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Contents

Foreword

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1 Scope

The present document specifies the radio network layer signalling protocol for the NG interface. The NG Application Protocol (NGAP) supports the functions of the NG interface by signalling procedures defined in this document. NGAP is developed in accordance to the general principles stated in TS 38.401 [2] and TS 38.410 [3].

2 References

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

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

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

[2] 3GPP TS 38.401: "NG-RAN; Architecture description".

[3] 3GPP TS 38.410: "NG-RAN; NG general aspects and principles".

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

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

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

[7] 3GPP TR 25.921 (version.7.0.0): "Guidelines and principles for protocol description and error handling".

[8] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description; Stage 2".

[9] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[10] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[11] 3GPP TS 32.422: "Trace control and configuration management".

[12] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in idle mode and in RRC inactive state".

[13] 3GPP TS 33.501: "Security architecture and procedures for 5G System".

[14] 3GPP TS 38.414: "NG-RAN; NG data transport".

[15] 3GPP TS 29.281: "General Packet Radio System (GPRS); Tunnelling Protocol User Plane (GTPv1-U)".

[16] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".

[17] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[18] 3GPP TS 38.331: "NG-RAN; Radio Resource Control (RRC) Protocol Specification".

[19] 3GPP TS 38.455: "NG-RAN; NR Positioning Protocol A (NRPPa)".

[20] 3GPP TS 23.007: "Technical Specification Group Core Network Terminals; Restoration procedures".

[21] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC); Protocol specification".

[22] 3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)".

[23] 3GPP TS 23.003: "Numbering, addressing and identification".

[24] 3GPP TS 38.423: "NG-RAN; Xn Application Protocol (XnAP)".

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

[26] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[27] 3GPP TS 33.401: "3GPP System Architecture Evolution (SAE); Security architecture".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP 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 3GPP TR 21.905 [1].

Elementary Procedure: NGAP consists of Elementary Procedures (Eps). An Elementary Procedure is a unit of interaction between the NG-RAN node and the AMF. These Elementary Procedures are defined separately and are intended to be used to build up complete sequences in a flexible manner. If the independence between some Eps is restricted, it is described under the relevant EP description. Unless otherwise stated by the restrictions, the Eps may be invoked independently of each other as standalone procedures, which can be active in parallel. The usage of several NGAP Eps together or together with Eps from other interfaces is specified in stage 2 specifications (e.g., TS 38.401 [2], TS 38.410 [3] and TS 38.300 [8]).

An EP consists of an initiating message and possibly a response message. Two kinds of Eps are used:

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

For Class 1 Eps, the types of responses can be as follows:

Successful:

- A signalling message explicitly indicates that the elementary procedure successfully completed with the receipt of the response.

Unsuccessful:

- A signalling message explicitly indicates that the EP failed.
- On time supervision expiry (i.e., absence of expected response).

Successful and Unsuccessful:

- One signalling message reports both successful and unsuccessful outcome for the different included requests. The response message used is the one defined for successful outcome.

Class 2 Eps are considered always successful.

gNB: as defined in TS 38.300 [8].

ng-eNB: as defined in TS 38.300 [8].

NG-RAN node: as defined in TS 38.300 [8].

PDU session resource: as defined in TS 38.401 [2].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP 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 3GPP TR 21.905 [1].

5GC	5G Core Network
5QI	5G QoS Identifier
AMF	Access and Mobility Management Function
CGI	Cell Global Identifier
CP	Control Plane
DRB	Data Radio Bearer
E-CID	Enhanced Cell-ID
EP	Elementary Procedure
E-RAB	E-UTRAN Radio Access Bearer
GBR	Guaranteed Bit Rate
GTP	GPRS Tunnelling Protocol
GUAMI	Globally Unique AMF Identifier
IE	Information Element
K_AFM_CIK	K_{AMF} Change Indicator
LMF	Location Management Function
N3IWF	Non 3GPP InterWorking Function
NAS	Non-Access Stratum
NGAP	NG Application Protocol
NRPPa	NR Positioning Protocol Annex
NSSAI	Network Slice Selection Assistance Information
OTDOA	Observed Time Difference of Arrival
PDCP	Packet Data Convergence Protocol
PLMN	Public Land Mobile Network
PWS	Public Warning System
QoS	Quality of Service
RAN	Radio Access Network
RRC	Radio Resource Control
SCTP	Stream Control Transmission Protocol
SMF	Session Management Function
S-NG-RAN node	Secondary NG-RAN node
S-NSSAI	Single Network Slice Selection Assistance Information
TAI	Tracking Area Identity
TEID	Tunnel Endpoint Identifier
TNL	Transport Network Layer
TNLA	Transport Network Layer Association
UE	User Equipment
UP	User Plane
UPF	User Plane Function

4 General

4.1 Procedure Specification Principles

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

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

- The procedure text discriminates between:

1) Functionality which "shall" be executed

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

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

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

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

4.2 Forwards and Backwards Compatibility

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

4.3 Specification Notations

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

Procedure	When referring to an elementary procedure in the specification the Procedure Name is written with the first letters in each word in upper case characters followed by the word "procedure", e.g., Procedure Name procedure.
Message	When referring to a message in the specification the MESSAGE NAME is written with all letters in upper case characters followed by the word "message", e.g., MESSAGE NAME message.
IE	When referring to an information element (IE) in the specification the *Information Element Name* is written with the first letters in each word in upper case characters and all letters in Italic font followed by the abbreviation "IE", e.g., *Information Element* IE.
Value of an IE	When referring to the value of an information element (IE) in the specification the "Value" is written as it is specified in subclause 9.2 enclosed by quotation marks, e.g., "Value".

5 NGAP Services

NGAP provides the signalling service between the NG-RAN node and the AMF that is required to fulfil the NGAP functions described in TS 38.410 [3]. NGAP services are divided into two groups:

Non UE-associated services:	They are related to the whole NG interface instance between the NG-RAN node and AMF utilising a non UE-associated signalling connection.
UE-associated services:	They are related to one UE. NGAP functions that provide these services are associated with a UE-associated signalling connection that is maintained for the UE in question.

6 Services Expected from Signalling Transport

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

7 Functions of NGAP

The functions of NGAP are described in TS 38.410 [3].

8 NGAP Procedures

8.1 List of NGAP Elementary Procedures

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

Table 8.1-1: Class 1 procedures

Elementary Procedure	Initiating Message	Successful Outcome	Unsuccessful Outcome
		Response message	Response message
AMF Configuration Update	AMF CONFIGURATION UPDATE	AMF CONFIGURATION UPDATE ACKNOWLEDGE	AMF CONFIGURATION UPDATE FAILURE
RAN Configuration Update	RAN CONFIGURATION UPDATE	RAN CONFIGURATION UPDATE ACKNOWLEDGE	RAN CONFIGURATION UPDATE FAILURE
Handover Cancellation	HANDOVER CANCEL	HANDOVER CANCEL ACKNOWLEDGE	
Handover Preparation	HANDOVER REQUIRED	HANDOVER COMMAND	HANDOVER PREPARATION FAILURE
Handover Resource Allocation	HANDOVER REQUEST	HANDOVER REQUEST ACKNOWLEDGE	HANDOVER FAILURE
Initial Context Setup	INITIAL CONTEXT SETUP REQUEST	INITIAL CONTEXT SETUP RESPONSE	INITIAL CONTEXT SETUP FAILURE
NG Reset	NG RESET	NG RESET ACKNOWLEDGE	
NG Setup	NG SETUP REQUEST	NG SETUP RESPONSE	NG SETUP FAILURE
Path Switch Request	PATH SWITCH REQUEST	PATH SWITCH REQUEST ACKNOWLEDGE	PATH SWITCH REQUEST FAILURE
PDU Session Resource Modify	PDU SESSION RESOURCE MODIFY REQUEST	PDU SESSION RESOURCE MODIFY RESPONSE	
PDU Session Resource Modify Indication	PDU SESSION RESOURCE MODIFY INDICATION	PDU SESSION RESOURCE MODIFY CONFIRM	
PDU Session Resource Release	PDU SESSION RESOURCE RELEASE COMMAND	PDU SESSION RESOURCE RELEASE RESPONSE	
PDU Session Resource Setup	PDU SESSION RESOURCE SETUP REQUEST	PDU SESSION RESOURCE SETUP RESPONSE	
UE Context Modification	UE CONTEXT MODIFICATION REQUEST	UE CONTEXT MODIFICATION RESPONSE	UE CONTEXT MODIFICATION FAILURE
UE Context Release	UE CONTEXT RELEASE COMMAND	UE CONTEXT RELEASE COMPLETE	
Write-Replace Warning	WRITE-REPLACE WARNING REQUEST	WRITE-REPLACE WARNING RESPONSE	
PWS Cancel	PWS CANCEL REQUEST	PWS CANCEL RESPONSE	
UE Radio Capability Check	UE RADIO CAPABILITY CHECK REQUEST	UE RADIO CAPABILITY CHECK RESPONSE	

