ID id-SenB-UE-X2AP-ID          CRITICALITY ignore  TYPE UE-X2AP-ID          PRESENCE mandatory} |
  { ID id-Cause                     CRITICALITY ignore  TYPE Cause              PRESENCE mandatory} |
  { ID id-CriticalityDiagnostics    CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional} |
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY ignore  TYPE UE-X2AP-ID-Extension PRESENCE optional} |
  { ID id-SenB-UE-X2AP-ID-Extension CRITICALITY ignore  TYPE UE-X2AP-ID-Extension PRESENCE optional},
  ...
}
```

```

-- *****
--
-- SENB MODIFICATION REQUIRED
--
-- *****

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

SenBModificationRequired-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory } |
    { ID id-SeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory } |
    { ID id-Cause                    CRITICALITY ignore  TYPE Cause                PRESENCE mandatory } |
    { ID id-SCGChangeIndication      CRITICALITY ignore  TYPE SCGChangeIndication PRESENCE optional } |
    { ID id-E-RABs-ToBeReleased-ModReqd CRITICALITY ignore  TYPE E-RABs-ToBeReleased-ModReqd PRESENCE optional } |
    { ID id-SeNBtoMeNBContainer      CRITICALITY ignore  TYPE SeNBtoMeNBContainer PRESENCE optional } |
    { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional } |
    { ID id-SeNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional },
    ...
}

E-RABs-ToBeReleased-ModReqd ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeReleased-ModReqdItemIEs} }

E-RABs-ToBeReleased-ModReqdItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-ToBeReleased-ModReqdItem CRITICALITY ignore  TYPE E-RABs-ToBeReleased-ModReqdItem PRESENCE mandatory },
    ...
}

E-RABs-ToBeReleased-ModReqdItem ::= SEQUENCE {
    e-RAB-ID          E-RAB-ID,
    cause             Cause,
    iE-Extensions     ProtocolExtensionContainer { {E-RABs-ToBeReleased-ModReqdItemExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeReleased-ModReqdItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- SENB MODIFICATION CONFIRM
--
-- *****

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

```

```

SeNBModificationConfirm-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-SeNB-UE-X2AP-ID          CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-MeNBtoSeNBContainer      CRITICALITY ignore TYPE MeNBtoSeNBContainer PRESENCE optional}|
  { ID id-CriticalityDiagnostics   CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional}|
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY ignore TYPE UE-X2AP-ID-Extension PRESENCE optional}|
  { ID id-SeNB-UE-X2AP-ID-Extension CRITICALITY ignore TYPE UE-X2AP-ID-Extension PRESENCE optional}|
  ...
}

-- *****
--
-- SENB MODIFICATION REFUSE
--
-- *****

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

SeNBModificationRefuse-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-SeNB-UE-X2AP-ID          CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-Cause                    CRITICALITY ignore TYPE Cause                    PRESENCE mandatory}|
  { ID id-MeNBtoSeNBContainer      CRITICALITY ignore TYPE MeNBtoSeNBContainer PRESENCE optional}|
  { ID id-CriticalityDiagnostics   CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional}|
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY ignore TYPE UE-X2AP-ID-Extension PRESENCE optional}|
  { ID id-SeNB-UE-X2AP-ID-Extension CRITICALITY ignore TYPE UE-X2AP-ID-Extension PRESENCE optional}|
  ...
}

-- *****
--
-- SENB RELEASE REQUEST
--
-- *****

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

SeNBReleaseRequest-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-SeNB-UE-X2AP-ID          CRITICALITY reject TYPE UE-X2AP-ID          PRESENCE optional}|
  { ID id-Cause                    CRITICALITY ignore TYPE Cause                    PRESENCE optional}|
  { ID id-E-RABS-ToBeReleased-List-RelReq CRITICALITY ignore TYPE E-RABS-ToBeReleased-List-RelReq PRESENCE optional}|
  { ID id-UE-ContextKeptIndicator   CRITICALITY ignore TYPE UE-ContextKeptIndicator   PRESENCE optional}|
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject TYPE UE-X2AP-ID-Extension PRESENCE optional}|
  { ID id-SeNB-UE-X2AP-ID-Extension CRITICALITY reject TYPE UE-X2AP-ID-Extension PRESENCE optional}|
  { ID id-MakeBeforeBreakIndicator  CRITICALITY ignore TYPE MakeBeforeBreakIndicator  PRESENCE optional}|
  ...
}

```

```

E-RABs-ToBeReleased-List-RelReq ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeReleased-RelReqItemIEs} }

E-RABs-ToBeReleased-RelReqItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-ToBeReleased-RelReqItem      CRITICALITY ignore  TYPE E-RABs-ToBeReleased-RelReqItem  PRESENCE mandatory},
  ...
}

E-RABs-ToBeReleased-RelReqItem ::= CHOICE {
  sCG-Bearer      E-RABs-ToBeReleased-RelReqItem-SCG-Bearer,
  split-Bearer    E-RABs-ToBeReleased-RelReqItem-Split-Bearer,
  ...
}

E-RABs-ToBeReleased-RelReqItem-SCG-Bearer ::= SEQUENCE {
  e-RAB-ID          E-RAB-ID,
  uL-Forwarding-GTPtunnelEndpoint  GTPtunnelEndpoint          OPTIONAL,
  dL-Forwarding-GTPtunnelEndpoint  GTPtunnelEndpoint          OPTIONAL,
  iE-Extensions    ProtocolExtensionContainer { {E-RABs-ToBeReleased-RelReqItem-SCG-BearerExtIEs} } OPTIONAL,
  ...
}

E-RABs-ToBeReleased-RelReqItem-SCG-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

E-RABs-ToBeReleased-RelReqItem-Split-Bearer ::= SEQUENCE {
  e-RAB-ID          E-RAB-ID,
  dL-Forwarding-GTPtunnelEndpoint  GTPtunnelEndpoint          OPTIONAL,
  iE-Extensions    ProtocolExtensionContainer { {E-RABs-ToBeReleased-RelReqItem-Split-BearerExtIEs} } OPTIONAL,
  ...
}

E-RABs-ToBeReleased-RelReqItem-Split-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- SENB RELEASE REQUIRED
--
-- *****

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

SenBReleaseRequired-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID      CRITICALITY reject  TYPE UE-X2AP-ID      PRESENCE mandatory}|
  { ID id-SenB-UE-X2AP-ID     CRITICALITY reject  TYPE UE-X2AP-ID     PRESENCE mandatory}|
  { ID id-Cause                CRITICALITY ignore  TYPE Cause          PRESENCE mandatory}|
  { ID id-MeNB-UE-X2AP-ID-Extension  CRITICALITY reject  TYPE UE-X2AP-ID-Extension  PRESENCE optional}|
  { ID id-SenB-UE-X2AP-ID-Extension  CRITICALITY reject  TYPE UE-X2AP-ID-Extension  PRESENCE optional},
  ...
}

```

```

}
-- *****
--
-- SENB RELEASE CONFIRM
--
-- *****

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

SenBReleaseConfirm-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID                CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory} |
    { ID id-SenB-UE-X2AP-ID                CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory} |
    { ID id-E-RABs-ToBeReleased-List-RelConf CRITICALITY ignore TYPE E-RABs-ToBeReleased-List-RelConf PRESENCE optional} |
    { ID id-CriticalityDiagnostics         CRITICALITY ignore TYPE CriticalityDiagnostics     PRESENCE optional} |
    { ID id-MeNB-UE-X2AP-ID-Extension      CRITICALITY ignore TYPE UE-X2AP-ID-Extension       PRESENCE optional} |
    { ID id-SenB-UE-X2AP-ID-Extension      CRITICALITY ignore TYPE UE-X2AP-ID-Extension       PRESENCE optional},
    ...
}

E-RABs-ToBeReleased-List-RelConf ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeReleased-RelConfItemIEs} }

E-RABs-ToBeReleased-RelConfItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-ToBeReleased-RelConfItem CRITICALITY ignore TYPE E-RABs-ToBeReleased-RelConfItem PRESENCE mandatory},
    ...
}

E-RABs-ToBeReleased-RelConfItem ::= CHOICE {
    sCG-Bearer      E-RABs-ToBeReleased-RelConfItem-SCG-Bearer,
    split-Bearer    E-RABs-ToBeReleased-RelConfItem-Split-Bearer,
    ...
}

E-RABs-ToBeReleased-RelConfItem-SCG-Bearer ::= SEQUENCE {
    e-RAB-ID          E-RAB-ID,
    uL-Forwarding-GTPtunnelEndpoint GTPtunnelEndpoint OPTIONAL,
    dL-Forwarding-GTPtunnelEndpoint GTPtunnelEndpoint OPTIONAL,
    iE-Extensions     ProtocolExtensionContainer { {E-RABs-ToBeReleased-RelConfItem-SCG-BearerExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeReleased-RelConfItem-SCG-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABs-ToBeReleased-RelConfItem-Split-Bearer ::= SEQUENCE {
    e-RAB-ID          E-RAB-ID,
    dL-Forwarding-GTPtunnelEndpoint GTPtunnelEndpoint OPTIONAL,
    iE-Extensions     ProtocolExtensionContainer { {E-RABs-ToBeReleased-RelConfItem-Split-BearerExtIEs} } OPTIONAL,
    ...
}

```

```

E-RABs-ToBeReleased-RelConfItem-Split-BearerExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- SENB COUNTER CHECK REQUEST
--
-- *****

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

SeNBCounterCheckRequest-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-SENB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-E-RABs-SubjectToCounterCheck-List  CRITICALITY ignore  TYPE E-RABs-SubjectToCounterCheck-List  PRESENCE mandatory}|
  { ID id-MeNB-UE-X2AP-ID-Extension  CRITICALITY ignore  TYPE UE-X2AP-ID-Extension  PRESENCE optional}|
  { ID id-SENB-UE-X2AP-ID-Extension  CRITICALITY ignore  TYPE UE-X2AP-ID-Extension  PRESENCE optional},
  ...
}

E-RABs-SubjectToCounterCheck-List ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-SubjectToCounterCheckItemIEs} }

E-RABs-SubjectToCounterCheckItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-SubjectToCounterCheckItem  CRITICALITY ignore  TYPE E-RABs-SubjectToCounterCheckItem  PRESENCE mandatory},
  ...
}

E-RABs-SubjectToCounterCheckItem ::= SEQUENCE {
  e-RAB-ID          E-RAB-ID,
  uL-Count          INTEGER (0..4294967295),
  dL-Count          INTEGER (0..4294967295),
  iE-Extensions    ProtocolExtensionContainer { {E-RABs-SubjectToCounterCheckItemExtIEs} } OPTIONAL,
  ...
}

E-RABs-SubjectToCounterCheckItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- X2 REMOVAL REQUEST
--
-- *****

X2RemovalRequest ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container    {{X2RemovalRequest-IEs}},
  ...
}

X2RemovalRequest-IEs X2AP-PROTOCOL-IES ::= {

```



```

    { ID id-GlobalENB-ID          CRITICALITY reject  TYPE GlobalENB-ID          PRESENCE mandatory}|
    { ID id-X2RemovalThreshold    CRITICALITY reject  TYPE X2BenefitValue        PRESENCE optional},
    ...
}

-- *****
--
-- X2 REMOVAL RESPONSE
--
-- *****

X2RemovalResponse ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{X2RemovalResponse-IEs}},
    ...
}

X2RemovalResponse-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-GlobalENB-ID          CRITICALITY reject  TYPE GlobalENB-ID          PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional},
    ...
}

-- *****
--
-- X2 REMOVAL FAILURE
--
-- *****

X2RemovalFailure ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{X2RemovalFailure-IEs}},
    ...
}

X2RemovalFailure-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Cause                 CRITICALITY ignore  TYPE Cause                 PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional},
    ...
}

-- *****
--
-- RETRIEVE UE CONTEXT REQUEST
--
-- *****

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

```

```

RetrieveUEContextRequest-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-New-eNB-UE-X2AP-ID          CRITICALITY reject TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-SeNB-UE-X2AP-ID-Extension    CRITICALITY reject TYPE UE-X2AP-ID-Extension PRESENCE optional}|
  { ID id-resumeID                     CRITICALITY reject TYPE ResumeID         PRESENCE mandatory}|
  { ID id-ShortMAC-I                   CRITICALITY reject TYPE ShortMAC-I       PRESENCE mandatory}|
  { ID id-NewEUTRANCellIdentifier      CRITICALITY reject TYPE EUTRANCellIdentifier PRESENCE mandatory}|
  { ID id-FailureCellCRNTI            CRITICALITY reject TYPE CRNTI           PRESENCE optional}|
  { ID id-FailureCellPCI              CRITICALITY reject TYPE PCI             PRESENCE optional}|
  ...
}

-- *****
--
-- RETRIEVE UE CONTEXT RESPONSE
--
-- *****

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

RetrieveUEContextResponse-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-New-eNB-UE-X2AP-ID          CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-New-eNB-UE-X2AP-ID-Extension CRITICALITY ignore TYPE UE-X2AP-ID-Extension PRESENCE optional}|
  { ID id-Old-eNB-UE-X2AP-ID          CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-Old-eNB-UE-X2AP-ID-Extension CRITICALITY ignore TYPE UE-X2AP-ID-Extension PRESENCE optional}|
  { ID id-GUMMEI-ID                   CRITICALITY reject TYPE GUMMEI           PRESENCE mandatory}|
  { ID id-UE-ContextInformationRetrieve CRITICALITY reject TYPE UE-ContextInformationRetrieve PRESENCE mandatory}|
  { ID id-TraceActivation              CRITICALITY ignore TYPE TraceActivation       PRESENCE optional}|
  { ID id-SRVCCOperationPossible       CRITICALITY ignore TYPE SRVCCOperationPossible PRESENCE optional}|
  { ID id-Masked-IMEISV                CRITICALITY ignore TYPE Masked-IMEISV         PRESENCE optional}|
  { ID id-ExpectedUEBehaviour          CRITICALITY ignore TYPE ExpectedUEBehaviour   PRESENCE optional}|
  { ID id-ProSeAuthorized              CRITICALITY ignore TYPE ProSeAuthorized       PRESENCE optional}|
  { ID id-CriticalityDiagnostics        CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional}|
  { ID id-V2XServicesAuthorized         CRITICALITY ignore TYPE V2XServicesAuthorized  PRESENCE optional}|
  { ID id-AerialUEsubscriptionInformation CRITICALITY ignore TYPE AerialUEsubscriptionInformation PRESENCE optional}|
  { ID id-Subscription-Based-UE-DifferentiationInfo CRITICALITY ignore TYPE Subscription-Based-UE-DifferentiationInfo PRESENCE optional}|
  ...
}

UE-ContextInformationRetrieve ::= SEQUENCE {
  mME-UE-SLAP-ID          UE-SLAP-ID,
  uESecurityCapabilities  UESecurityCapabilities,
  aS-SecurityInformation  AS-SecurityInformation,
  uEAggregateMaximumBitRate UEAggregateMaximumBitRate,
  subscriberProfileIDforRFP SubscriberProfileIDforRFP OPTIONAL,
  e-RABs-ToBeSetup-ListRetrieve E-RABs-ToBeSetup-ListRetrieve,
  rRC-Context             RRC-Context,
  handoverRestrictionList HandoverRestrictionList OPTIONAL,
  locationReportingInformation LocationReportingInformation OPTIONAL,
  managBasedMDTallowed    ManagementBasedMDTallowed OPTIONAL,
  managBasedMDTPLMNList   MDTPLMNList OPTIONAL,
}

```

```

    iE-Extensions          ProtocolExtensionContainer { {UE-ContextInformationRetrieve-ExtIEs} } OPTIONAL,
    ...
}

UE-ContextInformationRetrieve-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
{ ID id-UESidelinkAggregateMaximumBitRate    CRITICALITY ignore  EXTENSION UESidelinkAggregateMaximumBitRate    PRESENCE optional},
    ...
}

E-RABs-ToBeSetup-ListRetrieve ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeSetupRetrieve-ItemIEs} }

E-RABs-ToBeSetupRetrieve-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-ToBeSetupRetrieve-Item    CRITICALITY ignore  TYPE E-RABs-ToBeSetupRetrieve-Item    PRESENCE mandatory},
    ...
}

E-RABs-ToBeSetupRetrieve-Item ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,
    e-RAB-Level-QoS-Parameters    E-RAB-Level-QoS-Parameters,
    bearerType              BearerType OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {E-RABs-ToBeSetupRetrieve-ItemExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeSetupRetrieve-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-uL-GTPTunnelEndpoint    CRITICALITY reject  EXTENSION GTPTunnelEndpoint    PRESENCE mandatory}|
    { ID id-dL-Forwarding          CRITICALITY ignore  EXTENSION DL-Forwarding          PRESENCE optional },
    ...
}

-- *****
--
-- RETRIEVE UE CONTEXT FAILURE
--
-- *****

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

RetrieveUEContextFailure-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-New-eNB-UE-X2AP-ID        CRITICALITY ignore  TYPE UE-X2AP-ID        PRESENCE mandatory}|
    { ID id-New-eNB-UE-X2AP-ID-Extension    CRITICALITY ignore  TYPE UE-X2AP-ID-Extension    PRESENCE optional}|
    { ID id-Cause                    CRITICALITY ignore  TYPE Cause                    PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics        CRITICALITY ignore  TYPE CriticalityDiagnostics    PRESENCE optional},
    ...
}

-- *****
--
-- SGNB ADDITION REQUEST
--
-- *****

```

```

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

SgNBAdditionRequest-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID                CRITICALITY reject  TYPE UE-X2AP-ID                PRESENCE mandatory}|
  { ID id-NRUESecurityCapabilities        CRITICALITY reject  TYPE NRUESecurityCapabilities          PRESENCE mandatory}|
  { ID id-SgNBSecurityKey                 CRITICALITY reject  TYPE SgNBSecurityKey                 PRESENCE mandatory}|
  { ID id-SgNBUEAggregateMaximumBitRate   CRITICALITY reject  TYPE UEAggregateMaximumBitRate       PRESENCE mandatory}|
  { ID id-SelectedPLMN                    CRITICALITY ignore  TYPE PLMN-Identity                   PRESENCE optional}|
  { ID id-HandoverRestrictionList         CRITICALITY ignore  TYPE HandoverRestrictionList         PRESENCE optional}|
  { ID id-E-RABs-ToBeAdded-SgNBAddReqList CRITICALITY reject  TYPE E-RABs-ToBeAdded-SgNBAddReqList PRESENCE mandatory}|
  { ID id-MeNBtoSgNBContainer             CRITICALITY reject  TYPE MeNBtoSgNBContainer             PRESENCE mandatory}|
  { ID id-SgNB-UE-X2AP-ID                 CRITICALITY reject  TYPE SgNB-UE-X2AP-ID                 PRESENCE optional}|
  { ID id-ExpectedUEBehaviour            CRITICALITY ignore  TYPE ExpectedUEBehaviour             PRESENCE optional}|
  { ID id-MeNB-UE-X2AP-ID-Extension       CRITICALITY reject  TYPE UE-X2AP-ID-Extension            PRESENCE optional}|
  { ID id-RequestedSplitSRBs              CRITICALITY reject  TYPE SplitSRBs                       PRESENCE optional}|
  { ID id-MeNBResourceCoordinationInformation CRITICALITY ignore  TYPE MeNBResourceCoordinationInformation PRESENCE optional}|
  { ID id-SGNB-Addition-Trigger-Ind       CRITICALITY reject  TYPE SGNB-Addition-Trigger-Ind       PRESENCE optional}|
  { ID id-SubscriberProfileIDforRFP       CRITICALITY ignore  TYPE SubscriberProfileIDforRFP       PRESENCE optional}|
  { ID id-MeNBCell-ID                     CRITICALITY reject  TYPE ECGI                             PRESENCE mandatory}|
  { ID id-DesiredActNotificationLevel     CRITICALITY ignore  TYPE DesiredActNotificationLevel     PRESENCE optional}|
  { ID id-TraceActivation                  CRITICALITY ignore  TYPE TraceActivation                  PRESENCE optional}|
  { ID id-LocationInformationSgNBReporting CRITICALITY ignore  TYPE LocationInformationSgNBReporting PRESENCE optional}|
  { ID id-Masked-IMEISV                   CRITICALITY ignore  TYPE Masked-IMEISV                   PRESENCE optional}|
  ...
}

E-RABs-ToBeAdded-SgNBAddReqList ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeAdded-SgNBAddReq-ItemIEs} }

E-RABs-ToBeAdded-SgNBAddReq-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-ToBeAdded-SgNBAddReq-Item CRITICALITY reject  TYPE E-RABs-ToBeAdded-SgNBAddReq-Item PRESENCE mandatory},
  ...
}

E-RABs-ToBeAdded-SgNBAddReq-Item ::= SEQUENCE {
  e-RAB-ID                E-RAB-ID,
  drb-ID                  DRB-ID,
  en-DC-ResourceConfiguration EN-DC-ResourceConfiguration,
  resource-configuration CHOICE {
    sgNBPDCPpresent      E-RABs-ToBeAdded-SgNBAddReq-Item-SgNBPDCPpresent,
    sgNBPDCPnotpresent   E-RABs-ToBeAdded-SgNBAddReq-Item-SgNBPDCPnotpresent,
    ...
  },
  iE-Extensions          ProtocolExtensionContainer { {E-RABs-ToBeAdded-SgNBAddReq-ItemExtIEs} } OPTIONAL,
  ...
}

E-RABs-ToBeAdded-SgNBAddReq-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

```

```

E-RABs-ToBeAdded-SgNBAddReq-Item-SgNBPDCCPpresent ::= SEQUENCE {
    full-E-RAB-Level-QoS-Parameters          E-RAB-Level-QoS-Parameters,
    max-MCG-admit-E-RAB-Level-QoS-Parameters GBR-QoSInformation                OPTIONAL,
-- This IE shall be present if MCG resource and SCG resources IEs in the EN-DC Resource Configuration IE are set to "present" and GBR QoS
Information IE is present in Full E-RAB Level QoS Parameters IE --
    dL-Forwarding                            DL-Forwarding                    OPTIONAL,
    meNB-DL-GTP-TEIDatMCG                    GTPtunnelEndpoint                  OPTIONAL,
-- This IE shall be present if MCG resource IE in the EN-DC Resource Configuration IE is set to "present" --
    s1-UL-GTPtunnelEndpoint                  GTPtunnelEndpoint,
    iE-Extensions                            ProtocolExtensionContainer { {E-RABs-ToBeAdded-SgNBAddReq-Item-SgNBPDCCPpresentExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeAdded-SgNBAddReq-Item-SgNBPDCCPpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-RLCMode-transferred              CRITICALITY ignore  EXTENSION RLCMode                PRESENCE optional}|
    { ID id-BearerType                      CRITICALITY ignore  EXTENSION BearerType                PRESENCE optional},
    ...
}

E-RABs-ToBeAdded-SgNBAddReq-Item-SgNBPDCCPnotpresent ::= SEQUENCE {
    requested-SCG-E-RAB-Level-QoS-Parameters E-RAB-Level-QoS-Parameters,
    meNB-UL-GTP-TEIDatPDCP                  GTPtunnelEndpoint,
    secondary-meNB-UL-GTP-TEIDatPDCP       GTPtunnelEndpoint  OPTIONAL,
    rlc-Mode                                 RLCMode,
    uL-Configuration                        ULConfiguration OPTIONAL,
-- This IE shall be present if MCG resource and SCG resources IEs in the EN-DC Resource Configuration IE are set to "present" --
    iE-Extensions                            ProtocolExtensionContainer { {E-RABs-ToBeAdded-SgNBAddReq-Item-SgNBPDCCPnotpresentExtIEs} }  OPTIONAL,
    ...
}

E-RABs-ToBeAdded-SgNBAddReq-Item-SgNBPDCCPnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-uLpDCPSnLength                  CRITICALITY ignore  EXTENSION PDCPSnLength                PRESENCE optional}|
    { ID id-dLPDCPSnLength                  CRITICALITY ignore  EXTENSION PDCPSnLength                PRESENCE optional}|
    { ID id-duplicationActivation           CRITICALITY ignore  EXTENSION DuplicationActivation        PRESENCE optional},
    ...
}

-- *****
--
-- SGNB ADDITION REQUEST ACKNOWLEDGE
--
-- *****

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

SgNBAdditionRequestAcknowledge-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID                 CRITICALITY reject  TYPE UE-X2AP-ID                       PRESENCE mandatory}|
    { ID id-SgNB-UE-X2AP-ID                 CRITICALITY reject  TYPE SgNB-UE-X2AP-ID                   PRESENCE mandatory}|
    { ID id-E-RABs-Admitted-ToBeAdded-SgNBAddReqAckList CRITICALITY ignore  TYPE E-RABs-Admitted-ToBeAdded-SgNBAddReqAckList PRESENCE mandatory}|
    { ID id-E-RABs-NotAdmitted-List         CRITICALITY ignore  TYPE E-RAB-List                         PRESENCE optional}|
    { ID id-SgNBtoMeNBContainer             CRITICALITY reject  TYPE SgNBtoMeNBContainer                PRESENCE mandatory}|
}

```

```

    { ID id-CriticalityDiagnostics          CRITICALITY ignore TYPE CriticalityDiagnostics          PRESENCE optional} |
    { ID id-MeNB-UE-X2AP-ID-Extension      CRITICALITY reject TYPE UE-X2AP-ID-Extension      PRESENCE optional} |
    { ID id-AdmittedSplitSRBs              CRITICALITY reject TYPE SplitSRBs                PRESENCE optional} |
    { ID id-SgNBResourceCoordinationInformation CRITICALITY ignore TYPE SgNBResourceCoordinationInformation PRESENCE optional} |
    { ID id-RRCCongfigIndication            CRITICALITY reject TYPE RRC-Config-Ind          PRESENCE optional} |
    { ID id-LocationInformationSgNB         CRITICALITY ignore TYPE LocationInformationSgNB        PRESENCE optional},
    ...
}

E-RABS-Admitted-ToBeAdded-SgNBAddReqAckList ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABS-Admitted-ToBeAdded-SgNBAddReqAck-ItemIEs} }

E-RABS-Admitted-ToBeAdded-SgNBAddReqAck-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABS-Admitted-ToBeAdded-SgNBAddReqAck-Item CRITICALITY ignore TYPE E-RABS-Admitted-ToBeAdded-SgNBAddReqAck-Item PRESENCE mandatory}
}

E-RABS-Admitted-ToBeAdded-SgNBAddReqAck-Item ::= SEQUENCE {
  e-RAB-ID E-RAB-ID,
  en-DC-ResourceConfiguration EN-DC-ResourceConfiguration,
  resource-configuration CHOICE {
    sgNBPDCCpresent E-RABS-Admitted-ToBeAdded-SgNBAddReqAck-Item-SgNBPDCCpresent,
    sgNBPDCCnotpresent E-RABS-Admitted-ToBeAdded-SgNBAddReqAck-Item-SgNBPDCCnotpresent,
    ...
  },
  iE-Extensions ProtocolExtensionContainer { {E-RABS-ToBeAdded-SgNBAddReqAck-ItemExtIEs} } OPTIONAL,
  ...
}

E-RABS-ToBeAdded-SgNBAddReqAck-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

E-RABS-Admitted-ToBeAdded-SgNBAddReqAck-Item-SgNBPDCCpresent ::= SEQUENCE {
  s1-DL-GTPTunnelEndpoint GTPTunnelEndpoint,
  sgNB-UL-GTP-TEIDatPDCP GTPTunnelEndpoint OPTIONAL,
  -- This IE shall be present if MCG resource IE in the EN-DC Resource Configuration IE is set to "present" --
  rlc-Mode RLCMode OPTIONAL,
  -- This IE shall be present if MCG resource IE in the EN-DC Resource Configuration IE is set to "present" --
  dL-Forwarding-GTPTunnelEndpoint GTPTunnelEndpoint OPTIONAL,
  uL-Forwarding-GTPTunnelEndpoint GTPTunnelEndpoint OPTIONAL,
  mCG-E-RAB-Level-QoS-Parameters E-RAB-Level-QoS-Parameters OPTIONAL,
  -- This IE shall be present if MCG resource and SCG resource IEs in the EN-DC Resource Configuration IE are set to "present" and the GBR QoS Information IE is present in the Requested MCG E-RAB Level QoS Parameters IE --
  uL-Configuration ULConfiguration OPTIONAL,
  -- This IE shall be present if MCG resource and SCG resources IEs in the EN-DC Resource Configuration IE are set to "present" --
  iE-Extensions ProtocolExtensionContainer { {E-RABS-Admitted-ToBeAdded-SgNBAddReqAck-Item-SgNBPDCCpresentExtIEs} } OPTIONAL,
  ...
}

E-RABS-Admitted-ToBeAdded-SgNBAddReqAck-Item-SgNBPDCCpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-uLPDCPSnLength CRITICALITY ignore EXTENSION PDCPSnLength PRESENCE optional} |
  { ID id-dLPDCPSnLength CRITICALITY ignore EXTENSION PDCPSnLength PRESENCE optional},
}

```

```

}
...
}
E-RABs-Admitted-ToBeAdded-SgNBAddReqAck-Item-SgNBPDCCnotpresent ::= SEQUENCE {
    sgNB-DL-GTP-TEIDatSCG          GTPtunnelEndpoint,
    secondary-sgNB-DL-GTP-TEIDatSCG  GTPtunnelEndpoint OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABs-Admitted-ToBeAdded-SgNBAddReqAck-Item-SgNBPDCCnotpresentExtIEs} }
    OPTIONAL,
    ...
}
E-RABs-Admitted-ToBeAdded-SgNBAddReqAck-Item-SgNBPDCCnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-lCID                CRITICALITY ignore EXTENSION LCID          PRESENCE optional},
    ...
}

-- *****
--
-- SGNB ADDITION REQUEST REJECT
--
-- *****

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

SgNBAdditionRequestReject-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-SgNB-UE-X2AP-ID          CRITICALITY reject TYPE SgNB-UE-X2AP-ID        PRESENCE optional}|
    { ID id-Cause                     CRITICALITY ignore TYPE Cause                PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics    CRITICALITY ignore TYPE CriticalityDiagnostics    PRESENCE optional}|
    { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject TYPE UE-X2AP-ID-Extension    PRESENCE optional},
    ...
}

-- *****
--
-- SGNB RECONFIGURATION COMPLETE
--
-- *****

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

SgNBReconfigurationComplete-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-SgNB-UE-X2AP-ID          CRITICALITY reject TYPE SgNB-UE-X2AP-ID        PRESENCE mandatory}|
    { ID id-ResponseInformationSgNBReconfComp CRITICALITY ignore TYPE ResponseInformationSgNBReconfComp PRESENCE mandatory}|

```

```

    { ID id-MeNB-UE-X2AP-ID-Extension          CRITICALITY reject  TYPE UE-X2AP-ID-Extension          PRESENCE optional},
    ...
}

ResponseInformationSgNBReconfComp ::= CHOICE {
    success-SgNBReconfComp          ResponseInformationSgNBReconfComp-SuccessItem,
    reject-by-MeNB-SgNBReconfComp   ResponseInformationSgNBReconfComp-RejectByMeNBItem,
    ...
}

ResponseInformationSgNBReconfComp-SuccessItem ::= SEQUENCE {
    meNBtoSgNBContainer              MeNBtoSgNBContainer              OPTIONAL,
    iE-Extensions                    ProtocolExtensionContainer { {ResponseInformationSgNBReconfComp-SuccessItemExtIEs} } OPTIONAL,
    ...
}

ResponseInformationSgNBReconfComp-SuccessItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ResponseInformationSgNBReconfComp-RejectByMeNBItem ::= SEQUENCE {
    cause                            Cause,
    iE-Extensions                    ProtocolExtensionContainer { {ResponseInformationSgNBReconfComp-RejectByMeNBItemExtIEs} } OPTIONAL,
    ...
}

ResponseInformationSgNBReconfComp-RejectByMeNBItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- SGNB MODIFICATION REQUEST
--
-- *****

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

SgNBModificationRequest-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-SgNB-UE-X2AP-ID          CRITICALITY reject  TYPE SgNB-UE-X2AP-ID     PRESENCE mandatory}|
    { ID id-Cause                    CRITICALITY ignore  TYPE Cause              PRESENCE mandatory}|
    { ID id-SelectedPLMN              CRITICALITY ignore  TYPE PLMN-Identity      PRESENCE optional}|
    { ID id-HandoverRestrictionList   CRITICALITY ignore  TYPE HandoverRestrictionList PRESENCE optional}|
    { ID id-SCGConfigurationQuery     CRITICALITY ignore  TYPE SCGConfigurationQuery PRESENCE optional}|
    { ID id-UE-ContextInformation-SgNBModReq CRITICALITY reject  TYPE UE-ContextInformation-SgNBModReq PRESENCE optional}|
    { ID id-MeNBtoSgNBContainer        CRITICALITY reject  TYPE MeNBtoSgNBContainer PRESENCE optional}|
    { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional}|
    { ID id-MeNBResourceCoordinationInformation CRITICALITY ignore  TYPE MeNBResourceCoordinationInformation PRESENCE optional}|
    { ID id-RequestedSplitSRBs        CRITICALITY ignore  TYPE SplitSRBs          PRESENCE optional}|
}

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    { ID id-RequestedSplitSRBsrelease          CRITICALITY ignore TYPE SplitSRBs          PRESENCE optional} |
    { ID id-DesiredActNotificationLevel        CRITICALITY ignore TYPE DesiredActNotificationLevel PRESENCE optional} |
    { ID id-LocationInformationSgNBReporting    CRITICALITY ignore TYPE LocationInformationSgNBReporting PRESENCE optional} |
    { ID id-MeNBCell-ID                        CRITICALITY ignore TYPE ECGI                          PRESENCE optional},
    ...
}

UE-ContextInformation-SgNBModReq ::= SEQUENCE {
    nRUE-SecurityCapabilities      NRUESecurityCapabilities          OPTIONAL,
    sgNB-SecurityKey              SgNBSecurityKey                  OPTIONAL,
    sgNBUEAggregateMaximumBitRate UEAggregateMaximumBitRate      OPTIONAL,
    e-RABs-ToBeAdded              E-RABs-ToBeAdded-SgNBModReq-List OPTIONAL,
    e-RABs-ToBeModified           E-RABs-ToBeModified-SgNBModReq-List OPTIONAL,
    e-RABs-ToBeReleased           E-RABs-ToBeReleased-SgNBModReq-List OPTIONAL,
    iE-Extensions                 ProtocolExtensionContainer { {UE-ContextInformationSgNBModReqExtIEs} } OPTIONAL,
    ...
}

UE-ContextInformationSgNBModReqExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-SubscriberProfileIDforRFP          CRITICALITY ignore EXTENSION SubscriberProfileIDforRFP          PRESENCE
optional},
    ...
}