Table 8.1-2: Class 2 procedures

Elementary Procedure	Message
Downlink RAN Configuration Transfer	DOWNLINK RAN CONFIGURATION TRANSFER
Downlink RAN Status Transfer	DOWNLINK RAN STATUS TRANSFER
Downlink NAS Transport	DOWNLINK NAS TRANSPORT
Error Indication	ERROR INDICATION
Uplink RAN Configuration Transfer	UPLINK RAN CONFIGURATION TRANSFER
Uplink RAN Status Transfer	UPLINK RAN STATUS TRANSFER
Handover Notification	HANDOVER NOTIFY
Initial UE Message	INITIAL UE MESSAGE
NAS Non Delivery Indication	NAS NON DELIVERY INDICATION
Paging	PAGING
PDU Session Resource Notify	PDU SESSION RESOURCE NOTIFY
Reroute NAS Request	REROUTE NAS REQUEST
UE Context Release Request	UE CONTEXT RELEASE REQUEST
Uplink NAS Transport	UPLINK NAS TRANSPORT
AMF Status Indication	AMF STATUS INDICATION
PWS Restart Indication	PWS RESTART INDICATION
PWS Failure Indication	PWS FAILURE INDICATION
Downlink UE Associated NRPPa Transport	DOWNLINK UE ASSOCIATED NRPPA TRANSPORT
Uplink UE Associated NRPPa Transport	UPLINK UE ASSOCIATED NRPPA TRANSPORT
Downlink Non UE Associated NRPPa Transport	DOWNLINK NON UE ASSOCIATED NRPPA TRANSPORT
Uplink Non UE Associated NRPPa Transport	UPLINK NON UE ASSOCIATED NRPPA TRANSPORT
Trace Start	TRACE START
Trace Failure Indication	TRACE FAILURE INDICATION
Deactivate Trace	DEACTIVATE TRACE
Cell Traffic Trace	CELL TRAFFIC TRACE
Location Reporting Control	LOCATION REPORTING CONTROL
Location Reporting Failure Indication	LOCATION REPORTING FAILURE INDICATION
Location Report	LOCATION REPORT
UE TNLA Binding Release	UE TNLA BINDING RELEASE REQUEST
UE Capability Info Indication	UE CAPABILITY INFO INDICATION

8.2 PDU Session Management Procedures

8.2.1 PDU Session Resource Setup

8.2.1.1 General

The purpose of the PDU Session Resource Setup procedure is to assign resources on Uu and NG-U for one or several PDU session resources and the corresponding QoS flows, and to setup corresponding Data Radio Bearers for a given UE. The procedure uses UE-associated signalling.

8.2.1.2 Successful Operation

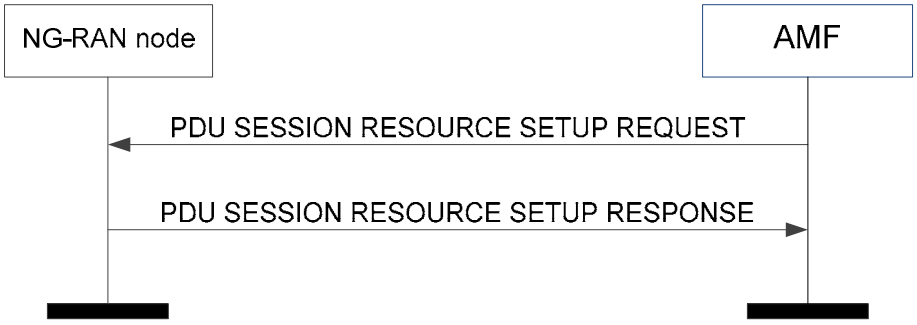

Figure 8.2.1.2-1: PDU session resource setup: successful operation

The AMF initiates the procedure by sending a PDU SESSION RESOURCE SETUP REQUEST message to the NG-RAN node.

- The PDU SESSION RESOURCE SETUP REQUEST message shall contain the information required by the NG-RAN node to setup PDU session related NG-RAN configuration consisting of at least one PDU session resource and for each PDU session resource to setup include a *PDU Session Resource Setup Request Item IEs* IE.

Upon reception of the PDU SESSION RESOURCE SETUP REQUEST message, and if resources are available for the requested configuration, the NG-RAN node shall execute the requested NG-RAN configuration and allocate associated resources over NG and over Uu for each PDU session listed in the *PDU Session Resource Setup Request Item IEs* IE.

If the *RAN Paging Priority* IE is included in the PDU SESSION RESOURCE SETUP REQUEST message, the NG-RAN node may use it to determine a priority for paging the UE in RRC_INACTIVE state.

For each requested PDU session, if resources are available for the requested configuration, the NG-RAN node shall establish at least one or several Data Radio Bearers and associate each accepted QoS flow of the PDU session to a Data Radio Bearer established.

For each PDU session successfully established the NG-RAN node shall pass to the UE the *PDU Session NAS-PDU* IE, if available, and the value contained in the *PDU Session ID* IE received for the PDU session. The NG-RAN node shall not send to the UE the PDU Session NAS PDUs associated to the failed PDU sessions.

For each PDU session the NG-RAN node shall store the UP transport layer information included in the *PDU Session Resource Setup Request Transfer* IE contained in the PDU SESSION RESOURCE SETUP REQUEST message and use it as the uplink termination point for the user plane data for this PDU session.

For each PDU session, if the *Additional Transport Layer Information* IE is included in the *PDU Session Resource Setup Request Transfer* IE contained in the PDU SESSION RESOURCE SETUP REQUEST message, the NG-RAN node may forward the UP transport layer information to the S-NG-RAN node as the uplink termination point for the user plane data for this PDU session split in different tunnel.

For each PDU session for which the *PDU Session Type* IE is included in the PDU SESSION RESOURCE SETUP REQUEST message and is set to "ethernet" or "unstructured", the NG-RAN node shall not perform header compression for the concerned PDU session.

For each PDU session for which the *Security Indication* IE is included in the *PDU Session Resource Setup Request Transfer* IE of the PDU SESSION RESOURCE SETUP REQUEST message, and the *Integrity Protection Indication* IE or *Confidentiality Protection Indication* IE is set to "required", then the NG-RAN node shall perform user plane integrity protection or ciphering, respectively, for the concerned PDU session. If the NG-RAN node cannot perform the user plane integrity protection or ciphering, it shall reject the setup of the PDU session resources with an appropriate cause value.

If the NG-RAN node is an ng-eNB, it shall reject all PDU sessions for which the *Integrity Protection Indication* IE is set to "required".

For each PDU session for which the *Security Indication* IE is included in the *PDU Session Resource Setup Request Transfer* IE of the PDU SESSION RESOURCE SETUP REQUEST message, and the *Integrity Protection Indication* IE or *Confidentiality Protection Indication* IE is set to "preferred", then the NG-RAN node should, if supported, perform user plane integrity protection or ciphering, respectively, for the concerned PDU session and shall notify whether it performed the user plane integrity protection or ciphering by including the *Integrity Protection Result* IE or *Confidentiality Protection Result* IE, respectively, in the PDU SESSION RESOURCE SETUP RESPONSE message.

For each PDU session for which the *Security Indication* IE is included in the *PDU Session Resource Setup Request Transfer* IE of the PDU SESSION RESOURCE SETUP REQUEST message, and the *Integrity Protection Indication* IE or *Confidentiality Protection Indication* IE is set to "not needed", then the NG-RAN node shall not perform user plane integrity protection nor perform ciphering for the concerned PDU session.

For each PDU session in the PDU SESSION RESOURCE SETUP REQUEST message the NG-RAN node shall enforce the traffic corresponding to the received *PDU Session Resource Aggregate Maximum Bit Rate* IE. The NG-RAN node shall use the received Aggregate Maximum Bit Rate for the concerned PDU session and concerned UE as specified in TS 23.501 [9].

For each QoS flow requested to be setup the NG-RAN node shall take into account the received *QoS Flow Level QoS Parameters* IE. For each QoS flow the NG-RAN node shall establish or modify the resources according to the values of

the *Allocation and Retention Priority* IE (priority level and pre-emption indicators) and the resource situation as follows:

- The NG-RAN node shall consider the priority level of the requested QoS flow, when deciding on the resource allocation.
- The priority levels and the pre-emption indicators may (individually or in combination) be used to determine whether the QoS flow setup has to be performed unconditionally and immediately. If the requested QoS flow is marked as "may trigger pre-emption" and the resource situation requires so, the NG-RAN node may trigger the pre-emption procedure which may then cause the forced release of a lower priority QoS flow which is marked as "pre-emptable". Whilst the process and the extent of the pre-emption procedure are operator-dependent, the pre-emption indicators shall be treated as follows:

  1. The values of the last received *Pre-emption Vulnerability* IE and *Priority Level* IE shall prevail.
  2. If the *Pre-emption Capability* IE is set to "may trigger pre-emption", then this allocation request may trigger the pre-emption procedure.
  3. If the *Pre-emption Capability* IE is set to "shall not trigger pre-emption", then this allocation request shall not trigger the pre-emption procedure.
  4. If the *Pre-emption Vulnerability* IE is set to "pre-emptable", then this QoS flow shall be included in the pre-emption process.
  5. If the *Pre-emption Vulnerability* IE is set to "not pre-emptable", then this QoS flow shall not be included in the pre-emption process.
  6. If the *Priority Level* IE is set to "no priority" the given values for the *Pre-emption Capability* IE and *Pre-emption Vulnerability* IE shall not be considered. Instead the values "shall not trigger pre-emption" and "not pre-emptable" shall prevail.

- The NG-RAN node pre-emption process shall keep the following rules:

  1. The NG-RAN node shall only pre-empt QoS flows with lower priority, in ascending order of priority.
  2. The pre-emption may be done for QoS flows belonging to the same UE or to other UEs.

NOTE: The text above on NG-RAN node pre-emption process may need to be refined.

For each QoS flow which has been successfully established, the NG-RAN node stores the mapped E-RAB ID if included in the *PDU Session Resource Setup Request Transfer* IE contained in the PDU SESSION RESOURCE SETUP REQUEST message and uses it as specified in TS 38.300 [8].