E-RABs-ToBeAdded-SgNBModReq-List ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeAdded-SgNBModReq-ItemIEs} }

E-RABs-ToBeAdded-SgNBModReq-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-ToBeAdded-SgNBModReq-Item    CRITICALITY ignore TYPE E-RABs-ToBeAdded-SgNBModReq-Item    PRESENCE mandatory},
    ...
}

E-RABs-ToBeAdded-SgNBModReq-Item ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,
    drb-ID                  DRB-ID,
    en-DC-ResourceConfiguration EN-DC-ResourceConfiguration,
    resource-configuration CHOICE {
        sgNBPDCPpresent      E-RABs-ToBeAdded-SgNBModReq-Item-SgNBPDCPpresent,
        sgNBPDCPnotpresent   E-RABs-ToBeAdded-SgNBModReq-Item-SgNBPDCPnotpresent,
        ...
    },
    iE-Extensions          ProtocolExtensionContainer { {E-RABs-ToBeAdded-SgNBModReq-ItemExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeAdded-SgNBModReq-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABs-ToBeAdded-SgNBModReq-Item-SgNBPDCPpresent ::= SEQUENCE {
    full-E-RAB-Level-QoS-Parameters      E-RAB-Level-QoS-Parameters,
    max-MN-admit-E-RAB-Level-QoS-Parameters GBR-QoSInformation          OPTIONAL,
    -- This IE shall be present if MCG resource and SCG resources IEs in the EN-DC Resource Configuration IE are set to "present" and GBR QoS
Information IE is present in Full E-RAB Level QoS Parameters IE --
    dL-Forwarding                        DL-Forwarding          OPTIONAL,

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    meNB-DL-GTP-TEIDatMCG          GTPtunnelEndpoint          OPTIONAL,
-- This IE shall be present if MCG resource IE in the EN-DC Resource Configuration IE is set to "present" --
s1-UL-GTPtunnelEndpoint          GTPtunnelEndpoint,
iE-Extensions                    ProtocolExtensionContainer { {E-RABs-ToBeAdded-SgNBModReq-Item-SgNBPDCCpresentExtIEs} } OPTIONAL,
...
}

E-RABs-ToBeAdded-SgNBModReq-Item-SgNBPDCCpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-RLCMode-transferred          CRITICALITY ignore EXTENSION RLCMode          PRESENCE optional}|
  { ID id-BearerType                  CRITICALITY ignore EXTENSION BearerType        PRESENCE optional},
  ...
}

E-RABs-ToBeAdded-SgNBModReq-Item-SgNBPDCCnotpresent ::= SEQUENCE {
  requested-SCG-E-RAB-Level-QoS-Parameters E-RAB-Level-QoS-Parameters,
  meNB-UL-GTP-TEIDatPDCP                  GTPtunnelEndpoint,
  secondary-meNB-UL-GTP-TEIDatPDCP        GTPtunnelEndpoint OPTIONAL,
  rlc-Mode                                 RLCMode,
  uL-Configuration                        ULConfiguration OPTIONAL,
-- This IE shall be present if MCG resource and SCG resources IEs in the EN-DC Resource Configuration IE are set to "present" --
iE-Extensions                            ProtocolExtensionContainer { {E-RABs-ToBeAdded-SgNBModReq-Item-SgNBPDCCnotpresentExtIEs} } OPTIONAL,
...
}

E-RABs-ToBeAdded-SgNBModReq-Item-SgNBPDCCnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-uLPDCPSnLength                CRITICALITY ignore EXTENSION PDCPSnLength        PRESENCE optional}|
  { ID id-dLPDCPSnLength                CRITICALITY ignore EXTENSION PDCPSnLength        PRESENCE optional}|
  { ID id-duplicationActivation         CRITICALITY ignore EXTENSION DuplicationActivation PRESENCE optional},
  ...
}

E-RABs-ToBeModified-SgNBModReq-List ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeModified-SgNBModReq-ItemIEs} }

E-RABs-ToBeModified-SgNBModReq-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-ToBeModified-SgNBModReq-Item CRITICALITY ignore TYPE E-RABs-ToBeModified-SgNBModReq-Item PRESENCE mandatory},
  ...
}

E-RABs-ToBeModified-SgNBModReq-Item ::= SEQUENCE {
  e-RAB-ID                               E-RAB-ID,
  en-DC-ResourceConfiguration            EN-DC-ResourceConfiguration,
  resource-configuration                 CHOICE {
    sgNBPDCCpresent                      E-RABs-ToBeModified-SgNBModReq-Item-SgNBPDCCpresent,
    sgNBPDCCnotpresent                  E-RABs-ToBeModified-SgNBModReq-Item-SgNBPDCCnotpresent,
    ...
  },
  iE-Extensions                          ProtocolExtensionContainer { {E-RABs-ToBeModified-SgNBModReq-ItemExtIEs} } OPTIONAL,
  ...
}

E-RABs-ToBeModified-SgNBModReq-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {

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```

}
...
E-RABs-ToBeModified-SgNBModReq-Item-SgNBPDCCpresent ::= SEQUENCE {
    full-E-RAB-Level-QoS-Parameters          E-RAB-Level-QoS-Parameters          OPTIONAL,
    max-MN-admit-E-RAB-Level-QoS-Parameters GBR-QoSInformation                  OPTIONAL,
    meNB-DL-GTP-TEIDatMCG                     GTPtunnelEndpoint                    OPTIONAL,
    s1-UL-GTPtunnelEndpoint                   GTPtunnelEndpoint                    OPTIONAL,
    iE-Extensions                             ProtocolExtensionContainer { {E-RABs-ToBeModified-SgNBModReq-Item-SgNBPDCCpresentExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeModified-SgNBModReq-Item-SgNBPDCCpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-RLC-Status          CRITICALITY ignore          EXTENSION RLC-Status          PRESENCE optional },
    ...
}

E-RABs-ToBeModified-SgNBModReq-Item-SgNBPDCCnotpresent ::= SEQUENCE {
    requested-SCG-E-RAB-Level-QoS-Parameters          E-RAB-Level-QoS-Parameters          OPTIONAL,
    meNB-UL-GTP-TEIDatPDCP                           GTPtunnelEndpoint                    OPTIONAL,
    uL-Configuration                                 ULConfiguration                      OPTIONAL,
    iE-Extensions                                     ProtocolExtensionContainer { {E-RABs-ToBeModified-SgNBModReq-Item-SgNBPDCCnotpresentExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeModified-SgNBModReq-Item-SgNBPDCCnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-uLpDCPSnLength          CRITICALITY ignore          EXTENSION PDCPSnLength          PRESENCE optional}|
    { ID id-dLPDCPSnLength          CRITICALITY ignore          EXTENSION PDCPSnLength          PRESENCE optional}|
    { ID id-secondarymeNBULGTPTEIDatPDCP          CRITICALITY ignore          EXTENSION GTPtunnelEndpoint          PRESENCE optional},
    ...
}

E-RABs-ToBeReleased-SgNBModReq-List ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeReleased-SgNBModReq-ItemIEs} }

E-RABs-ToBeReleased-SgNBModReq-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-ToBeReleased-SgNBModReq-Item CRITICALITY ignore          TYPE E-RABs-ToBeReleased-SgNBModReq-Item          PRESENCE mandatory},
    ...
}

E-RABs-ToBeReleased-SgNBModReq-Item ::= SEQUENCE {
    e-RAB-ID          E-RAB-ID,
    en-DC-ResourceConfiguration          EN-DC-ResourceConfiguration,
    resource-configuration          CHOICE {
        sgNBPDCCpresent          E-RABs-ToBeReleased-SgNBModReq-Item-SgNBPDCCpresent,
        sgNBPDCCnotpresent          E-RABs-ToBeReleased-SgNBModReq-Item-SgNBPDCCnotpresent,
        ...
    },
    iE-Extensions          ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBModReq-ItemExtIEs} }          OPTIONAL,
    ...
}

E-RABs-ToBeReleased-SgNBModReq-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```

}

E-RABs-ToBeReleased-SgNBModReq-Item-SgNBPDCCppresent ::= SEQUENCE {
    dL-GTPTunnelEndpoint          GTPtunnelEndpoint          OPTIONAL,
    uL-GTPTunnelEndpoint          GTPtunnelEndpoint          OPTIONAL,
    iE-Extensions                 ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBModReq-Item-SgNBPDCCppresentExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeReleased-SgNBModReq-Item-SgNBPDCCppresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABs-ToBeReleased-SgNBModReq-Item-SgNBPDCCpnotpresent ::= SEQUENCE {
    iE-Extensions                 ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBModReq-Item-SgNBPDCCpnotpresentExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeReleased-SgNBModReq-Item-SgNBPDCCpnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- SGNB MODIFICATION REQUEST ACKNOWLEDGE
--
-- *****

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

SgNBModificationRequestAcknowledge-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID          CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-SgNB-UE-X2AP-ID          CRITICALITY ignore TYPE SgNB-UE-X2AP-ID          PRESENCE
mandatory}|
    { ID id-E-RABs-Admitted-ToBeAdded-SgNBModAckList          CRITICALITY ignore TYPE E-RABs-Admitted-ToBeAdded-SgNBModAckList          PRESENCE
optional}|
    { ID id-E-RABs-Admitted-ToBeModified-SgNBModAckList          CRITICALITY ignore TYPE E-RABs-Admitted-ToBeModified-SgNBModAckList          PRESENCE optional}|
    { ID id-E-RABs-Admitted-ToBeReleased-SgNBModAckList          CRITICALITY ignore TYPE E-RABs-Admitted-ToBeReleased-SgNBModAckList          PRESENCE optional}|
    { ID id-E-RABs-NotAdmitted-List          CRITICALITY ignore TYPE E-RAB-List          PRESENCE optional}|
    { ID id-SgNBtoMeNBContainer          CRITICALITY ignore TYPE SgNBtoMeNBContainer          PRESENCE optional}|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore TYPE CriticalityDiagnostics          PRESENCE optional}|
    { ID id-MeNB-UE-X2AP-ID-Extension          CRITICALITY ignore TYPE UE-X2AP-ID-Extension          PRESENCE optional}|
    { ID id-SgNBResourceCoordinationInformation          CRITICALITY ignore TYPE SgNBResourceCoordinationInformation          PRESENCE optional}|
    { ID id-AdmittedSplitSRBs          CRITICALITY ignore TYPE SplitSRBs          PRESENCE optional}|
    { ID id-AdmittedSplitSRBsrelease          CRITICALITY ignore TYPE SplitSRBs          PRESENCE
optional}|
    { ID id-RRCConfigIndication          CRITICALITY reject TYPE RRC-Config-Ind          PRESENCE optional}|
    { ID id-LocationInformationSgNB          CRITICALITY ignore TYPE LocationInformationSgNB          PRESENCE optional},
    ...
}

```

```

}

E-RABs-Admitted-ToBeAdded-SgNBModAckList ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-Admitted-ToBeAdded-
SgNBModAck-ItemIEs} }

E-RABs-Admitted-ToBeAdded-SgNBModAck-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-Admitted-ToBeAdded-SgNBModAck-Item  CRITICALITY ignore  TYPE E-RABs-Admitted-ToBeAdded-SgNBModAck-Item  PRESENCE mandatory}
}

E-RABs-Admitted-ToBeAdded-SgNBModAck-Item ::= SEQUENCE {
  e-RAB-ID                E-RAB-ID,
  en-DC-ResourceConfiguration  EN-DC-ResourceConfiguration,
  resource-configuration    CHOICE {
    sgNBPDCCppresent        E-RABs-Admitted-ToBeAdded-SgNBModAck-Item-SgNBPDCCppresent,
    sgNBPDPCnotpresent      E-RABs-Admitted-ToBeAdded-SgNBModAck-Item-SgNBPDPCnotpresent,
    ...
  },
  iE-Extensions            ProtocolExtensionContainer { {E-RABs-Admitted-ToBeAdded-SgNBModAck-ItemExtIEs} }  OPTIONAL,
  ...
}

E-RABs-Admitted-ToBeAdded-SgNBModAck-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

E-RABs-Admitted-ToBeAdded-SgNBModAck-Item-SgNBPDCCppresent ::= SEQUENCE {
  s1-DL-GTPTunnelEndpoint  GTPTunnelEndpoint,
  sgNB-UL-GTP-TEIDatPDCP   GTPTunnelEndpoint  OPTIONAL,
  -- This IE shall be present if MCG resource IE in the EN-DC Resource Configuration IE are set to "present" --
  rlc-Mode                  RLCMode  OPTIONAL,
  -- This IE shall be present if MCG resource IE in the EN-DC Resource Configuration IE are set to "present" --
  dL-Forwarding-GTPTunnelEndpoint  GTPTunnelEndpoint  OPTIONAL,
  uL-Forwarding-GTPTunnelEndpoint  GTPTunnelEndpoint  OPTIONAL,
  mCG-E-RAB-Level-QoS-Parameters  E-RAB-Level-QoS-Parameters  OPTIONAL,
  -- This IE shall be present if MCG resource and SCG resource IEs in the EN-DC Resource Configuration IE are set to "present" and the GBR QoS
Information IE is present in the Requested MCG E-RAB Level QoS Parameters IE --
  uL-Configuration        ULConfiguration  OPTIONAL,
  -- This IE shall be present if MCG resource and SCG resources IEs in the EN-DC Resource Configuration IE are set to "present" --
  iE-Extensions            ProtocolExtensionContainer { {E-RABs-Admitted-ToBeAdded-SgNBModAck-Item-SgNBPDCCppresentExtIEs} }  OPTIONAL,
  ...
}

E-RABs-Admitted-ToBeAdded-SgNBModAck-Item-SgNBPDCCppresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-uLPDCPSnLength  CRITICALITY ignore  EXTENSION PDCPSnLength  PRESENCE optional}|
  { ID id-dLPDCPSnLength  CRITICALITY ignore  EXTENSION PDCPSnLength  PRESENCE optional},
  ...
}

E-RABs-Admitted-ToBeAdded-SgNBModAck-Item-SgNBPDPCnotpresent ::= SEQUENCE {
  sgNB-DL-GTP-TEIDatSCG  GTPTunnelEndpoint,
  secondary-sgNB-DL-GTP-TEIDatSCG  GTPTunnelEndpoint  OPTIONAL,
  iE-Extensions            ProtocolExtensionContainer { {E-RABs-Admitted-ToBeAdded-SgNBModAck-Item-SgNBPDPCnotpresentExtIEs} }  OPTIONAL,
  ...
}

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```

E-RABS-Admitted-ToBeAdded-SgNBModAck-Item-SgNBPDCCnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-lCID          CRITICALITY ignore  EXTENSION LCID          PRESENCE optional},
  ...
}

E-RABS-Admitted-ToBeModified-SgNBModAckList ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABS-Admitted-ToBeModified-
SgNBModAck-ItemIEs} }

E-RABS-Admitted-ToBeModified-SgNBModAck-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABS-Admitted-ToBeModified-SgNBModAck-Item          CRITICALITY ignore  TYPE E-RABS-Admitted-ToBeModified-SgNBModAck-Item  PRESENCE
mandatory}
}

E-RABS-Admitted-ToBeModified-SgNBModAck-Item ::= SEQUENCE {
  e-RAB-ID                E-RAB-ID,
  en-DC-ResourceConfiguration  EN-DC-ResourceConfiguration,
  resource-configuration    CHOICE {
    sgNBPDCCpresent        E-RABS-Admitted-ToBeModified-SgNBModAck-Item-SgNBPDCCpresent,
    sgNBPDCCnotpresent     E-RABS-Admitted-ToBeModified-SgNBModAck-Item-SgNBPDCCnotpresent,
    ...
  },
  iE-Extensions          ProtocolExtensionContainer { {E-RABS-ToBeAdded-SgNBModAck-ItemExtIEs} }  OPTIONAL,
  ...
}

E-RABS-ToBeAdded-SgNBModAck-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

E-RABS-Admitted-ToBeModified-SgNBModAck-Item-SgNBPDCCpresent ::= SEQUENCE {
  s1-DL-GTPTunnelEndpoint  GTPTunnelEndpoint                OPTIONAL,
  sgNB-UL-GTP-TEIDatPDCP   GTPTunnelEndpoint                OPTIONAL,
  mCG-E-RAB-Level-QoS-Parameters  E-RAB-Level-QoS-Parameters  OPTIONAL,
  uL-Configuration        ULConfiguration                OPTIONAL,
  iE-Extensions          ProtocolExtensionContainer { {E-RABS-Admitted-ToBeModified-SgNBModAck-Item-SgNBPDCCpresentExtIEs} }  OPTIONAL,
  ...
}

E-RABS-Admitted-ToBeModified-SgNBModAck-Item-SgNBPDCCpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-uLpDCPSnLength  CRITICALITY ignore  EXTENSION PDCPSnLength  PRESENCE optional}|
  { ID id-dLPDCPSnLength  CRITICALITY ignore  EXTENSION PDCPSnLength  PRESENCE optional},
  ...
}

E-RABS-Admitted-ToBeModified-SgNBModAck-Item-SgNBPDCCnotpresent ::= SEQUENCE {
  sgNB-DL-GTP-TEIDatSCG  GTPTunnelEndpoint
  OPTIONAL,
  iE-Extensions          ProtocolExtensionContainer { {E-RABS-Admitted-ToBeModified-SgNBModAck-Item-SgNBPDCCnotpresentExtIEs} }
  OPTIONAL,
  ...
}

E-RABS-Admitted-ToBeModified-SgNBModAck-Item-SgNBPDCCnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {

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```

    { ID id-secondarysgNBDLGTPEIDatPDCP          CRITICALITY ignore EXTENSION GTPtunnelEndpoint PRESENCE optional}|
    { ID id-RLC-Status                            CRITICALITY ignore     EXTENSION RLC-Status      PRESENCE optional },
    ...
}

E-RABS-Admitted-ToBeReleased-SgNBModAckList ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABS-Admitted-ToBeReleased-SgNBModAck-ItemIEs} }

E-RABS-Admitted-ToBeReleased-SgNBModAck-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABS-Admitted-ToBeReleased-SgNBModAck-Item          CRITICALITY ignore TYPE E-RABS-Admitted-ToReleased-SgNBModAck-Item PRESENCE
mandatory}
}

E-RABS-Admitted-ToReleased-SgNBModAck-Item ::= SEQUENCE {
  e-RAB-ID                E-RAB-ID,
  en-DC-ResourceConfiguration EN-DC-ResourceConfiguration,
  resource-configuration CHOICE {
    sgNBPDCPpresent          E-RABS-Admitted-ToBeReleased-SgNBModAck-Item-SgNBPDCPpresent,
    sgNBPDCPnotpresent       E-RABS-Admitted-ToBeReleased-SgNBModAck-Item-SgNBPDCPnotpresent,
    ...
  },
  iE-Extensions            ProtocolExtensionContainer { {E-RABS-ToBeReleased-SgNBModAck-ItemExtIEs} } OPTIONAL,
  ...
}

E-RABS-ToBeReleased-SgNBModAck-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

E-RABS-Admitted-ToBeReleased-SgNBModAck-Item-SgNBPDCPpresent ::= SEQUENCE {
  iE-Extensions            ProtocolExtensionContainer { {E-RABS-Admitted-ToBeReleased-SgNBModAck-Item-SgNBPDCPpresentExtIEs} } OPTIONAL,
  ...
}

E-RABS-Admitted-ToBeReleased-SgNBModAck-Item-SgNBPDCPpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

E-RABS-Admitted-ToBeReleased-SgNBModAck-Item-SgNBPDCPnotpresent ::= SEQUENCE {
  iE-Extensions            ProtocolExtensionContainer { {E-RABS-Admitted-ToBeReleased-SgNBModAck-Item-SgNBPDCPnotpresentExtIEs} } OPTIONAL,
  ...
}

E-RABS-Admitted-ToBeReleased-SgNBModAck-Item-SgNBPDCPnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- SGNB MODIFICATION REQUEST REJECT
--
-- *****

```

```

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

SgNBModificationRequestReject-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID          CRITICALITY ignore  TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-SgNB-UE-X2AP-ID          CRITICALITY ignore  TYPE SgNB-UE-X2AP-ID    PRESENCE mandatory}|
    { ID id-Cause                    CRITICALITY ignore  TYPE Cause              PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics    CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional}|
    { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY ignore  TYPE UE-X2AP-ID-Extension PRESENCE optional},
    ...
}

-- *****
--
-- SGNB MODIFICATION REQUIRED
--
-- *****

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

SgNBModificationRequired-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-SgNB-UE-X2AP-ID          CRITICALITY reject  TYPE SgNB-UE-X2AP-ID    PRESENCE mandatory}|
    { ID id-Cause                    CRITICALITY ignore  TYPE Cause              PRESENCE mandatory}|
    { ID id-PDCPChangeIndication     CRITICALITY ignore  TYPE PDCPChangeIndication PRESENCE optional}|
    { ID id-E-RABs-ToBeReleased-SgNBModReqdList CRITICALITY ignore  TYPE E-RABs-ToBeReleased-SgNBModReqdList PRESENCE optional}|
    { ID id-SgNBtoMeNBContainer       CRITICALITY ignore  TYPE SgNBtoMeNBContainer PRESENCE optional}|
    { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional}|
    { ID id-E-RABs-ToBeModified-SgNBModReqdList CRITICALITY ignore  TYPE E-RABs-ToBeModified-SgNBModReqdList PRESENCE optional}|
    { ID id-SgNBResourceCoordinationInformation CRITICALITY ignore  TYPE SgNBResourceCoordinationInformation PRESENCE optional}|
    { ID id-RRCCongigIndication       CRITICALITY reject  TYPE RRC-Config-Ind     PRESENCE optional}|
    { ID id-LocationInformationSgNB   CRITICALITY ignore  TYPE LocationInformationSgNB PRESENCE optional},
    ...
}

E-RABs-ToBeReleased-SgNBModReqdList ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeReleased-SgNBModReqd-ItemIEs} }

E-RABs-ToBeReleased-SgNBModReqd-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-ToBeReleased-SgNBModReqd-Item CRITICALITY ignore  TYPE E-RABs-ToBeReleased-SgNBModReqd-Item PRESENCE mandatory },
    ...
}

E-RABs-ToBeReleased-SgNBModReqd-Item ::= SEQUENCE {
    e-RAB-ID          E-RAB-ID,
    cause             Cause,
    iE-Extensions     ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBModReqd-ItemExtIEs} } OPTIONAL,
}

```



```

}
...
E-RABs-ToBeReleased-SgNBModReqd-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-RLCMode-transferred          CRITICALITY ignore  EXTENSION RLCMode          PRESENCE optional},
  ...
}

E-RABs-ToBeModified-SgNBModReqdList ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeModified-SgNBModReqd-ItemIEs} }

E-RABs-ToBeModified-SgNBModReqd-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-ToBeModified-SgNBModReqd-Item  CRITICALITY ignore  TYPE E-RABs-ToBeModified-SgNBModReqd-Item  PRESENCE mandatory },
  ...
}

E-RABs-ToBeModified-SgNBModReqd-Item ::= SEQUENCE {
  e-RAB-ID                               E-RAB-ID,
  en-DC-ResourceConfiguration            EN-DC-ResourceConfiguration,
  resource-configuration                 CHOICE {
    sgNBPDCCpresent                       E-RABs-ToBeModified-SgNBModReqd-Item-SgNBPDCCpresent,
    sgNBPDCCnotpresent                     E-RABs-ToBeModified-SgNBModReqd-Item-SgNBPDCCnotpresent,
    ...
  },
  iE-Extensions                          ProtocolExtensionContainer { {E-RABs-ToBeModified-SgNBModReqd-ItemExtIEs} } OPTIONAL,
  ...
}

E-RABs-ToBeModified-SgNBModReqd-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

E-RABs-ToBeModified-SgNBModReqd-Item-SgNBPDCCpresent ::= SEQUENCE {
  requested-MCG-E-RAB-Level-QoS-Parameters  E-RAB-Level-QoS-Parameters          OPTIONAL,
  uL-Configuration                          ULConfiguration                      OPTIONAL,
  sgNB-UL-GTP-TEIDatPDCP                    GTPtunnelEndpoint                    OPTIONAL,
  s1-DL-GTP-TEIDatSgNB                       GTPtunnelEndpoint                    OPTIONAL,
  iE-Extensions                              ProtocolExtensionContainer { {E-RABs-ToBeModified-SgNBModReqd-Item-SgNBPDCCpresentExtIEs} } OPTIONAL,
  ...
}

E-RABs-ToBeModified-SgNBModReqd-Item-SgNBPDCCpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-uLpDCPSnLength                    CRITICALITY ignore  EXTENSION PDCPSnLength  PRESENCE optional}|
  { ID id-dLPDCPSnLength                    CRITICALITY ignore  EXTENSION PDCPSnLength  PRESENCE optional}|
  { ID id-new-drb-ID-req                     CRITICALITY ignore  EXTENSION NewDRBIDrequest  PRESENCE optional},
  ...
}

E-RABs-ToBeModified-SgNBModReqd-Item-SgNBPDCCnotpresent ::= SEQUENCE {
  sgNB-DL-GTP-TEIDatSCG                     GTPtunnelEndpoint                    OPTIONAL,
  secondary-sgNB-DL-GTP-TEIDatSCG           GTPtunnelEndpoint                    OPTIONAL,
  iE-Extensions                              ProtocolExtensionContainer { {E-RABs-ToBeModified-SgNBModReqd-Item-SgNBPDCCnotpresentExtIEs} } OPTIONAL,
  ...
}

```

```

E-RABs-ToBeModified-SgNBModReqd-Item-SgNBPDPCnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-RLC-Status          CRITICALITY ignore          EXTENSION RLC-Status          PRESENCE optional} |
  { ID id-lCID                CRITICALITY ignore          EXTENSION LCID                PRESENCE optional},
  ...
}

-- *****
--
-- SGNB MODIFICATION CONFIRM
--
-- *****

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

SgNBModificationConfirm-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY ignore  TYPE UE-X2AP-ID          PRESENCE mandatory} |
  { ID id-SgNB-UE-X2AP-ID          CRITICALITY ignore  TYPE SgNB-UE-X2AP-ID     PRESENCE
mandatory} |
  { ID id-E-RABs-AdmittedToBeModified-SgNBModConfList CRITICALITY ignore  TYPE E-RABs-AdmittedToBeModified-SgNBModConfList PRESENCE optional} |
  { ID id-MeNBtoSgNBContainer      CRITICALITY ignore  TYPE MeNBtoSgNBContainer PRESENCE optional} |
  { ID id-CriticalityDiagnostics   CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional} |
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY ignore  TYPE UE-X2AP-ID-Extension PRESENCE optional} |
  { ID id-MeNBResourceCoordinationInformation CRITICALITY ignore  TYPE MeNBResourceCoordinationInformation PRESENCE optional},
  ...
}

E-RABs-AdmittedToBeModified-SgNBModConfList ::= SEQUENCE (SIZE (1..maxnoofBearers)) OF ProtocolIE-Single-Container
  { {E-RABs-AdmittedToBeModified-SgNBModConf-ItemIEs} }

E-RABs-AdmittedToBeModified-SgNBModConf-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-AdmittedToBeModified-SgNBModConf-Item CRITICALITY ignore TYPE E-RABs-AdmittedToBeModified-SgNBModConf-Item PRESENCE
mandatory },
  ...
}

E-RABs-AdmittedToBeModified-SgNBModConf-Item ::= SEQUENCE {
  e-RAB-ID          E-RAB-ID,
  en-DC-ResourceConfiguration EN-DC-ResourceConfiguration,
  resource-configuration CHOICE {
    sgNBPDPCpresent      E-RABs-AdmittedToBeModified-SgNBModConf-Item-SgNBPDPCpresent,
    sgNBPDPCnotpresent   E-RABs-AdmittedToBeModified-SgNBModConf-Item-SgNBPDPCnotpresent,
    ...
  },
  iE-Extensions      ProtocolExtensionContainer { {E-RABs-AdmittedToBeModified-SgNBModConf-ItemExtIEs} } OPTIONAL,
  ...
}

E-RABs-AdmittedToBeModified-SgNBModConf-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

```

```

}
E-RABs-AdmittedToBeModified-SgNBModConf-Item-SgNBPDCCPpresent ::= SEQUENCE {
    iE-Extensions          ProtocolExtensionContainer { {E-RABs-AdmittedToBeModified-SgNBModConf-Item-SgNBPDCCPpresentExtIEs} }    OPTIONAL,
    ...
}
E-RABs-AdmittedToBeModified-SgNBModConf-Item-SgNBPDCCPpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}
E-RABs-AdmittedToBeModified-SgNBModConf-Item-SgNBPDCCPnotpresent ::= SEQUENCE {
    secondary-meNB-UL-GTP-TEIDatPDCP          GTPtunnelEndpoint          OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {E-RABs-AdmittedToBeModified-SgNBModConf-Item-SgNBPDCCPnotpresentExtIEs} }    OPTIONAL,
    ...
}
E-RABs-AdmittedToBeModified-SgNBModConf-Item-SgNBPDCCPnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-uLpDCPSnLength          CRITICALITY ignore  EXTENSION PDCPSnLength          PRESENCE optional}|
    { ID id-dLpDCPSnLength          CRITICALITY ignore  EXTENSION PDCPSnLength          PRESENCE optional},
    ...
}
-- *****
--
-- SGNB MODIFICATION REFUSE
--
-- *****

SgNBModificationRefuse ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container          {{SgNBModificationRefuse-IEs}},
    ...
}
SgNBModificationRefuse-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID          CRITICALITY ignore  TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-SgNB-UE-X2AP-ID          CRITICALITY ignore  TYPE SgNB-UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-Cause          CRITICALITY ignore  TYPE Cause          PRESENCE mandatory}|
    { ID id-MeNBtoSgNBContainer          CRITICALITY ignore  TYPE MeNBtoSgNBContainer          PRESENCE optional}|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics          PRESENCE optional}|
    { ID id-MeNB-UE-X2AP-ID-Extension          CRITICALITY ignore  TYPE UE-X2AP-ID-Extension          PRESENCE optional},
    ...
}
-- *****
--
-- SGNB RELEASE REQUEST
--
-- *****

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

```

```

}

SgNBReleaseRequest-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-SgNB-UE-X2AP-ID          CRITICALITY reject  TYPE SgNB-UE-X2AP-ID        PRESENCE optional}|
  { ID id-Cause                     CRITICALITY ignore  TYPE Cause                  PRESENCE mandatory}|
  { ID id-E-RABs-ToBeReleased-SgNBRelReqList CRITICALITY ignore  TYPE E-RABs-ToBeReleased-SgNBRelReqList PRESENCE optional}|
  { ID id-UE-ContextKeptIndicator   CRITICALITY ignore  TYPE UE-ContextKeptIndicator PRESENCE optional}|
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension   PRESENCE optional}|
  { ID id-MeNBtoSgNBContainer        CRITICALITY reject  TYPE MeNBtoSgNBContainer    PRESENCE optional},
  ...
}

E-RABs-ToBeReleased-SgNBRelReqList ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeReleased-SgNBRelReq-ItemIEs} }

E-RABs-ToBeReleased-SgNBRelReq-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-ToBeReleased-SgNBRelReq-Item CRITICALITY ignore  TYPE E-RABs-ToBeReleased-SgNBRelReq-Item PRESENCE mandatory},
  ...
}

E-RABs-ToBeReleased-SgNBRelReq-Item ::= SEQUENCE {
  e-RAB-ID E-RAB-ID,
  en-DC-ResourceConfiguration EN-DC-ResourceConfiguration,
  resource-configuration CHOICE {
    sgNBPDCCpresent E-RABs-ToBeReleased-SgNBRelReq-Item-SgNBPDCCpresent,
    sgNBPDCCnotpresent E-RABs-ToBeReleased-SgNBRelReq-Item-SgNBPDCCnotpresent,
    ...
  },
  iE-Extensions ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBRelReq-ItemExtIEs} } OPTIONAL,
  ...
}

E-RABs-ToBeReleased-SgNBRelReq-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

E-RABs-ToBeReleased-SgNBRelReq-Item-SgNBPDCCpresent ::= SEQUENCE {
  uL-GTPTunnelEndpoint GTPtunnelEndpoint OPTIONAL,
  dL-GTPTunnelEndpoint GTPtunnelEndpoint OPTIONAL,
  iE-Extensions ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBRelReq-Item-SgNBPDCCpresentExtIEs} } OPTIONAL,
  ...
}

E-RABs-ToBeReleased-SgNBRelReq-Item-SgNBPDCCpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

E-RABs-ToBeReleased-SgNBRelReq-Item-SgNBPDCCnotpresent ::= SEQUENCE {
  iE-Extensions ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBRelReq-Item-SgNBPDCCnotpresentExtIEs} } OPTIONAL,
  ...
}

```

```

E-RABs-ToBeReleased-SgNBRelReq-Item-SgNBPDCCnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- SGNB RELEASE REQUEST ACKNOWLEDGE
--
-- *****

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

SgNBReleaseRequestAcknowledge-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID                CRITICALITY ignore TYPE UE-X2AP-ID                PRESENCE mandatory } |
  { ID id-SgNB-UE-X2AP-ID                CRITICALITY ignore TYPE SgNB-UE-X2AP-ID          PRESENCE mandatory } |
  { ID id-CriticalityDiagnostics          CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional } |
  { ID id-MeNB-UE-X2AP-ID-Extension      CRITICALITY reject TYPE UE-X2AP-ID-Extension PRESENCE optional } |
  { ID id-E-RABs-Admitted-ToBeReleased-SgNBRelReqAckList CRITICALITY ignore TYPE E-RABs-Admitted-ToBeReleased-SgNBRelReqAckList PRESENCE optional },
  ...
}

E-RABs-Admitted-ToBeReleased-SgNBRelReqAckList ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF
  ProtocolIE-Single-Container { {E-RABs-Admitted-ToBeReleased-SgNBRelReqAck-ItemIEs} }

E-RABs-Admitted-ToBeReleased-SgNBRelReqAck-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-Admitted-ToBeReleased-SgNBRelReqAck-Item CRITICALITY ignore TYPE E-RABs-Admitted-ToBeReleased-SgNBRelReqAck-Item PRESENCE mandatory },
  ...
}

E-RABs-Admitted-ToBeReleased-SgNBRelReqAck-Item ::= SEQUENCE {
  e-RAB-ID          E-RAB-ID,
  rlc-Mode-transferred RLCMode,
  iE-Extensions     ProtocolExtensionContainer { {E-RABs-Admitted-ToBeReleased-SgNBRelReqAck-ItemExtIEs} } OPTIONAL,
  ...
}

E-RABs-Admitted-ToBeReleased-SgNBRelReqAck-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- SGNB RELEASE REQUEST REJECT
--
-- *****

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

```

```

}

SgNBReleaseRequestReject-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-SgNB-UE-X2AP-ID          CRITICALITY ignore TYPE SgNB-UE-X2AP-ID      PRESENCE mandatory}|
  { ID id-Cause                     CRITICALITY ignore TYPE Cause              PRESENCE mandatory}|
  { ID id-CriticalityDiagnostics     CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional}|
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject TYPE UE-X2AP-ID-Extension PRESENCE optional},
  ...
}

-- *****
--
-- SGNB RELEASE REQUIRED
--
-- *****

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

SgNBReleaseRequired-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-SgNB-UE-X2AP-ID          CRITICALITY reject TYPE SgNB-UE-X2AP-ID      PRESENCE mandatory}|
  { ID id-Cause                     CRITICALITY ignore TYPE Cause              PRESENCE mandatory}|
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject TYPE UE-X2AP-ID-Extension PRESENCE optional }|
  { ID id-E-RABs-ToBeReleased-SgNBRelReqdList CRITICALITY ignore TYPE E-RABs-ToBeReleased-SgNBRelReqdList PRESENCE optional },
  ...
}

E-RABs-ToBeReleased-SgNBRelReqdList ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeReleased-SgNBRelReqd-ItemIEs} }

E-RABs-ToBeReleased-SgNBRelReqd-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-ToBeReleased-SgNBRelReqd-Item          CRITICALITY ignore TYPE E-RABs-ToBeReleased-SgNBRelReqd-Item          PRESENCE mandatory},
  ...
}

E-RABs-ToBeReleased-SgNBRelReqd-Item ::= SEQUENCE {
  e-RAB-ID          E-RAB-ID,
  rlc-Mode-transferred RLCMode,
  iE-Extensions     ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBRelReqd-ItemExtIEs} } OPTIONAL,
  ...
}

E-RABs-ToBeReleased-SgNBRelReqd-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- SGNB RELEASE CONFIRM
--

```

```

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

SgNBReleaseConfirm-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID                CRITICALITY ignore TYPE UE-X2AP-ID                PRESENCE mandatory}|
    { ID id-SgNB-UE-X2AP-ID                CRITICALITY ignore TYPE SgNB-UE-X2AP-ID                PRESENCE mandatory}|
    { ID id-E-RABs-ToBeReleased-SgNBRelConfList CRITICALITY ignore TYPE E-RABs-ToBeReleased-SgNBRelConfList PRESENCE optional}|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore TYPE CriticalityDiagnostics          PRESENCE optional}|
    { ID id-MeNB-UE-X2AP-ID-Extension       CRITICALITY ignore TYPE UE-X2AP-ID-Extension       PRESENCE optional},
    ...
}

E-RABs-ToBeReleased-SgNBRelConfList ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeReleased-SgNBRelConf-ItemIEs} }

E-RABs-ToBeReleased-SgNBRelConf-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-E-RABs-ToBeReleased-SgNBRelConf-Item          CRITICALITY ignore          TYPE E-RABs-ToBeReleased-SgNBRelConf-Item          PRESENCE mandatory},
    ...
}

E-RABs-ToBeReleased-SgNBRelConf-Item ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,
    en-DC-ResourceConfiguration EN-DC-ResourceConfiguration,
    resource-configuration CHOICE {
        sgNBPDCPpresent          E-RABs-ToBeReleased-SgNBRelConf-Item-SgNBPDCPpresent,
        sgNBPDCPnotpresent       E-RABs-ToBeReleased-SgNBRelConf-Item-SgNBPDCPnotpresent,
        ...
    },
    iE-Extensions           ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBRelConf-ItemExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeReleased-SgNBRelConf-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABs-ToBeReleased-SgNBRelConf-Item-SgNBPDCPpresent ::= SEQUENCE {
    uL-GTPTunnelEndpoint      GTPtunnelEndpoint          OPTIONAL,
    dL-GTPTunnelEndpoint      GTPtunnelEndpoint          OPTIONAL,
    iE-Extensions             ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBRelConf-Item-SgNBPDCPpresentExtIEs} } OPTIONAL,
    ...
}

E-RABs-ToBeReleased-SgNBRelConf-Item-SgNBPDCPpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABs-ToBeReleased-SgNBRelConf-Item-SgNBPDCPnotpresent ::= SEQUENCE {
    iE-Extensions             ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBRelConf-Item-SgNBPDCPnotpresentExtIEs} } OPTIONAL,
    ...
}

```

```

}
E-RABs-ToBeReleased-SgNBRelConf-Item-SgNBPDCCnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- SGNB COUNTER CHECK REQUEST
--
-- *****

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

SgNBCounterCheckRequest-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID                CRITICALITY reject  TYPE UE-X2AP-ID                PRESENCE mandatory} |
  { ID id-SgNB-UE-X2AP-ID                CRITICALITY reject  TYPE SgNB-UE-X2AP-ID          PRESENCE mandatory} |
  { ID id-E-RABs-SubjectToSgNBCounterCheck-List  CRITICALITY ignore  TYPE E-RABs-SubjectToSgNBCounterCheck-List  PRESENCE mandatory} |
  { ID id-MeNB-UE-X2AP-ID-Extension        CRITICALITY ignore  TYPE UE-X2AP-ID-Extension        PRESENCE optional},
  ...
}

E-RABs-SubjectToSgNBCounterCheck-List ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-SubjectToSgNBCounterCheck-ItemIEs} }

E-RABs-SubjectToSgNBCounterCheck-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-SubjectToSgNBCounterCheck-Item  CRITICALITY ignore  TYPE E-RABs-SubjectToSgNBCounterCheck-Item  PRESENCE mandatory},
  ...
}

E-RABs-SubjectToSgNBCounterCheck-Item ::= SEQUENCE {
  e-RAB-ID                E-RAB-ID,
  uL-Count                INTEGER (0..4294967295),
  dL-Count                INTEGER (0..4294967295),
  iE-Extensions           ProtocolExtensionContainer { {E-RABs-SubjectToSgNBCounterCheck-ItemExtIEs} } OPTIONAL,
  ...
}

E-RABs-SubjectToSgNBCounterCheck-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- SGNB CHANGE REQUIRED
--
-- *****

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

```



```

}

SgNBChangeRequired-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-SgNB-UE-X2AP-ID          CRITICALITY reject  TYPE SgNB-UE-X2AP-ID      PRESENCE mandatory}|
  { ID id-Target-SgNB-ID           CRITICALITY reject  TYPE GlobalGNB-ID        PRESENCE mandatory}|
  { ID id-Cause                     CRITICALITY ignore  TYPE Cause                PRESENCE mandatory}|
  { ID id-SgNBtoMeNBContainer       CRITICALITY reject  TYPE SgNBtoMeNBContainer  PRESENCE optional}|
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional},
  ...
}

-- *****
--
-- SGNB CHANGE CONFIRM
--
-- *****

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

SgNBChangeConfirm-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY ignore  TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-SgNB-UE-X2AP-ID          CRITICALITY ignore  TYPE SgNB-UE-X2AP-ID      PRESENCE mandatory}|
  { ID id-E-RABs-ToBeReleased-SgNBChaConfList CRITICALITY ignore  TYPE E-RABs-ToBeReleased-SgNBChaConfList PRESENCE optional}|
  { ID id-CriticalityDiagnostics    CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional}|
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY ignore  TYPE UE-X2AP-ID-Extension PRESENCE optional},
  ...
}

E-RABs-ToBeReleased-SgNBChaConfList ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-ToBeReleased-SgNBChaConf-ItemIEs} }

E-RABs-ToBeReleased-SgNBChaConf-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-ToBeReleased-SgNBChaConf-Item          CRITICALITY ignore          TYPE E-RABs-ToBeReleased-SgNBChaConf-Item          PRESENCE mandatory},
  ...
}

E-RABs-ToBeReleased-SgNBChaConf-Item ::= SEQUENCE {
  e-RAB-ID          E-RAB-ID,
  en-DC-ResourceConfiguration EN-DC-ResourceConfiguration,
  resource-configuration CHOICE {
    sgNBPDCPpresent          E-RABs-ToBeReleased-SgNBChaConf-Item-SgNBPDCPpresent,
    sgNBPDCPnotpresent       E-RABs-ToBeReleased-SgNBChaConf-Item-SgNBPDCPnotpresent,
    ...
  },
  iE-Extensions      ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBChaConf-ItemExtIEs} } OPTIONAL,
  ...
}

E-RABs-ToBeReleased-SgNBChaConf-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

```

```

}
E-RABs-ToBeReleased-SgNBChaConf-Item-SgNBPDCCpresent ::= SEQUENCE {
    uL-GTPTunnelEndpoint      GTPtunnelEndpoint          OPTIONAL,
    dL-GTPTunnelEndpoint      GTPtunnelEndpoint          OPTIONAL,
    iE-Extensions              ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBChaConf-Item-SgNBPDCCpresentExtIEs} } OPTIONAL,
    ...
}
E-RABs-ToBeReleased-SgNBChaConf-Item-SgNBPDCCpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}
E-RABs-ToBeReleased-SgNBChaConf-Item-SgNBPDCCnotpresent ::= SEQUENCE {
    iE-Extensions              ProtocolExtensionContainer { {E-RABs-ToBeReleased-SgNBChaConf-Item-SgNBPDCCnotpresentExtIEs} } OPTIONAL,
    ...
}
E-RABs-ToBeReleased-SgNBChaConf-Item-SgNBPDCCnotpresentExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}
-- *****
--
-- RRC TRANSFER
--
-- *****

RRCTransfer ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container      {{RRCTransfer-IEs}},
    ...
}
RRCTransfer-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-SgNB-UE-X2AP-ID          CRITICALITY reject TYPE SgNB-UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-SplitsRB                  CRITICALITY reject TYPE SplitsRB          PRESENCE optional}|
    { ID id-NRUEReport                CRITICALITY reject TYPE NRUEReport          PRESENCE optional}|
    { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject TYPE UE-X2AP-ID-Extension PRESENCE optional},
    ...
}
-- *****
--
-- SGNB CHANGE REFUSE
--
-- *****

SgNBChangeRefuse ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container      {{SgNBChangeRefuse-IEs}},
    ...
}
SgNBChangeRefuse-IEs X2AP-PROTOCOL-IES ::= {

```

```

    { ID id-MeNB-UE-X2AP-ID          CRITICALITY ignore TYPE UE-X2AP-ID          PRESENCE mandatory}|
    { ID id-SgNB-UE-X2AP-ID          CRITICALITY ignore TYPE SgNB-UE-X2AP-ID        PRESENCE mandatory}|
    { ID id-Cause                     CRITICALITY ignore TYPE Cause                PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics    CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional}|
    { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject TYPE UE-X2AP-ID-Extension PRESENCE optional},
    ...
}

-- *****
--
-- EN-DC X2 SETUP REQUEST
--
-- *****

ENDCX2SetupRequest ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{ENDCX2SetupRequest-IEs}},
    ...
}

ENDCX2SetupRequest-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-InitiatingNodeType-EndcX2Setup          CRITICALITY reject TYPE InitiatingNodeType-EndcX2Setup          PRESENCE mandatory},
    ...
}

InitiatingNodeType-EndcX2Setup ::= CHOICE {
    init-eNB          ProtocolIE-Container    {{ENB-ENDCX2SetupReqIEs}},
    init-en-gNB      ProtocolIE-Container    {{En-gNB-ENDCX2SetupReqIEs}},
    ...
}

ENB-ENDCX2SetupReqIEs X2AP-PROTOCOL-IES ::= {
    { ID id-GlobalENB-ID          CRITICALITY reject TYPE GlobalENB-ID          PRESENCE mandatory}|
    { ID id-ServedEUTRAcellsENDCX2ManagementList CRITICALITY reject TYPE ServedEUTRAcellsENDCX2ManagementList PRESENCE mandatory}|
    { ID id-InterfaceInstanceIndication          CRITICALITY reject TYPE InterfaceInstanceIndication          PRESENCE optional},
    ...
}

ServedEUTRAcellsENDCX2ManagementList ::= SEQUENCE (SIZE (1.. maxCellineNB)) OF SEQUENCE {
    servedEUTRACellInfo          ServedCell-Information,
    nrNeighbourInfo              NRNeighbour-Information    OPTIONAL,
    iE-Extensions                ProtocolExtensionContainer { {ServedEUTRAcellsENDCX2Management-ExtIEs} } OPTIONAL,
    ...
}

ServedEUTRAcellsENDCX2Management-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

En-gNB-ENDCX2SetupReqIEs X2AP-PROTOCOL-IES ::= {
    { ID id-Globalen-gNB-ID          CRITICALITY reject TYPE GlobalGNB-ID          PRESENCE mandatory}|
    { ID id-ServedNRcellsENDCX2ManagementList CRITICALITY reject TYPE ServedNRcellsENDCX2ManagementList PRESENCE mandatory},
    ...
}

```

```

ServedNRcellsENDCX2ManagementList ::= SEQUENCE (SIZE (1.. maxCellinengNB)) OF SEQUENCE {
    servedNRCellInfo          ServedNRCell-Information,
    nrNeighbourInfo           NRNeighbour-Information OPTIONAL,
    iE-Extensions             ProtocolExtensionContainer { {En-gNBServedCells-ExtIEs} } OPTIONAL,
    ...
}

En-gNBServedCells-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ServedNRCell-Information ::= SEQUENCE {
    nrpCI                     NRPCI,
    nrCellID                  NR CGI,
    fiveGS-TAC                FiveGS-TAC OPTIONAL,
    configured-TAC            TAC OPTIONAL,
    broadcastPLMNs            BroadcastPLMNs-Item,
    nrModeInfo                CHOICE {
        fdd      FDD-InfoServedNRCell-Information,
        tdd      TDD-InfoServedNRCell-Information,
        ...
    },
    measurementTimingConfiguration OCTET STRING,
    iE-Extensions             ProtocolExtensionContainer { {ServedNRCell-Information-ExtIEs} } OPTIONAL,
    ...
}

ServedNRCell-Information-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    {ID id-additionalPLMNs-Item          CRITICALITY ignore EXTENSION AdditionalPLMNs-Item          PRESENCE optional}|
    { ID id-BPLMN-ID-Info-NR            CRITICALITY ignore EXTENSION BPLMN-ID-Info-NR            PRESENCE optional},
    ...
}

FDD-InfoServedNRCell-Information ::= SEQUENCE {
    ul-NRFreqInfo            NRFreqInfo,
    dl-NRFreqInfo            NRFreqInfo,
    ul-NR-TxBW               NR-TxBW,
    dl-NR-TxBW               NR-TxBW,
    iE-Extensions           ProtocolExtensionContainer { {FDD-InfoServedNRCell-Information-ExtIEs} } OPTIONAL,
    ...
}

FDD-InfoServedNRCell-Information-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

TDD-InfoServedNRCell-Information ::= SEQUENCE {
    nrFreqInfo               NRFreqInfo,
    nr-TxBW                  NR-TxBW,
    iE-Extensions           ProtocolExtensionContainer { {TDD-InfoServedNRCell-Information-ExtIEs} } OPTIONAL,
    ...
}

TDD-InfoServedNRCell-Information-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {

```

```

}
...
}
CellAssistanceInformation ::= CHOICE {
    limited-list          Limited-list,
    full-list             ENUMERATED {allServedNRcells, ...},
    ...
}

Limited-list ::= SEQUENCE (SIZE (1..maxCellInengNB)) OF SEQUENCE {
    nrCellID              NRCGI,
    iE-Extensions         ProtocolExtensionContainer { {Limited-list-ExtIEs} } OPTIONAL,
    ...
}

Limited-list-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- EN-DC X2 SETUP RESPONSE
--
-- *****

ENDCX2SetupResponse ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    {{ENDCX2SetupResponse-IEs}},
    ...
}

ENDCX2SetupResponse-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-RespondingNodeType-EndcX2Setup          CRITICALITY reject  TYPE RespondingNodeType-EndcX2Setup  PRESENCE mandatory},
    ...
}

RespondingNodeType-EndcX2Setup ::= CHOICE {
    respond-eNB          ProtocolIE-Container    {{ENB-ENDCX2SetupReqAckIEs}},
    respond-en-gNB       ProtocolIE-Container    {{En-gNB-ENDCX2SetupReqAckIEs}},
    ...
}

ENB-ENDCX2SetupReqAckIEs X2AP-PROTOCOL-IES ::= {
    { ID id-GlobalENB-ID              CRITICALITY reject  TYPE GlobalENB-ID              PRESENCE mandatory}|
    { ID id-ServedEUTRAcellsENDCX2ManagementList  CRITICALITY reject  TYPE ServedEUTRAcellsENDCX2ManagementList  PRESENCE mandatory}|
    { ID id-InterfaceInstanceIndication  CRITICALITY reject  TYPE InterfaceInstanceIndication          PRESENCE optional },
    ...
}

En-gNB-ENDCX2SetupReqAckIEs X2AP-PROTOCOL-IES ::= {
    { ID id-Globalen-gNB-ID           CRITICALITY reject  TYPE Globalen-gNB-ID           PRESENCE mandatory}|
    { ID id-ServedNRcellsENDCX2ManagementList  CRITICALITY reject  TYPE ServedNRcellsENDCX2ManagementList  PRESENCE mandatory},
    ...
}

```

```

}
-- *****
--
-- EN-DC X2 SETUP FAILURE
--
-- *****

ENDCX2SetupFailure ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{ENDCX2SetupFailure-IEs}},
    ...
}

ENDCX2SetupFailure-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Cause                CRITICALITY ignore      TYPE Cause                PRESENCE mandatory} |
    { ID id-CriticalityDiagnostics CRITICALITY ignore      TYPE CriticalityDiagnostics PRESENCE optional } |
    { ID id-TimeToWait            CRITICALITY ignore      TYPE TimeToWait            PRESENCE optional } |
    { ID id-InterfaceInstanceIndication CRITICALITY reject      TYPE InterfaceInstanceIndication PRESENCE optional },
    ...
}

-- *****
--
-- EN-DC CONFIGURATION UPDATE
--
-- *****

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

ENDCConfigurationUpdate-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-InitiatingNodeType-EndcConfigUpdate CRITICALITY reject      TYPE InitiatingNodeType-EndcConfigUpdate PRESENCE mandatory} |
    { ID id-InterfaceInstanceIndication CRITICALITY reject      TYPE InterfaceInstanceIndication PRESENCE optional},
    ...
}

InitiatingNodeType-EndcConfigUpdate ::= CHOICE {
    init-eNB          ProtocolIE-Container    {{ENB-ENDCConfigUpdateIEs}},
    init-en-gNB       ProtocolIE-Container    {{En-gNB-ENDCConfigUpdateIEs}},
    ...
}

ENB-ENDCConfigUpdateIEs X2AP-PROTOCOL-IES ::= {
    { ID id-CellAssistanceInformation CRITICALITY reject      TYPE CellAssistanceInformation PRESENCE optional } |
    { ID id-ServedEUTRAcellsENDCX2ManagementList CRITICALITY reject      TYPE ServedEUTRAcellsENDCX2ManagementList PRESENCE optional } |
    { ID id-ServedEUTRAcellsToModifyListENDCConfUpd CRITICALITY reject      TYPE ServedEUTRAcellsToModifyListENDCConfUpd PRESENCE optional } |
    { ID id-ServedEUTRAcellsToDeleteListENDCConfUpd CRITICALITY reject      TYPE ServedEUTRAcellsToDeleteListENDCConfUpd PRESENCE optional },
    ...
}

ServedEUTRAcellsToModifyListENDCConfUpd ::= SEQUENCE (SIZE (1.. maxCellLineNB)) OF SEQUENCE {
    old-ECGI          ECGI,

```

```

    servedEUTRACellInfo          ServedCell-Information,
    nrNeighbourInfo              NRNeighbour-Information    OPTIONAL,
    iE-Extensions                ProtocolExtensionContainer { {ServedEUTRACellsToModifyListENDCConfUpd-ExtIEs} } OPTIONAL,
    ...
}

ServedEUTRACellsToModifyListENDCConfUpd-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ServedEUTRACellsToDeleteListENDCConfUpd ::= SEQUENCE (SIZE (1..maxCellineNB)) OF ECGI

En-gNB-ENDCConfigUpdateIEs X2AP-PROTOCOL-IES ::= {
    { ID id-ServedNRcellsENDCX2ManagementList          CRITICALITY reject TYPE ServedNRcellsENDCX2ManagementList          PRESENCE optional }|
    { ID id-ServedNRcellsToModifyListENDCConfUpd        CRITICALITY reject TYPE ServedNRcellsToModifyENDCConfUpdList          PRESENCE optional }|
    { ID id-ServedNRcellsToDeleteListENDCConfUpd        CRITICALITY reject TYPE ServedNRcellsToDeleteENDCConfUpdList          PRESENCE optional },
    ...
}

ServedNRcellsToModifyENDCConfUpdList ::= SEQUENCE (SIZE (1..maxCellinengNB)) OF ServedNRCellsToModify-Item

ServedNRCellsToModify-Item ::= SEQUENCE {
    old-nrcgi                NRCGI,
    servedNRCellInformation   ServedNRCell-Information,
    nrNeighbourInformation    NRNeighbour-Information    OPTIONAL,
    nrDeactivationIndication  DeactivationIndication      OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { {ServedNRCellsToModify-Item-ExtIEs} } OPTIONAL,
    ...
}

ServedNRCellsToModify-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ServedNRcellsToDeleteENDCConfUpdList ::= SEQUENCE (SIZE (1..maxCellinengNB)) OF NRCGI

-- *****
--
-- EN-DC CONFIGURATION UPDATE ACKNOWLEDGE
--
-- *****

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

ENDCConfigurationUpdateAcknowledge-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-RespondingNodeType-EndcConfigUpdate          CRITICALITY reject TYPE RespondingNodeType-EndcConfigUpdate          PRESENCE mandatory }|
    { ID id-InterfaceInstanceIndication                 CRITICALITY reject TYPE InterfaceInstanceIndication                 PRESENCE optional },
    ...
}

```

```

RespondingNodeType-EndcConfigUpdate ::= CHOICE {
  respond-eNB          ProtocolIE-Container  {{ENB-ENDCConfigUpdateAckIEs}},
  respond-en-gNB      ProtocolIE-Container  {{En-gNB-ENDCConfigUpdateAckIEs}},
  ...
}

ENB-ENDCConfigUpdateAckIEs X2AP-PROTOCOL-IES ::= {
  ...
}

En-gNB-ENDCConfigUpdateAckIEs X2AP-PROTOCOL-IES ::= {
  { ID id-ServedNRcellsENDCX2ManagementList          CRITICALITY reject  TYPE ServedNRcellsENDCX2ManagementList          PRESENCE optional},
  ...
}

-- *****
--
-- EN-DC CONFIGURATION UPDATE FAILURE
--
-- *****

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

ENDCConfigurationUpdateFailure-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-Cause          CRITICALITY ignore  TYPE Cause          PRESENCE mandatory}|
  { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics          PRESENCE optional }|
  { ID id-TimeToWait          CRITICALITY ignore  TYPE TimeToWait          PRESENCE optional }|
  { ID id-InterfaceInstanceIndication          CRITICALITY reject  TYPE InterfaceInstanceIndication          PRESENCE optional },
  ...
}

-- *****
--
-- EN-DC CELL ACTIVATION REQUEST
--
-- *****

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

ENDCCellActivationRequest-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-ServedNRCellsToActivate          CRITICALITY reject  TYPE ServedNRCellsToActivate          PRESENCE mandatory}|
  { ID id-ActivationID          CRITICALITY reject  TYPE ActivationID          PRESENCE mandatory}|
  { ID id-InterfaceInstanceIndication          CRITICALITY reject  TYPE InterfaceInstanceIndication          PRESENCE optional },
  ...
}

```



```

}

ServedNRCellsToActivate ::= SEQUENCE (SIZE (1.. maxCellInengNB)) OF ServedNRCellsToActivate-Item

ServedNRCellsToActivate-Item ::= SEQUENCE {
    nrCellID                NRCGI,
    iE-Extensions           ProtocolExtensionContainer { {ServedNRCellsToActivate-Item-ExtIEs} } OPTIONAL,
    ...
}

ServedNRCellsToActivate-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- EN-DC CELL ACTIVATION RESPONSE
--
-- *****

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

ENDCCellActivationResponse-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-ActivatedNRCellList          CRITICALITY ignore  TYPE ActivatedNRCellList          PRESENCE mandatory } |
    { ID id-ActivationID                  CRITICALITY reject  TYPE ActivationID              PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics        CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional } |
    { ID id-InterfaceInstanceIndication  CRITICALITY reject  TYPE InterfaceInstanceIndication PRESENCE optional },
    ...
}

ActivatedNRCellList ::= SEQUENCE (SIZE (1.. maxCellInengNB)) OF ActivatedNRCellList-Item

ActivatedNRCellList-Item ::= SEQUENCE {
    nrCellID                NRCGI,
    iE-Extensions           ProtocolExtensionContainer { {ActivatedNRCellList-Item-ExtIEs} } OPTIONAL,
    ...
}

ActivatedNRCellList-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- EN-DC CELL ACTIVATION FAILURE
--
-- *****

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

```

```

}
ENDCCellActivationFailure-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-ActivationID          CRITICALITY reject  TYPE ActivationID          PRESENCE mandatory }|
  { ID id-Cause                 CRITICALITY ignore  TYPE Cause                        PRESENCE mandatory }|
  { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics       PRESENCE optional }|
  { ID id-InterfaceInstanceIndication CRITICALITY reject  TYPE InterfaceInstanceIndication  PRESENCE optional },
  ...
}
-- *****
--
-- SECONDARY RAT DATA USAGE REPORT
--
-- *****

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

SecondaryRATDataUsageReport-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-SgNB-UE-X2AP-ID          CRITICALITY reject  TYPE SgNB-UE-X2AP-ID     PRESENCE mandatory}|
  { ID id-SecondaryRATUsageReportList CRITICALITY reject  TYPE SecondaryRATUsageReportList PRESENCE mandatory}|
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional},
  ...
}
-- *****
--
-- SGNB ACTIVITY NOTIFICATION
--
-- *****

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

SgNBActivityNotification-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID          CRITICALITY reject  TYPE UE-X2AP-ID          PRESENCE mandatory}|
  { ID id-SgNB-UE-X2AP-ID          CRITICALITY reject  TYPE SgNB-UE-X2AP-ID     PRESENCE mandatory}|
  { ID id-UEContextLevelUserPlaneActivity CRITICALITY ignore  TYPE UserPlaneTrafficActivityReport PRESENCE optional}|
  { ID id-ERABActivityNotifyItemList CRITICALITY ignore  TYPE ERABActivityNotifyItemList PRESENCE optional}|
  { ID id-MeNB-UE-X2AP-ID-Extension CRITICALITY reject  TYPE UE-X2AP-ID-Extension PRESENCE optional},
  ...
}
-- *****
--
-- EN-DC PARTIAL RESET REQUIRED
--
-- *****

```

```

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

ENDCPartialResetRequired-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-UEs-ToBeReset          CRITICALITY reject  TYPE UEsToBeResetList          PRESENCE mandatory}|
    { ID id-Cause                  CRITICALITY ignore  TYPE Cause                    PRESENCE mandatory}|
    { ID id-InterfaceInstanceIndication CRITICALITY reject  TYPE InterfaceInstanceIndication    PRESENCE optional},
    ...
}

-- *****
--
-- EN-DC PARTIAL RESET CONFIRM
--
-- *****

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

ENDCPartialResetConfirm-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-UEs-Admitted-ToBeReset          CRITICALITY reject  TYPE UEsToBeResetList          PRESENCE mandatory}|
    { ID id-InterfaceInstanceIndication      CRITICALITY reject  TYPE InterfaceInstanceIndication    PRESENCE optional},
    ...
}

-- *****
--
-- E-UTRA - NR CELL RESOURCE COORDINATION REQUEST
--
-- *****

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

EUTRANRCellResourceCoordinationRequest-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-InitiatingNodeType-EutranrCellResourceCoordination CRITICALITY reject  TYPE InitiatingNodeType-EutranrCellResourceCoordination
    PRESENCE mandatory}|
    { ID id-InterfaceInstanceIndication          CRITICALITY reject  TYPE InterfaceInstanceIndication
    PRESENCE optional },
    ...
}

InitiatingNodeType-EutranrCellResourceCoordination ::= CHOICE {
    initiate-eNB      ProtocolIE-Container    {{ENB-EUTRA-NRCellResourceCoordinationReqIEs}},
    initiate-en-gNB   ProtocolIE-Container    {{En-gNB-EUTRA-NRCellResourceCoordinationReqIEs}},
    ...
}

```

```

ENB-EUTRA-NRCellResourceCoordinationReqIEs X2AP-PROTOCOL-IES ::= {
  { ID id-DataTrafficResourceIndication      CRITICALITY reject TYPE DataTrafficResourceIndication      PRESENCE mandatory}|
  { ID id-SpectrumSharingGroupID            CRITICALITY reject TYPE SpectrumSharingGroupID            PRESENCE mandatory}|
  { ID id-ListofEUTRACellsinEUTRACoordinationReq CRITICALITY reject TYPE ListofEUTRACellsinEUTRACoordinationReq PRESENCE mandatory},
  ...
}

En-gNB-EUTRA-NRCellResourceCoordinationReqIEs X2AP-PROTOCOL-IES ::= {
  { ID id-DataTrafficResourceIndication      CRITICALITY reject TYPE DataTrafficResourceIndication      PRESENCE mandatory}|
  { ID id-ListofEUTRACellsinNRCoordinationReq CRITICALITY reject TYPE ListofEUTRACellsinNRCoordinationReq PRESENCE mandatory }|
  { ID id-SpectrumSharingGroupID            CRITICALITY reject TYPE SpectrumSharingGroupID            PRESENCE mandatory}|
  { ID id-ListofNRCellsinNRCoordinationReq   CRITICALITY reject TYPE ListofNRCellsinNRCoordinationReq   PRESENCE mandatory},
  ...
}

ListofEUTRACellsinEUTRACoordinationReq ::= SEQUENCE (SIZE (0..maxCellineNB)) OF ECGI
ListofEUTRACellsinNRCoordinationReq ::= SEQUENCE (SIZE (1..maxCellineNB)) OF ECGI
ListofNRCellsinNRCoordinationReq ::= SEQUENCE (SIZE (0..maxnoNRCellsSpectrumSharingWithE-UTRA)) OF NRCGI

-- *****
--
-- E-UTRA - NR CELL RESOURCE COORDINATION RESPONSE
--
-- *****

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

EUTRANRCellResourceCoordinationResponse-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-RespondingNodeType-EutranrCellResourceCoordination CRITICALITY reject TYPE RespondingNodeType-EutranrCellResourceCoordination PRESENCE mandatory}|
  { ID id-InterfaceInstanceIndication CRITICALITY reject TYPE InterfaceInstanceIndication PRESENCE optional },
  ...
}

RespondingNodeType-EutranrCellResourceCoordination ::= CHOICE {
  respond-eNB      ProtocolIE-Container      {{ENB-EUTRA-NRCellResourceCoordinationReqAckIEs}},
  respond-en-gNB   ProtocolIE-Container      {{En-gNB-EUTRA-NRCellResourceCoordinationReqAckIEs}},
  ...
}

ENB-EUTRA-NRCellResourceCoordinationReqAckIEs X2AP-PROTOCOL-IES ::= {
  { ID id-DataTrafficResourceIndication      CRITICALITY reject TYPE DataTrafficResourceIndication      PRESENCE mandatory}|
  { ID id-SpectrumSharingGroupID            CRITICALITY reject TYPE SpectrumSharingGroupID            PRESENCE mandatory}|
  { ID id-ListofEUTRACellsinEUTRACoordinationResp CRITICALITY reject TYPE ListofEUTRACellsinEUTRACoordinationResp PRESENCE mandatory},
  ...
}

```

```

En-gNB-EUTRA-NRCellResourceCoordinationReqAckIEs X2AP-PROTOCOL-IES ::= {
  { ID id-DataTrafficResourceIndication      CRITICALITY reject  TYPE DataTrafficResourceIndication      PRESENCE mandatory}|
  { ID id-SpectrumSharingGroupID            CRITICALITY reject  TYPE SpectrumSharingGroupID          PRESENCE mandatory}|
  { ID id-ListOfNRCellsinNRCoordinationResp  CRITICALITY reject  TYPE ListofNRCellsinNRCoordinationResp PRESENCE mandatory},
  ...
}

ListOfEUTRACellsinEUTRACoordinationResp ::= SEQUENCE (SIZE (0..maxCellLineNB)) OF ECGI
ListOfNRCellsinNRCoordinationResp ::= SEQUENCE (SIZE (0..maxnoNRcellsSpectrumSharingWithE-UTRA)) OF NRCGI

-- *****
--
-- EN-DC X2 REMOVAL REQUEST
--
-- *****

ENDCX2RemovalRequest ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container   {{ENDCX2RemovalRequest-IEs}},
  ...
}

ENDCX2RemovalRequest-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-InitiatingNodeType-EndcX2Removal      CRITICALITY reject  TYPE InitiatingNodeType-EndcX2Removal      PRESENCE mandatory}|
  { ID id-InterfaceInstanceIndication           CRITICALITY reject  TYPE InterfaceInstanceIndication           PRESENCE optional },
  ...
}

InitiatingNodeType-EndcX2Removal ::= CHOICE {
  init-eNB      ProtocolIE-Container   {{ENB-ENDCX2RemovalReqIEs}},
  init-en-gNB   ProtocolIE-Container   {{En-gNB-ENDCX2RemovalReqIEs}},
  ...
}

ENB-ENDCX2RemovalReqIEs X2AP-PROTOCOL-IES ::= {
  { ID id-GlobalENB-ID                          CRITICALITY reject  TYPE GlobalENB-ID                          PRESENCE mandatory},
  ...
}

En-gNB-ENDCX2RemovalReqIEs X2AP-PROTOCOL-IES ::= {
  { ID id-Globalen-gNB-ID                        CRITICALITY reject  TYPE GlobalGNB-ID                          PRESENCE mandatory},
  ...
}

-- *****
--
-- EN-DC X2 REMOVAL RESPONSE
--
-- *****

ENDCX2RemovalResponse ::= SEQUENCE {

```

```

    protocolIEs      ProtocolIE-Container      {{ENDCX2RemovalResponse-IEs}},
    ...
}

ENDCX2RemovalResponse-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-RespondingNodeType-EndcX2Removal      CRITICALITY reject  TYPE RespondingNodeType-EndcX2Removal  PRESENCE mandatory} |
  { ID id-InterfaceInstanceIndication          CRITICALITY reject  TYPE InterfaceInstanceIndication  PRESENCE optional },
  ...
}