The NG-RAN node shall report to the AMF in the PDU SESSION RESOURCE SETUP RESPONSE message the result for each individual PDU session resource requested to be setup. In particular, for each PDU session resource successfully setup, it shall include the *PDU Session Resource Setup Response Transfer* IE containing the following information:

- The list of QoS flows which have been successfully established in the *QoS Flow Setup Response List* IE.
- The list of QoS flows which have failed to be established, if any, in the *QoS Flow Failed to Setup List* IE.
- The UP transport layer information to be used for the PDU session.

For each PDU session resource successfully setup at the NG-RAN, the NG-RAN node may allocate resources for an additional NG-U PDU session resource GTP-U tunnel, indicated in the *Additional PDU Session Resource Setup Response* IE.

The list of PDU session resources which failed to be setup, if any, shall be reported in the PDU SESSION RESOURCE SETUP RESPONSE message with an appropriate cause value within the *PDU Session Resource Failed to Setup List* IE.

Upon reception of the PDU SESSION RESOURCE SETUP RESPONSE message the AMF shall, for each PDU session indicated in the *PDU Session ID* IE, transfer transparently the *PDU Session Resource Setup Response Transfer* IE to each SMF associated with the concerned PDU session. In case the splitting PDU session is not used by the NG-RAN node, the SMF should remove the Additional Transport Layer Information, if any.

When the NG-RAN node reports unsuccessful establishment of a QoS flow, the cause value should be precise enough to enable the SMF to know the reason for an unsuccessful establishment.

Upon reception of the PDU SESSION RESOURCE SETUP REQUEST message to setup a QoS flow for IMS voice, if successful IMS voice over NG-RAN is not able to be supported, the NG-RAN node shall initiate EPS fallback or RAT fallback for IMS voice procedure as specified in TS 23.501 [9] and report unsuccessful establishment of the QoS flow in the *PDU Session Resource Setup Response Transfer* IE with cause value "IMS voice EPS fallback or RAT fallback triggered".

Interactions with Handover Preparation procedure:

If a handover becomes necessary during the PDU Session Resource Setup procedure, the NG-RAN node may interrupt the ongoing PDU Session Resource Setup procedure and initiate the Handover Preparation procedure as follows:

1. The NG-RAN node shall send the PDU SESSION RESOURCE SETUP RESPONSE message in which the NG-RAN node shall indicate, if necessary, all the PDU session resources failed to be setup with an appropriate cause value.

2. The NG-RAN node shall trigger the handover procedure.

8.2.1.3 Unsuccessful Operation

The unsuccessful operation is specified in the successful operation section.

8.2.1.4 Abnormal Conditions

Void.

8.2.2 PDU Session Resource Release

8.2.2.1 General

The purpose of the PDU Session Resource Release procedure is to enable the release of already established PDU session resources for a given UE. The procedure uses UE-associated signalling.

8.2.2.2 Successful Operation

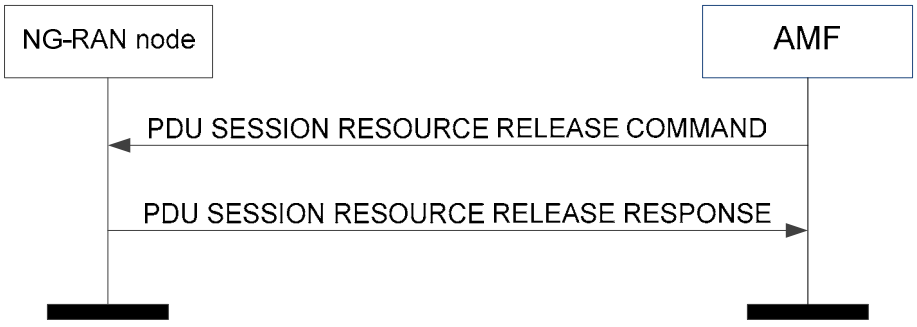

Figure 8.2.2.2-1: PDU session resource release: successful operation

The AMF initiates the procedure by sending a PDU SESSION RESOURCE RELEASE COMMAND message.

The PDU SESSION RESOURCE RELEASE COMMAND message shall contain the information required by the NG-RAN node to release at least one PDU session in the *PDU Session Resource to Release List* IE. If a *NAS-PDU* IE is contained in the message, the NG-RAN node shall pass it to the UE.

Upon reception of the PDU SESSION RESOURCE RELEASE COMMAND message the NG-RAN node shall execute the release of the requested PDU sessions. For each PDU session to be released the NG-RAN node shall release the corresponding resources over Uu and over NG.

If the *RAN Paging Priority* IE is included in the PDU SESSION RESOURCE RELEASE COMMAND message, the NG-RAN node may use it to determine a priority for paging the UE in RRC_INACTIVE state.

The NG-RAN node shall, if supported, report in the PDU SESSION RESOURCE RELEASE RESPONSE message location information of the UE in the *User Location Information* IE.

After sending a PDU SESSION RESOURCE RELEASE RESPONSE message, the NG-RAN node shall be prepared to receive a PDU SESSION RESOURCE SETUP REQUEST message requesting establishment of a PDU session with a PDU Session ID corresponding to one of the PDU Session IDs that were present in the *PDU Session Resource to Release List* IE of the PDU SESSION RESOURCE RELEASE COMMAND message.

If the *User Location Information* IE is included in the PDU SESSION RESOURCE RELEASE RESPONSE message, the AMF shall handle this information as specified in TS 23.501 [9].

8.2.2.3 Unsuccessful Operation

The unsuccessful operation is specified in the successful operation section.

8.2.2.4 Abnormal Conditions

Void.

8.2.3 PDU Session Resource Modify

8.2.3.1 General

The purpose of the PDU Session Resource Modify procedure is to enable configuration modifications of already established PDU Session(s) for a given UE. It is also to enable the setup, modification and release of the QoS flow for already established PDU session(s). The procedure uses UE-associated signalling.

8.2.3.2 Successful Operation

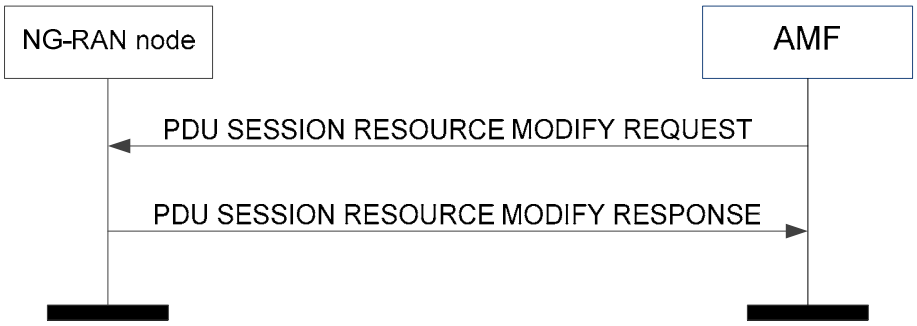

Figure 8.2.3.2-1: PDU session resource modify: successful operation

The AMF initiates the procedure by sending a PDU SESSION RESOURCE MODIFY REQUEST message to the NG-RAN node.

- The PDU SESSION RESOURCE MODIFY REQUEST message shall contain the information required by the NG-RAN node, which may trigger the NG-RAN configuration modification for the existing PDU sessions listed in the *PDU Session Resource Modify Request Item IEs* IE.

Upon reception of the PDU SESSION RESOURCE MODIFY REQUEST message, if the NG-RAN configuration is triggered to be modified and if resources are available for the modified NG-RAN configuration, the NG-RAN node shall execute the configuration modification for the requested PDU session.

If the *RAN Paging Priority* IE is included in the PDU SESSION RESOURCE MODIFY REQUEST message, the NG-RAN node may use it to determine a priority for paging the UE in RRC_INACTIVE state.

For each PDU session included in the *PDU Session Resource Modify Request Item IEs* IE:

- For each QoS flow included in the *QoS Flow Add or Modify Request List* IE, based on the *QoS Flow Level QoS Parameters* IE, the NG-RAN node may establish, modify or release the Data Radio Bearer configuration and may change allocation of resources on NG or Uu accordingly. The NG-RAN node shall associate each QoS flow accepted to setup or modify with a Data Radio Bearer of the PDU session. The associated Data Radio Bearer for the QoS flow accepted to modify may not change.

- For each QoS flow included in the *QoS Flow to Release List* IE, the NG-RAN node shall de-associate the QoS flow with the previously associated Data Radio Bearer.

- The NG-RAN node shall pass the *NAS-PDU* IE received for the PDU session to the UE when modifying the PDU session configuration. The NG-RAN node does not send the NAS PDUs associated to the failed PDU sessions to the UE.

- The NG-RAN node may change allocation of resources on NG according to the requested target configuration.

- If the *PDU Session Aggregate Maximum Bit Rate* IE is included in the *PDU Session Resource Modify Request Transfer* IE, the NG-RAN node shall use the received Aggregate Maximum Bit Rate for the concerned PDU session and concerned UE as specified in TS 23.501 [9].

- If the *UL NG-U UP TNL Information* IE is included in the *PDU Session Resource Modify Request Transfer* IE, the NG-RAN node shall update the transport layer information for the uplink data accordingly for the concerned PDU session.