RespondingNodeType-EndcX2Removal ::= CHOICE {
  respond-eNB      ProtocolIE-Container      {{ENB-ENDCX2RemovalReqAckIEs}},
  respond-en-gNB   ProtocolIE-Container      {{En-gNB-ENDCX2RemovalReqAckIEs}},
  ...
}

ENB-ENDCX2RemovalReqAckIEs X2AP-PROTOCOL-IES ::= {
  { ID id-GlobalenB-ID                          CRITICALITY reject  TYPE GlobalenB-ID                          PRESENCE mandatory},
  ...
}

En-gNB-ENDCX2RemovalReqAckIEs X2AP-PROTOCOL-IES ::= {
  { ID id-Globalen-gNB-ID                       CRITICALITY reject  TYPE GlobalenB-ID                          PRESENCE mandatory},
  ...
}

-- *****
--
-- EN-DC X2 REMOVAL FAILURE
--
-- *****

ENDCX2RemovalFailure ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container      {{ENDCX2RemovalFailure-IEs}},
  ...
}

ENDCX2RemovalFailure-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-Cause                          CRITICALITY ignore  TYPE Cause                          PRESENCE mandatory} |
  { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics          PRESENCE optional } |
  { ID id-InterfaceInstanceIndication     CRITICALITY reject  TYPE InterfaceInstanceIndication     PRESENCE optional },
  ...
}

-- *****
--
-- DATA FORWARDING ADDRESS INDICATION
--
-- *****

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

```

```

DataForwardingAddressIndication-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-New-eNB-UE-X2AP-ID                CRITICALITY ignore TYPE UE-X2AP-ID                PRESENCE mandatory }|
  { ID id-New-eNB-UE-X2AP-ID-Extension      CRITICALITY ignore TYPE UE-X2AP-ID-Extension    PRESENCE optional }|
  { ID id-Old-eNB-UE-X2AP-ID                CRITICALITY ignore TYPE UE-X2AP-ID                PRESENCE mandatory }|
  { ID id-Old-eNB-UE-X2AP-ID-Extension      CRITICALITY ignore TYPE UE-X2AP-ID-Extension    PRESENCE optional }|
  { ID id-E-RABs-DataForwardingAddress-List CRITICALITY ignore TYPE E-RABs-DataForwardingAddress-List PRESENCE mandatory },
  ...
}

E-RABs-DataForwardingAddress-List ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RABs-DataForwardingAddress-ItemIEs} }

E-RABs-DataForwardingAddress-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABs-DataForwardingAddress-Item CRITICALITY ignore TYPE E-RABs-DataForwardingAddress-Item PRESENCE mandatory },
  ...
}

E-RABs-DataForwardingAddress-Item ::= SEQUENCE {
  e-RAB-ID          E-RAB-ID,
  dl-GTPTunnelEndpoint GTPtunnelEndpoint,
  iE-Extensions     ProtocolExtensionContainer { {E-RABs-DataForwardingAddress-ItemExtIEs} } OPTIONAL,
  ...
}

E-RABs-DataForwardingAddress-ItemExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- GNB STATUS INDICATION
--
-- *****

GNBStatusIndication ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container   { { GNBStatusIndicationIEs } },
  ...
}

GNBStatusIndicationIEs X2AP-PROTOCOL-IES ::= {
  { ID id-GNBOverloadInformation          CRITICALITY ignore TYPE GNBOverloadInformation          PRESENCE mandatory }|
  { ID id-InterfaceInstanceIndication    CRITICALITY reject TYPE InterfaceInstanceIndication    PRESENCE optional },
  ...
}

-- *****
--
-- EN-DC CONFIGURATION TRANSFER
--
-- *****

ENDCConfigurationTransfer ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container   {{ENDCConfigurationTransfer-IEs}},

```

```

}
...
}
ENDCConfigurationTransfer-IEs X2AP-PROTOCOL-IES ::= {
  { ID id-endcSONConfigurationTransfer    CRITICALITY ignore  TYPE EndcSONConfigurationTransfer    PRESENCE optional}|
  { ID id-InterfaceInstanceIndication    CRITICALITY reject  TYPE InterfaceInstanceIndication    PRESENCE optional }},
  ...
}

-- *****
--
-- TRACE START
--
-- *****

TraceStart ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container      { {TraceStartIEs} },
  ...
}

TraceStartIEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID                CRITICALITY reject  TYPE UE-X2AP-ID                PRESENCE mandatory }|
  { ID id-SgNB-UE-X2AP-ID                CRITICALITY reject  TYPE SgNB-UE-X2AP-ID          PRESENCE mandatory }|
  { ID id-TraceActivation                CRITICALITY ignore  TYPE TraceActivation          PRESENCE mandatory }},
  ...
}

-- *****
--
-- DEACTIVATE TRACE
--
-- *****

DeactivateTrace ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container      { {DeactivateTraceIEs} },
  ...
}

DeactivateTraceIEs X2AP-PROTOCOL-IES ::= {
  { ID id-MeNB-UE-X2AP-ID                CRITICALITY reject  TYPE UE-X2AP-ID                PRESENCE mandatory }|
  { ID id-SgNB-UE-X2AP-ID                CRITICALITY reject  TYPE SgNB-UE-X2AP-ID          PRESENCE mandatory }|
  { ID id-EUTRANTraceID                  CRITICALITY ignore  TYPE EUTRANTraceID            PRESENCE mandatory }},
  ...
}

END
-- ASN1STOP

```

9.3.5 Information Element definitions

```

-- ASN1START
-- *****
--

```



```
-- Information Element Definitions
--
-- *****
X2AP-IEs {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) x2ap (2) version1 (1) x2ap-IEs (2) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

    id-E-RAB-Item,
    id-Number-of-Antennaports,
    id-MBSFN-Subframe-Info,
    id-PRACH-Configuration,
    id-CSG-Id,
    id-MDTConfiguration,
    id-SignallingBasedMDTPLMNList,
    id-MultibandInfoList,
    id-FreqBandIndicatorPriority,
    id-NeighbourTAC,
    id-Time-UE-StayedInCell-EnhancedGranularity,
    id-MBMS-Service-Area-List,
    id-HO-cause,
    id-eARFCNExtension,
    id-DL-EARFCNExtension,
    id-UL-EARFCNExtension,
    id-M3Configuration,
    id-M4Configuration,
    id-M5Configuration,
    id-MDT-Location-Info,
    id-NRrestrictioninEPSasSecondaryRAT,
    id-NRrestrictionin5GS,
    id-AdditionalSpecialSubframe-Info,
    id-UEID,
    id-enhancedRNTP,
    id-ProSeUEtoNetworkRelaying,
    id-M6Configuration,
    id-M7Configuration,
    id-OffsetOfNbiotChannelNumberToDL-EARFCN,
    id-OffsetOfNbiotChannelNumberToUL-EARFCN,
    id-AdditionalSpecialSubframeExtension-Info,
    id-BandwidthReducedSI,
    id-extended-e-RAB-MaximumBitrateDL,
    id-extended-e-RAB-MaximumBitrateUL,
    id-extended-e-RAB-GuaranteedBitrateDL,
    id-extended-e-RAB-GuaranteedBitrateUL,
    id-extended-uEaggregateMaximumBitRateDownlink,
    id-extended-uEaggregateMaximumBitRateUplink,
    id-E-RABUsageReport-Item,
    id-SecondaryRATUsageReport-Item,
```

id-UEAppLayerMeasConfig,
id-DL-scheduling-PDCCH-CCE-usage,
id-UL-scheduling-PDCCH-CCE-usage,
id-DownlinkPacketLossRate,
id-UplinkPacketLossRate,
id-serviceType,
id-ProtectedEUTRAResourceIndication,
id-NRS-NSSS-PowerOffset,
id-NSSS-NumOccasionDifferentPrecoder,
id-CNTTypeRestrictions,
id-BluetoothMeasurementConfiguration,
id-WLANMeasurementConfiguration,
id-ECGI,
id-NRCGI,
id-MeNBCoordinationAssistanceInformation,
id-SgNBCoordinationAssistanceInformation,
id-NRNeighbourInfoToAdd,
id-LastNG-RANPLMNIdentity,
id-BPLMN-ID-Info-EUTRA,
id-NBIoT-UL-DL-AlignmentOffset,

maxnoofBearers,
maxCelllineNB,
maxEARFCN,
maxEARFCNPlusOne,
newmaxEARFCN,
maxInterfaces,

maxnoofBands,
maxnoofBPLMNs,
maxnoofAdditionalPLMNs,
maxnoofCells,
maxnoofEPLMNs,
maxnoofEPLMNsPlusOne,
maxnoofForbLACs,
maxnoofForbTACs,
maxnoofNeighbours,
maxnoofPRBs,
maxNrOfErrors,
maxPools,
maxnoofMBSFN,
maxnoofTAforMDT,
maxnoofCellIDforMDT,
maxnoofMBMSServiceAreaIdentities,
maxnoofMDTPLMNs,
maxnoofCoMPHypothesisSet,
maxnoofCoMPCells,
maxUEReport,
maxCellReport,
maxnoofPA,
maxCSIProcess,
maxCSIReport,
maxSubband,
maxnooftimeperiods,

```

maxnoofCellIDforQMC,
maxnoofTAforQMC,
maxnoofPLMNforQMC,
maxUESinengNBDU,
maxnoofProtectedResourcePatterns,
maxnoNRcellsSpectrumSharingWithE-UTRA,
maxnoofNrCellBands,
maxnoofBluetoothName,
maxnoofWLANName,
maxofNRNeighbours,
maxnoofextBPLMNs,
maxnoofextBPLMNsminus1,
maxnoofBPLMNsminus1

FROM X2AP-Constants

Criticality,
ProcedureCode,
ProtocolIE-ID,
TriggeringMessage
FROM X2AP-CommonDataTypes

ProtocolExtensionContainer{},
ProtocolIE-Single-Container{},

X2AP-PROTOCOL-EXTENSION,
X2AP-PROTOCOL-IES
FROM X2AP-Containers;

-- A

ABSInformation ::= CHOICE {
    fdd                ABSInformationFDD,
    tdd                ABSInformationTDD,
    abs-inactive       NULL,
    ...
}

ABSInformationFDD ::= SEQUENCE {
    abs-pattern-info          BIT STRING (SIZE(40)),
    numberOfCellSpecificAntennaPorts  ENUMERATED {one, two, four, ...},
    measurement-subset       BIT STRING (SIZE(40)),
    iE-Extensions            ProtocolExtensionContainer { {ABSInformationFDD-ExtIEs} } OPTIONAL,
    ...
}

ABSInformationFDD-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ABSInformationTDD ::= SEQUENCE {
    abs-pattern-info          BIT STRING (SIZE(1..70, ...)),
    numberOfCellSpecificAntennaPorts  ENUMERATED {one, two, four, ...},
    measurement-subset       BIT STRING (SIZE(1..70, ...)),

```

```

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

ABSInformationTDD-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ABS-Status ::= SEQUENCE {
    dL-ABS-status          DL-ABS-status,
    usableABSInformation   UsableABSInformation,
    iE-Extensions          ProtocolExtensionContainer { {ABS-Status-ExtIEs} } OPTIONAL,
    ...
}

ABS-Status-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ActivationID ::= INTEGER (0..255)

AdditionalSpecialSubframe-Info ::= SEQUENCE {
    additionalSpecialSubframePatterns AdditionalSpecialSubframePatterns,
    cyclicPrefixDL                   CyclicPrefixDL,
    cyclicPrefixUL                   CyclicPrefixUL,
    iE-Extensions                    ProtocolExtensionContainer { {AdditionalSpecialSubframe-Info-ExtIEs} } OPTIONAL,
    ...
}

AdditionalSpecialSubframe-Info-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

AdditionalSpecialSubframePatterns ::= ENUMERATED {
    ssp0,
    ssp1,
    ssp2,
    ssp3,
    ssp4,
    ssp5,
    ssp6,
    ssp7,
    ssp8,
    ssp9,
    ...
}

AdditionalSpecialSubframeExtension-Info ::= SEQUENCE {
    additionalSpecialSubframePatternsExtension AdditionalSpecialSubframePatternsExtension,
    cyclicPrefixDL                          CyclicPrefixDL,
    cyclicPrefixUL                          CyclicPrefixUL,
    iE-Extensions                          ProtocolExtensionContainer { {AdditionalSpecialSubframeExtension-Info-ExtIEs} } OPTIONAL,
    ...
}

```

```

AdditionalSpecialSubframeExtension-Info-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

AdditionalSpecialSubframePatternsExtension ::= ENUMERATED {
    ssp10,
    ...
}

AerialUESubscriptionInformation ::= ENUMERATED {
    allowed,
    not-allowed,
    ...
}

AllocationAndRetentionPriority ::= SEQUENCE {
    priorityLevel          PriorityLevel,
    pre-emptionCapability  Pre-emptionCapability,
    pre-emptionVulnerability Pre-emptionVulnerability,
    iE-Extensions         ProtocolExtensionContainer { {AllocationAndRetentionPriority-ExtIEs} } OPTIONAL,
    ...
}

AllocationAndRetentionPriority-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

AreaScopeOfMDT ::= CHOICE {
    cellBased          CellBasedMDT,
    tABased            TABasedMDT,
    pLMNWide          NULL,
    ...,
    tAIBased          TAIBasedMDT
}

AreaScopeOfQMC ::= CHOICE {
    cellBased          CellBasedQMC,
    tABased            TABasedQMC,
    tAIBased          TAIBasedQMC,
    pLMNAreaBased     PLMNAreaBasedQMC,
    ...
}

AS-SecurityInformation ::= SEQUENCE {
    key-eNodeB-star      Key-eNodeB-Star,
    nextHopChainingCount NextHopChainingCount,
    iE-Extensions        ProtocolExtensionContainer { {AS-SecurityInformation-ExtIEs} } OPTIONAL,
    ...
}

AS-SecurityInformation-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```

AdditionalPLMNs-Item ::= SEQUENCE (SIZE(1..maxnoofAdditionalPLMNs)) OF PLMN-Identity

-- B

BandwidthReducedSI ::= ENUMERATED {
    scheduled,
    ...
}

BearerType ::= ENUMERATED {
    non-IP,
    ...
}

BenefitMetric ::= INTEGER (-101..100, ...)

BitRate ::= INTEGER (0..10000000000)

BroadcastPLMNs-Item ::= SEQUENCE (SIZE(1..maxnoofBPLMNs)) OF PLMN-Identity

BluetoothMeasurementConfiguration ::= SEQUENCE {
    bluetoothMeasConfig          BluetoothMeasConfig,
    bluetoothMeasConfigNameList  BluetoothMeasConfigNameList          OPTIONAL,
    bt-rssi                      ENUMERATED {true, ...}                OPTIONAL,
    iE-Extensions                ProtocolExtensionContainer { {BluetoothMeasurementConfiguration-ExtIEs} } OPTIONAL,
    ...
}

BluetoothMeasurementConfiguration-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

BluetoothMeasConfigNameList ::= SEQUENCE (SIZE(1..maxnoofBluetoothName)) OF BluetoothName

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

BluetoothName ::= OCTET STRING (SIZE (1..248))

BPLMN-ID-Info-EUTRA ::= SEQUENCE (SIZE(1..maxnoofBPLMNsmenus1)) OF BPLMN-ID-Info-EUTRA-Item

BPLMN-ID-Info-EUTRA-Item ::= SEQUENCE {
    broadcastPLMNs          BroadcastPLMNs-Item,
    tac                    TAC,
    e-utraCI               EUTRANCellIdentifier,
    iE-Extension           ProtocolExtensionContainer { {BPLMN-ID-Info-EUTRA-Item-ExtIEs} } OPTIONAL,
    ...
}

BPLMN-ID-Info-EUTRA-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

BPLMN-ID-Info-NR ::= SEQUENCE (SIZE(1..maxnoofextBPLMNsmenus1)) OF BPLMN-ID-Info-NR-Item

```

```
BPLMN-ID-Info-NR-Item ::= SEQUENCE {
    broadcastPLMNs          BroadcasttextPLMNs,
    fiveGStac              FiveGS-TAC          OPTIONAL,
    nr-CI                  NRCellIdentifier,
    iE-Extension           ProtocolExtensionContainer { {BPLMN-ID-Info-NR-Item-ExtIEs} } OPTIONAL,
    ...
}

BPLMN-ID-Info-NR-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

BroadcasttextPLMNs ::= SEQUENCE (SIZE(1..maxnoofextBPLMNs)) OF PLMN-Identity

-- C

CapacityValue ::= INTEGER (0..100)

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

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

CauseProtocol ::= ENUMERATED {
    transfer-syntax-error,
    abstract-syntax-error-reject,
    abstract-syntax-error-ignore-and-notify,
    message-not-compatible-with-receiver-state,
    semantic-error,
    unspecified,
    abstract-syntax-error-falsely-constructed-message,
    ...
}

CauseRadioNetwork ::= ENUMERATED {
    handover-desirable-for-radio-reasons,
    time-critical-handover,
    resource-optimisation-handover,
    reduce-load-in-serving-cell,
    partial-handover,
    unknown-new-eNB-UE-X2AP-ID,
}
```

```

unknown-old-eNB-UE-X2AP-ID,
unknown-pair-of-UE-X2AP-ID,
ho-target-not-allowed,
tx2relocoverall-expiry,
trelocprep-expiry,
cell-not-available,
no-radio-resources-available-in-target-cell,
invalid-MME-GroupID,
unknown-MME-Code,
encryption-and-or-integrity-protection-algorithms-not-supported,
reportCharacteristicsEmpty,
noReportPeriodicity,
existingMeasurementID,
unknown-eNB-Measurement-ID,
measurement-temporarily-not-available,
unspecified,
...
load-balancing,
handover-optimisation,
value-out-of-allowed-range,
multiple-E-RAB-ID-instances,
switch-off-ongoing,
not-supported-QCI-value,
measurement-not-supported-for-the-object,
tDCoverall-expiry,
tDCprep-expiry,
action-desirable-for-radio-reasons,
reduce-load,
resource-optimisation,
time-critical-action,
target-not-allowed,
no-radio-resources-available,
invalid-QoS-combination,
encryption-algorithms-not-supported,
procedure-cancelled,
rRM-purpose,
improve-user-bit-rate,
user-inactivity,
radio-connection-with-UE-lost,
failure-in-the-radio-interface-procedure,
bearer-option-not-supported,
mCG-Mobility,
sCG-Mobility,
count-reaches-max-value,
unknown-old-en-gNB-UE-X2AP-ID,
pDCP-Overload
}

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

```



```

CellBasedMDT ::= SEQUENCE {
    cellIdListforMDT      CellIdListforMDT,
    iE-Extensions         ProtocolExtensionContainer { {CellBasedMDT-ExtIEs} } OPTIONAL,
    ...
}

CellBasedMDT-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

CellBasedQMC-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CellCapacityClassValue ::= INTEGER (1..100, ...)

CellDeploymentStatusIndicator ::= ENUMERATED {pre-change-notification, ...}

CellIdListforMDT ::= SEQUENCE (SIZE(1..maxnoofCellIDforMDT)) OF ECGI

CellIdListforQMC ::= SEQUENCE (SIZE(1..maxnoofCellIDforQMC)) OF ECGI

CellReplacingInfo ::= SEQUENCE {
    replacingCellsList      ReplacingCellsList,
    iE-Extensions           ProtocolExtensionContainer { {CellReplacingInfo-ExtIEs} } OPTIONAL,
    ...
}

CellReplacingInfo-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CellReportingIndicator ::= ENUMERATED {stop-request, ... }

Cell-Size ::= ENUMERATED {verysmall, small, medium, large, ... }

CellType ::= SEQUENCE {
    cell-Size                Cell-Size,
    iE-Extensions            ProtocolExtensionContainer { {CellType-ExtIEs} } OPTIONAL,
    ...
}

CellType-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```

CNTTypeRestrictions ::= SEQUENCE (SIZE(1..maxnoofEPLMNsPlusOne)) OF CNTTypeRestrictionsItem

CNTTypeRestrictionsItem ::= SEQUENCE {
    plmn-Id          PLMN-Identity,
    cn-type          ENUMERATED {fiveGC-forbidden, ... , epc-forbidden},
    iE-Extensions    ProtocolExtensionContainer { {CNTTypeRestrictionsItem-ExtIEs} } OPTIONAL,
    ...
}

CNTTypeRestrictionsItem-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CoMPHypothesisSet ::= SEQUENCE (SIZE(1..maxnoofCoMPCells)) OF CoMPHypothesisSetItem

CoMPHypothesisSetItem ::= SEQUENCE {
    coMPCellID      ECGI,
    coMPHypothesis  BIT STRING (SIZE(6..4400, ...)),
    iE-Extensions   ProtocolExtensionContainer { {CoMPHypothesisSetItem-ExtIEs} } OPTIONAL,
    ...
}

CoMPHypothesisSetItem-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CoMPInformation ::= SEQUENCE {
    coMPInformationItem      CoMPInformationItem,
    coMPInformationStartTime CoMPInformationStartTime,
    iE-Extensions           ProtocolExtensionContainer { {CoMPInformation-ExtIEs} } OPTIONAL,
    ...
}

CoMPInformation-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CoMPInformationItem ::= SEQUENCE (SIZE(1..maxnoofCoMPHypothesisSet)) OF
SEQUENCE {
    coMPHypothesisSet      CoMPHypothesisSet,
    benefitMetric          BenefitMetric,
    iE-Extensions         ProtocolExtensionContainer { {CoMPInformationItem-ExtIEs} } OPTIONAL,
    ...
}

CoMPInformationItem-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CoMPInformationStartTime ::= SEQUENCE (SIZE(0..1)) OF
SEQUENCE {
    startSFN              INTEGER (0..1023, ...),
    startSubframeNumber   INTEGER (0..9, ...),
    iE-Extensions         ProtocolExtensionContainer { {CoMPInformationStartTime-ExtIEs} } OPTIONAL,
}

```

```

    }
    ...
}

CompInformationStartTime-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CompositeAvailableCapacity ::= SEQUENCE {
    cellCapacityClassValue          CellCapacityClassValue          OPTIONAL,
    capacityValue                    CapacityValue,
    iE-Extensions                    ProtocolExtensionContainer { {CompositeAvailableCapacity-ExtIEs} } OPTIONAL,
    ...
}

CompositeAvailableCapacity-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CompositeAvailableCapacityGroup ::= SEQUENCE {
    dL-CompositeAvailableCapacity    CompositeAvailableCapacity,
    uL-CompositeAvailableCapacity    CompositeAvailableCapacity,
    iE-Extensions                    ProtocolExtensionContainer { {CompositeAvailableCapacityGroup-ExtIEs} } OPTIONAL,
    ...
}

CompositeAvailableCapacityGroup-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

Correlation-ID ::= OCTET STRING (SIZE (4))

COUNTvalue ::= SEQUENCE {
    pDCP-SN                          PDCP-SN,
    hFN                               HFN,
    iE-Extensions                    ProtocolExtensionContainer { {COUNTvalue-ExtIEs} } OPTIONAL,
    ...
}

COUNTvalue-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

COUNTValueExtended ::= SEQUENCE {
    pDCP-SNExtended                  PDCP-SNExtended,
    hFNModified                      HFNModified,
    iE-Extensions                    ProtocolExtensionContainer { {COUNTValueExtended-ExtIEs} } OPTIONAL,
    ...
}

COUNTValueExtended-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

COUNTvaluePDCP-SNlength18 ::= SEQUENCE {

```

```

    pDCP-SNlength18          PDCP-SNlength18,
    hFNforPDCP-SNlength18   HFNforPDCP-SNlength18,
    iE-Extensions           ProtocolExtensionContainer { {COUNTvaluePDCP-SNlength18-ExtIEs} } OPTIONAL,
    ...
}

COUNTvaluePDCP-SNlength18-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CoverageModificationList ::= SEQUENCE (SIZE (1..maxCellineNB)) OF CoverageModification-Item

CoverageModification-Item ::= SEQUENCE {
    eCGI                      ECGI,
    coverageState             INTEGER (0..15, ...),
    cellDeploymentStatusIndicator CellDeploymentStatusIndicator    OPTIONAL,
    cellReplacingInfo         CellReplacingInfo                   OPTIONAL,
-- Included in case the Cell Deployment Status Indicator IE is present
    ...
}

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

CriticalityDiagnostics-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CriticalityDiagnostics-IE-List ::= SEQUENCE (SIZE (1..maxNrOfErrors)) OF
SEQUENCE {
    iECriticality             Criticality,
    iE-ID                     ProtocolIE-ID,
    typeOfError               TypeOfError,
    iE-Extensions            ProtocolExtensionContainer { {CriticalityDiagnostics-IE-List-ExtIEs} } OPTIONAL,
    ...
}

CriticalityDiagnostics-IE-List-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CRNTI ::= BIT STRING (SIZE (16))

CSGMembershipStatus ::= ENUMERATED {
    member,
    not-member
}

```

```

CSG-Id ::= BIT STRING (SIZE (27))

CSIReportList ::= SEQUENCE (SIZE(1..maxUEReport)) OF
  SEQUENCE {
    uEID                               UEID,
    cSIReportPerCSIProcess             CSIReportPerCSIProcess,
    iE-Extensions                      ProtocolExtensionContainer { {CSIReportList-ExtIEs} } OPTIONAL,
    ...
  }

CSIReportList-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

CSIReportPerCSIProcess ::= SEQUENCE (SIZE(1.. maxCSIProcess)) OF
  SEQUENCE {
    cSIProcessConfigurationIndex      INTEGER (1..7, ...),
    cSIReportPerCSIProcessItem        CSIReportPerCSIProcessItem,
    iE-Extensions                     ProtocolExtensionContainer { {CSIReportPerCSIProcess-ExtIEs} } OPTIONAL,
    ...
  }

CSIReportPerCSIProcess-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

CSIReportPerCSIProcessItem ::= SEQUENCE (SIZE(1.. maxCSIReport)) OF
  SEQUENCE {
    rI                                 INTEGER (1..8, ...),
    widebandCQI                       WidebandCQI,
    subbandSize                       SubbandSize,
    subbandCQIList                    SubbandCQIList OPTIONAL,
    iE-Extensions                     ProtocolExtensionContainer { {CSIReportPerCSIProcessItem-ExtIEs} } OPTIONAL,
    ...
  }

CSIReportPerCSIProcessItem-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

CyclicPrefixDL ::= ENUMERATED {
  normal,
  extended,
  ...
}

CyclicPrefixUL ::= ENUMERATED {
  normal,
  extended,
  ...
}

```

```
-- D
```

```
DataTrafficResources ::= BIT STRING (SIZE(6..17600))
```

```
DataTrafficResourceIndication ::= SEQUENCE {
    activationSFN          INTEGER (0..1023),
    sharedResourceType     SharedResourceType,
    reservedSubframePattern ReservedSubframePattern OPTIONAL,
    iE-Extensions         ProtocolExtensionContainer { {DataTrafficResourceIndication-ExtIEs} } OPTIONAL,
    ...
}
```

```
DataTrafficResourceIndication-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
DeactivationIndication ::= ENUMERATED {
    deactivated,
    ...
}
```

```
DeliveryStatus ::= SEQUENCE {
    highestSuccessDeliveredPDCPSN    INTEGER (0..4095),
    iE-Extensions                    ProtocolExtensionContainer { {DeliveryStatus-ExtIEs} } OPTIONAL,
    ...
}
```

```
DeliveryStatus-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
DesiredActNotificationLevel ::= ENUMERATED {none, e-rab, ue-level, ...}
```

```
DL-ABS-status ::= INTEGER (0..100)
```

```
DL-Forwarding ::= ENUMERATED {
    dL-forwardingProposed,
    ...
}
```

```
DL-GBR-PRB-usage ::= INTEGER (0..100)
```

```
DL-non-GBR-PRB-usage ::= INTEGER (0..100)
```

```
DLResourceBitmapULandDLSharing ::= DataTrafficResources
```

```
DLResourcesULandDLSharing ::= CHOICE {
    unchanged          NULL,
    changed            DLResourceBitmapULandDLSharing,
    ...
}
```

```
DL-scheduling-PDCCH-CCE-usage ::= INTEGER (0..100)
```

```

DL-Total-PRB-usage ::= INTEGER (0..100)

DRB-ID ::= INTEGER (1..32)

DuplicationActivation ::= ENUMERATED {active, inactive, ...}

DynamicDLTransmissionInformation ::= CHOICE {
    naics-active          DynamicNAICSInformation,
    naics-inactive        NULL,
    ...
}

DynamicNAICSInformation ::= SEQUENCE {
    transmissionModes      BIT STRING (SIZE(8))                OPTIONAL,
    pB-information          INTEGER(0..3)                       OPTIONAL,
    pA-list                 SEQUENCE (SIZE(0..maxnoofPA)) OF PA-Values,
    iE-Extensions          ProtocolExtensionContainer { {DynamicNAICSInformation-ExtIEs} } OPTIONAL,
    ...
}

DynamicNAICSInformation-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- E

EARFCN ::= INTEGER (0..maxEARFCN)

EARFCNExtension ::= INTEGER(maxEARFCNplusOne..newmaxEARFCN, ...)

ECGI ::= SEQUENCE {
    pLMN-Identity          PLMN-Identity,
    eUTRANcellIdentifier   EUTRANCellIdentifier,
    iE-Extensions          ProtocolExtensionContainer { {ECGI-ExtIEs} } OPTIONAL,
    ...
}

ECGI-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

EndcSONConfigurationTransfer ::= OCTET STRING

EnhancedRNTP ::= SEQUENCE {
    enhancedRNTPBitmap      BIT STRING (SIZE(12..8800, ...)),
    rNTP-High-Power-Threshold RNT-Threshold,
    enhancedRNTPStartTime   EnhancedRNTPStartTime OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {EnhancedRNTP-ExtIEs} } OPTIONAL,
    ...
}

EnhancedRNTP-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```

}

EnhancedRNTPStartTime ::= SEQUENCE {
    startSFN          INTEGER (0..1023, ...),
    startSubframeNumber  INTEGER (0..9, ...),
    iE-Extensions     ProtocolExtensionContainer { {EnhancedRNTPStartTime-ExtIEs} } OPTIONAL,
    ...
}

EnhancedRNTPStartTime-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ENB-ID ::= CHOICE {
    macro-eNB-ID      BIT STRING (SIZE (20)),
    home-eNB-ID       BIT STRING (SIZE (28)),
    ... ,
    short-Macro-eNB-ID  BIT STRING (SIZE(18)),
    long-Macro-eNB-ID   BIT STRING (SIZE(21))
}

EncryptionAlgorithms ::= BIT STRING (SIZE (16, ...))

EN-DC-ResourceConfiguration ::= SEQUENCE {
    pDCPatSgNB        ENUMERATED {present, not-present, ...},
    mCGresources      ENUMERATED {present, not-present, ...},
    sCGresources      ENUMERATED {present, not-present, ...},
    iE-Extensions     ProtocolExtensionContainer { {EN-DC-ResourceConfigurationExtIEs} } OPTIONAL,
    ...
}

EN-DC-ResourceConfigurationExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

EPLMNs ::= SEQUENCE (SIZE(1..maxnoofEPLMNs)) OF PLMN-Identity

ERABActivityNotifyItemList ::= SEQUENCE (SIZE (0..maxnoofBearers)) OF ERABActivityNotifyItem

ERABActivityNotifyItem ::= SEQUENCE {
    e-RAB-ID          E-RAB-ID,
    activityReport    UserPlaneTrafficActivityReport,
    iE-Extensions     ProtocolExtensionContainer { {ERABActivityNotifyItem-ExtIEs} } OPTIONAL,
    ...
}

ERABActivityNotifyItem-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RAB-ID ::= INTEGER (0..15, ...)

E-RAB-Level-QoS-Parameters ::= SEQUENCE {

```



```

    qCI                QCI,
    allocationAndRetentionPriority AllocationAndRetentionPriority,
    gbrQosInformation  GBR-QosInformation                                OPTIONAL,
    iE-Extensions      ProtocolExtensionContainer { {E-RAB-Level-QoS-Parameters-ExtIEs} } OPTIONAL,
    ...
}

E-RAB-Level-QoS-Parameters-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
-- Extended for introduction of downlink and uplink packet loss rate for enhanced Voice performance -
  { ID id-DownlinkPacketLossRate    CRITICALITY ignore  EXTENSION Packet-LossRate    PRESENCE optional } |
  { ID id-UplinkPacketLossRate      CRITICALITY ignore  EXTENSION Packet-LossRate    PRESENCE optional },
  ...
}

E-RAB-List ::= SEQUENCE (SIZE(1.. maxnoofBearers)) OF ProtocolIE-Single-Container { {E-RAB-ItemIEs} }

E-RAB-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RAB-Item    CRITICALITY ignore    TYPE E-RAB-Item    PRESENCE mandatory },
  ...
}

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

E-RAB-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

E-RABUsageReportList ::= SEQUENCE (SIZE(1..maxnooftimeperiods)) OF ProtocolIE-Single-Container { {E-RABUsageReport-ItemIEs} }

E-RABUsageReport-ItemIEs X2AP-PROTOCOL-IES ::= {
  { ID id-E-RABUsageReport-Item    CRITICALITY ignore    TYPE E-RABUsageReport-Item    PRESENCE mandatory },
  ...
}

E-RABUsageReport-Item ::= SEQUENCE {
  startTimeStamp    OCTET STRING (SIZE(4)),
  endTimeStamp     OCTET STRING (SIZE(4)),
  usageCountUL     INTEGER (0..18446744073709551615),
  usageCountDL     INTEGER (0..18446744073709551615),
  iE-Extensions    ProtocolExtensionContainer { {E-RABUsageReport-Item-ExtIEs} } OPTIONAL,
  ...
}

E-RABUsageReport-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

EUTRA-Mode-Info ::= CHOICE {
  fDD      FDD-Info,

```

```

    tDD      TDD-Info,
    ...
}

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

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

EventType ::= ENUMERATED{
    change-of-serving-cell,
    ...
}

ExpectedUEBehaviour ::= SEQUENCE {
    expectedActivity          ExpectedUEActivityBehaviour OPTIONAL,
    expectedHOInterval       ExpectedHOInterval           OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { {ExpectedUEBehaviour-ExtIEs} } OPTIONAL,
    ...
}

ExpectedUEBehaviour-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ExpectedUEActivityBehaviour ::= SEQUENCE {
    expectedActivityPeriod          ExpectedActivityPeriod          OPTIONAL,
    expectedIdlePeriod              ExpectedIdlePeriod              OPTIONAL,
    sourceofUEActivityBehaviourInformation SourceOfUEActivityBehaviourInformation OPTIONAL,
    iE-Extensions                  ProtocolExtensionContainer { {ExpectedUEActivityBehaviour-ExtIEs} } OPTIONAL,
    ...
}

ExpectedUEActivityBehaviour-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ExpectedActivityPeriod ::= INTEGER (1..30|40|50|60|80|100|120|150|180|181,...)

ExpectedIdlePeriod ::= INTEGER (1..30|40|50|60|80|100|120|150|180|181,...)

ExpectedHOInterval ::= ENUMERATED {
    sec15, sec30, sec60, sec90, sec120, sec180, long-time,
    ...
}

ExtendedULInterferenceOverloadInfo ::= SEQUENCE {
    associatedSubframes          BIT STRING (SIZE (5)),
    extended-ul-InterferenceOverloadIndication UL-InterferenceOverloadIndication,
    iE-Extensions                ProtocolExtensionContainer { {ExtendedULInterferenceOverloadInfo-ExtIEs} } OPTIONAL,
    ...
}

ExtendedULInterferenceOverloadInfo-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```

}

ExtendedBitRate ::= INTEGER (10000000001..4000000000000,...)

-- F

FDD-Info ::= SEQUENCE {
    uL-EARFCN                EARFCN,
    dL-EARFCN                EARFCN,
    uL-Transmission-Bandwidth Transmission-Bandwidth,
    dL-Transmission-Bandwidth Transmission-Bandwidth,
    iE-Extensions            ProtocolExtensionContainer { {FDD-Info-ExtIEs} } OPTIONAL,
    ...
}

FDD-Info-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-UL-EARFCNExtension          CRITICALITY reject EXTENSION EARFCNExtension          PRESENCE optional} |
    { ID id-DL-EARFCNExtension          CRITICALITY reject EXTENSION EARFCNExtension          PRESENCE optional} |
    { ID id-OffsetOfNbiotChannelNumberToDL-EARFCN CRITICALITY reject EXTENSION OffsetOfNbiotChannelNumberToEARFCN PRESENCE optional} |
    { ID id-OffsetOfNbiotChannelNumberToUL-EARFCN CRITICALITY reject EXTENSION OffsetOfNbiotChannelNumberToEARFCN PRESENCE optional} |
    { ID id-NRS-NSSS-PowerOffset        CRITICALITY ignore EXTENSION NRS-NSSS-PowerOffset        PRESENCE optional} |
    { ID id-NSSS-NumOccasionDifferentPrecoder CRITICALITY ignore EXTENSION NSSS-NumOccasionDifferentPrecoder PRESENCE optional} |
    ...
}

FDD-InfoNeighbourServedNRCell-Information ::= SEQUENCE {
    ul-NRFreqInfo            NRFreqInfo,
    dl-NRFreqInfo            NRFreqInfo,
    iE-Extensions            ProtocolExtensionContainer { {FDD-InfoNeighbourServedNRCell-Information-ExtIEs} } OPTIONAL,
    ...
}

FDD-InfoNeighbourServedNRCell-Information-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ForbiddenInterRATs ::= ENUMERATED {
    all,
    geran,
    utran,
    cdma2000,
    ...,
    geranandutran,
    cdma2000andutran
}

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

ForbiddenTAs-Item ::= SEQUENCE {
    pLMN-Identity            PLMN-Identity,
    forbiddenTACs            ForbiddenTACs,
    iE-Extensions            ProtocolExtensionContainer { {ForbiddenTAs-Item-ExtIEs} } OPTIONAL,
    ...
}

```

```

}

ForbiddenTAs-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

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

ForbiddenLAs-Item ::= SEQUENCE {
    pLMN-Identity          PLMN-Identity,
    forbiddenLACs         ForbiddenLACs,
    iE-Extensions         ProtocolExtensionContainer { {ForbiddenLAs-Item-ExtIEs} } OPTIONAL,
    ...
}

ForbiddenLAs-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

Fourframes ::= BIT STRING (SIZE (24))

FreqBandIndicator ::= INTEGER (1..256, ...)

FreqBandIndicatorPriority ::= ENUMERATED {
    not-broadcasted,
    broadcasted,
    ...
}

FreqBandNrItem ::= SEQUENCE {
    freqBandIndicatorNr          INTEGER (1..1024,...),
    supportedSULBandList        SEQUENCE (SIZE(0..maxnoofNrCellBands)) OF SupportedSULFreqBandItem,
    iE-Extensions               ProtocolExtensionContainer { {FreqBandNrItem-ExtIEs} } OPTIONAL,
    ...
}

FreqBandNrItem-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- G

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

```

```

}

GBR-QosInformation-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
-- Extension for maximum bitrate > 10Gbps --
  { ID id-extended-e-RAB-MaximumBitrateDL    CRITICALITY ignore EXTENSION ExtendedBitRate PRESENCE optional} |
  { ID id-extended-e-RAB-MaximumBitrateUL    CRITICALITY ignore EXTENSION ExtendedBitRate PRESENCE optional} |
  { ID id-extended-e-RAB-GuaranteedBitrateDL CRITICALITY ignore EXTENSION ExtendedBitRate PRESENCE optional} |
  { ID id-extended-e-RAB-GuaranteedBitrateUL CRITICALITY ignore EXTENSION ExtendedBitRate PRESENCE optional},
  ...
}

GlobalENB-ID ::= SEQUENCE {
  pLMN-Identity    PLMN-Identity,
  eNB-ID          ENB-ID,
  iE-Extensions    ProtocolExtensionContainer { {GlobalENB-ID-ExtIEs} } OPTIONAL,
  ...
}

GlobalENB-ID-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

GlobalGNB-ID ::= SEQUENCE {
  pLMN-Identity    PLMN-Identity,
  gNB-ID          GNB-ID,
  iE-Extensions    ProtocolExtensionContainer { {GlobalGNB-ID-ExtIEs} } OPTIONAL,
  ...
}

GlobalGNB-ID-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

GNBOverloadInformation ::= ENUMERATED {overloaded, not-overloaded, ...}

GTPtunnelEndpoint ::= SEQUENCE {
  transportLayerAddress    TransportLayerAddress,
  gTP-TEID                GTP-TEI,
  iE-Extensions            ProtocolExtensionContainer { {GTPtunnelEndpoint-ExtIEs} } OPTIONAL,
  ...
}

GTPtunnelEndpoint-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

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

GUGroupIDList ::= SEQUENCE (SIZE (1..maxPools)) OF GU-Group-ID

GU-Group-ID ::= SEQUENCE {
  pLMN-Identity    PLMN-Identity,
  mME-Group-ID     MME-Group-ID,
}

```

```

    iE-Extensions      ProtocolExtensionContainer { {GU-Group-ID-ExtIEs} } OPTIONAL,
    ...
}

GU-Group-ID-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

GUMMEI                ::= SEQUENCE {
    gU-Group-ID        GU-Group-ID,
    mME-Code           MME-Code,
    iE-Extensions      ProtocolExtensionContainer { {GUMMEI-ExtIEs} } OPTIONAL,
    ...
}

GUMMEI-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

GNB-ID ::= CHOICE {
    gNB-ID BIT STRING (SIZE (22..32)),
    ...
}

-- H

HandoverReportType ::= ENUMERATED {
    hoTooEarly,
    hoToWrongCell,
    ...,
    interRATpingpong
}

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

HandoverRestrictionList-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-NRrestrictioninEPSasSecondaryRAT          CRITICALITY ignore EXTENSION NRrestrictioninEPSasSecondaryRAT          PRESENCE optional}|
    { ID id-CNTypeRestrictions                       CRITICALITY ignore EXTENSION CNTypeRestrictions                       PRESENCE optional}|
    { ID id-NRrestrictionin5GS                       CRITICALITY ignore EXTENSION NRrestrictionin5GS                       PRESENCE optional}|
    { ID id-LastNG-RANPLMNIdentity                   CRITICALITY ignore EXTENSION PLMN-Identity                             PRESENCE optional},
    ...
}

```

```
HFN ::= INTEGER (0..1048575)

HFNModified ::= INTEGER (0..131071)

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

HWLoadIndicator ::= SEQUENCE {
    dLHWLoadIndicator      LoadIndicator,
    uLHWLoadIndicator      LoadIndicator,
    iE-Extensions          ProtocolExtensionContainer { {HWLoadIndicator-ExtIEs} } OPTIONAL,
    ...
}

HWLoadIndicator-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- I

IntegrityProtectionAlgorithms ::= BIT STRING (SIZE (16, ...))

InterfaceInstanceIndication ::= INTEGER (0..255, ...)

InterfacesToTrace ::= BIT STRING (SIZE (8))

InvokeIndication ::= ENUMERATED{
    abs-information,
    ...,
    naics-information-start,
    naics-information-stop
}

-- J
-- K

Key-eNodeB-Star ::= BIT STRING (SIZE(256))

-- L

LAC          ::= OCTET STRING (SIZE (2)) --(EXCEPT ('0000'H|'FFFE'H))

LastVisitedCell-Item ::= CHOICE {
    e-UTRAN-Cell      LastVisitedEUTRANCellInformation,
    uTRAN-Cell        LastVisitedUTRANCellInformation,
    gERAN-Cell        LastVisitedGERANCellInformation,
    ...,
    nG-RAN-Cell       LastVisitedNGRANCellInformation
}

LastVisitedEUTRANCellInformation ::= SEQUENCE {
    global-Cell-ID      ECGI,
    cellType            CellType,
    time-UE-StayedInCell Time-UE-StayedInCell,
```

```

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

LastVisitedEUTRANCellInformation-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
-- Extension for Rel-11 to support enhanced granularity for time UE stayed in cell --
  { ID id-Time-UE-StayedInCell-EnhancedGranularity  CRITICALITY ignore  EXTENSION Time-UE-StayedInCell-EnhancedGranularity  PRESENCE optional}|
  { ID id-HO-cause  CRITICALITY ignore  EXTENSION Cause  PRESENCE optional},
  ...
}

LastVisitedGERANCellInformation ::= CHOICE {
  undefined          NULL,
  ...
}

LastVisitedNGRANCellInformation ::= OCTET STRING

LastVisitedUTRANCellInformation ::= OCTET STRING

LCID ::= INTEGER(1..32, ...)

LHN-ID ::= OCTET STRING(SIZE (32..256))

Links-to-log ::= ENUMERATED {uplink, downlink, both-uplink-and-downlink, ...}

LoadIndicator ::= ENUMERATED {
  lowLoad,
  mediumLoad,
  highLoad,
  overLoad,
  ...
}

LocationInformationSgNB ::= SEQUENCE {
  pSCell-id          NRCGI,
  iE-Extensions      ProtocolExtensionContainer { {LocationInformationSgNB-ExtIEs} } OPTIONAL,
  ...
}

LocationInformationSgNB-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

LocationInformationSgNBReporting ::= ENUMERATED {
  pSCell,
  ...
}

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

```



```

}
LocationReportingInformation-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}
-- M
M1PeriodicReporting ::= SEQUENCE {
  reportInterval          ReportIntervalMDT,
  reportAmount            ReportAmountMDT,
  iE-Extensions           ProtocolExtensionContainer { {M1PeriodicReporting-ExtIEs} } OPTIONAL,
  ...
}
M1PeriodicReporting-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}
M1ReportingTrigger ::= ENUMERATED {
  periodic,
  a2eventtriggered,
  ...,
  a2eventtriggered-periodic
}
M1ThresholdEventA2 ::= SEQUENCE {
  measurementThreshold    MeasurementThresholdA2,
  iE-Extensions           ProtocolExtensionContainer { {M1ThresholdEventA2-ExtIEs} } OPTIONAL,
  ...
}
M1ThresholdEventA2-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}
M3Configuration ::= SEQUENCE {
  m3period                M3period,
  iE-Extensions           ProtocolExtensionContainer { {M3Configuration-ExtIEs} } OPTIONAL,
  ...
}
M3Configuration-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}
M3period ::= ENUMERATED {ms100, ms1000, ms10000, ... }
M4Configuration ::= SEQUENCE {
  m4period                M4period,
  m4-links-to-log         Links-to-log,
  iE-Extensions           ProtocolExtensionContainer { {M4Configuration-ExtIEs} } OPTIONAL,
  ...
}

```

```
M4Configuration-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

M4period ::= ENUMERATED {ms1024, ms2048, ms5120, ms10240, min1, ... }

M5Configuration ::= SEQUENCE {
    m5period          M5period,
    m5-links-to-log   Links-to-log,
    iE-Extensions     ProtocolExtensionContainer { {M5Configuration-ExtIEs} } OPTIONAL,
    ...
}

M5Configuration-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

M5period ::= ENUMERATED {ms1024, ms2048, ms5120, ms10240, min1, ... }

M6Configuration ::= SEQUENCE {
    m6report-interval M6report-interval,
    m6delay-threshold M6delay-threshold OPTIONAL,
    -- This IE shall be present if the M6 Links to log IE is set to "uplink" or to "both-uplink-and-downlink" --
    m6-links-to-log   Links-to-log,
    iE-Extensions     ProtocolExtensionContainer { {M6Configuration-ExtIEs} } OPTIONAL,
    ...
}

M6Configuration-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

M6report-interval ::= ENUMERATED { ms1024, ms2048, ms5120, ms10240, ... }

M6delay-threshold ::= ENUMERATED { ms30, ms40, ms50, ms60, ms70, ms80, ms90, ms100, ms150, ms300, ms500, ms750, ... }

M7Configuration ::= SEQUENCE {
    m7period          M7period,
    m7-links-to-log   Links-to-log,
    iE-Extensions     ProtocolExtensionContainer { {M7Configuration-ExtIEs} } OPTIONAL,
    ...
}

M7Configuration-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

M7period ::= INTEGER(1..60, ...)

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

ManagementBasedMDTAllowed ::= ENUMERATED {allowed, ...}
```

```

Masked-IMEISV ::= BIT STRING (SIZE (64))

MDT-Activation ::= ENUMERATED {
    immediate-MDT-only,
    immediate-MDT-and-Trace,
    ...
}

MDT-Configuration ::= SEQUENCE {
    mdt-Activation MDT-Activation,
    areaScopeOfMDT AreaScopeOfMDT,
    measurementsToActivate MeasurementsToActivate,
    mlreportingTrigger MlReportingTrigger,
    mlthresholdeventA2 MlThresholdEventA2 OPTIONAL,
    -- Included in case of event-triggered, or event-triggered periodic reporting for measurement M1
    mlperiodicReporting MlPeriodicReporting OPTIONAL,
    -- Included in case of periodic, or event-triggered periodic reporting for measurement M1
    iE-Extensions ProtocolExtensionContainer { {MDT-Configuration-ExtIEs} } OPTIONAL,
    ...
}

MDT-Configuration-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    {ID id-M3Configuration CRITICALITY ignore EXTENSION M3Configuration PRESENCE conditional}|
    {ID id-M4Configuration CRITICALITY ignore EXTENSION M4Configuration PRESENCE conditional}|
    {ID id-M5Configuration CRITICALITY ignore EXTENSION M5Configuration PRESENCE conditional}|
    {ID id-MDT-Location-Info CRITICALITY ignore EXTENSION MDT-Location-Info PRESENCE optional}|
    {ID id-SignallingBasedMDTPLMNList CRITICALITY ignore EXTENSION MDTPLMNList PRESENCE optional}|
    {ID id-M6Configuration CRITICALITY ignore EXTENSION M6Configuration PRESENCE conditional}|
    {ID id-M7Configuration CRITICALITY ignore EXTENSION M7Configuration PRESENCE conditional}|
    { ID id-BluetoothMeasurementConfiguration CRITICALITY ignore EXTENSION BluetoothMeasurementConfiguration PRESENCE optional}|
    { ID id-WLANMeasurementConfiguration CRITICALITY ignore EXTENSION WLANMeasurementConfiguration PRESENCE optional},
    ...
}

MDTPLMNList ::= SEQUENCE (SIZE(1..maxnoofMDTPLMNs)) OF PLMN-Identity

MDT-Location-Info ::= BIT STRING (SIZE (8))

Measurement-ID ::= INTEGER (1..4095, ...)

MeasurementsToActivate ::= BIT STRING (SIZE (8))

MeasurementThresholdA2 ::= CHOICE {
    threshold-RSRP Threshold-RSRP,
    threshold-RSRQ Threshold-RSRQ,
    ...
}

MeNBCoordinationAssistanceInformation ::= ENUMERATED{
    coordination-not-required,
    ...
}

```

```

MeNBResourceCoordinationInformation ::= SEQUENCE {
    eUTRA-Cell-ID          ECGI,
    uLCoordinationInformation BIT STRING (SIZE(6..4400, ...)),
    dLCoordinationInformation BIT STRING (SIZE(6..4400, ...)) OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {MeNBResourceCoordinationInformationExtIEs} } OPTIONAL,
    ...
}

MeNBResourceCoordinationInformationExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-NRCGI          CRITICALITY ignore EXTENSION NRCGI PRESENCE optional}|
    { ID id-MeNBCoordinationAssistanceInformation CRITICALITY reject EXTENSION MeNBCoordinationAssistanceInformation PRESENCE optional},
    ...
}

MeNBtoSeNBContainer ::= OCTET STRING

MME-Group-ID ::= OCTET STRING (SIZE (2))

MME-Code ::= OCTET STRING (SIZE (1))

MBMS-Service-Area-Identity-List ::= SEQUENCE (SIZE(1.. maxnoofMBMSServiceAreaIdentities)) OF MBMS-Service-Area-Identity

MBMS-Service-Area-Identity ::= OCTET STRING (SIZE (2))

MBSFN-Subframe-Infolist ::= SEQUENCE (SIZE(1.. maxnoofMBSFN)) OF MBSFN-Subframe-Info

MBSFN-Subframe-Info ::= SEQUENCE {
    radioframeAllocationPeriod RadioframeAllocationPeriod,
    radioframeAllocationOffset RadioframeAllocationOffset,
    subframeAllocation          SubframeAllocation,
    iE-Extensions              ProtocolExtensionContainer { {MBSFN-Subframe-Info-ExtIEs} } OPTIONAL,
    ...
}

MBSFN-Subframe-Info-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

MobilityParametersModificationRange ::= SEQUENCE {
    handoverTriggerChangeLowerLimit INTEGER (-20..20),
    handoverTriggerChangeUpperLimit INTEGER (-20..20),
    ...
}

MobilityParametersInformation ::= SEQUENCE {
    handoverTriggerChange INTEGER (-20..20),
    ...
}

MultibandInfoList ::= SEQUENCE (SIZE(1..maxnoofBands)) OF BandInfo

BandInfo ::= SEQUENCE {
    freqBandIndicator FreqBandIndicator,

```

```

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

BandInfo-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

MeNBtoSgNBContainer ::= OCTET STRING

SplitSRBs ::= ENUMERATED {srb1, srb2, srb1and2, ...}

SplitSRB ::= SEQUENCE {
    rrcContainer           RRCContainer           OPTIONAL,
    srbType                SRBType,
    deliveryStatus         DeliveryStatus        OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {SplitSRB-ExtIEs} } OPTIONAL,
    ...
}

SplitSRB-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- N

NBIoT-UL-DL-AlignmentOffset ::= ENUMERATED {
    khz-7dot5,
    khz0,
    khz7dot5,
    ...
}

Neighbour-Information ::= SEQUENCE (SIZE (0..maxnoofNeighbours)) OF SEQUENCE {
    eCGI                   ECGI,
    pCI                     PCI,
    eARFCN                  EARFCN,
    iE-Extensions          ProtocolExtensionContainer { {Neighbour-Information-ExtIEs} } OPTIONAL,
    ...
}

Neighbour-Information-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-NeighbourTAC      CRITICALITY ignore EXTENSION TAC      PRESENCE optional}|
    { ID id-eARFCNExtension   CRITICALITY reject EXTENSION EARFCNExtension PRESENCE optional},
    ...
}

NextHopChainingCount ::= INTEGER (0..7)

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

Number-of-Antennaports ::= ENUMERATED {
    an1,
    an2,

```

```

    an4,
    ...
}

NRFreqInfo ::= SEQUENCE{
    nRARFCN          INTEGER (0.. 3279165),
    freqBandListNr  SEQUENCE (SIZE(1..maxnoofNrCellBands)) OF FreqBandNrItem,
    sULInformation  SULInformation          OPTIONAL,
    iE-Extensions   ProtocolExtensionContainer { {NRFreqInfo-ExtIEs} } OPTIONAL,
    ...
}

NRFreqInfo-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

NRCellIdentifier ::= BIT STRING (SIZE (36))

NR CGI ::= SEQUENCE {
    pLMN-Identity          PLMN-Identity,
    nrCellIdentifier       NRCellIdentifier,
    iE-Extensions          ProtocolExtensionContainer { {NR CGI-ExtIEs} } OPTIONAL,
    ...
}

NR CGI-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

NRNeighbour-Information ::= SEQUENCE (SIZE (1.. maxofNRNeighbours)) OF SEQUENCE {
    nrpCI          NRPCI,
    nrCellID       NR CGI,
    fiveGS-TAC     FiveGS-TAC  OPTIONAL,
    configured-TAC TAC          OPTIONAL,
    measurementTimingConfiguration OCTET STRING,
    nrNeighbourModeInfo CHOICE {
        fdd      FDD-InfoNeighbourServedNRCell-Information,
        tdd      TDD-InfoNeighbourServedNRCell-Information,
        ...
    },
    iE-Extensions ProtocolExtensionContainer { {NRNeighbour-Information-ExtIEs} } OPTIONAL,
    ...
}

NRNeighbour-Information-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

NRPCI ::= INTEGER (0..1007)

NRrestrictioninEPSasSecondaryRAT ::= ENUMERATED {
    nrrestrictedinEPSasSecondaryRAT,
    ...
}

```

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

NREncryptionAlgorithms ::= BIT STRING (SIZE (16,...))
NRintegrityProtectionAlgorithms ::= BIT STRING (SIZE (16,...))

NR-TxBW ::= SEQUENCE {
    nRSCS    NRSCS,
    nNRNRB  NRNRB,
    iE-Extensions          ProtocolExtensionContainer { {NR-TxBW-ExtIEs} } OPTIONAL,
    ...
}

NR-TxBW-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

NRNRB ::= ENUMERATED { nrb11, nrb18, nrb24, nrb25, nrb31, nrb32, nrb38, nrb51, nrb52, nrb65, nrb66, nrb78, nrb79, nrb93, nrb106, nrb107, nrb121,
nrb132, nrb133, nrb135, nrb160, nrb162, nrb189, nrb216, nrb217, nrb245, nrb264, nrb270, nrb273, ...}

NRSCS ::= ENUMERATED { scs15, scs30, scs60, scs120, ...}

NRS-NSSS-PowerOffset ::= ENUMERATED { minusThree, zero, three, ...}

FiveGS-TAC ::= OCTET STRING (SIZE (3))

NRUeReport ::= SEQUENCE {
    uENRMeasurements          RRCContainer,
    iE-Extensions          ProtocolExtensionContainer { {NRUeReport-ExtIEs} } OPTIONAL,
    ...
}

NRUeReport-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

NRUESecurityCapabilities ::= SEQUENCE {
    nREncryptionAlgorithms    NREncryptionAlgorithms,
    nRintegrityProtectionAlgorithms    NRintegrityProtectionAlgorithms,
    iE-Extensions          ProtocolExtensionContainer { {NRUESecurityCapabilities-ExtIEs} } OPTIONAL,
    ...
}

NRUESecurityCapabilities-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

NSSS-NumOccasionDifferentPrecoder ::= ENUMERATED { two, four, eight, ...}

-- O
```

```
OffsetOfNbiotChannelNumberToEARFCN ::= ENUMERATED {
    minusTen,
    minusNine,
    minusEight,
    minusSeven,
    minusSix,
    minusFive,
    minusFour,
    minusThree,
    minusTwo,
    minusOne,
    minusZeroDotFive,
    zero,
    one,
    two,
    three,
    four,
    five,
    six,
    seven,
    eight,
    nine,
    ...,
    minusEightDotFive,
    minusFourDotFive,
    threeDotFive,
    sevenDotFive
}
```

```
Oneframe ::= BIT STRING (SIZE (6))
```

```
-- P
```

```
Packet-LossRate ::= INTEGER(0..1000)
```

```
PA-Values ::= ENUMERATED {
    dB-6,
    dB-4dot77,
    dB-3,
    dB-1dot77,
    dB0,
    dB1,
    dB2,
    dB3,
    ...
}
```

```
PDCPChangeIndication ::= ENUMERATED {s-KgNB-update-required, pdcp-data-recovery-required,...}
```

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

```
PDCP-SNExtended ::= INTEGER (0..32767)
```



```

PDCP-SNlength18 ::= INTEGER (0..262143)

PDCPSnLength    ::= ENUMERATED {twelve-bits,eighteen-bits,...}

PCI ::= INTEGER (0..503, ...)

PLMN-Identity ::= OCTET STRING (SIZE(3))

Port-Number ::= OCTET STRING (SIZE (2))

PRACH-Configuration ::= SEQUENCE {
    rootSequenceIndex          INTEGER (0..837),
    zeroCorrelationIndex       INTEGER (0..15),
    highSpeedFlag              BOOLEAN,
    prach-FreqOffset            INTEGER (0..94),
    prach-ConfigIndex           INTEGER (0..63)    OPTIONAL, -- present for TDD --
    iE-Extensions               ProtocolExtensionContainer { {PRACH-Configuration-ExtIEs} } OPTIONAL,
    ...
}

PLMNAreaBasedQMC ::= SEQUENCE {
    plmnListforQMC             PLMNListforQMC,
    iE-Extensions              ProtocolExtensionContainer { {PLMNAreaBasedQMC-ExtIEs} } OPTIONAL,
    ...
}

PLMNAreaBasedQMC-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

PLMNListforQMC ::= SEQUENCE (SIZE(1..maxnoofPLMNforQMC)) OF PLMN-Identity

PRACH-Configuration-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

Pre-emptionCapability ::= ENUMERATED {
    shall-not-trigger-pre-emption,
    may-trigger-pre-emption
}

Pre-emptionVulnerability ::= ENUMERATED {
    not-pre-emptable,
    pre-emptable
}

PriorityLevel          ::= INTEGER { spare (0), highest (1), lowest (14), no-priority (15) } (0..15)

ProSeAuthorized ::= SEQUENCE {
    proSeDirectDiscovery          ProSeDirectDiscovery          OPTIONAL,
    proSeDirectCommunication      ProSeDirectCommunication      OPTIONAL,
    iE-Extensions                 ProtocolExtensionContainer { {ProSeAuthorized-ExtIEs} } OPTIONAL,
    ...
}

```

```

}

ProSeAuthorized-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-ProSeUEtoNetworkRelaying    CRITICALITY ignore  EXTENSION ProSeUEtoNetworkRelaying  PRESENCE optional},
  ...
}

ProSeDirectDiscovery ::= ENUMERATED {
  authorized,
  not-authorized,
  ...
}

ProSeDirectCommunication ::= ENUMERATED {
  authorized,
  not-authorized,
  ...
}

ProSeUEtoNetworkRelaying ::= ENUMERATED {
  authorized,
  not-authorized,
  ...
}

ProtectedEUTRAResourceIndication ::= SEQUENCE {
  activationSFN                INTEGER (0..1023),
  protectedResourceList        ProtectedResourceList,
  mBSFNControlRegionLength     INTEGER (0..3) OPTIONAL,
  pDCCHRegionLength            INTEGER (1..3) OPTIONAL,
  iE-Extensions                ProtocolExtensionContainer { {ProtectedEUTRAResourceIndication-ExtIEs} } OPTIONAL,
  ...
}

ProtectedEUTRAResourceIndication-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
} -- Rapporteur: missing extension --

ProtectedFootprintTimePattern ::= SEQUENCE {
  protectedFootprintTimePeriodicity    INTEGER (1..320, ...),
  protectedFootprintStartTime           INTEGER (1..20, ...),
  iE-Extensions                         ProtocolExtensionContainer { {ProtectedFootprintTimePattern-ExtIEs} } OPTIONAL,
  ...
}

ProtectedFootprintTimePattern-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

ProtectedResourceList ::= SEQUENCE (SIZE(1.. maxnoofProtectedResourcePatterns)) OF ProtectedResourceList-Item

ProtectedResourceList-Item ::= SEQUENCE {
  resourceType                ResourceType,

```

```

    intraPRBProtectedResourceFootprint    BIT STRING (SIZE(84, ...)),
    protectedFootprintFrequencyPattern    BIT STRING (SIZE(6..110, ...)),
    protectedFootprintTimePattern          ProtectedFootprintTimePattern,
    iE-Extensions                          ProtocolExtensionContainer { {ProtectedResourceList-Item-ExtIEs} } OPTIONAL,
    ...
}

ProtectedResourceList-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- Q

QCI ::= INTEGER (0..255)

-- R

RadioframeAllocationOffset ::= INTEGER (0..7, ...)

RadioframeAllocationPeriod ::= ENUMERATED{
    n1,
    n2,
    n4,
    n8,
    n16,
    n32,
    ...
}

RadioResourceStatus ::= SEQUENCE {
    dL-GBR-PRB-usage          DL-GBR-PRB-usage,
    uL-GBR-PRB-usage          UL-GBR-PRB-usage,
    dL-non-GBR-PRB-usage      DL-non-GBR-PRB-usage,
    uL-non-GBR-PRB-usage      UL-non-GBR-PRB-usage,
    dL-Total-PRB-usage        DL-Total-PRB-usage,
    uL-Total-PRB-usage        UL-Total-PRB-usage,
    iE-Extensions              ProtocolExtensionContainer { {RadioResourceStatus-ExtIEs} } OPTIONAL,
    ...
}

RadioResourceStatus-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    {ID id-DL-scheduling-PDCCH-CCE-usage      CRITICALITY ignore EXTENSION DL-scheduling-PDCCH-CCE-usage      PRESENCE optional}|
    {ID id-UL-scheduling-PDCCH-CCE-usage      CRITICALITY ignore EXTENSION UL-scheduling-PDCCH-CCE-usage      PRESENCE optional},
    ...
}

ReceiveStatusOfULPDCPSDUs ::= BIT STRING (SIZE(4096))

ReceiveStatusOfULPDCPSDUsExtended ::= BIT STRING (SIZE(1..16384))

ReceiveStatusOfULPDCPSDUsPDCP-SNlength18 ::= BIT STRING (SIZE(1..131072))

Reestablishment-Indication ::= ENUMERATED {

```

```

    reestablished,
    ...
}

Registration-Request ::= ENUMERATED {
    start,
    stop,
    ...,
    partial-stop,
    add
}

RelativeNarrowbandTxPower ::= SEQUENCE {
    rNTP-PerPRB                BIT STRING (SIZE(6..110, ...)),
    rNTP-Threshold             RNTP-Threshold,
    numberOfCellSpecificAntennaPorts  ENUMERATED {one, two, four, ...},
    p-B                        INTEGER (0..3,...),
    pDCCCH-InterferenceImpact  INTEGER (0..4,...),
    iE-Extensions             ProtocolExtensionContainer { {RelativeNarrowbandTxPower-ExtIEs} } OPTIONAL,
    ...
}

RelativeNarrowbandTxPower-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-enhancedRNTP    CRITICALITY ignore  EXTENSION EnhancedRNTP    PRESENCE optional },
    ...
}

ReplacingCellsList ::= SEQUENCE (SIZE(0.. maxCellineNB)) OF ReplacingCellsList-Item

ReplacingCellsList-Item ::= SEQUENCE {
    eCGI                ECGI,
    ...
}

ReportAmountMDT ::= ENUMERATED{r1, r2, r4, r8, r16, r32, r64, rinfinity}

ReportArea ::= ENUMERATED{
    ecgi,
    ...
}

ReportCharacteristics ::= BIT STRING (SIZE (32))

ReportingPeriodicityCSIR ::= ENUMERATED {
    ms5,
    ms10,
    ms20,
    ms40,
    ms80,
    ...
}

ReportingPeriodicityRSRPMR ::= ENUMERATED {

```

```
one-hundred-20-ms,  
two-hundred-40-ms,  
four-hundred-80-ms,  
six-hundred-40-ms,  
...  
}  
  
ReportIntervalMDT ::= ENUMERATED {ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, min1, min6, min12, min30, min60}  
  
ReservedSubframePattern ::= SEQUENCE {  
    subframeType          SubframeType,  
    reservedSubframePattern BIT STRING (SIZE(10..160)),  
    mBSFNControlRegionLength INTEGER (0..3),  
    iE-Extensions        ProtocolExtensionContainer { {ReservedSubframePattern-ExtIEs} } OPTIONAL,  
    ...  
}  
  
ReservedSubframePattern-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {  
    ...  
}  
  
ResourceType ::= ENUMERATED {  
    downlinknonCRS,  
    CRS,  
    uplink,  
    ...  
}  
  
ResumeID ::= CHOICE {  
    non-truncated BIT STRING(SIZE(40)),  
    truncated BIT STRING(SIZE(24)),  
    ...  
}  
  
RLCMode ::= ENUMERATED {  
    rlc-am,  
    rlc-um-bidirectional,  
    rlc-um-unidirectional-ul,  
    rlc-um-unidirectional-dl,  
    ...  
}  
  
RLC-Status ::= SEQUENCE {  
    reestablishment-Indication Reestablishment-Indication,  
    iE-Extensions        ProtocolExtensionContainer { {RLC-Status-ExtIEs} } OPTIONAL,  
    ...  
}  
  
RLC-Status-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {  
    ...  
}  
  
RNTP-Threshold ::= ENUMERATED {  
    minusInfinity,  
    ...  
}
```

```
    minusEleven,
    minusTen,
    minusNine,
    minusEight,
    minusSeven,
    minusSix,
    minusFive,
    minusFour,
    minusThree,
    minusTwo,
    minusOne,
    zero,
    one,
    two,
    three,
    ...
}

RRC-Config-Ind ::= ENUMERATED {
    full-config,
    delta-config,
    ...
}

RRC-Context ::= OCTET STRING

RRCConnReestabIndicator ::= ENUMERATED {
    reconfigurationFailure, handoverFailure, otherFailure, ...
}
-- The values correspond to the values of ReestablishmentCause reported from the UE in the RRCConnectionReestablishmentRequest, as defined in TS
36.331 [9]

RRCConnSetupIndicator ::= ENUMERATED {
    rrcConnSetup,
    ...
}

RSRPMeasurementResult ::= SEQUENCE (SIZE(1..maxCellReport)) OF
    SEQUENCE {
        rSRPCellID                ECGI,
        rSRPMeasured                INTEGER (0..97, ...),
        iE-Extensions                ProtocolExtensionContainer { {RSRPMeasurementResult-ExtIEs} } OPTIONAL,
        ...
    }

RSRPMeasurementResult-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

RSRPMRList ::= SEQUENCE (SIZE(1..maxUEReport)) OF
    SEQUENCE {
        rSRPMeasurementResult        RSRPMeasurementResult,
        iE-Extensions                ProtocolExtensionContainer { {RSRPMRList-ExtIEs} } OPTIONAL,
        ...
    }
```

```

    }
RSRPMRLList-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-UEID    CRITICALITY ignore  EXTENSION UEID    PRESENCE optional},
    ...
}

RRCContainer ::= OCTET STRING

-- S

S1TNNLLoadIndicator ::= SEQUENCE {
    dLS1TNNLLoadIndicator    LoadIndicator,
    uLS1TNNLLoadIndicator    LoadIndicator,
    iE-Extensions            ProtocolExtensionContainer { {S1TNNLLoadIndicator-ExtIEs} } OPTIONAL,
    ...
}

S1TNNLLoadIndicator-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

SCGChangeIndication ::= ENUMERATED {pDCPCountWrapAround, pSCellChange, other, ...}

SecondaryRATUsageReportList ::= SEQUENCE (SIZE(1..maxnoofBearers)) OF ProtocolIE-Single-Container {{SecondaryRATUsageReport-ItemIEs}}

SecondaryRATUsageReport-ItemIEs X2AP-PROTOCOL-IES ::= {
    { ID id-SecondaryRATUsageReport-Item    CRITICALITY reject  TYPE SecondaryRATUsageReport-Item    PRESENCE mandatory},
    ...
}

SecondaryRATUsageReport-Item ::= SEQUENCE {
    e-RAB-ID                E-RAB-ID,
    secondaryRATType        ENUMERATED {nr, ...},
    e-RABUsageReportList    E-RABUsageReportList,
    iE-Extensions            ProtocolExtensionContainer { {SecondaryRATUsageReport-Item-ExtIEs} } OPTIONAL,
    ...
}

SecondaryRATUsageReport-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

SenBSecurityKey ::= BIT STRING (SIZE(256))

SenBtoMeNBContainer ::= OCTET STRING

ServedCells ::= SEQUENCE (SIZE (1.. maxCelllineNB)) OF SEQUENCE {
    servedCellInfo          ServedCell-Information,
    neighbour-Info          Neighbour-Information    OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { {ServedCell-ExtIEs} } OPTIONAL,
    ...
}