The NG-RAN node shall report to the AMF, in the PDU SESSION RESOURCE MODIFY RESPONSE message, the result for each PDU session requested to be modified listed in the PDU SESSION RESOURCE MODIFY REQUEST message:

- For each PDU session which is successfully modified, the *PDU Session Resource Modify Response Transfer* IE shall be included to report:

    1. The list of QoS flows which have been successfully setup or modified, if any, shall be included in the *QoS Flow Add or Modify Response List* IE in case the PDU Session Resource Modify procedure is triggered by QoS flow setup or modification.

    2. The list of QoS flows which have failed to be setup or modified, if any, shall be included in the *QoS Flow Failed to Add or Modify List* IE in case the PDU Session Resource Modify procedure is triggered by QoS flow setup or modification.

- For each PDU session which failed to be modified, the failure cause shall be included in the *Cause* IE for each PDU session within the *PDU Session Resource Failed to Modify List* IE.

The NG-RAN node shall, if supported, report in the PDU SESSION RESOURCE MODIFY RESPONSE message location information of the UE in the *User Location Information* IE.

For a PDU session or a QoS flow which failed to be modified, the NG-RAN node shall fall back to the configuration of the PDU session or the QoS flow as it was configured prior to the reception of the PDU SESSION RESOURCE MODIFY REQUEST message.

Upon reception of the PDU SESSION RESOURCE MODIFY REQUEST message to setup a QoS flow for IMS voice, if successful IMS voice over NG-RAN is not able to be supported, the NG-RAN node shall initiate EPS fallback or RAT fallback for IMS voice procedure as specified in TS 23.501 [9] and report unsuccessful establishment of the QoS flow in the *PDU Session Resource Setup Response Transfer* IE with cause value "IMS voice EPS fallback or RAT fallback triggered".

If the *User Location Information* IE is included in the PDU SESSION RESOURCE MODIFY RESPONSE message, the AMF shall handle this information as specified in TS 23.501 [9].

Interactions with Handover Preparation procedure:

If a handover becomes necessary during the PDU Session Resource Modify procedure, the NG-RAN node may interrupt the ongoing PDU Session Resource Modify procedure and initiate the Handover Preparation procedure as follows:

1. The NG-RAN node shall send the PDU SESSION RESOURCE MODIFY RESPONSE message in which the NG-RAN node shall indicate, if necessary, all the PDU sessions failed with an appropriate cause value.

2. The NG-RAN node shall trigger the handover procedure.

NOTE: Description of step 1 may need to be refined with examples of appropriate cause values.

8.2.3.3 Unsuccessful Operation

The unsuccessful operation is specified in the successful operation section.

8.2.3.4 Abnormal Conditions

Void.

8.2.4 PDU Session Resource Notify

8.2.4.1 General

The purpose of the PDU Session Resource Notify procedure is to notify that the already established QoS flow(s) or PDU session(s) for a given UE are released or not fulfilled anymore or fulfilled again by the NG-RAN node for which a notification is issued. The procedure uses UE-associated signalling.

8.2.4.2 Successful Operation

Figure 8.2.4.2-1: PDU session resource notify

The NG-RAN node initiates the procedure by sending a PDU SESSION RESOURCE NOTIFY message.

The PDU SESSION RESOURCE NOTIFY message shall contain the information of PDU sessions or QoS flows which are released or not fulfilled anymore or fulfilled again by the NG-RAN node.

- For each PDU session of which some QoS flows are released or not fulfilled anymore or fulfilled again by the NG-RAN node, the *PDU Session Resource Notify Transfer* IE shall be included to report for each PDU session of which some QoS flow(s) are released or not fulfilled anymore or fulfilled again:

  1. The list of QoS flows which are released by the NG-RAN node, if any, shall be included in the *QoS Flow Released List* IE.

  2. The list of GBR QoS flows which are not fulfilled anymore or fulfilled again by the NG-RAN node, if any, shall be included in the *QoS Flow Notify List* IE together with the *Notification Cause* IE.

- For each PDU session which is released by the NG-RAN node, the *PDU Session Resource Released List* IE shall be included to report the release cause in the *Cause* IE.

The NG-RAN node shall, if supported, report in the PDU SESSION RESOURCE NOTIFY message location information of the UE in the *User Location Information* IE.

Upon reception of the PDU SESSION RESOURCE NOTIFY message, the AMF shall, for each PDU session indicated in the *PDU Session ID* IE, transfer transparently the *PDU Session Resource Notify Transfer* IE to each SMF associated with the concerned PDU session. Upon reception of *PDU Session Resource Notify Transfer* IE, SMF normally initiate the appropriate release or modify procedure on the core network side for the PDU session(s) or QoS flow(s) identified as not fulfilled anymore.

If the *User Location Information* IE is included in the PDU SESSION RESOURCE NOTIFY message, the AMF shall handle this information as specified in TS 23.501 [9].

8.2.4.3 Abnormal Conditions

Void.

8.2.5 PDU Session Resource Modify Indication

8.2.5.1 General

The purpose of the PDU Session Resource Modify Indication procedure is for the NG-RAN node to request modification of the established PDU session(s). The procedure uses UE-associated signalling.

8.2.5.2 Successful Operation

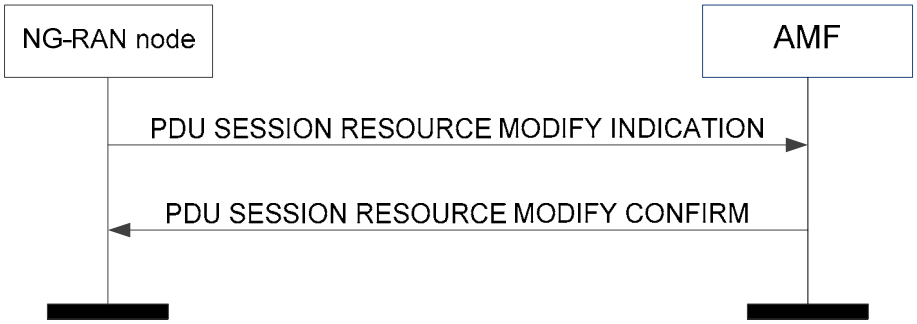

Figure 8.2.5.2-1: PDU session resource modify indication: successful operation

The NG-RAN node initiates the procedure by sending a PDU SESSION RESOURCE MODIFY INDICATION message. Upon reception of the PDU SESSION RESOURCE MODIFY INDICATION message, the AMF shall, for each PDU session indicated in the *PDU Session ID* IE, transparently transfer the *PDU Session Resource Modify Indication Transfer* IE to each SMF associated with the concerned PDU session.

- The *DL TNL Information* IE included in the *PDU Session Resource Modify Indication Transfer* IE in the PDU SESSION RESOURCE MODIFY INDICATION message shall be considered by the SMF as the new DL address of the PDU sessions.

NOTE 1: The text above on the *PDU Session Resource Modify Indication Transfer* IE may need to be refined.

The AMF shall report to the NG-RAN node in the PDU SESSION MODIFY RESOURCE CONFIRM message the result for each PDU session listed in PDU SESSION RESOURCE MODIFY INDICATION message:

- For each PDU session which is successfully modified, the *PDU Session Resource Modify Confirm Transfer* IE shall be included to report:

  1. The list of QoS flows which are modified successfully shall be included in the *QoS Flow Modify Confirm List* IE.

  2. The list of QoS flows which fail to be modified, if any, shall be included in the *QoS Flow Failed to Modify List* IE.

NOTE 2: The text above on the *PDU Session Resource Modify Confirm Transfer* IE may need to be refined, including whether to define a Modify Failure Confirm.

- For each PDU session which failed to be modified, the *PDU Session Resource Modify Confirm Transfer* IE shall be included to report the failure cause.

Upon reception of the *PDU Session Resource Modify Confirm Transfer* IE for each PDU session listed in the PDU SESSION RESOURCE MODIFY CONFIRM message:

- If the *QoS Flow Failed To Modify List* IE is included, the NG-RAN node shall either

  1. de-associate the corresponding Data Radio Bearer for the concerned QoS flow, or

  2. keep the previous transport information before sending the PDU SESSION RESOURCE MODIFY INDICATION unchanged for the concerned QoS flow.

- If a PDU session failed to be modified is included, the NG-RAN node shall either

  1. release all corresponding NG-RAN configuration and resources for the concerned PDU session, or

2. keep the previous transport information before sending the PDU SESSION RESOURCE MODIFY INDICATION unchanged for the concerned PDU session.

8.2.5.3 Unsuccessful Operation

The unsuccessful operation is specified in the successful operation section.

8.2.5.4 Abnormal Conditions

Void.

8.3 UE Context Management Procedures

8.3.1 Initial Context Setup

8.3.1.1 General

The purpose of the Initial Context Setup procedure is to establish the necessary overall initial UE Context at the NG-RAN node, when required, including PDU session context, the Security Key, Mobility Restriction List, UE Radio Capability and UE Security Capabilities, etc. The AMF may initiate the Initial Context Setup procedure if a UE-associated logical NG-connection exists for the UE or if the AMF has received the *RAN UE NGAP ID* IE in an INITIAL UE MESSAGE message either over this NG interface instance or another NG interface instance, The procedure uses UE-associated signalling.