```

```

ServedCell-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-NRNeighbourInfoToAdd          CRITICALITY ignore  EXTENSION NRNeighbour-Information          PRESENCE optional },
  ...
}

ServedCell-Information ::= SEQUENCE {
  pCI          PCI,
  cellId       ECGI,
  tAC          TAC,
  broadcastPLMNs BroadcastPLMNs-Item,
  eUTRA-Mode-Info EUTRA-Mode-Info,
  iE-Extensions ProtocolExtensionContainer { {ServedCell-Information-ExtIEs} } OPTIONAL,
  ...
}

ServedCell-Information-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-Number-of-Antennaports          CRITICALITY ignore  EXTENSION Number-of-Antennaports          PRESENCE optional}|
  { ID id-PRACH-Configuration            CRITICALITY ignore  EXTENSION PRACH-Configuration            PRESENCE optional}|
  { ID id-MBSFN-Subframe-Info            CRITICALITY ignore  EXTENSION MBSFN-Subframe-Infolist        PRESENCE optional}|
  { ID id-CSG-Id                         CRITICALITY ignore  EXTENSION CSG-Id                         PRESENCE optional}|
  { ID id-MBMS-Service-Area-List          CRITICALITY ignore  EXTENSION MBMS-Service-Area-Identity-List PRESENCE optional}|
  { ID id-MultibandInfoList               CRITICALITY ignore  EXTENSION MultibandInfoList             PRESENCE optional}|
  { ID id-FreqBandIndicatorPriority        CRITICALITY ignore  EXTENSION FreqBandIndicatorPriority      PRESENCE optional}|
  { ID id-BandwidthReducedSI              CRITICALITY ignore  EXTENSION BandwidthReducedSI            PRESENCE optional}|
  { ID id-ProtectedEUTRAResourceIndication CRITICALITY ignore  EXTENSION ProtectedEUTRAResourceIndication PRESENCE optional}|
  { ID id-BPLMN-ID-Info-EUTRA            CRITICALITY ignore  EXTENSION BPLMN-ID-Info-EUTRA          PRESENCE optional},
  ...
}

ServiceType ::= ENUMERATED{
  qMC-for-streaming-service,
  qMC-for-MTISI-service,
  ...
}

SgNBCoordinationAssistanceInformation ::= ENUMERATED{
  coordination-not-required,
  ...
}

SgNBResourceCoordinationInformation ::= SEQUENCE {
  nR-CGI          NRCGI,
  uLCoordinationInformation BIT STRING (SIZE(6..4400, ...)),
  dLCoordinationInformation BIT STRING (SIZE(6..4400, ...)) OPTIONAL,
  iE-Extensions   ProtocolExtensionContainer { {SgNBResourceCoordinationInformationExtIEs} } OPTIONAL,
  ...
}

SgNBResourceCoordinationInformationExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  { ID id-ECGI          CRITICALITY ignore  EXTENSION ECGI          PRESENCE optional}|
  { ID id-SgNBCoordinationAssistanceInformation CRITICALITY reject  EXTENSION SgNBCoordinationAssistanceInformation PRESENCE optional},
  ...
}

```



```
SgNB-UE-X2AP-ID ::= INTEGER (0..4294967295)

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

SharedResourceType ::= CHOICE{
    uLOnlySharing          ULOnlySharing,
    uLandDLSharing        ULandDLSharing,
    ...
}

ShortMAC-I ::= BIT STRING (SIZE(16))

SgNB-Addition-Trigger-Ind ::= ENUMERATED {
    sn-change,
    inter-eNB-HO,
    intra-eNB-HO,
    ...
}

SourceOfUEActivityBehaviourInformation ::= ENUMERATED {
    subscription-information,
    statistics,
    ...
}

SpecialSubframe-Info ::= SEQUENCE {
    specialSubframePatterns    SpecialSubframePatterns,
    cyclicPrefixDL             CyclicPrefixDL,
    cyclicPrefixUL             CyclicPrefixUL,
    iE-Extensions              ProtocolExtensionContainer { {SpecialSubframe-Info-ExtIEs} } OPTIONAL,
    ...
}

SpecialSubframe-Info-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

SpecialSubframePatterns ::= ENUMERATED {
    ssp0,
    ssp1,
    ssp2,
    ssp3,
    ssp4,
    ssp5,
    ssp6,
    ssp7,
    ssp8,
    ...
}
```

```

SpectrumSharingGroupID ::= INTEGER (1..maxCellNB)

SubbandCQI ::= SEQUENCE {
    subbandCQICodeword0          SubbandCQICodeword0,
    subbandCQICodeword1          SubbandCQICodeword1 OPTIONAL,
    iE-Extensions                ProtocolExtensionContainer { {SubbandCQI-ExtIEs} } OPTIONAL,
    ...
}

Subscription-Based-UE-DifferentiationInfo ::= SEQUENCE {
    periodicCommunicationIndicator ENUMERATED {periodically, ondemand, ...} OPTIONAL,
    periodicTime                   INTEGER (1..3600, ...) OPTIONAL,
    scheduledCommunicationTime      ScheduledCommunicationTime OPTIONAL,
    stationaryIndication            ENUMERATED {stationary, mobile, ...} OPTIONAL,
    trafficProfile                  ENUMERATED {single-packet, dual-packets, multiple-packets, ...} OPTIONAL,
    batteryIndication              ENUMERATED {battery-powered, battery-powered-not-rechargeable-or-replaceable, not-battery-powered, ...}
    OPTIONAL,
    iE-Extensions                  ProtocolExtensionContainer { { Subscription-Based-UE-DifferentiationInfo-ExtIEs} } OPTIONAL,
    ...
}

Subscription-Based-UE-DifferentiationInfo-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ScheduledCommunicationTime ::= SEQUENCE {
    dayOfWeek                       BIT STRING (SIZE(7)) OPTIONAL,
    timeOfDayStart                   INTEGER (0..86399, ...) OPTIONAL,
    timeOfDayEnd                     INTEGER (0..86399, ...) OPTIONAL,
    iE-Extensions                    ProtocolExtensionContainer { { ScheduledCommunicationTime-ExtIEs} } OPTIONAL,
    ...
}

ScheduledCommunicationTime-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

SRVCCOperationPossible ::= ENUMERATED {
    possible,
    ...
}

SubbandCQI-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

SubbandCQICodeword0 ::= CHOICE {
    four-bitCQI                     INTEGER (0..15, ...),
    two-bitSubbandDifferentialCQI    INTEGER (0..3, ...),
    two-bitDifferentialCQI           INTEGER (0..3, ...),
    ...
}

SubbandCQICodeword1 ::= CHOICE {

```

```

    four-bitCQI                INTEGER (0..15, ...),
    three-bitSpatialDifferentialCQI  INTEGER (0..7, ...),
    two-bitSubbandDifferentialCQI    INTEGER (0..3, ...),
    two-bitDifferentialCQI          INTEGER (0..3, ...),
    ...
}

SubbandCQIList ::= SEQUENCE (SIZE(1.. maxSubband)) OF SubbandCQIItem

SubbandCQIItem ::= SEQUENCE {
    subbandCQI                SubbandCQI,
    subbandIndex              INTEGER (0..27,...),
    iE-Extensions             ProtocolExtensionContainer { {SubbandCQIItem-ExtIEs} } OPTIONAL,
    ...
}

SubbandCQIItem-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

SubbandSize ::= ENUMERATED {
    size2,
    size3,
    size4,
    size6,
    size8,
    ...
}

SubscriberProfileIDforRFP ::= INTEGER (1..256)

SubframeAllocation ::= CHOICE {
    oneframe                    Oneframe,
    fourframes                  Fourframes,
    ...
}

SubframeAssignment ::= ENUMERATED {
    sa0,
    sa1,
    sa2,
    sa3,
    sa4,
    sa5,
    sa6,
    ...
}

SubframeType ::= ENUMERATED{mbsfn,nonmbsfn,...}

SgNBSecurityKey ::= BIT STRING (SIZE(256))

SgNBtoMeNBContainer ::= OCTET STRING

```

```

SRBType ::= ENUMERATED {srb1, srb2, ...}
SCGConfigurationQuery ::= ENUMERATED {true,...}

SULInformation ::= SEQUENCE {
    sUL-ARFCN          INTEGER (0.. 3279165),
    sUL-TxBW           NR-TxBW,
    iE-Extensions     ProtocolExtensionContainer { {SULInformation-ExtIEs} }    OPTIONAL,
    ...
}

SupportedSULFreqBandItem ::= SEQUENCE {
    freqBandIndicatorNr    INTEGER (1..1024,...),
    iE-Extensions         ProtocolExtensionContainer { {SupportedSULFreqBandItem-ExtIEs} }    OPTIONAL,
    ...
}

SupportedSULFreqBandItem-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

SULInformation-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- T

TABasedMDT ::= SEQUENCE {
    tAListforMDT         TAIListforMDT,
    iE-Extensions       ProtocolExtensionContainer { {TABasedMDT-ExtIEs} }    OPTIONAL,
    ...
}

TABasedMDT-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

TAIBasedMDT ::= SEQUENCE {
    tAIListforMDT       TAIListforMDT,
    iE-Extensions       ProtocolExtensionContainer { {TAIBasedMDT-ExtIEs} }    OPTIONAL,
    ...
}

TAIBasedMDT-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAIListforMDT ::= SEQUENCE (SIZE(1..maxnoofTAforMDT)) OF TAI-Item

TAI-Item ::= SEQUENCE {
    tAC                 TAC,
    pLMN-Identity       PLMN-Identity,
}

```

```

    iE-Extensions      ProtocolExtensionContainer { {TAI-Item-ExtIEs} } OPTIONAL,
    ...
}

TAI-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAListforMDT ::= SEQUENCE (SIZE(1..maxnoofTAforMDT)) OF TAC

TABasedQMC ::= SEQUENCE {
    tAListforQMC      TAListforQMC,
    iE-Extensions      ProtocolExtensionContainer { {TABasedQMC-ExtIEs} } OPTIONAL,
    ...
}

TABasedQMC-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAListforQMC ::= SEQUENCE (SIZE(1..maxnoofTAforQMC)) OF TAC

TAIBasedQMC ::= SEQUENCE {
    tAIListforQMC      TAIListforQMC,
    iE-Extensions      ProtocolExtensionContainer { {TAIBasedQMC-ExtIEs} } OPTIONAL,
    ...
}

TAIBasedQMC-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAIListforQMC ::= SEQUENCE (SIZE(1..maxnoofTAforQMC)) OF TAI-Item

TargetCellInUTRAN ::= OCTET STRING -- This IE is to be encoded according to the UTRAN Cell ID in the Last Visited UTRAN Cell Information IE in TS
25.413 [24]

TargeteNBtoSource-eNBTransparentContainer ::= OCTET STRING

TDD-Info ::= SEQUENCE {
    eARFCN                EARFCN,
    transmission-Bandwidth Transmission-Bandwidth,
    subframeAssignment    SubframeAssignment,
    specialSubframe-Info  SpecialSubframe-Info,
    iE-Extensions          ProtocolExtensionContainer { {TDD-Info-ExtIEs} } OPTIONAL,
    ...
}

TDD-Info-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-AdditionalSpecialSubframe-Info          CRITICALITY ignore EXTENSION AdditionalSpecialSubframe-Info          PRESENCE optional} |
    { ID id-eARFCNExtension                          CRITICALITY reject   EXTENSION EARFCNExtension                          PRESENCE optional} |
    { ID id-AdditionalSpecialSubframeExtension-Info CRITICALITY ignore EXTENSION AdditionalSpecialSubframeExtension-Info PRESENCE optional} |
    { ID id-OffsetOfNbiotChannelNumberToDL-EARFCN   CRITICALITY reject   EXTENSION OffsetOfNbiotChannelNumberToEARFCN   PRESENCE optional} |
    { ID id-NBIoT-UL-DL-AlignmentOffset              CRITICALITY reject   EXTENSION NBIoT-UL-DL-AlignmentOffset              PRESENCE optional},

```

```

}
...
}
TDD-InfoNeighbourServedNRCell-Information ::= SEQUENCE {
    nRFreqInfo          NRFreqInfo,
    iE-Extensions       ProtocolExtensionContainer { {TDD-InfoNeighbourServedNRCell-Information-ExtIEs} } OPTIONAL,
    ...
}

TDD-InfoNeighbourServedNRCell-Information-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

Threshold-RSRP ::= INTEGER(0..97)

Threshold-RSRQ ::= INTEGER(0..34)

TimeToWait ::= ENUMERATED {
    v1s,
    v2s,
    v5s,
    v10s,
    v20s,
    v60s,
    ...
}

Time-UE-StayedInCell ::= INTEGER (0..4095)

Time-UE-StayedInCell-EnhancedGranularity ::= INTEGER (0..40950)

TraceActivation ::= SEQUENCE {
    eUTRANTraceID          EUTRANTraceID,
    interfacesToTrace      InterfacesToTrace,
    traceDepth             TraceDepth,
    traceCollectionEntityIPAddress TraceCollectionEntityIPAddress,
    iE-Extensions          ProtocolExtensionContainer { {TraceActivation-ExtIEs} } OPTIONAL,
    ...
}

TraceActivation-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-MDTConfiguration          CRITICALITY ignore EXTENSION MDT-Configuration          PRESENCE optional}|
    { ID id-UEAppLayerMeasConfig      CRITICALITY ignore EXTENSION UEAppLayerMeasConfig      PRESENCE optional},
    ...
}

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

TraceDepth ::= ENUMERATED {
    minimum,
    medium,
    maximum,
    minimumWithoutVendorSpecificExtension,
    mediumWithoutVendorSpecificExtension,
}

```

```

    maximumWithoutVendorSpecificExtension,
    ...
}

Transmission-Bandwidth ::= ENUMERATED {
    bw6,
    bw15,
    bw25,
    bw50,
    bw75,
    bw100,
    ...,
    bw1
}

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

TunnelInformation ::= SEQUENCE {
    transportLayerAddress TransportLayerAddress,
    uDP-Port-Number Port-Number OPTIONAL,
    iE-Extensions ProtocolExtensionContainer { {Tunnel-Information-ExtIEs} } OPTIONAL,
    ...
}

Tunnel-Information-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

-- U

UEAggregateMaximumBitRate ::= SEQUENCE {
    uEAggregateMaximumBitRateDownlink BitRate,
    uEAggregateMaximumBitRateUplink BitRate,
    iE-Extensions ProtocolExtensionContainer { {UEAggregate-MaximumBitrate-ExtIEs} } OPTIONAL,
    ...
}

UEAggregate-MaximumBitrate-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    { ID id-extended-uEAggregateMaximumBitRateDownlink CRITICALITY ignore EXTENSION ExtendedBitRate PRESENCE optional}|
    { ID id-extended-uEAggregateMaximumBitRateUplink CRITICALITY ignore EXTENSION ExtendedBitRate PRESENCE optional},
    ...
}

UEAppLayerMeasConfig ::= SEQUENCE {
    containerForAppLayerMeasConfig OCTET STRING (SIZE(1..1000)),
    areaScopeOfQMC AreaScopeOfQMC,
    iE-Extensions ProtocolExtensionContainer { {UEAppLayerMeasConfig-ExtIEs} } OPTIONAL,

```

```

}
...
}
UEAppLayerMeasConfig-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  {ID id-serviceType CRITICALITY ignore EXTENSION ServiceType PRESENCE optional},
  ...
}
UE-ContextKeptIndicator ::= ENUMERATED {
  true,
  ...
}
UEID ::= BIT STRING (SIZE (16))
UE-HistoryInformation ::= SEQUENCE (SIZE(1..maxnoofCells)) OF LastVisitedCell-Item
UE-HistoryInformationFromTheUE ::= OCTET STRING
-- This IE is a transparent container and shall be encoded as the VisitedCellInfoList field contained in the UEInformationResponse message as
defined in TS 36.331 [9]
UE-SlAP-ID ::= INTEGER (0.. 4294967295)
UE-X2AP-ID ::= INTEGER (0..4095)
UE-X2AP-ID-Extension ::= INTEGER (0..4095, ...)
UE-RLF-Report-Container ::= OCTET STRING
-- This IE is a transparent container and shall be encoded as the RLF-Report-r9 field contained in the UEInformationResponse message as defined in
TS 36.331 [9]
UE-RLF-Report-Container-for-extended-bands ::= OCTET STRING
-- This IE is a transparent container and shall be encoded as the RLF-Report-v9e0 field contained in the UEInformationResponse message as defined
in TS 36.331 [9]
UESecurityCapabilities ::= SEQUENCE {
  encryptionAlgorithms EncryptionAlgorithms,
  integrityProtectionAlgorithms IntegrityProtectionAlgorithms,
  iE-Extensions ProtocolExtensionContainer { {UESecurityCapabilities-ExtIEs} } OPTIONAL,
  ...
}
UESecurityCapabilities-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}
UESidelinkAggregateMaximumBitRate ::= SEQUENCE {
  uESidelinkAggregateMaximumBitRate BitRate,
  iE-Extensions ProtocolExtensionContainer { {UE-Sidelink-Aggregate-MaximumBitRate-ExtIEs} } OPTIONAL,
  ...
}
UE-Sidelink-Aggregate-MaximumBitRate-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
  ...
}

```



```

}
UEsToBeResetList ::= SEQUENCE (SIZE (1.. maxUESinengNBDU)) OF UEsToBeResetList-Item
UEsToBeResetList-Item ::= SEQUENCE {
    meNB-ID                UE-X2AP-ID,
    meNB-ID-ext            UE-X2AP-ID-Extension                OPTIONAL,
    sgNB-ID                SgNB-UE-X2AP-ID                    OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {UEsToBeResetList-Item-ExtIEs} } OPTIONAL,
    ...
}
UEsToBeResetList-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}
ULandDLSharing ::= SEQUENCE{
    uLResourcesULandDLSharing          ULResourcesULandDLSharing,
    dLResourcesULandDLSharing          DLResourcesULandDLSharing,
    iE-Extensions                      ProtocolExtensionContainer { {ULandDLSharing-ExtIEs} } OPTIONAL,
    ...
}
ULandDLSharing-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}
ULConfiguration ::= SEQUENCE {
    uL-PDCP                UL-UE-Configuration,
    iE-Extensions          ProtocolExtensionContainer { {ULConfiguration-ExtIEs} } OPTIONAL,
    ...
}
ULConfiguration-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}
UL-UE-Configuration ::= ENUMERATED { no-data, shared, only, ... }
UL-GBR-PRB-usage ::= INTEGER (0..100)
UL-HighInterferenceIndicationInfo ::= SEQUENCE (SIZE(1..maxCellineNB)) OF UL-HighInterferenceIndicationInfo-Item
UL-HighInterferenceIndicationInfo-Item ::= SEQUENCE {
    target-Cell-ID          ECGI,
    ul-interferenceindication UL-HighInterferenceIndication,
    iE-Extensions          ProtocolExtensionContainer { {UL-HighInterferenceIndicationInfo-Item-ExtIEs} } OPTIONAL,
    ...
}
UL-HighInterferenceIndicationInfo-Item-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```

UL-HighInterferenceIndication ::= BIT STRING (SIZE(1..110, ...))

UL-InterferenceOverloadIndication ::= SEQUENCE (SIZE(1..maxnoofPRBs)) OF UL-InterferenceOverloadIndication-Item

UL-InterferenceOverloadIndication-Item ::= ENUMERATED {
    high-interference,
    medium-interference,
    low-interference,
    ...
}

UL-non-GBR-PRB-usage ::= INTEGER (0..100)

ULOnlySharing ::= SEQUENCE{
    uLResourceBitmapULOnlySharing    DataTrafficResources,
    iE-Extensions                    ProtocolExtensionContainer { {ULOnlySharing-ExtIEs} }        OPTIONAL,
    ...
}

ULOnlySharing-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ULResourceBitmapULandDLSharing ::= DataTrafficResources

ULResourcesULandDLSharing ::= CHOICE {
    unchanged          NULL,
    changed            ULResourceBitmapULandDLSharing,
    ...
}

UL-scheduling-PDCCH-CCE-usage ::= INTEGER (0..100)

UL-Total-PRB-usage ::= INTEGER (0..100)

UsableABSInformation ::= CHOICE {
    fdd                UsableABSInformationFDD,
    tdd                UsableABSInformationTDD,
    ...
}

UsableABSInformationFDD ::= SEQUENCE {
    usable-abs-pattern-info    BIT STRING (SIZE(40)),
    iE-Extensions              ProtocolExtensionContainer { {UsableABSInformationFDD-ExtIEs} } OPTIONAL,
    ...
}

UsableABSInformationFDD-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

UsableABSInformationTDD ::= SEQUENCE {
    usable-abs-pattern-info    BIT STRING (SIZE(1..70, ...)),

```

```

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

UsableABSInformationTDD-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

UserPlaneTrafficActivityReport ::= ENUMERATED {inactive, re-activated, ...}

-- V

V2XServicesAuthorized ::= SEQUENCE {
    vehicleUE              VehicleUE                                OPTIONAL,
    pedestrianUE           PedestrianUE                            OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {V2XServicesAuthorized-ExtIEs} } OPTIONAL,
    ...
}

V2XServicesAuthorized-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

VehicleUE ::= ENUMERATED {
    authorized,
    not-authorized,
    ...
}

PedestrianUE ::= ENUMERATED {
    authorized,
    not-authorized,
    ...
}

-- W

WidebandCQI ::= SEQUENCE {
    widebandCQICodeword0   INTEGER (0..15, ...),
    widebandCQICodeword1   WidebandCQICodeword1                OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {WidebandCQI-ExtIEs} } OPTIONAL,
    ...
}

WidebandCQI-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

WidebandCQICodeword1 ::= CHOICE {
    four-bitCQI             INTEGER (0..15, ...),
    three-bitSpatialDifferentialCQI  INTEGER (0..7, ...),
    ...
}

```

```

WLANMeasurementConfiguration ::= SEQUENCE {
    wlanMeasConfig          WLANMeasConfig,
    wlanMeasConfigNameList  WLANMeasConfigNameList          OPTIONAL,
    wlan-rssi               ENUMERATED {true, ...}           OPTIONAL,
    wlan-rtt               ENUMERATED {true, ...}           OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {WLANMeasurementConfiguration-ExtIEs} } OPTIONAL,
    ...
}

WLANMeasurementConfiguration-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {
    ...
}

WLANMeasConfigNameList ::= SEQUENCE (SIZE(1..maxnoofWLANName)) OF WLANName

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

WLANName ::= OCTET STRING (SIZE (1..32))

WTID ::= CHOICE {
    wTID-Type1          WTID-Type1,
    wTID-Type2          WTID-Long-Type2,
    ...
}

WTID-Type1 ::= SEQUENCE {
    pLMN-Identity          PLMN-Identity,
    shortWTID              BIT STRING (SIZE(24)),
    ...
}

WTID-Long-Type2 ::= BIT STRING (SIZE(48))

WT-UE-XwAP-ID ::= OCTET STRING (SIZE (3))

-- X

X2BenefitValue ::= INTEGER (1..8, ...)

-- Y
-- Z

END
-- ASN1STOP

```

9.3.6 Common definitions

```

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

```

```

-- *****
X2AP-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) x2ap (2) version1 (1) x2ap-CommonDataTypes (3) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- *****
--
-- Extension constants
--
-- *****

maxPrivateIEs                INTEGER ::= 65535
maxProtocolExtensions        INTEGER ::= 65535
maxProtocolIEs               INTEGER ::= 65535

-- *****
--
-- Common Data Types
--
-- *****

Criticality      ::= ENUMERATED { reject, ignore, notify }

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

PrivateIE-ID    ::= CHOICE {
    local          INTEGER (0.. maxPrivateIEs),
    global         OBJECT IDENTIFIER
}

ProcedureCode   ::= INTEGER (0..255)

ProtocolIE-ID   ::= INTEGER (0..maxProtocolIEs)

TriggeringMessage ::= ENUMERATED { initiating-message, successful-outcome, unsuccessful-outcome}

END
-- ASN1STOP

```

9.3.7 Constant definitions

```

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

```

```

-- *****
X2AP-Constants {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) x2ap (2) version1 (1) x2ap-Constants (4) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    ProcedureCode,
    ProtocolIE-ID
FROM X2AP-CommonDataTypes;

-- *****
--
-- Elementary Procedures
--
-- *****

id-handoverPreparation          ProcedureCode ::= 0
id-handoverCancel              ProcedureCode ::= 1
id-loadIndication              ProcedureCode ::= 2
id-errorIndication             ProcedureCode ::= 3
id-snStatusTransfer            ProcedureCode ::= 4
id-uEContextRelease            ProcedureCode ::= 5
id-x2Setup                     ProcedureCode ::= 6
id-reset                       ProcedureCode ::= 7
id-eNBConfigurationUpdate      ProcedureCode ::= 8
id-resourceStatusReportingInitiation ProcedureCode ::= 9
id-resourceStatusReporting     ProcedureCode ::= 10
id-privateMessage              ProcedureCode ::= 11
id-mobilitySettingsChange      ProcedureCode ::= 12
id-rLFIndication               ProcedureCode ::= 13
id-handoverReport              ProcedureCode ::= 14
id-cellActivation              ProcedureCode ::= 15
id-x2Release                   ProcedureCode ::= 16
id-x2APMessageTransfer         ProcedureCode ::= 17
id-x2Removal                   ProcedureCode ::= 18
id-seNBAdditionPreparation     ProcedureCode ::= 19
id-seNBReconfigurationCompletion ProcedureCode ::= 20
id-meNBinitiatedSeNBModificationPreparation ProcedureCode ::= 21
id-seNBinitiatedSeNBModification ProcedureCode ::= 22
id-meNBinitiatedSeNBRelease    ProcedureCode ::= 23
id-seNBinitiatedSeNBRelease    ProcedureCode ::= 24
id-seNBCounterCheck           ProcedureCode ::= 25
id-retrieveUEContext           ProcedureCode ::= 26
id-sgNBAdditionPreparation     ProcedureCode ::= 27
id-sgNBReconfigurationCompletion ProcedureCode ::= 28
id-meNBinitiatedSgNBModificationPreparation ProcedureCode ::= 29
id-sgNBinitiatedSgNBModification ProcedureCode ::= 30
id-meNBinitiatedSgNBRelease    ProcedureCode ::= 31
id-sgNBinitiatedSgNBRelease    ProcedureCode ::= 32

```

```

id-sgNBCounterCheck      ProcedureCode ::= 33
id-sgNBChange            ProcedureCode ::= 34
id-rRCTransfer           ProcedureCode ::= 35
id-endcX2Setup           ProcedureCode ::= 36
id-endcConfigurationUpdate ProcedureCode ::= 37
id-secondaryRATDataUsageReport ProcedureCode ::= 38
id-endcCellActivation     ProcedureCode ::= 39
id-endcPartialReset      ProcedureCode ::= 40
id-eUTRANRCellResourceCoordination ProcedureCode ::= 41
id-SgNBActivityNotification ProcedureCode ::= 42
id-endcX2Removal         ProcedureCode ::= 43
id-dataForwardingAddressIndication ProcedureCode ::= 44
id-gNBStatusIndication   ProcedureCode ::= 45
id-deactivateTrace       ProcedureCode ::= 46
id-traceStart            ProcedureCode ::= 47
id-endcConfigurationTransfer ProcedureCode ::= 48
-- *****
--
-- Lists
--
-- *****

maxEARFCN                INTEGER ::= 65535
maxEARFCNPlusOne         INTEGER ::= 65536
newmaxEARFCN             INTEGER ::= 262143
maxInterfaces            INTEGER ::= 16
maxCelllineNB           INTEGER ::= 256
maxnoofBands             INTEGER ::= 16
maxnoofBearers           INTEGER ::= 256
maxNrOfErrors            INTEGER ::= 256
maxnoofPDCP-SN           INTEGER ::= 16
maxnoofEPLMNs            INTEGER ::= 15
maxnoofEPLMNsPlusOne    INTEGER ::= 16
maxnoofForbLACs          INTEGER ::= 4096
maxnoofForbTACs          INTEGER ::= 4096
maxnoofBPLMNs            INTEGER ::= 6
maxnoofAdditionalPLMNs   INTEGER ::= 6
maxnoofNeighbours        INTEGER ::= 512
maxnoofPRBs              INTEGER ::= 110
maxPools                  INTEGER ::= 16
maxnoofCells             INTEGER ::= 16
maxnoofMBSFN              INTEGER ::= 8
maxFailedMeasObjects     INTEGER ::= 32
maxnoofCellIDforMDT      INTEGER ::= 32
maxnoofTAforMDT          INTEGER ::= 8
maxnoofMBMSServiceAreaIdentities INTEGER ::= 256
maxnoofMDTPLMNs          INTEGER ::= 16
maxnoofCoMPHypothesisSet INTEGER ::= 256
maxnoofCoMPCells         INTEGER ::= 32
maxUEReport              INTEGER ::= 128
maxCellReport            INTEGER ::= 9
maxnoofPA                 INTEGER ::= 3
maxCSIProcess            INTEGER ::= 4
maxCSIReport             INTEGER ::= 2

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maxSubband                INTEGER ::= 14
maxofNRNeighbours        INTEGER ::= 1024
maxCellInengNB           INTEGER ::= 16384
-- maxnoofNRCarriers      INTEGER ::= 32
maxnooftimeperiods       INTEGER ::= 2
maxnoofCellIDforQMC      INTEGER ::= 32
maxnoofTAforQMC          INTEGER ::= 8
maxnoofPLMNforQMC        INTEGER ::= 16
maxUESinengNBDU          INTEGER ::= 8192
maxnoofProtectedResourcePatterns INTEGER ::= 16
maxnoNRcellsSpectrumSharingWithE-UTRA INTEGER ::= 64
maxnoofNrCellBands       INTEGER ::= 32
maxnoofBluetoothName     INTEGER ::= 4
maxnoofWLANName          INTEGER ::= 4
maxnoofextBPLMNs         INTEGER ::= 12
maxnoofextBPLMNsmminus1  INTEGER ::= 11
maxnoofBPLMNsmminus1    INTEGER ::= 11

-- *****
--
-- IEs
--
-- *****

id-E-RABs-Admitted-Item   ProtocolIE-ID ::= 0
id-E-RABs-Admitted-List  ProtocolIE-ID ::= 1
id-E-RAB-Item            ProtocolIE-ID ::= 2
id-E-RABs-NotAdmitted-List ProtocolIE-ID ::= 3
id-E-RABs-ToBeSetup-Item ProtocolIE-ID ::= 4
id-Cause                 ProtocolIE-ID ::= 5
id-CellInformation        ProtocolIE-ID ::= 6
id-CellInformation-Item  ProtocolIE-ID ::= 7
id-New-eNB-UE-X2AP-ID    ProtocolIE-ID ::= 9
id-Old-eNB-UE-X2AP-ID    ProtocolIE-ID ::= 10
id-TargetCell-ID         ProtocolIE-ID ::= 11
id-TargeteNBtoSource-eNBTransparentContainer ProtocolIE-ID ::= 12
id-TraceActivation        ProtocolIE-ID ::= 13
id-UE-ContextInformation ProtocolIE-ID ::= 14
id-UE-HistoryInformation ProtocolIE-ID ::= 15
id-UE-X2AP-ID            ProtocolIE-ID ::= 16
id-CriticalityDiagnostics ProtocolIE-ID ::= 17
id-E-RABs-SubjectToStatusTransfer-List ProtocolIE-ID ::= 18
id-E-RABs-SubjectToStatusTransfer-Item ProtocolIE-ID ::= 19
id-ServedCells           ProtocolIE-ID ::= 20
id-GlobalENB-ID          ProtocolIE-ID ::= 21
id-TimeToWait            ProtocolIE-ID ::= 22
id-GUMMEI-ID            ProtocolIE-ID ::= 23
id-GUGroupIDList         ProtocolIE-ID ::= 24
id-ServedCellsToAdd      ProtocolIE-ID ::= 25
id-ServedCellsToModify   ProtocolIE-ID ::= 26
id-ServedCellsToDelete   ProtocolIE-ID ::= 27
id-Registration-Request  ProtocolIE-ID ::= 28
id-CellToReport          ProtocolIE-ID ::= 29
id-ReportingPeriodicity  ProtocolIE-ID ::= 30

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|--|----------------------|
| id-CellToReport-Item | ProtocolIE-ID ::= 31 |
| id-CellMeasurementResult | ProtocolIE-ID ::= 32 |
| id-CellMeasurementResult-Item | ProtocolIE-ID ::= 33 |
| id-GUGroupIDToAddList | ProtocolIE-ID ::= 34 |
| id-GUGroupIDToDeleteList | ProtocolIE-ID ::= 35 |
| id-SRVCCOperationPossible | ProtocolIE-ID ::= 36 |
| id-Measurement-ID | ProtocolIE-ID ::= 37 |
| id-ReportCharacteristics | ProtocolIE-ID ::= 38 |
| id-ENB1-Measurement-ID | ProtocolIE-ID ::= 39 |
| id-ENB2-Measurement-ID | ProtocolIE-ID ::= 40 |
| id-Number-of-Antennaports | ProtocolIE-ID ::= 41 |
| id-CompositeAvailableCapacityGroup | ProtocolIE-ID ::= 42 |
| id-ENB1-Cell-ID | ProtocolIE-ID ::= 43 |
| id-ENB2-Cell-ID | ProtocolIE-ID ::= 44 |
| id-ENB2-Proposed-Mobility-Parameters | ProtocolIE-ID ::= 45 |
| id-ENB1-Mobility-Parameters | ProtocolIE-ID ::= 46 |
| id-ENB2-Mobility-Parameters-Modification-Range | ProtocolIE-ID ::= 47 |
| id-FailureCellPCI | ProtocolIE-ID ::= 48 |
| id-Re-establishmentCelleCGI | ProtocolIE-ID ::= 49 |
| id-FailureCellCRNTI | ProtocolIE-ID ::= 50 |
| id-ShortMAC-I | ProtocolIE-ID ::= 51 |
| id-SourceCelleCGI | ProtocolIE-ID ::= 52 |
| id-FailureCelleCGI | ProtocolIE-ID ::= 53 |
| id-HandoverReportType | ProtocolIE-ID ::= 54 |
| id-PRACH-Configuration | ProtocolIE-ID ::= 55 |
| id-MBSFN-Subframe-Info | ProtocolIE-ID ::= 56 |
| id-ServedCellsToActivate | ProtocolIE-ID ::= 57 |
| id-ActivatedCellList | ProtocolIE-ID ::= 58 |
| id-DeactivationIndication | ProtocolIE-ID ::= 59 |
| id-UE-RLF-Report-Container | ProtocolIE-ID ::= 60 |
| id-ABSInformation | ProtocolIE-ID ::= 61 |
| id-InvokeIndication | ProtocolIE-ID ::= 62 |
| id-ABS-Status | ProtocolIE-ID ::= 63 |
| id-PartialSuccessIndicator | ProtocolIE-ID ::= 64 |
| id-MeasurementInitiationResult-List | ProtocolIE-ID ::= 65 |
| id-MeasurementInitiationResult-Item | ProtocolIE-ID ::= 66 |
| id-MeasurementFailureCause-Item | ProtocolIE-ID ::= 67 |
| id-CompleteFailureCauseInformation-List | ProtocolIE-ID ::= 68 |
| id-CompleteFailureCauseInformation-Item | ProtocolIE-ID ::= 69 |
| id-CSG-Id | ProtocolIE-ID ::= 70 |
| id-CSGMembershipStatus | ProtocolIE-ID ::= 71 |
| id-MDTConfiguration | ProtocolIE-ID ::= 72 |
| id-ManagementBasedMDTAllowed | ProtocolIE-ID ::= 74 |
| id-RRConnSetupIndicator | ProtocolIE-ID ::= 75 |
| id-NeighbourTAC | ProtocolIE-ID ::= 76 |
| id-Time-UE-StayedInCell-EnhancedGranularity | ProtocolIE-ID ::= 77 |
| id-RRConnReestabIndicator | ProtocolIE-ID ::= 78 |
| id-MBMS-Service-Area-List | ProtocolIE-ID ::= 79 |
| id-HO-cause | ProtocolIE-ID ::= 80 |
| id-TargetCellInUTRAN | ProtocolIE-ID ::= 81 |
| id-MobilityInformation | ProtocolIE-ID ::= 82 |
| id-SourceCellCRNTI | ProtocolIE-ID ::= 83 |
| id-MultibandInfoList | ProtocolIE-ID ::= 84 |
| id-M3Configuration | ProtocolIE-ID ::= 85 |

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|---|-----------------------|
| id-M4Configuration | ProtocolIE-ID ::= 86 |
| id-M5Configuration | ProtocolIE-ID ::= 87 |
| id-MDT-Location-Info | ProtocolIE-ID ::= 88 |
| id-ManagementBasedMDTPLMNList | ProtocolIE-ID ::= 89 |
| id-SignallingBasedMDTPLMNList | ProtocolIE-ID ::= 90 |
| id-ReceiveStatusOfULPDCPSDUsExtended | ProtocolIE-ID ::= 91 |
| id-ULCOUNTValueExtended | ProtocolIE-ID ::= 92 |
| id-DLCOUNTValueExtended | ProtocolIE-ID ::= 93 |
| id-eARFCNExtension | ProtocolIE-ID ::= 94 |
| id-UL-EARFCNExtension | ProtocolIE-ID ::= 95 |
| id-DL-EARFCNExtension | ProtocolIE-ID ::= 96 |
| id-AdditionalSpecialSubframe-Info | ProtocolIE-ID ::= 97 |
| id-Masked-IMEISV | ProtocolIE-ID ::= 98 |
| id-IntendedULDLConfiguration | ProtocolIE-ID ::= 99 |
| id-ExtendedULInterferenceOverloadInfo | ProtocolIE-ID ::= 100 |
| id-RNL-Header | ProtocolIE-ID ::= 101 |
| id-x2APMessage | ProtocolIE-ID ::= 102 |
| id-ProSeAuthorized | ProtocolIE-ID ::= 103 |
| id-ExpectedUEBehaviour | ProtocolIE-ID ::= 104 |
| id-UE-HistoryInformationFromTheUE | ProtocolIE-ID ::= 105 |
| id-DynamicDLTransmissionInformation | ProtocolIE-ID ::= 106 |
| id-UE-RLF-Report-Container-for-extended-bands | ProtocolIE-ID ::= 107 |
| id-COMPInformation | ProtocolIE-ID ::= 108 |
| id-ReportingPeriodicityRSRPMR | ProtocolIE-ID ::= 109 |
| id-RSRPMList | ProtocolIE-ID ::= 110 |
| id-MeNB-UE-X2AP-ID | ProtocolIE-ID ::= 111 |
| id-SeNB-UE-X2AP-ID | ProtocolIE-ID ::= 112 |
| id-UE-SecurityCapabilities | ProtocolIE-ID ::= 113 |
| id-SeNBSecurityKey | ProtocolIE-ID ::= 114 |
| id-SeNBUEAggregateMaximumBitRate | ProtocolIE-ID ::= 115 |
| id-ServingPLMN | ProtocolIE-ID ::= 116 |
| id-E-RABs-ToBeAdded-List | ProtocolIE-ID ::= 117 |
| id-E-RABs-ToBeAdded-Item | ProtocolIE-ID ::= 118 |
| id-MeNBtoSeNBContainer | ProtocolIE-ID ::= 119 |
| id-E-RABs-Admitted-ToBeAdded-List | ProtocolIE-ID ::= 120 |
| id-E-RABs-Admitted-ToBeAdded-Item | ProtocolIE-ID ::= 121 |
| id-SeNBtoMeNBContainer | ProtocolIE-ID ::= 122 |
| id-ResponseInformationSeNBReconfComp | ProtocolIE-ID ::= 123 |
| id-UE-ContextInformationSeNBModReq | ProtocolIE-ID ::= 124 |
| id-E-RABs-ToBeAdded-ModReqItem | ProtocolIE-ID ::= 125 |
| id-E-RABs-ToBeModified-ModReqItem | ProtocolIE-ID ::= 126 |
| id-E-RABs-ToBeReleased-ModReqItem | ProtocolIE-ID ::= 127 |
| id-E-RABs-Admitted-ToBeAdded-ModAckList | ProtocolIE-ID ::= 128 |
| id-E-RABs-Admitted-ToBeModified-ModAckList | ProtocolIE-ID ::= 129 |
| id-E-RABs-Admitted-ToBeReleased-ModAckList | ProtocolIE-ID ::= 130 |
| id-E-RABs-Admitted-ToBeAdded-ModAckItem | ProtocolIE-ID ::= 131 |
| id-E-RABs-Admitted-ToBeModified-ModAckItem | ProtocolIE-ID ::= 132 |
| id-E-RABs-Admitted-ToBeReleased-ModAckItem | ProtocolIE-ID ::= 133 |
| id-E-RABs-ToBeReleased-ModReqd | ProtocolIE-ID ::= 134 |
| id-E-RABs-ToBeReleased-ModReqdItem | ProtocolIE-ID ::= 135 |
| id-SCGChangeIndication | ProtocolIE-ID ::= 136 |
| id-E-RABs-ToBeReleased-List-RelReq | ProtocolIE-ID ::= 137 |
| id-E-RABs-ToBeReleased-RelReqItem | ProtocolIE-ID ::= 138 |
| id-E-RABs-ToBeReleased-List-RelConf | ProtocolIE-ID ::= 139 |

| | |
|---|-----------------------|
| id-E-RABs-ToBeReleased-RelConfItem | ProtocolIE-ID ::= 140 |
| id-E-RABs-SubjectToCounterCheck-List | ProtocolIE-ID ::= 141 |
| id-E-RABs-SubjectToCounterCheckItem | ProtocolIE-ID ::= 142 |
| id-CoverageModificationList | ProtocolIE-ID ::= 143 |
| id-ReportingPeriodicityCSIR | ProtocolIE-ID ::= 145 |
| id-CSIRReportList | ProtocolIE-ID ::= 146 |
| id-UEID | ProtocolIE-ID ::= 147 |
| id-enhancedRNTP | ProtocolIE-ID ::= 148 |
| id-ProSeUEtoNetworkRelaying | ProtocolIE-ID ::= 149 |
| id-ReceiveStatusOfULPDCPSDUsPDCP-SNlength18 | ProtocolIE-ID ::= 150 |
| id-ULCOUNTValuePDCP-SNlength18 | ProtocolIE-ID ::= 151 |
| id-DLCOUNTValuePDCP-SNlength18 | ProtocolIE-ID ::= 152 |
| id-UE-ContextReferenceAtSeNB | ProtocolIE-ID ::= 153 |
| id-UE-ContextKeptIndicator | ProtocolIE-ID ::= 154 |
| id-New-eNB-UE-X2AP-ID-Extension | ProtocolIE-ID ::= 155 |
| id-Old-eNB-UE-X2AP-ID-Extension | ProtocolIE-ID ::= 156 |
| id-MeNB-UE-X2AP-ID-Extension | ProtocolIE-ID ::= 157 |
| id-SeNB-UE-X2AP-ID-Extension | ProtocolIE-ID ::= 158 |
| id-LHN-ID | ProtocolIE-ID ::= 159 |
| id-FreqBandIndicatorPriority | ProtocolIE-ID ::= 160 |
| id-M6Configuration | ProtocolIE-ID ::= 161 |
| id-M7Configuration | ProtocolIE-ID ::= 162 |
| id-Tunnel-Information-for-BBF | ProtocolIE-ID ::= 163 |
| id-SIPTO-BearerDeactivationIndication | ProtocolIE-ID ::= 164 |
| id-GW-TransportLayerAddress | ProtocolIE-ID ::= 165 |
| id-Correlation-ID | ProtocolIE-ID ::= 166 |
| id-SIPTO-Correlation-ID | ProtocolIE-ID ::= 167 |
| id-SIPTO-L-GW-TransportLayerAddress | ProtocolIE-ID ::= 168 |
| id-X2RemovalThreshold | ProtocolIE-ID ::= 169 |
| id-CellReportingIndicator | ProtocolIE-ID ::= 170 |
| id-BearerType | ProtocolIE-ID ::= 171 |
| id-resumeID | ProtocolIE-ID ::= 172 |
| id-UE-ContextInformationRetrieve | ProtocolIE-ID ::= 173 |
| id-E-RABs-ToBeSetupRetrieve-Item | ProtocolIE-ID ::= 174 |
| id-NewEUTRANCellIdentifier | ProtocolIE-ID ::= 175 |
| id-V2XServicesAuthorized | ProtocolIE-ID ::= 176 |
| id-OffsetOfNbiotChannelNumberToDL-EARFCN | ProtocolIE-ID ::= 177 |
| id-OffsetOfNbiotChannelNumberToUL-EARFCN | ProtocolIE-ID ::= 178 |
| id-AdditionalSpecialSubframeExtension-Info | ProtocolIE-ID ::= 179 |
| id-BandwidthReducedSI | ProtocolIE-ID ::= 180 |
| id-MakeBeforeBreakIndicator | ProtocolIE-ID ::= 181 |
| id-UE-ContextReferenceAtWT | ProtocolIE-ID ::= 182 |
| id-WT-UE-ContextKeptIndicator | ProtocolIE-ID ::= 183 |
| id-UESidelinkAggregateMaximumBitRate | ProtocolIE-ID ::= 184 |
| id-uL-GTPtunnelEndpoint | ProtocolIE-ID ::= 185 |
| id-DL-scheduling-PDCCH-CCE-usage | ProtocolIE-ID ::= 193 |
| id-UL-scheduling-PDCCH-CCE-usage | ProtocolIE-ID ::= 194 |
| id-UEAppLayerMeasConfig | ProtocolIE-ID ::= 195 |
| id-extended-e-RAB-MaximumBitrateDL | ProtocolIE-ID ::= 196 |
| id-extended-e-RAB-MaximumBitrateUL | ProtocolIE-ID ::= 197 |
| id-extended-e-RAB-GuaranteedBitrateDL | ProtocolIE-ID ::= 198 |
| id-extended-e-RAB-GuaranteedBitrateUL | ProtocolIE-ID ::= 199 |
| id-extended-uEAggregateMaximumBitRateDownlink | ProtocolIE-ID ::= 200 |
| id-extended-uEAggregateMaximumBitRateUplink | ProtocolIE-ID ::= 201 |

| | |
|---|-----------------------|
| id-NRrestrictioninEPSasSecondaryRAT | ProtocolIE-ID ::= 202 |
| id-SgNBSecurityKey | ProtocolIE-ID ::= 203 |
| id-SgNBUEAggregateMaximumBitRate | ProtocolIE-ID ::= 204 |
| id-E-RABS-ToBeAdded-SgNBAddReqList | ProtocolIE-ID ::= 205 |
| id-MeNBtoSgNBContainer | ProtocolIE-ID ::= 206 |
| id-SgNB-UE-X2AP-ID | ProtocolIE-ID ::= 207 |
| id-RequestedSplitSRBs | ProtocolIE-ID ::= 208 |
| id-E-RABS-ToBeAdded-SgNBAddReq-Item | ProtocolIE-ID ::= 209 |
| id-E-RABS-Admitted-ToBeAdded-SgNBAddReqAckList | ProtocolIE-ID ::= 210 |
| id-SgNBtoMeNBContainer | ProtocolIE-ID ::= 211 |
| id-AdmittedSplitSRBs | ProtocolIE-ID ::= 212 |
| id-E-RABS-Admitted-ToBeAdded-SgNBAddReqAck-Item | ProtocolIE-ID ::= 213 |
| id-ResponseInformationSgNBReconfComp | ProtocolIE-ID ::= 214 |
| id-UE-ContextInformation-SgNBModReq | ProtocolIE-ID ::= 215 |
| id-E-RABS-ToBeAdded-SgNBModReq-Item | ProtocolIE-ID ::= 216 |
| id-E-RABS-ToBeModified-SgNBModReq-Item | ProtocolIE-ID ::= 217 |
| id-E-RABS-ToBeReleased-SgNBModReq-Item | ProtocolIE-ID ::= 218 |
| id-E-RABS-Admitted-ToBeAdded-SgNBModAckList | ProtocolIE-ID ::= 219 |
| id-E-RABS-Admitted-ToBeModified-SgNBModAckList | ProtocolIE-ID ::= 220 |
| id-E-RABS-Admitted-ToBeReleased-SgNBModAckList | ProtocolIE-ID ::= 221 |
| id-E-RABS-Admitted-ToBeAdded-SgNBModAck-Item | ProtocolIE-ID ::= 222 |
| id-E-RABS-Admitted-ToBeModified-SgNBModAck-Item | ProtocolIE-ID ::= 223 |
| id-E-RABS-Admitted-ToBeReleased-SgNBModAck-Item | ProtocolIE-ID ::= 224 |
| id-E-RABS-ToBeReleased-SgNBModReqdList | ProtocolIE-ID ::= 225 |
| id-E-RABS-ToBeModified-SgNBModReqdList | ProtocolIE-ID ::= 226 |
| id-E-RABS-ToBeReleased-SgNBModReqd-Item | ProtocolIE-ID ::= 227 |
| id-E-RABS-ToBeModified-SgNBModReqd-Item | ProtocolIE-ID ::= 228 |
| id-E-RABS-ToBeReleased-SgNBChaConfList | ProtocolIE-ID ::= 229 |
| id-E-RABS-ToBeReleased-SgNBChaConf-Item | ProtocolIE-ID ::= 230 |
| id-E-RABS-ToBeReleased-SgNBRelReqList | ProtocolIE-ID ::= 231 |
| id-E-RABS-ToBeReleased-SgNBRelReq-Item | ProtocolIE-ID ::= 232 |
| id-E-RABS-ToBeReleased-SgNBRelConfList | ProtocolIE-ID ::= 233 |
| id-E-RABS-ToBeReleased-SgNBRelConf-Item | ProtocolIE-ID ::= 234 |
| id-E-RABS-SubjectToSgNBCounterCheck-List | ProtocolIE-ID ::= 235 |
| id-E-RABS-SubjectToSgNBCounterCheck-Item | ProtocolIE-ID ::= 236 |
| id-RRCContainer | ProtocolIE-ID ::= 237 |
| id-SRBType | ProtocolIE-ID ::= 238 |
| id-Target-SgNB-ID | ProtocolIE-ID ::= 239 |
| id-HandoverRestrictionList | ProtocolIE-ID ::= 240 |
| id-SCGConfigurationQuery | ProtocolIE-ID ::= 241 |
| id-SplitSRB | ProtocolIE-ID ::= 242 |
| id-NRUEReport | ProtocolIE-ID ::= 243 |
| id-InitiatingNodeType-EndcX2Setup | ProtocolIE-ID ::= 244 |
| id-InitiatingNodeType-EndcConfigUpdate | ProtocolIE-ID ::= 245 |
| id-RespondingNodeType-EndcX2Setup | ProtocolIE-ID ::= 246 |
| id-RespondingNodeType-EndcConfigUpdate | ProtocolIE-ID ::= 247 |
| id-NRUESecurityCapabilities | ProtocolIE-ID ::= 248 |
| id-PDCPChangeIndication | ProtocolIE-ID ::= 249 |
| id-ServedEUTRAcellsENDCX2ManagementList | ProtocolIE-ID ::= 250 |
| id-CellAssistanceInformation | ProtocolIE-ID ::= 251 |
| id-Globalen-gNB-ID | ProtocolIE-ID ::= 252 |
| id-ServedNRcellsENDCX2ManagementList | ProtocolIE-ID ::= 253 |
| id-UE-ContextReferenceAtSgNB | ProtocolIE-ID ::= 254 |
| id-SecondaryRATUsageReport | ProtocolIE-ID ::= 255 |

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|---|-----------------------|
| id-ActivationID | ProtocolIE-ID ::= 256 |
| id-MeNBResourceCoordinationInformation | ProtocolIE-ID ::= 257 |
| id-SgNBResourceCoordinationInformation | ProtocolIE-ID ::= 258 |
| id-ServedEUTRAcellsToModifyListENDCCConfUpd | ProtocolIE-ID ::= 259 |
| id-ServedEUTRAcellsToDeleteListENDCCConfUpd | ProtocolIE-ID ::= 260 |
| id-ServedNRcellsToModifyListENDCCConfUpd | ProtocolIE-ID ::= 261 |
| id-ServedNRcellsToDeleteListENDCCConfUpd | ProtocolIE-ID ::= 262 |
| id-E-RABUsageReport-Item | ProtocolIE-ID ::= 263 |
| id-Old-SgNB-UE-X2AP-ID | ProtocolIE-ID ::= 264 |
| id-SecondaryRATUsageReportList | ProtocolIE-ID ::= 265 |
| id-SecondaryRATUsageReport-Item | ProtocolIE-ID ::= 266 |
| id-ServedNRCellsToActivate | ProtocolIE-ID ::= 267 |
| id-ActivatedNRCellList | ProtocolIE-ID ::= 268 |
| id-SelectedPLMN | ProtocolIE-ID ::= 269 |
| id-UEs-ToBeReset | ProtocolIE-ID ::= 270 |
| id-UEs-Admitted-ToBeReset | ProtocolIE-ID ::= 271 |
| id-RRCCConfigIndication | ProtocolIE-ID ::= 272 |
| id-DownlinkPacketLossRate | ProtocolIE-ID ::= 273 |
| id-UplinkPacketLossRate | ProtocolIE-ID ::= 274 |
| id-SubscriberProfileIDforRFP | ProtocolIE-ID ::= 275 |
| id-serviceType | ProtocolIE-ID ::= 276 |
| id-AerialUEsubscriptionInformation | ProtocolIE-ID ::= 277 |
| id-SGNB-Addition-Trigger-Ind | ProtocolIE-ID ::= 278 |
| id-MeNBCell-ID | ProtocolIE-ID ::= 279 |
| id-RequestedSplitSRBsrelease | ProtocolIE-ID ::= 280 |
| id-AdmittedSplitSRBsrelease | ProtocolIE-ID ::= 281 |
| id-NRS-NSSS-PowerOffset | ProtocolIE-ID ::= 282 |
| id-NSSS-NumOccasionDifferentPrecoder | ProtocolIE-ID ::= 283 |
| id-ProtectedEUTRAResourceIndication | ProtocolIE-ID ::= 284 |
| id-InitiatingNodeType-EutranrCellResourceCoordination | ProtocolIE-ID ::= 285 |
| id-RespondingNodeType-EutranrCellResourceCoordination | ProtocolIE-ID ::= 286 |
| id-DataTrafficResourceIndication | ProtocolIE-ID ::= 287 |
| id-SpectrumSharingGroupID | ProtocolIE-ID ::= 288 |
| id-ListofEUTRAcellsinEUTRACoordinationReq | ProtocolIE-ID ::= 289 |
| id-ListofEUTRAcellsinEUTRACoordinationResp | ProtocolIE-ID ::= 290 |
| id-ListofEUTRAcellsinNRCoordinationReq | ProtocolIE-ID ::= 291 |
| id-ListofNRCellsinNRCoordinationReq | ProtocolIE-ID ::= 292 |
| id-ListofNRCellsinNRCoordinationResp | ProtocolIE-ID ::= 293 |
| id-E-RABs-AdmittedToBeModified-SgNBModConfList | ProtocolIE-ID ::= 294 |
| id-E-RABs-AdmittedToBeModified-SgNBModConf-Item | ProtocolIE-ID ::= 295 |
| id-UEContextLevelUserPlaneActivity | ProtocolIE-ID ::= 296 |
| id-ERABActivityNotifyItemList | ProtocolIE-ID ::= 297 |
| id-InitiatingNodeType-EndcX2Removal | ProtocolIE-ID ::= 298 |
| id-RespondingNodeType-EndcX2Removal | ProtocolIE-ID ::= 299 |
| id-RLC-Status | ProtocolIE-ID ::= 300 |
| id-CNTypeRestrictions | ProtocolIE-ID ::= 301 |
| id-uLpDCPSnLength | ProtocolIE-ID ::= 302 |
| id-BluetoothMeasurementConfiguration | ProtocolIE-ID ::= 303 |
| id-WLANMeasurementConfiguration | ProtocolIE-ID ::= 304 |
| id-NRrestrictionin5GS | ProtocolIE-ID ::= 305 |
| id-dL-Forwarding | ProtocolIE-ID ::= 306 |
| id-E-RABs-DataForwardingAddress-List | ProtocolIE-ID ::= 307 |
| id-E-RABs-DataForwardingAddress-Item | ProtocolIE-ID ::= 308 |
| id-Subscription-Based-UE-DifferentiationInfo | ProtocolIE-ID ::= 309 |

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|--|-----------------------|
| id-GNBOverloadInformation | ProtocolIE-ID ::= 310 |
| id-dLPDCPSnLength | ProtocolIE-ID ::= 311 |
| id-secondarysgNB DLGTPTEIDatPDCP | ProtocolIE-ID ::= 312 |
| id-secondarymeNB ULGTPTEIDatPDCP | ProtocolIE-ID ::= 313 |
| id-lCID | ProtocolIE-ID ::= 314 |
| id-duplicationActivation | ProtocolIE-ID ::= 315 |
| id-ECGI | ProtocolIE-ID ::= 316 |
| id-RLCMode-transferred | ProtocolIE-ID ::= 317 |
| id-E-RABS-Admitted-ToBeReleased-SgNBRelReqAckList | ProtocolIE-ID ::= 318 |
| id-E-RABS-Admitted-ToBeReleased-SgNBRelReqAck-Item | ProtocolIE-ID ::= 319 |
| id-E-RABS-ToBeReleased-SgNBRelReqdList | ProtocolIE-ID ::= 320 |
| id-E-RABS-ToBeReleased-SgNBRelReqd-Item | ProtocolIE-ID ::= 321 |
| id-NRCGI | ProtocolIE-ID ::= 322 |
| id-MeNBCoordinationAssistanceInformation | ProtocolIE-ID ::= 323 |
| id-SgNBCoordinationAssistanceInformation | ProtocolIE-ID ::= 324 |
| id-new-drb-ID-req | ProtocolIE-ID ::= 325 |
| id-endcSONConfigurationTransfer | ProtocolIE-ID ::= 326 |
| id-NRNeighbourInfoToAdd | ProtocolIE-ID ::= 327 |
| id-NRNeighbourInfoToModify | ProtocolIE-ID ::= 328 |
| id-DesiredActNotificationLevel | ProtocolIE-ID ::= 329 |
| id-LocationInformationSgNBReporting | ProtocolIE-ID ::= 330 |
| id-LocationInformationSgNB | ProtocolIE-ID ::= 331 |
| id-LastNG-RANPLMNIdentity | ProtocolIE-ID ::= 332 |
| id-EUTRANTraceID | ProtocolIE-ID ::= 333 |
| id-additionalPLMNs-Item | ProtocolIE-ID ::= 334 |
| id-InterfaceInstanceIndication | ProtocolIE-ID ::= 335 |
| id-BPLMN-ID-Info-EUTRA | ProtocolIE-ID ::= 336 |
| id-BPLMN-ID-Info-NR | ProtocolIE-ID ::= 337 |
| id-NBIoT-UL-DL-AlignmentOffset | ProtocolIE-ID ::= 338 |

END
-- ASN1STOP

9.3.8 Container definitions

```
-- ASN1START
-- *****
--
-- Container definitions
--
-- *****

X2AP-Containers {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) x2ap (2) version1 (1) x2ap-Containers (5) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

```

--
-- *****
IMPORTS
    maxPrivateIEs,
    maxProtocolExtensions,
    maxProtocolIEs,
    Criticality,
    Presence,
    PrivateIE-ID,
    ProtocolIE-ID
FROM X2AP-CommonDataTypes;

-- *****
--
-- Class Definition for Protocol IEs
--
-- *****

X2AP-PROTOCOL-IES ::= CLASS {
    &id          ProtocolIE-ID          UNIQUE,
    &criticality Criticality,
    &Value,
    &presence    Presence
}
WITH SYNTAX {
    ID          &id
    CRITICALITY &criticality
    TYPE        &Value
    PRESENCE    &presence
}

-- *****
--
-- Class Definition for Protocol IEs
--
-- *****

X2AP-PROTOCOL-IES-PAIR ::= CLASS {
    &id          ProtocolIE-ID          UNIQUE,
    &firstCriticality Criticality,
    &FirstValue,
    &secondCriticality Criticality,
    &SecondValue,
    &presence    Presence
}
WITH SYNTAX {
    ID          &id
    FIRST CRITICALITY &firstCriticality
    FIRST TYPE      &FirstValue
    SECOND CRITICALITY &secondCriticality
    SECOND TYPE     &SecondValue
    PRESENCE       &presence
}

```

```

-- *****
--
-- Class Definition for Protocol Extensions
--
-- *****

X2AP-PROTOCOL-EXTENSION ::= CLASS {
    &id                ProtocolIE-ID        UNIQUE,
    &criticality        Criticality,
    &Extension,
    &presence            Presence
}
WITH SYNTAX {
    ID                &id
    CRITICALITY        &criticality
    EXTENSION          &Extension
    PRESENCE           &presence
}

-- *****
--
-- Class Definition for Private IEs
--
-- *****

X2AP-PRIVATE-IES ::= CLASS {
    &id                PrivateIE-ID,
    &criticality        Criticality,
    &Value,
    &presence            Presence
}
WITH SYNTAX {
    ID                &id
    CRITICALITY        &criticality
    TYPE              &Value
    PRESENCE           &presence
}

-- *****
--
-- Container for Protocol IEs
--
-- *****

ProtocolIE-Container {X2AP-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Single-Container {X2AP-PROTOCOL-IES : IEsSetParam} ::=
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Field {X2AP-PROTOCOL-IES : IEsSetParam} ::= SEQUENCE {
    id                X2AP-PROTOCOL-IES.&id                ({IEsSetParam}),

```



```

    criticality      X2AP-PROTOCOL-IES.&criticality      ({IEsSetParam}{@id}),
    value           X2AP-PROTOCOL-IES.&Value           ({IEsSetParam}{@id})
}

-- *****
--
-- Container for Protocol IE Pairs
--
-- *****

ProtocolIE-ContainerPair {X2AP-PROTOCOL-IES-PAIR : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-FieldPair {{IEsSetParam}}

ProtocolIE-FieldPair {X2AP-PROTOCOL-IES-PAIR : IEsSetParam} ::= SEQUENCE {
    id                X2AP-PROTOCOL-IES-PAIR.&id                ({IEsSetParam}),
    firstCriticality  X2AP-PROTOCOL-IES-PAIR.&firstCriticality  ({IEsSetParam}{@id}),
    firstValue        X2AP-PROTOCOL-IES-PAIR.&FirstValue        ({IEsSetParam}{@id}),
    secondCriticality X2AP-PROTOCOL-IES-PAIR.&secondCriticality  ({IEsSetParam}{@id}),
    secondValue       X2AP-PROTOCOL-IES-PAIR.&SecondValue       ({IEsSetParam}{@id})
}

-- *****
--
-- Container Lists for Protocol IE Containers
--
-- *****

ProtocolIE-ContainerList {INTEGER : lowerBound, INTEGER : upperBound, X2AP-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-Container {{IEsSetParam}}

ProtocolIE-ContainerPairList {INTEGER : lowerBound, INTEGER : upperBound, X2AP-PROTOCOL-IES-PAIR : IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-ContainerPair {{IEsSetParam}}

-- *****
--
-- Container for Protocol Extensions
--
-- *****

ProtocolExtensionContainer {X2AP-PROTOCOL-EXTENSION : ExtensionSetParam} ::=
    SEQUENCE (SIZE (1..maxProtocolExtensions)) OF
    ProtocolExtensionField {{ExtensionSetParam}}

ProtocolExtensionField {X2AP-PROTOCOL-EXTENSION : ExtensionSetParam} ::= SEQUENCE {
    id                X2AP-PROTOCOL-EXTENSION.&id                ({ExtensionSetParam}),
    criticality        X2AP-PROTOCOL-EXTENSION.&criticality        ({ExtensionSetParam}{@id}),
    extensionValue     X2AP-PROTOCOL-EXTENSION.&Extension         ({ExtensionSetParam}{@id})
}

-- *****
--

```

```
-- Container for Private IEs
--
-- *****
PrivateIE-Container {X2AP-PRIVATE-IES : IEsSetParam} ::=
  SEQUENCE (SIZE (1..maxPrivateIEs)) OF
    PrivateIE-Field {{IEsSetParam}}

PrivateIE-Field {X2AP-PRIVATE-IES : IEsSetParam} ::= SEQUENCE {
  id          X2AP-PRIVATE-IES.&id          ({IEsSetParam}),
  criticality X2AP-PRIVATE-IES.&criticality  ({IEsSetParam}{@id}),
  value       X2AP-PRIVATE-IES.&Value       ({IEsSetParam}{@id})
}

END
-- ASN1STOP
```

9.4 Message transfer syntax

X2AP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax, as specified in ITU-T Rec. X.691 [5].

9.5 Timers

$T_{\text{RELOCprep}}$

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

$T_{\text{X2RELOCoverall}}$

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

T_{DCprep}

- Specifies the maximum time for the SeNB Addition Preparation, MeNB initiated SeNB Modification Preparation, SgNB Addition Preparation, or MeNB initiated SgNB Modification Preparation procedure in the MeNB.

$T_{\text{DCoverall}}$

- Specifies the maximum time in the SeNB for either the SeNB initiated SeNB Modification procedure or the protection of the E-UTRAN actions necessary to configure UE resources at SeNB Addition or MeNB initiated SeNB Modification. Or specifies the maximum time in the SgNB for either the SgNB initiated SgNB Modification procedure or the protection of the E-UTRAN actions necessary to configure UE resources at SgNB Addition or MeNB initiated SgNB Modification.

10 Handling of unknown, unforeseen and erroneous protocol data

Section 10 of TS 36.413 [4] is applicable for the purposes of the present document.