8.3.1.2 Successful Operation

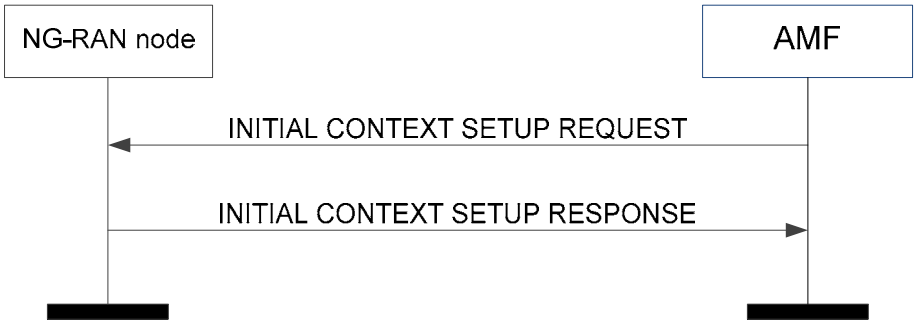

Figure 8.3.1.2-1: Initial context setup: successful operation

In case of the establishment of a PDU session the 5GC shall be prepared to receive user data before the INITIAL CONTEXT SETUP RESPONSE message has been received by the AMF. If no UE-associated logical NG-connection exists, the UE-associated logical NG-connection shall be established at reception of the INITIAL CONTEXT SETUP REQUEST message.

The INITIAL CONTEXT SETUP REQUEST message shall contain the *Index to RAT/Frequency Selection Priority* IE, if available in the AMF.

If the *NAS-PDU* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the NG-RAN node shall pass it transparently towards the UE.

If the *Masked IMEISV* IE is contained in the INITIAL CONTEXT SETUP REQUEST message the target NG-RAN node shall, if supported, use it to determine the characteristics of the UE for subsequent handling.

Upon receipt of the INITIAL CONTEXT SETUP REQUEST message the NG-RAN node shall

- attempt to execute the requested PDU session configuration;
- store the received UE Aggregate Maximum Bit Rate in the UE context, and use the received UE Aggregate Maximum Bit Rate for non-GBR Bearers for the concerned UE;
- store the received Mobility Restriction List in the UE context;
- store the received UE Radio Capability in the UE context;

- store the received Index to RAT/Frequency Selection Priority in the UE context and use it as defined in TS 23.501 [9];

- store the received UE Security Capabilities in the UE context;

- store the received Security Key in the UE context and, if the NG-RAN node is required to activate security for the UE, take this security key into use.

For the Initial Context Setup an initial value for the Next Hop Chaining Count is stored in the UE context.

If the *PDU Session Resource Setup Request List* IE is contained in the INITIAL CONTEXT SETUP REQUEST message, the NG-RAN node shall behave the same as the one defined in the PDU Session Resource Setup procedure. The NG-RAN node shall report to the AMF, in the INITIAL CONTEXT SETUP RESPONSE message, the successful establishment of the result for all the requested PDU sessions. When the NG-RAN node reports the unsuccessful establishment of a PDU Session, the cause value should be precise enough to enable the AMF to know the reason for the unsuccessful establishment.

The NG-RAN node shall use the information in the *Mobility Restriction List* IE if present in the INITIAL CONTEXT SETUP REQUEST message to

- determine a target for subsequent mobility action for which the NG-RAN node provides information about the target of the mobility action towards the UE;

- select a proper SCG during dual connectivity operation;

- assign proper RNA(s) for the UE when moving the UE to RRC_INACTIVE state.

If the *Mobility Restriction List* IE is not contained in the INITIAL CONTEXT SETUP REQUEST message, the NG-RAN node shall consider that no roaming and no access restriction apply to the UE. The NG-RAN node shall also consider that no roaming and no access restriction apply to the UE when:

- one of the QoS flows includes a particular ARP value (TS 23.501 [9]).

If the *Additional QoS Flow Information* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the NG-RAN node may consider it for the DRB allocation process. It is up to NG-RAN node implementation to decide whether and how to use it.

If the *Trace Activation* IE is included in the INITIAL CONTEXT SETUP REQUEST message the NG-RAN node shall, if supported, initiate the requested trace function as described in TS 32.422 [11].

If the *UE Security Capabilities* IE included in the INITIAL CONTEXT SETUP REQUEST message only contains the EIA0 or NIA0 algorithm as defined in TS 33.501 [13] and if the EIA0 or NIA0 algorithm is defined in the configured list of allowed integrity protection algorithms in the NG-RAN node (TS 33.501 [13]), the NG-RAN node shall take it into use and ignore the keys received in the *Security Key* IE.

If the *RRC Inactive Assistance Information* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the NG-RAN node shall, if supported, store this information in the UE context and use it for the RRC_INACTIVE state decision and configuration for the UE and RAN paging if any for a UE in RRC_INACTIVE state, as specified in TS 38.300 [8].

If the *Emergency Fallback Indicator* IE is included in the INITIAL CONTEXT SETUP REQUEST message, it indicates that the UE Context to be set up is subject to emergency service fallback as described in TS 23.501 [9] and the NG-RAN node may, if supported, take the appropriate mobility actions.

If the *Old AMF* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the NG-RAN node shall consider that this UE-associated logical NG-connection was redirected to this AMF from another AMF identified by the *Old AMF* IE.

After sending the INITIAL CONTEXT SETUP RESPONSE message, the procedure is terminated in the NG-RAN node.

Interactions with Initial UE Message procedure:

The NG-RAN node shall use the *AMF UE NGAP ID* IE and *RAN UE NGAP ID* IE received in the INITIAL CONTEXT SETUP REQUEST message as identification of the logical connection even if the *RAN UE NGAP ID* IE had been allocated in an INITIAL UE MESSAGE message sent over a different NG interface instance.

8.3.1.3 Unsuccessful Operation

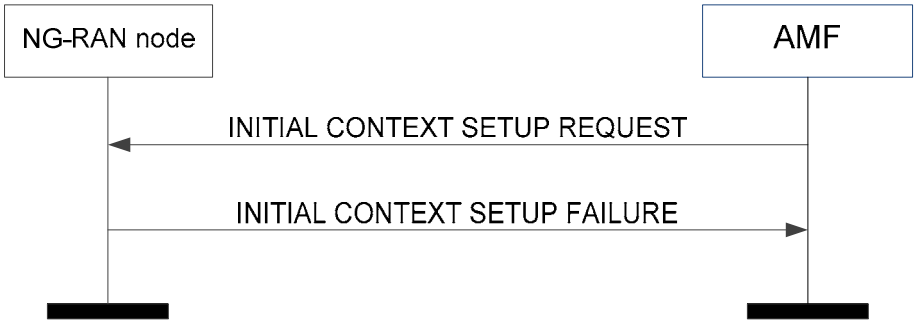

Figure 8.3.1.3-1: Initial context setup: unsuccessful operation

If the NG-RAN node is not able to establish an NG UE context, it shall consider the procedure as failed and reply with the INITIAL CONTEXT SETUP FAILURE message.

8.3.1.4 Abnormal Conditions

If the supported algorithms for encryption defined in the *Encryption Algorithms* IE in the *UE Security Capabilities* IE, plus the mandated support of EEA0 and NEA0 in all UEs (TS 33.501 [13]), do not match any allowed algorithms defined in the configured list of allowed encryption algorithms in the NG-RAN node (TS 33.501 [13]), the NG-RAN node shall reject the procedure using the INITIAL CONTEXT SETUP FAILURE message.

If the supported algorithms for integrity defined in the *Integrity Protection Algorithms* IE in the *UE Security Capabilities* IE, plus the mandated support of the EIA0 and NIA0 algorithm in all UEs (TS 33.501 [13]), do not match any allowed algorithms defined in the configured list of allowed integrity protection algorithms in the NG-RAN node (TS 33.501 [13]), the NG-RAN node shall reject the procedure using the INITIAL CONTEXT SETUP FAILURE message.

8.3.2 UE Context Release Request (NG-RAN node initiated)

8.3.2.1 General

The purpose of the UE Context Release Request procedure is to enable the NG-RAN node to request the AMF to release the UE-associated logical NG-connection due to NG-RAN node generated reasons. The procedure uses UE-associated signalling.

8.3.2.2 Successful Operation

Figure 8.3.2.2-1: UE context release request

The NG-RAN node controlling a UE-associated logical NG-connection initiates the procedure by sending a UE CONTEXT RELEASE REQUEST message towards the affected AMF.

The UE CONTEXT RELEASE REQUEST message shall indicate the appropriate cause value, e.g., "$TXn_{RELOCOverall}$ Expiry", for the requested UE-associated logical NG-connection release.

Interactions with UE Context Release procedure:

The UE Context Release procedure should be initiated upon reception of a UE CONTEXT RELEASE REQUEST message.

8.3.2.3 Abnormal Conditions

Void.

8.3.3 UE Context Release (AMF initiated)

8.3.3.1 General

The purpose of the UE Context Release procedure is to enable the AMF to order the release of the UE-associated logical NG-connection due to various reasons, e.g., completion of a transaction between the UE and the 5GC, etc. The procedure uses UE-associated signalling.

8.3.3.2 Successful Operation

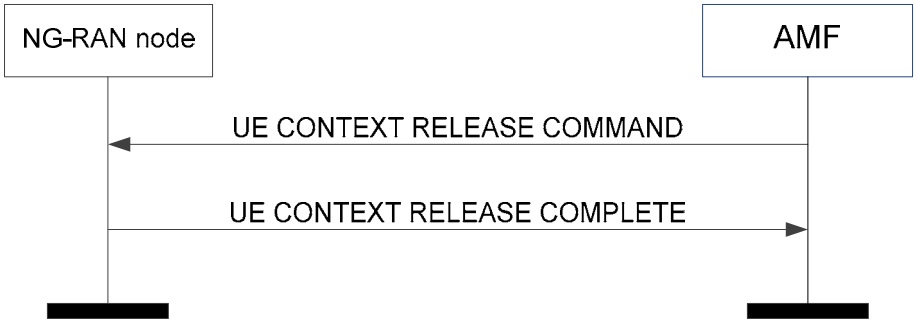

Figure 8.3.3.2-1: UE context release: successful operation

The AMF initiates the procedure by sending the UE CONTEXT RELEASE COMMAND message to the NG-RAN node.

The UE CONTEXT RELEASE COMMAND message shall contain both the AMF UE NGAP ID IE and the *RAN UE NGAP ID* IE if available, otherwise the message shall contain the *AMF UE NGAP ID* IE.

Upon reception of the UE CONTEXT RELEASE COMMAND message, the NG-RAN node shall release all related signalling and user data transport resources and reply with the UE CONTEXT RELEASE COMPLETE message.

If the *RAN Paging Priority* IE is included in the UE CONTEXT RELEASE COMMAND message, the NG-RAN node may use it to determine a priority for paging the UE in RRC_INACTIVE state.

NOTE: The applicability of the *RAN Paging Priority* IE to this procedure may need to be refined.

If the *User Location Information* IE is included in the UE CONTEXT RELEASE COMPLETE message, the AMF shall handle this information as specified in TS 23.502 [10].

If the *Information on Recommended Cells and RAN Nodes for Paging* IE is included in the UE CONTEXT RELEASE COMPLETE message, the AMF shall, if supported, store it and may use it for subsequent paging.

8.3.3.3 Unsuccessful Operation

Not applicable.

8.3.3.4 Abnormal Conditions

If the UE Context Release procedure is not initiated towards the NG-RAN node before the expiry of the timer $TNG_{RELOCOverall}$, the NG-RAN node shall request the AMF to release the UE context.

If the UE returns to the NG-RAN node before the reception of the UE CONTEXT RELEASE COMMAND message or the expiry of the timer $TNG_{RELOCOverall}$, the NG-RAN node shall stop the timer $TNG_{RELOCOverall}$ and continue to serve the UE.

8.3.4 UE Context Modification

8.3.4.1 General

The purpose of the UE Context Modification procedure is to partly modify the established UE Context. The procedure uses UE-associated signalling.

NOTE: The text above may need to be refined to include example(s) for partly modifying an established UE context.

8.3.4.2 Successful Operation

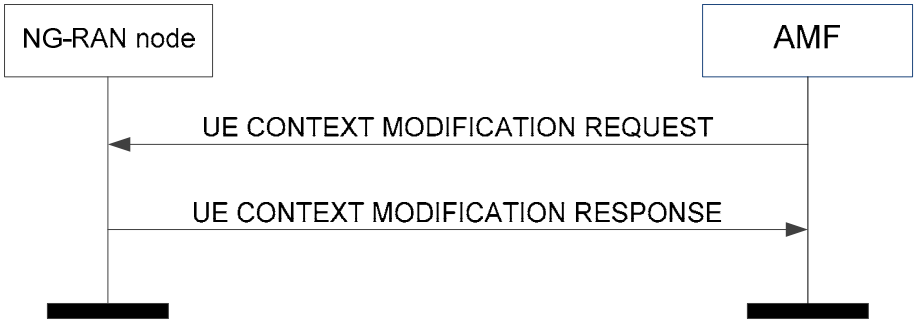

Figure 8.3.4.2-1: UE context modification: successful operation

Upon receipt of the UE CONTEXT MODIFICATION REQUEST message the NG-RAN node shall

- store the received *Security Key* IE and, if the NG-RAN node is required to activate security for the UE, take this security key into use.
- store the *UE Security Capabilities* IE and take them into use together with the received keys according to TS 33.501 [13].
- store the *Index to RAT/Frequency Selection Priority* IE and use it as defined in TS 23.501 [9].

If the *RAN Paging Priority* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the NG-RAN node may use it to determine a priority for paging the UE in RRC_INACTIVE state.

If the *UE Aggregate Maximum Bit Rate* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the NG-RAN node shall

- replace the previously provided UE Aggregate Maximum Bit Rate by the received UE Aggregate Maximum Bit Rate in the UE context;
- use the received UE Aggregate Maximum Bit Rate for all non-GBR QoS flows for the concerned UE as specified in TS 23.501 [9].

If the *RRC Inactive Assistance Information* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the NG-RAN node shall, if supported, store this information in the UE context and use it for the RRC_INACTIVE state decision and configuration for the UE and RAN paging if any for a UE in RRC_INACTIVE state, as specified in TS 38.300 [8].

The NG-RAN node shall report, in the UE CONTEXT MODIFICATION RESPONSE message to the AMF, the successful update of the UE context.

If the *Emergency Fallback Indicator* IE is included in the UE CONTEXT MODIFICATION REQUEST message, it indicates that the concerned UE Context is subject to emergency service fallback as described in TS 23.501 [9] and the NG-RAN node may, if supported, take the appropriate mobility actions.

After sending the UE CONTEXT MODIFICATION RESPONSE message, the procedure is terminated in the NG-RAN node.

If the *New AMF UE NGAP ID* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the NG-RAN node shall use the received value for future signalling with the AMF.

8.3.4.3 Unsuccessful Operation

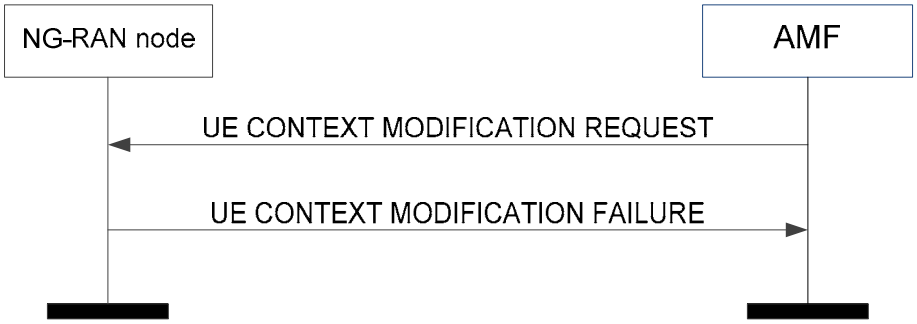

Figure 8.3.4.3-1: UE context modification: unsuccessful operation

In case the UE context update cannot be performed successfully, the NG-RAN node shall respond with the UE CONTEXT MODIFICATION FAILURE message to the AMF with an appropriate cause value in the *Cause* IE.

8.3.4.4 Abnormal Conditions

If the UE CONTEXT MODIFICATION REQUEST message including the *New AMF UE NGAP ID* IE is received after the NG-RAN node has initiated another class 1 NGAP EP, the NG-RAN node shall be prepared to receive the response message containing an AMF UE NGAP ID with the value received in the *New AMF UE NGAP ID* IE.

8.4 UE Mobility Management Procedures

8.4.1 Handover Preparation

8.4.1.1 General

The purpose of the Handover Preparation procedure is to request the preparation of resources at the target side via the 5GC. There is only one Handover Preparation procedure ongoing at the same time for a certain UE.

8.4.1.2 Successful Operation

Figure 8.4.1.2-1: Handover preparation: successful operation

The source NG-RAN node initiates the handover preparation by sending the HANDOVER REQUIRED message to the serving AMF. When the source NG-RAN node sends the HANDOVER REQUIRED message, it shall start the timer $TNG_{RELOCprep}$. The source NG-RAN node shall indicate the appropriate cause value for the handover in the *Cause* IE.

In case of intra-system handover, the information in the *Source to Target Transparent Container* IE shall be encoded according to the definition of the *Source NG-RAN node to Target NG-RAN node Transparent Container* IE.

If the *DL Forwarding* IE is included for a given QoS flow in the *PDU Session Resource Information Item IEs* IE within the *Source NG-RAN node to Target NG-RAN node Transparent Container* IE in the HANDOVER REQUIRED message and it is set to "DL forwarding proposed", it indicates that the source NG-RAN node proposes forwarding of downlink data for that QoS flow.

If the *DRBs Requested for Data Forwarding List* IE is included in the *PDU Session Resource Information Item IEs* IE within the *Source NG-RAN node to Target NG-RAN node Transparent Container* IE in the HANDOVER REQUIRED

message, it indicates that the source NG-RAN node proposes forwarding of downlink data for those DRBs. If the HANDOVER COMMAND message contains the *DL Forwarding Transport Layer Information IE* for a given DRB within the *Handover Command Transfer* IE, the source NG-RAN node shall consider that the forwarding of downlink data for this DRB is accepted by the target NG-RAN node. If the HANDOVER COMMAND message contains the *UL Forwarding Transport Layer Information* IE for a given DRB within the *Handover Command Transfer* IE, it means the target NG-RAN node has requested the forwarding of uplink data for this DRB.

In case of inter-system handover to LTE, the information in the *Source to Target Transparent Container* IE shall be encoded according to the *Source eNB to Target eNB Transparent Container* IE definition as specified in TS 36.413 [16].

If the AMF receives the *Direct Forwarding Path Availability* IE in the HANDOVER REQUIRED message indicating that a direct path is available, it shall handle it as specified in TS 23.502 [10].

When the preparation, including the reservation of resources at the target side is ready, the AMF responds with the HANDOVER COMMAND message to the source NG-RAN node.

Upon reception of the HANDOVER COMMAND message the source NG-RAN node shall stop the timer $TNG_{RELOCprep}$ and start the timer $TNG_{RELOCoverall}$.