Annex A (informative): Change history

| TSG # | TSG Doc. | CR | Rev | Subject/Comment | New |
|---------|-----------|------|-----|---|--------|
| 09/2009 | | | | Rel-9 version is created based on v.8.7.0 | 9.0.0 |
| 45 | RP-090787 | 0296 | 1 | Handling of Emergency Calls in Limited Service Mode | 9.0.0 |
| 45 | RP-090787 | 0297 | 1 | Emergency Calls Mobility Handling | 9.0.0 |
| 46 | RP-091192 | 0307 | | Introduction of signalling support for Composite Available Capacity with relative units | 9.1.0 |
| 46 | RP-091192 | 0308 | 2 | Configuration adaptation for MLB on X2 | 9.1.0 |
| 46 | RP-091183 | 0310 | 1 | Clarification on operational use of updated configuration data | 9.1.0 |
| 46 | RP-091192 | 0317 | 2 | Automatic PRACH information exchange over X2 for SON | 9.1.0 |
| 46 | RP-091192 | 0333 | 1 | Introduction of Radio Link Failure Indication procedure | 9.1.0 |
| 46 | RP-091192 | 0334 | 1 | Introduction of Handover Report procedure | 9.1.0 |
| 46 | RP-091192 | 0335 | | Introduction of signalling support for Composite Available Capacity with relative units | 9.1.0 |
| 47 | RP-100213 | 0337 | | Correction to the Resource Status Reporting Initiation procedure | 9.2.0 |
| 47 | RP-100229 | 0341 | 2 | Addition of MBSFN information on X2 interface | 9.2.0 |
| 47 | RP-100228 | 0344 | 4 | Cell pair identification for Mobility Settings Change procedure | 9.2.0 |
| 47 | RP-100213 | 0352 | | Addition of cause value for not admitted E-RAB | 9.2.0 |
| 47 | RP-100229 | 0355 | 1 | Rapporteur's update of X2AP protocol | 9.2.0 |
| 47 | RP-100230 | 0356 | 3 | RNL-based energy saving solution | 9.2.0 |
| 47 | RP-100228 | 0358 | 1 | Inclusion of UE RLF Report in RLF INDICATION message | 9.2.0 |
| 48 | RP-100599 | 0363 | 1 | Correction of RLF INDICATION message | 9.3.0 |
| 48 | RP-100599 | 0364 | 1 | Missing error cause for Not supported QCI on Handover | 9.3.0 |
| 48 | RP-100599 | 0370 | 1 | Introduction of PLMN-related abnormal conditions during X2 handover in network sharing scenarios. | 9.3.0 |
| 48 | RP-100599 | 0372 | 1 | Outcome of RAN3#68 review of X2AP | 9.3.0 |
| 48 | RP-100599 | 0373 | 1 | Correction of forbidden inter-RAT | 9.3.0 |
| 49 | RP-100908 | 0376 | 1 | Explicit PLMN coding in Trace IEs | 9.4.0 |
| 49 | RP-100906 | 0380 | 2 | The corrections for Last Visited Cell Information | 9.4.0 |
| 49 | RP-100906 | 0383 | 1 | Handover Restriction List | 9.4.0 |
| 49 | RP-100908 | 0384 | 1 | Complete list of served cells to be provided in X2 SETUP and eNB Configuration Update messages | 9.4.0 |
| 50 | RP-101271 | 0385 | | Clarification on Handover Restriction List | 9.5.0 |
| 50 | RP-101270 | 0403 | 3 | Correction of semantics description | 9.5.0 |
| 12/2010 | | | | Rel-10 version created based in v. 9.5.0 | 10.0.0 |
| 50 | RP-101304 | 0393 | 2 | Introduction of partial failure in Resource Status Reporting Initiation procedure including detailed reporting of failure cause | 10.0.0 |
| 50 | RP-101279 | 0407 | 4 | X2 handover support | 10.0.0 |
| SP-49 | SP-100629 | | | Clarification on the use of References (TS 21.801 CR#0030) | 10.1.0 |
| 51 | RP-110231 | 0408 | | Conditions for Enhanced X2 mobility | 10.1.0 |
| 51 | RP-110237 | 0409 | | Introduction of X2 signalling support for eICIC | 10.1.0 |
| 51 | RP-110222 | 0411 | 1 | Correction of the usage of optional ShortMAC-I IE in RLF INDICATION message | 10.1.0 |
| 51 | RP-110230 | 0413 | 2 | Support for MDT | 10.1.0 |
| 51 | RP-110226 | 0419 | 2 | Clarification on TEID value range for X2AP | 10.1.0 |
| 51 | RP-110231 | 0420 | | Clarify X2 Handover Scenarios | 10.1.0 |
| 51 | RP-110237 | 0427 | 1 | Enabling reporting of ABS resource status for eICIC purposes | 10.1.0 |
| 52 | RP-110695 | 0435 | 1 | MDT correction for TAI | 10.2.0 |
| 52 | RP-110698 | 0436 | 1 | Clarification on Radio Resource Status | 10.2.0 |
| 52 | RP-110700 | 0443 | 4 | X2 support of RLF Report extension for SON MRO defined in R10 | 10.2.0 |
| 52 | RP-110695 | 0447 | 3 | Support for MDT user consent | 10.2.0 |
| 52 | RP-110686 | 0451 | 2 | Rapporteur's proposal following review of TS 36.423 | 10.2.0 |
| 52 | RP-110689 | 0452 | 1 | Correction of the partial success mechanism in Resource Status Reporting | 10.2.0 |
| 52 | RP-110695 | 0453 | 2 | MDT amendments | 10.2.0 |
| 52 | RP-110685 | 0454 | | Reference review outcome in TS 36.423 | 10.2.0 |
| 52 | RP-110695 | 0456 | | Correction of trace function and trace session | 10.2.0 |
| 53 | RP-111196 | 0464 | 2 | Clarification of procedures defined for MLB purposes | 10.3.0 |
| 53 | RP-111196 | 0469 | 1 | ASN.1 definition conforms to ITU-T Recommendations | 10.3.0 |
| 53 | RP-111194 | 0476 | 2 | Updates of reported quantities for eICIC | 10.3.0 |
| 53 | RP-111195 | 0478 | 1 | Definition of value of bit in Measurements to Activate | 10.3.0 |
| 53 | RP-111197 | 0479 | | Clarification on PLMN Identity | 10.3.0 |
| 54 | RP-111648 | 0480 | 2 | Correction on ABS Information | 10.4.0 |
| 55 | RP-120234 | 0491 | 1 | Correct of reset | 10.5.0 |
| 03/2012 | | | | Rel-11 version created based in v. 10.5.0 | 11.0.0 |

| | | | | | |
|---------|-----------|------|----|---|--------|
| 55 | RP-120236 | 0487 | 1 | Addition of TAC to the neighbour information of a served cell for X2 setup and eNB update procedures | 11.0.0 |
| 56 | RP-120751 | 0496 | - | Introduction of the Security Algorithm (ZUC) | 11.1.0 |
| 56 | RP-120751 | 0498 | 2 | Clarification on TAC in X2 Setup | 11.1.0 |
| 56 | RP-120751 | 0501 | 3 | Adding RRC re-establishment cause to RLF indication | 11.1.0 |
| 56 | RP-120752 | 0513 | 1 | Correction on Emergency ARP Value | 11.1.0 |
| 56 | RP-120752 | 0516 | 1 | Improved granularity for the time UE stayed in cell | 11.1.0 |
| 57 | RP-121137 | 0520 | 2 | Support of MBMS Service Continuity | 11.2.0 |
| 57 | RP-121140 | 0527 | 3 | Multiband support per cell | 11.2.0 |
| 57 | RP-121135 | 0540 | 1 | Enhancement of HO REPORT to enable inter-RAT ping-pong detection and addition of HO cause value to the UE history information | 11.2.0 |
| 57 | RP-121139 | 0546 | | Support for new special subframe configurations | 11.2.0 |
| 58 | RP-121731 | 0548 | | Addition of Mobility Information | 11.3.0 |
| 58 | RP-121730 | 0549 | 3 | Introduction of new MDT measurements | 11.3.0 |
| 58 | RP-121732 | 0550 | 1 | HeNB Mobility enhancement when target is hybrid HeNB | 11.3.0 |
| 58 | RP-121730 | 0552 | 2 | Multi-PLMN MDT | 11.3.0 |
| 58 | RP-121731 | 0564 | | Clarification on successful handover for HO report procedure | 11.3.0 |
| 58 | RP-121737 | 0569 | 2 | X2AP Rapporteur Update | 11.3.0 |
| 59 | RP-130208 | 0572 | 3 | Correction on the Special Subframe Pattern | 11.4.0 |
| 59 | RP-130208 | 0580 | 2 | Support for Downlink-Only Bands | 11.4.0 |
| 59 | RP-130207 | 0581 | | Correction on use of Mobility Information | 11.4.0 |
| 59 | RP-130207 | 0582 | 1 | Correction on MRO procedures | 11.4.0 |
| 59 | RP-130237 | 0583 | 2 | Extending maxEARFCN | 11.4.0 |
| 59 | RP-130237 | 0584 | 1 | Extending Maximum Frequency Band Index | 11.4.0 |
| 59 | RP-130211 | 0585 | 1 | Rapporteur correction of X2AP | 11.4.0 |
| 59 | RP-130207 | 0586 | | Clarification on Signalling Based MDT PLMN List | 11.4.0 |
| 59 | RP-130210 | 0587 | 1 | X2AP modification for PDCP SN extension | 11.4.0 |
| 60 | RP-130643 | 0588 | | Correction on the Definition of Direct Neighbours | 11.5.0 |
| 60 | RP-130641 | 0589 | 1 | Correction for the MDT Location Information IE | 11.5.0 |
| 60 | RP-130640 | 0590 | 5 | Correction on RLF INDICATION procedure | 11.5.0 |
| 60 | RP-130643 | 0592 | 1 | Security key generation in case of MFBI | 11.5.0 |
| 60 | RP-130643 | 0593 | 2 | Correction on the Multiple Frequency Band Indicators | 11.5.0 |
| 61 | RP-131181 | 0598 | 1 | Correction on Handover Report procedure | 11.6.0 |
| 61 | RP-131179 | 0602 | 2 | Correction on ABS Information | 11.6.0 |
| 61 | RP-131183 | 0606 | 1 | Correction of terminology concerning the mobility restriction function | 11.6.0 |
| 62 | RP-131902 | 0609 | 3 | Correction of Handover Restriction List | 11.7.0 |
| 62 | RP-131902 | 0611 | 1 | Correction for Load Balancing Related cause value CR for 36423 | 11.7.0 |
| 62 | RP-131902 | 0623 | 2 | Correction for Load Balancing Related IE | 12.0.0 |
| 62 | RP-131909 | 0607 | 3 | Handling SIPTO@LN during UE Context Release procedure | 12.0.0 |
| 63 | RP-140294 | 0634 | | Correction to tabular of Served Cell Information IE | 12.1.0 |
| 64 | RP-140901 | 0629 | 4 | TDD eIMTA support on X2AP | 12.2.0 |
| 64 | RP-140906 | 0630 | 4 | Provide IMEISV to eNB to identify UE characteristics | 12.2.0 |
| 64 | RP-140905 | 0661 | 1 | Correction of SN STATUS TRANSFER | 12.2.0 |
| 64 | RP-140905 | 0676 | | Clarification of DL ABS status | 12.2.0 |
| 64 | RP-140897 | 0641 | 4 | Introduce X2GW procedures in Stage-3 | 12.2.0 |
| 65 | RP-141520 | 0663 | 3 | Introduction of the UE history reported from the UE | 12.3.0 |
| 65 | RP-141518 | 0690 | 2 | Introduction of an indication of the expected UE behaviour | 12.3.0 |
| 66 | RP-142089 | 0691 | 8 | Introduction of Dual Connectivity | 12.4.0 |
| 66 | RP-142090 | 0692 | 10 | Introduction of inter-eNB CoMP signalling | 12.4.0 |
| 66 | RP-142092 | 0748 | 5 | X2 support for Network Assisted Interference Cancellation | 12.4.0 |
| 66 | RP-142094 | 0754 | 2 | X2AP Rapporteur Update | 12.4.0 |
| 66 | RP-142094 | 0759 | 2 | Correction on RLF Report Container | 12.4.0 |
| 66 | RP-142094 | 0776 | 2 | Setting of Re-establishment Cell ID in RLF Indication message | 12.4.0 |
| 66 | RP-142094 | 0777 | 3 | X2 Removal Signaling | 12.4.0 |
| 12/2014 | | | | History table corrected | 12.4.1 |
| 12/2014 | | | | ASN.1 correction to make it compilable | 12.4.2 |
| 67 | RP-150353 | 0693 | 5 | ProSe authorized indication | 12.5.0 |
| 67 | RP-150351 | 0782 | 1 | Corrections on the usage of SeNB UE AMBR in dual connectivity | 12.5.0 |
| 67 | RP-150351 | 0790 | 1 | Corrections of Dual Connectivity in general | 12.5.0 |
| 67 | RP-150356 | 0797 | 1 | Correction on DC stage3 | 12.5.0 |
| 67 | RP-150348 | 0801 | 1 | Correction of the Usage of the MultibandInfoList IE | 12.5.0 |
| 67 | RP-150351 | 0802 | 1 | Introduction of Cause values for Dual Connectivity | 12.5.0 |
| 67 | RP-150356 | 0803 | 1 | ASN.1 Corrections for X2AP | 12.5.0 |
| 67 | RP-150351 | 0804 | 2 | Corrections for Dual Connectivity | 12.5.0 |

| | | | | | |
|---------|-----------|------|----|--|--------|
| 67 | RP-150356 | 0805 | | Miscellaneous Editorials for X2AP | 12.5.0 |
| 67 | RP-150351 | 0806 | 1 | Correction on SeNB behaviour for distinguishing uplink PDCP PDUs | 12.5.0 |
| 68 | RP-150943 | 0807 | 1 | Correction on the definition of SeNB Reconfiguration Complete | 12.6.0 |
| 68 | RP-150943 | 0827 | 1 | Introduction of a new DC cause for not supported configurations | 12.6.0 |
| 68 | RP-150943 | 0831 | | Clarification on UE-AMBR for split bearer | 12.6.0 |
| 06/2015 | | | | Rel-13 version created based in v. 12.6.0 | 13.0.0 |
| 68 | RP-150945 | 0808 | 8 | Addition of Intra-LTE notifications of AAS-based reconfigurations | 13.0.0 |
| 69 | RP-151455 | 0788 | 11 | Introduction of enhanced inter-eNB CoMP signalling | 13.1.0 |
| 69 | RP-151451 | 0854 | 1 | Correction on GBR parameters for dual connectivity | 13.1.0 |
| 69 | RP-151450 | 0877 | 1 | Handling of Unknown or Erroneous AP IDs in Dual Connectivity | 13.1.0 |
| 70 | RP-152100 | 0850 | 5 | UE-to-Network Relay authorization | 13.2.0 |
| 70 | RP-152099 | 0892 | 2 | Extension of PDCP SN | 13.2.0 |
| 70 | RP-152102 | 0901 | 4 | Adding CSG support to DC | 13.2.0 |
| 70 | RP-152086 | 0907 | | Correction on inter eNB CoMP | 13.2.0 |
| 70 | RP-152102 | 0910 | 5 | Support of SIPTO stand-alone architecture in dual connectivity | 13.2.0 |
| 70 | RP-152102 | 0911 | 2 | Support of SIPTO and LIPA in dual connectivity | 13.2.0 |
| 70 | RP-152102 | 0912 | 6 | Support of handover without SeNB change | 13.2.0 |
| 70 | RP-152102 | 0916 | 2 | Handling of User Inactivity in the SeNB | 13.2.0 |
| 70 | RP-152086 | 0918 | | Correction of Subband Index | 13.2.0 |
| 70 | RP-152085 | 0924 | 4 | Correction of intra cell handovers in multiband deployments | 13.2.0 |
| 70 | RP-152102 | 0927 | 2 | Extension of UE X2AP ID | 13.2.0 |
| 70 | RP-152102 | 0929 | 2 | SIPTO@LN and LIPA bearer deactivation for DC | 13.2.0 |
| 70 | RP-152103 | 0932 | 3 | Introduction of feMDT | 13.2.0 |
| 70 | RP-152108 | 0936 | 2 | Addition of the Cell Deployment Status Indicator and replacing cell information | 13.2.0 |
| 70 | RP-152102 | 0939 | 1 | Tunnel Information of BBAI in Dual Connectivity | 13.2.0 |
| 71 | RP-160449 | 0937 | 3 | Addition of X2 Removal Threshold to the X2 Removal Request message | 13.3.0 |
| 71 | RP-160449 | 0949 | 2 | Modification of an ongoing resource reporting procedure | 13.3.0 |
| 71 | RP-160448 | 0950 | 1 | Correction on SeNB Addition Preparation concerning inter-MeNB handover without SeNB change | 13.3.0 |
| 71 | RP-160448 | 0953 | 1 | Correction on usage of extended eNB UE X2AP ID | 13.3.0 |
| 71 | RP-160448 | 0954 | | Correction for SeNB Addition behaviour Abnormal | 13.3.0 |
| 71 | RP-160451 | 0959 | | Clarification on the abnormal condition for DC SIPTO@LN | 13.3.0 |
| 71 | RP-160449 | 0962 | 1 | Rapporteur's Update | 13.3.0 |
| 71 | RP-160448 | 0963 | 3 | Correction on Old/New eNB UE X2AP ID | 13.3.0 |
| 72 | RP-161042 | 0965 | 7 | Introduction of the inter-eNB UE Context Resume function | 13.4.0 |
| 72 | RP-161043 | 0968 | 1 | Correction on the DC function description | 13.4.0 |
| 72 | RP-161043 | 0969 | 3 | Correction on eNB UE X2AP ID Extension | 13.4.0 |
| 72 | RP-161043 | 0972 | 2 | Indication of Bearer Type for cIOT | 13.4.0 |
| 72 | RP-161047 | 0978 | | Correction of RSRP Measurement Report List | 13.4.0 |
| 73 | RP-161551 | 0989 | 1 | Correction on NB-IoT inter node RRC container | 13.5.0 |
| 73 | RP-161550 | 0998 | 2 | Correction on Security Related Information in UE Context Retrieval Request | 13.5.0 |
| 09/2016 | | | | Rel-14 version created based in v. 13.5.0 | 14.0.0 |
| 73 | RP-161552 | 0975 | 5 | Vehicular Authorization Signaling over X2 | 14.0.0 |
| 74 | RP-162337 | 1007 | | Clarification on V2X Services Authorized IE | 14.1.0 |
| 74 | RP-162340 | 1008 | 3 | Target cell selection for low complexity UEs and UEs in enhanced coverage | 14.1.0 |
| 74 | RP-162340 | 1011 | - | Correction to Served Cell Information for NB-IoT | 14.1.0 |

| Change history | | | | | | | |
|----------------|---------|-----------|------|-----|-----|--|-------------|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 03/2017 | RP-75 | RP-170535 | 1023 | | B | X2AP Support for Inter-eNB Mobility without WT Change | 14.2.0 |
| 03/2017 | RP-75 | RP-170537 | 1005 | 3 | B | Introduction of a new special subframe configuration | 14.2.0 |
| 03/2017 | RP-75 | RP-170538 | 1025 | | B | Support of V2X over X2 | 14.2.0 |
| 03/2017 | RP-75 | RP-170542 | 1026 | | B | Introduction of New types of eNB ID | 14.2.0 |
| 03/2017 | RP-75 | RP-170536 | 1024 | 1 | B | Introduction of eMOB Stage3 | 14.2.0 |
| 06/2017 | RP-75 | RP-171329 | 1033 | 1 | A | Introduction of UL TNL address in ClOT UP Solution | 14.3.0 |
| 09/2017 | RP-77 | RP-171974 | 1035 | 1 | F | Correction on NB-IoT UP mobility | 14.4.0 |
| 09/2017 | RP-77 | RP-171974 | 1037 | 1 | F | Correction of SeNB Release Confirm | 14.4.0 |
| 12/2017 | RP-78 | RP-172673 | 1044 | 2 | F | Introduction of new IEs in X2 for high performing load balance | 14.5.0 |
| 12/2017 | RP-78 | RP-172715 | 1046 | - | F | Correction of mismatched tabular and ASN.1 | 14.5.0 |
| 12/2017 | RP-78 | RP-172672 | 1041 | 6 | B | Baseline CR to TS 36.423 covering agreements of RAN3 #98 | 15.0.0 |
| 12/2017 | RP-78 | RP-172674 | 1045 | 1 | B | Introduction of QoE Measurement Collection for LTE | 15.0.0 |
| 03/2018 | RP-79 | RP-180468 | 1050 | - | B | X2AP corrections for agreed EN-DC BL CR | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1051 | 1 | F | Essential corrections for EN-DC | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1052 | 1 | F | Clarification on HRL for EN-DC | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1053 | - | F | Correction of counter Check procedure for EN-DC | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1054 | - | B | Support for supplementary UL carrier | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1056 | - | F | Correction on SgNB initiated SgNB Modification procedure | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1061 | 1 | F | Correction of mandatory/optional/Conditional IEs in 36.423 | 15.1.0 |
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| 03/2018 | RP-79 | RP-180468 | 1071 | 2 | F | Update of EN-DC X2 Setup and EN-DC Configuration Update | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1073 | - | F | Removal of wrong abnormal behaviour that does not exist in EN-DC | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1078 | 1 | | CR for addition of cause | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1079 | 2 | F | Clarification and correction on X2 for EN-DC | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1081 | 1 | F | Corrections for EN-DC | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1082 | 1 | F | Resolve the remaining issues over X2 for EN-DC | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1083 | 1 | F | Introduction of DRB ID for EN-DC | 15.1.0 |
| 03/2018 | RP-79 | RP-180314 | 1087 | 1 | F | Removing data forwarding from the corresponding node for EN-DC | 15.1.0 |
| 03/2018 | RP-79 | RP-180472 | 1092 | 1 | F | Rapporteur correction of 36.423 before NSA ASN.1 freeze | 15.1.0 |
| 03/2018 | RP-79 | RP-180473 | 1093 | - | A | Correction on Offset of NB-IoT Channel Number to EARFCN | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1094 | - | F | Correction of TAC for NG-RAN cells before NSA ASN.1 freeze | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1095 | - | F | Remove PDCP change indication in SN modification request message | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1096 | - | F | Change the presence of container in SgNB reconfiguration complete procedure | 15.1.0 |
| 03/2018 | RP-79 | RP-180468 | 1097 | - | F | Addition of Measurement Timing Configuration information | 15.1.0 |
| 06/2018 | RP-80 | RP-181241 | 1047 | 6 | B | Support of Enhanced VoLTE Performance | 15.2.0 |
| 06/2018 | RP-80 | RP-181239 | 1065 | 4 | F | X2 partial reset for EN-DC | 15.2.0 |
| 06/2018 | RP-80 | RP-181238 | 1068 | 1 | F | Clarification of the interactions with the UE Context Release | 15.2.0 |
| 06/2018 | RP-80 | RP-181241 | 1086 | 3 | C | Introduction of QMC for MTSI in EUTRAN | 15.2.0 |
| 06/2018 | RP-80 | RP-181237 | 1090 | 9 | B | Baseline CR for E-UTRA - NR Cell Resource Coordination for TS 36.423 covering agreements of RAN3#100 | 15.2.0 |
| 06/2018 | RP-80 | RP-181238 | 1104 | - | F | Correction of UL link configuration in TS36.423 | 15.2.0 |
| 06/2018 | RP-80 | RP-181410 | 1107 | 4 | F | Addition of the full config indicator | 15.2.0 |
| 06/2018 | RP-80 | RP-181239 | 1116 | 1 | F | Correction of the SeNB Reconfiguration Completion procedure | 15.2.0 |
| 06/2018 | RP-80 | RP-181239 | 1117 | 2 | F | Correction of abnormal conditions for EN-DC security algorithm selection | 15.2.0 |
| 06/2018 | RP-80 | RP-181238 | 1121 | 1 | F | Correction of reference in RRC Container | 15.2.0 |
| 06/2018 | RP-80 | RP-181238 | 1122 | - | F | Correction of condition presence of E-RAB Level QoS Parameters related | 15.2.0 |
| 06/2018 | RP-80 | RP-181238 | 1123 | 1 | F | Support of TEID change at SN | 15.2.0 |
| 06/2018 | RP-80 | RP-181237 | 1125 | 4 | B | X2AP CR for support of NR Multiple frequency band in EN-DC | 15.2.0 |
| 06/2018 | RP-80 | RP-181238 | 1130 | - | F | Correction of max NR ARFCN value | 15.2.0 |
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| 06/2018 | RP-80 | RP-181238 | 1133 | 1 | F | Use of SPID for EN-DC | 15.2.0 |
| 06/2018 | RP-80 | RP-181238 | 1134 | 1 | F | Correction of references to RRC containers for EN-DC | 15.2.0 |
| 06/2018 | RP-80 | RP-181238 | 1135 | - | F | Corrections on Tabular indentation and ASN.1 criticality | 15.2.0 |
| 06/2018 | RP-80 | RP-181239 | 1138 | - | F | Adding missing relation for the TEID | 15.2.0 |
| 06/2018 | RP-80 | RP-181241 | 1142 | 3 | B | Retrieve UE Context at UE Re-establishment | 15.2.0 |
| 06/2018 | RP-80 | RP-181241 | 1143 | - | D | Rapporteur's corrections on the specification | 15.2.0 |
| 06/2018 | RP-80 | RP-181239 | 1145 | - | F | Correction on the same terminology of "Split SRB" in TS36.423 | 15.2.0 |
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| 06/2018 | RP-80 | RP-181239 | 1158 | - | F | User Inactivity handling over X2 EN-DC | 15.2.0 |
| 06/2018 | RP-80 | RP-181239 | 1160 | 1 | F | Addition of Cause Value | 15.2.0 |
| 06/2018 | RP-80 | RP-181239 | 1161 | 2 | F | Addition of MeNB cell ID to solve the PCI confusion | 15.2.0 |

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| 06/2018 | RP-80 | RP-181239 | 1164 | - | F | Corrections on misalignment between tabular and ASN.1 | 15.2.0 |
| 06/2018 | RP-80 | RP-181239 | 1165 | 1 | F | Introduction of EN-DC X2 removal procedure | 15.2.0 |
| 06/2018 | RP-80 | RP-181239 | 1167 | - | F | Support of DL TEID change over S1 at SN | 15.2.0 |
| 06/2018 | RP-80 | RP-181242 | 1174 | 2 | B | Support of NB-IoT measurement enhancement and TDD Config | 15.2.0 |
| 06/2018 | RP-80 | RP-181239 | 1175 | - | F | ASN.1 correction for EN-DC support in TS 36.423 | 15.2.0 |
| 06/2018 | RP-80 | RP-181239 | 1176 | 1 | F | Introduction of a Configured TAC into the NR Neighbour Information IE and the Served NR Cell Information IE | 15.2.0 |
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| 09/2018 | RP-81 | RP-181920 | 1115 | 4 | F | Indication of the RLC re-establishment at the assisting node | 15.3.0 |
| 09/2018 | RP-81 | RP-181920 | 1190 | - | F | Addition of RRC config indication to SGNB MODIFICATION REQUIRED and SGNB MODIFICATION REQUEST ACKNOWLEDGE | 15.3.0 |
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| 09/2018 | RP-81 | RP-181920 | 1192 | 1 | F | Essential corrections for EN-DC | 15.3.0 |
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| 09/2018 | RP-81 | RP-181920 | 1198 | 1 | F | Corrections on E-UTRA – NR Cell Resource Coordination | 15.3.0 |
| 09/2018 | RP-81 | RP-181921 | 1201 | 2 | F | RLC Mode Indication over X2 – for 36.423 | 15.3.0 |
| 09/2018 | RP-81 | RP-181922 | 1202 | 4 | F | Baseline CR for TS 36.423 covering agreements of RAN3#AH1807 and RAN3#101 | 15.3.0 |
| 09/2018 | RP-81 | RP-181921 | 1203 | 2 | F | Correction of "Maximum MCG admissible E-RAB Level QoS Parameters" | 15.3.0 |
| 09/2018 | RP-81 | RP-181921 | 1206 | - | F | X2 Corrections for EN-DC | 15.3.0 |
| 09/2018 | RP-81 | RP-181921 | 1211 | 1 | F | Access Restriction Data for NR in EPC | 15.3.0 |
| 09/2018 | RP-81 | RP-181921 | 1214 | 2 | C | Extension of Data Traffic Resources IE for E-UTRA-NR Cell Resource Coordination | 15.3.0 |
| 09/2018 | RP-81 | RP-181921 | 1217 | - | F | Correction of 5GS TAC | 15.3.0 |
| 09/2018 | RP-81 | RP-181921 | 1221 | 1 | F | CR on clarification of successfully delivered for NR-U | 15.3.0 |
| 09/2018 | RP-81 | RP-181923 | 1226 | 3 | F | Data forwarding for Retrieve UE Context in case of RRC connection re-establishment | 15.3.0 |
| 09/2018 | RP-81 | RP-181924 | 1231 | 1 | F | CR to X2AP to introduce Bluetooth and WLAN measurement in MDT | 15.3.0 |
| 09/2018 | RP-81 | RP-182127 | 1233 | 4 | B | Introduction of Subscription based UE differentiation | 15.3.0 |
| 09/2018 | RP-81 | RP-181921 | 1235 | - | F | Correction of SgNB Activity Notification Procedure | 15.3.0 |
| 12/2018 | RP-82 | RP-182447 | 1237 | 4 | F | Addition of the RLC Mode information for PDCP transfer | 15.4.0 |
| 12/2018 | RP-82 | RP-182446 | 1243 | 3 | F | Correction on PDCP SN length | 15.4.0 |
| 12/2018 | RP-82 | RP-182447 | 1244 | 2 | F | Support of CA based PDCP duplication on X2 | 15.4.0 |
| 12/2018 | RP-82 | RP-182446 | 1245 | 1 | F | CR on Introduction of overload indication over X2 | 15.4.0 |
| 12/2018 | RP-82 | RP-182447 | 1246 | 1 | F | CR on alignment of terminology for eNB or MeNB | 15.4.0 |
| 12/2018 | RP-82 | RP-182446 | 1247 | 1 | F | Correction of SgNB Initiated SN Modification procedure for Measurement Gap | 15.4.0 |
| 12/2018 | RP-82 | RP-182446 | 1248 | - | F | ASN.1 corrections on NRNeighbour-Information IE and NRFreqInfo IE | 15.4.0 |
| 12/2018 | RP-82 | RP-182446 | 1250 | - | F | Correction on E-UTRA - NR resource coordination | 15.4.0 |
| 12/2018 | RP-82 | RP-182447 | 1253 | 3 | F | Corrections of MeNB/SgNB resource coordination | 15.4.0 |
| 12/2018 | RP-82 | RP-182446 | 1256 | 1 | F | Correction on SGNB ACTIVITY NOTIFICATION IE's | 15.4.0 |
| 12/2018 | RP-82 | RP-182447 | 1259 | 1 | F | Correction of PDCP SN Length Indication | 15.4.0 |
| 12/2018 | RP-82 | RP-182447 | 1264 | 2 | F | RLC reestablishment indication for TS36.423 | 15.4.0 |
| 12/2018 | RP-82 | RP-182504 | 1267 | 1 | F | Update on Retrieve UE Context Request message for TS36.423 | 15.4.0 |
| 12/2018 | RP-82 | RP-182447 | 1272 | 1 | F | Handling of RLC failure | 15.4.0 |
| 12/2018 | RP-82 | RP-182447 | 1273 | - | F | Add missing description on non-operational X2 interface for EN-DC | 15.4.0 |
| 12/2018 | RP-82 | RP-182447 | 1275 | 2 | F | Further corrections of MeNB/SgNB resource coordination | 15.4.0 |
| 12/2018 | RP-82 | RP-182447 | 1279 | 1 | F | Criticality Correction for X2AP UE-ID | 15.4.0 |
| 12/2018 | RP-82 | RP-182437 | 1280 | 2 | F | Allowing SgNB to request new DRB ID from MeNB in EN-DC for an already established SN terminated bearer | 15.4.0 |
| 03/2019 | RP-83 | RP-190555 | 1282 | 3 | F | Correction to RRC transfer | 15.5.0 |
| 03/2019 | RP-83 | RP-190555 | 1283 | 2 | F | Transfer of the PSCell information for LI purposes | 15.5.0 |
| 03/2019 | RP-83 | RP-190555 | 1285 | - | F | Enabling using Dual Connectivity cause values in EN-DC | 15.5.0 |
| 03/2019 | RP-83 | RP-190555 | 1287 | 1 | F | Desired Activity Notification Level | 15.5.0 |
| 03/2019 | RP-83 | RP-190555 | 1291 | - | F | Introduction of IMEISV to Addition Request over X2 | 15.5.0 |
| 03/2019 | RP-83 | RP-190555 | 1292 | 1 | F | Clarification on the usage of coordination assistance information | 15.5.0 |
| 03/2019 | RP-83 | RP-190556 | 1297 | 1 | F | Introducing NR Neighbour information in X2 Setup | 15.5.0 |
| 03/2019 | RP-83 | RP-190555 | 1298 | - | F | Rapporteur updates on version 15.4.0 | 15.5.0 |
| 03/2019 | RP-83 | RP-190523 | 1300 | 3 | F | Adding Trace Messages in X2AP | 15.5.0 |
| 03/2019 | RP-83 | RP-190556 | 1301 | 1 | F | Correction of EPC interworking | 15.5.0 |
| 03/2019 | RP-83 | RP-190555 | 1302 | - | F | Straighten-up SgNB's request to release and add the same SN-terminated bearer with different DRB ID | 15.5.0 |
| 03/2019 | RP-83 | RP-190561 | 1304 | 1 | F | Introduction of TNL Address discovery for EN-DC (using new container) | 15.5.0 |
| 2019-07 | RP-84 | RP-191395 | 1299 | 2 | F | Correction of MaxnoofBPLMNs for NR | 15.6.0 |
| 2019-07 | RP-84 | RP-191395 | 1307 | 1 | F | RRC config indication behaviour | 15.6.0 |
| 2019-07 | RP-84 | RP-191395 | 1308 | - | F | Transferring of NR RRC message in MeNB | 15.6.0 |

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| 2019-07 | RP-84 | RP-191396 | 1313 | 1 | F | PDCP SN length related clean-up over To Be Modified structure in SN initiated SN Modification procedure | 15.6.0 |
| 2019-07 | RP-84 | RP-191429 | 1314 | 5 | F | RAN sharing with multiple Cell ID broadcast | 15.6.0 |
| 2019-07 | RP-84 | RP-191395 | 1315 | - | F | SN Status Transfer applicability for Re-establishment | 15.6.0 |
| 2019-07 | RP-84 | RP-191395 | 1316 | 2 | F | Rapporteur's corrections to version 15.5.0 | 15.6.0 |
| 2019-07 | RP-84 | RP-191397 | 1317 | 1 | F | Correction of Core Network Type Restriction | 15.6.0 |
| 2019-07 | RP-84 | RP-191395 | 1318 | - | F | CR36423 for Addition of MN (MeNB) cell ID to solve the PCI confusion in SN(SgNB) modification Request message | 15.6.0 |
| 2019-07 | RP-84 | RP-191395 | 1321 | 1 | F | Updates on TS 36.423 for EN-DC TNL Address discovery | 15.6.0 |
| 2019-07 | RP-84 | RP-191394 | 1330 | 1 | F | PDCP SN length related clean-up over To Be Modified structure in MN initiated SN Modification procedure | 15.6.0 |
| 2019-09 | RP-85 | RP-192166 | 1322 | 2 | F | Correction of handling of the Location Information at the MeNB | 15.7.0 |
| 2019-09 | RP-85 | RP-192169 | 1336 | - | F | Correction on Data Forwarding Address Indication | 15.7.0 |
| 2019-09 | RP-85 | RP-192170 | 1339 | 1 | A | Correction on Handover Request Acknowledge | 15.7.0 |
| 2019-09 | RP-85 | RP-192169 | 1341 | 1 | F | Correction of NB-IoT TDD Cell Frequency info | 15.7.0 |
| 2019-09 | RP-85 | RP-192169 | 1359 | 1 | F | Non IP bearer support for Dual Connectivity | 15.7.0 |

History

| Document history | | |
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| V15.2.0 | July 2018 | Publication |
| V15.3.0 | October 2018 | Publication |
| V15.4.0 | April 2019 | Publication |
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| V15.6.0 | July 2019 | Publication |
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