If there are any PDU Sessions that could not be admitted in the target, they shall be indicated in the *PDU Session Resources to Release List* IE.

If the HANDOVER COMMAND message contains the *Handover Command Transfer* IE for a given PDU session, then the source NG-RAN node should initiate data forwarding for the QoS flows corresponding to the *QoS Flow to be Forwarded List* IE, as specified in TS 38.300 [8].

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

In case of inter-system handover to LTE, the information in the *Target to Source Transparent Container* IE shall be encoded according to the definition of the *Target eNB to Source eNB Transparent Container* IE as specified in TS 36.413 [16].

If the *Index to RAT/Frequency Selection Priority* IE is contained in the *Source NG-RAN Node to Target NG-RAN Node Transparent Container* IE, the target NG-RAN node shall store the content of the received *Index to RAT/Frequency Selection Priority* IE in the UE context and use it as defined in TS 23.501 [9].

Interactions with other NGAP procedures:

NOTE: Description of the interaction of the Handover Preparation procedure with other NGAP procedures may need to be refined.

8.4.1.3 Unsuccessful Operation

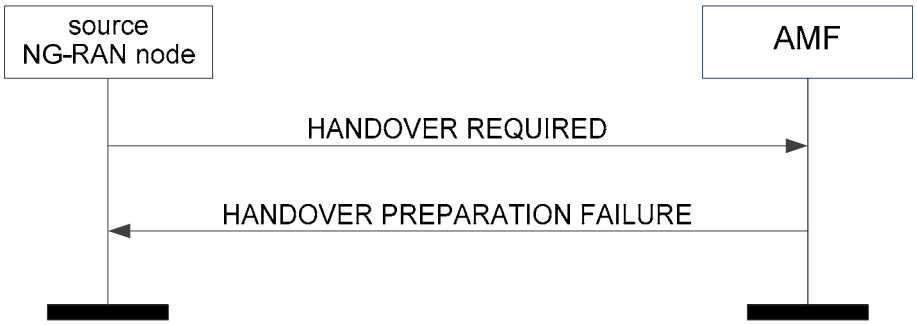

Figure 8.4.1.3-1: Handover preparation: unsuccessful operation

If the 5GC or the target side is not able to accept any of the PDU session resources or a failure occurs during the Handover Preparation, the AMF sends the HANDOVER PREPARATION FAILURE message with an appropriate cause value to the source NG-RAN node.

Interaction with Handover Cancel procedure:

If there is no response from the AMF to the HANDOVER REQUIRED message before timer $TNG_{RELOCprep}$ expires in the source NG-RAN node, the source NG-RAN node should cancel the Handover Preparation procedure by initiating the Handover Cancel procedure with the appropriate value for the *Cause* IE. The source NG-RAN node shall ignore any HANDOVER COMMAND message or HANDOVER PREPARATION FAILURE message received after the initiation of the Handover Cancel procedure.

8.4.1.4 Abnormal Conditions

Void.

8.4.2 Handover Resource Allocation

8.4.2.1 General

The purpose of the Handover Resource Allocation procedure is to reserve resources at the target NG-RAN node for the handover of a UE.

8.4.2.2 Successful Operation

Figure 8.4.2.2-1: Handover resource allocation: successful operation

The AMF initiates the procedure by sending the HANDOVER REQUEST message to the target NG-RAN node.

If the *Masked IMEISV* IE is contained in the HANDOVER REQUEST message the target NG-RAN node shall, if supported, use it to determine the characteristics of the UE for subsequent handling.

Upon receipt of the HANDOVER REQUEST message the target NG-RAN node shall

- attempt to execute the requested PDU session configuration and associated security;
- store the UE Aggregate Maximum Bit Rate in the UE context, and use the received UE Aggregate Maximum Bit Rate for all non-GBR QoS flows for the concerned UE as specified in TS 23.501 [9];
- store the received Mobility Restriction List in the UE context;
- store the received UE Security Capabilities in the UE context;
- store the received Security Context in the UE context and take it into use as defined in TS 33.501 [13].

Upon receiving the *PDU Session Resource Setup List* IE contained in the HANDOVER REQUEST message, the target NG-RAN node shall behave the same as defined in the PDU Session Resource Setup procedure. The target NG-RAN node shall then report in the HANDOVER REQUEST ACKNOWLEDGE message the successful establishment of the result for all the requested PDU sessions. In particular, for each PDU session resource successfully setup, it shall include the *Handover Request Acknowledge Transfer* IE containing the following information:

- The list of QoS flows which have been successfully established in the *QoS Flow Setup Response List* IE.
- The *Data Forwarding Accepted* IE if the data forwarding for the QoS flow is accepted.
- The list of QoS flows which have failed to be established, if any, in the *QoS Flow Failed to Setup List* IE.
- The UP transport layer information to be used for the PDU session.
- The security result associated to the PDU session.

The list of PDU session resources which failed to be setup, if any, shall be reported in the HANDOVER REQUEST ACKNOWLEDGE message with an appropriate cause value within the *PDU Session Resource Failed to Setup List* IE.

Upon reception of the HANDOVER REQUEST ACKNOWLEDGE message the AMF shall, for each PDU session indicated in the *PDU Session ID* IE, transfer transparently the *Handover Request Acknowledge Transfer* IE to each SMF associated with the concerned PDU session.

When the target NG-RAN node reports unsuccessful establishment of a QoS flow, the cause value should be precise enough to know the reason for an unsuccessful establishment.

NOTE: The text above may need to be refined, e.g. to add example cause value(s).

If the HANDOVER REQUEST message contains the *Data Forwarding Not Possible* IE associated with a given PDU session within the *Handover Request Transfer* IE set to "data forwarding not possible", the target NG-RAN node may not include the *DL Forwarding UP TNL Information* IE and for intra-system handover the *Data Forwarding Response DRB List* IE within the *Handover Request Acknowledge Transfer* IE in the HANDOVER REQUEST ACKNOWLEDGE message for that PDU session.

In case of intra-system handover, if the target NG-RAN node accepts the downlink data forwarding for at least one QoS flow for which the *DL Forwarding* IE is set to "DL forwarding proposed", it may include the *DL Forwarding UP TNL Information* IE in the *Handover Request Acknowledge Transfer* IE for the PDU session within the *PDU Session Resource Admitted List* IE in the HANDOVER REQUEST ACKNOWLEDGE message.

In case of intra-system handover, if the target NG-RAN node accepts the data forwarding for a successfully configured DRB, the target NG-RAN node may include the *DL Forwarding UP TNL Information* IE for the DRB within the *Data Forwarding Response DRB List* IE within *Handover Request Acknowledge Transfer* IE in the HANDOVER REQUEST ACKNOWLEDGE message.

If the HANDOVER REQUEST ACKNOWLEDGE message contains the *UL Forwarding UP TNL Information* IE for a given DRB in the *Data Forwarding Response DRB List* IE within the *Handover Request Acknowledge Transfer* IE, it indicates the target NG-RAN node has requested the forwarding of uplink data for the DRB.

In case of inter-system handover from E-UTRAN, the target NG-RAN node includes the *Data Forwarding Accepted* IE for each QoS flow that the *DL Forwarding* IE is set to "DL forwarding proposed" for the corresponding E-RAB in the *Source NG-RAN Node to Target NG-RAN Node Transparent Container* IE and that the target NG-RAN node has admitted the proposed forwarding of downlink data for the QoS flow. If the target NG-RAN node accepts the downlink data forwarding for at least one QoS flow of an admitted PDU session it shall include the *DL Forwarding UP TNL Information* IE in the *PDU Session Resource Setup Response Transfer* IE for that PDU session within the *PDU Session Resources Admitted List* IE of the HANDOVER REQUEST ACKNOWLEDGE message.

The target NG-RAN node shall use the information in the *Mobility Restriction List* IE if present in the HANDOVER REQUEST message to

- determine a target for subsequent mobility action for which the target NG-RAN node provides information about the target of the mobility action towards the UE;
- select a proper SCG during dual connectivity operation;
- assign proper RNA(s) for the UE when moving the UE to RRC_INACTIVE state.

If the *Mobility Restriction List* IE is not contained in the HANDOVER REQUEST message, the target NG-RAN node shall consider that no roaming and no access restriction apply to the UE. The target NG-RAN node shall also consider that no roaming and no access restriction apply to the UE when:

- one of the QoS flows includes a particular ARP value (TS 23.501 [9]).

If the *Trace Activation* IE is included in the HANDOVER REQUEST message the target NG-RAN node shall, if supported, initiate the requested trace function as described in TS 32.422 [11].

If the *Location Reporting Request Type* IE is included in the HANDOVER REQUEST message, the target NG-RAN node should perform the requested location reporting functionality for the UE as described in subclause 8.12.

If the *RRC Inactive Assistance Information* IE is included in the HANDOVER REQUEST message, the target NG-RAN node shall, if supported, store this information in the UE context and use it for the RRC_INACTIVE state decision and configuration for the UE and RAN paging if any for a UE in RRC_INACTIVE state, as specified in TS 38.300 [8].

If the K_{AMF} *Change Indicator* IE is included in the HANDOVER REQUEST message, the target NG-RAN node shall use this K_AFM_CI information as specified in TS 33.501 [13].

If the *NASC* IE is included in the HANDOVER REQUEST message, the target NG-RAN node shall use it towards the UE as specified in TS 33.501 [13].

After all necessary resources for the admitted PDU session resources have been allocated, the target NG-RAN node shall generate the HANDOVER REQUEST ACKNOWLEDGE message.

8.4.2.3 Unsuccessful Operation

Figure 8.4.2.3-1: Handover resource allocation: unsuccessful operation

If the target NG-RAN node does not admit at least one PDU session resource, or a failure occurs during the Handover Preparation, it shall send the HANDOVER FAILURE message to the AMF with an appropriate cause value.

8.4.2.4 Abnormal Conditions

If the supported algorithms for encryption defined in the *Encryption Algorithms* IE in the *UE Security Capabilities* IE, plus the mandated support of EEA0 and NEA0 in all UEs (TS 33.501 [13]), do not match any allowed algorithms defined in the configured list of allowed encryption algorithms in the NG-RAN node (TS 33.501 [13]), the target NG-RAN node shall reject the procedure using the HANDOVER FAILURE message.

If the supported algorithms for integrity defined in the *Integrity Protection Algorithms* IE in the *UE Security Capabilities* IE, plus the mandated support of the EIA0 and NIA0 algorithm in all UEs (TS 33.501 [13]), do not match any allowed algorithms defined in the configured list of allowed integrity protection algorithms in the NG-RAN node (TS 33.501 [13]), the target NG-RAN node shall reject the procedure using the HANDOVER FAILURE message.

8.4.3 Handover Notification

8.4.3.1 General

The purpose of the Handover Notification procedure is to indicate to the AMF that the UE has arrived to the target cell and the NG-based handover has been successfully completed.

8.4.3.2 Successful Operation

Figure 8.4.3.2-1: Handover notification

The target NG-RAN node shall send the HANDOVER NOTIFY message to the AMF when the UE has been identified in the target cell and the NG-based handover has been successfully completed.

8.4.3.3 Abnormal Conditions

Void.

8.4.4 Path Switch Request

8.4.4.1 General

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

8.4.4.2 Successful Operation

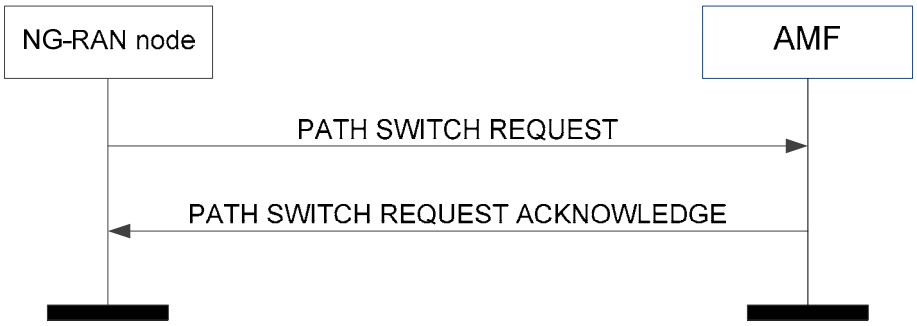

Figure 8.4.4.2-1: Path switch request: successful operation

The NG-RAN node initiates the procedure by sending the PATH SWITCH REQUEST message to the AMF.

After all necessary updates including the UP path switch have been successfully completed in the 5GC for at least one of the PDU session resources included in the PATH SWITCH REQUEST, the AMF shall send the PATH SWITCH REQUEST ACKNOWLEDGE message to the NG-RAN node and the procedure ends.

The list of accepted QoS flows shall be included in the PATH SWITCH REQUEST message within the *Path Switch Request Transfer* IE. The SMF shall handle this information as specified in TS 23.502 [10].

The list of PDU sessions which failed to be setup, if any, shall be included in the PATH SWITCH REQUEST message. The AMF shall handle this information as specified in TS 23.502 [10].

For each PDU session for which the *User Plane Security Information* IE is included in the *Path Switch Request Transfer* IE of the PATH SWITCH REQUEST message, the SMF shall behave as specified in TS 33.501 [13] and may send back the *Security Indication* IE within the *Path Switch Request Acknowledge Transfer* IE of the PATH SWITCH REQUEST ACKNOWLEDGE message.

Upon receiving the *Security Indication* IE within the *Path Switch Request Acknowledge Transfer* IE of the PATH SWITCH REQUEST ACKNOWLEDGE message, the NG-RAN node shall behave as specified in TS 33.501 [13].

If the *RRC Inactive Assistance Information* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the NG-RAN node shall, if supported, store this information in the UE context and use it for the RRC_INACTIVE state decision and configuration for the UE and RAN paging if any for a UE in RRC_INACTIVE state, as specified in TS 38.300 [8].

If the K_{AMF} *Change Indicator* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the NG-RAN node shall, if supported, use this K_AFM_CI information as specified in TS 33.501 [13].

Upon reception of the PATH SWITCH REQUEST ACKNOWLEDGE message the NG-RAN node shall store the received *Security Context* IE in the UE context and the NG-RAN node shall use it as specified in TS 33.501 [13].

If the *UE Security Capabilities* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the NG-RAN node shall handle it accordingly (TS 33.501 [13]).

8.4.4.3 Unsuccessful Operation

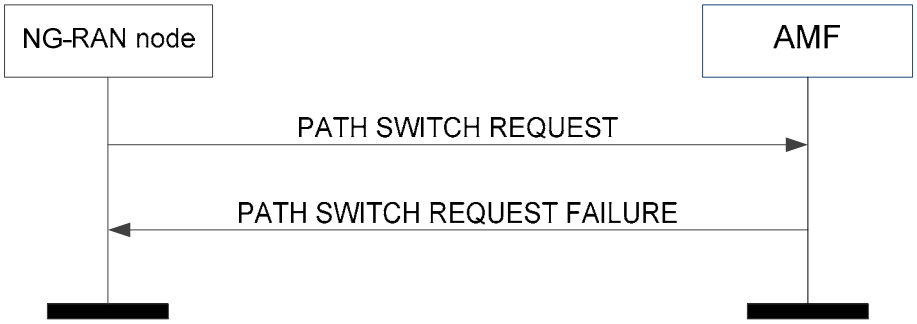

Figure 8.4.4.3-1: Path switch request: unsuccessful operation

If the 5GC fails to switch the downlink GTP tunnel endpoint towards a new GTP tunnel endpoint for all PDU session resources, the AMF shall send the PATH SWITCH REQUEST FAILURE message to the NG-RAN node with an appropriate cause value.

8.4.4.4 Abnormal Conditions

Void.

8.4.5 Handover Cancellation

8.4.5.1 General

The purpose of the Handover Cancel procedure is to enable a source NG-RAN node to cancel an ongoing handover preparation or an already prepared handover. The procedure uses UE-associated signalling.

8.4.5.2 Successful Operation

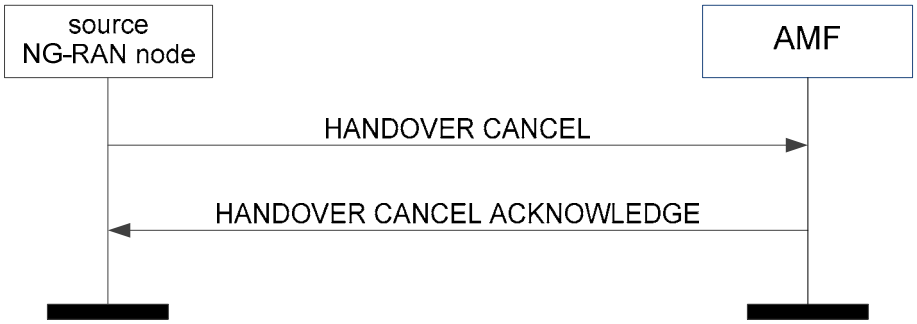

Figure 8.4.5.2-1: Handover cancel: successful operation

The source NG-RAN node initiates the procedure by sending a HANDOVER CANCEL message to the AMF.

8.4.5.3 Unsuccessful Operation

Not applicable.

8.4.5.4 Abnormal Conditions

Void.

8.4.6 Uplink RAN Status Transfer

8.4.6.1 General

The purpose of the Uplink RAN Status Transfer procedure is to enable lossless handover for NG-based handover.

8.4.6.2 Successful Operation

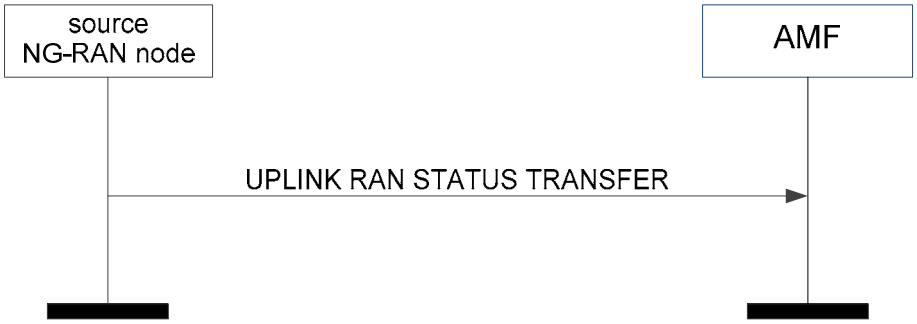

Figure 8.4.6.2-1: Uplink RAN status transfer

NOTE: Procedure description for the Uplink RAN Status Transfer procedure may need to be refined.

8.4.6.3 Abnormal Conditions

Void.

8.4.7 Downlink RAN Status Transfer

8.4.7.1 General

The purpose of the Downlink RAN Status Transfer procedure is to is to enable lossless handover for NG-based handover.

8.4.7.2 Successful Operation

Figure 8.4.7.2-1: Downlink RAN status transfer

NOTE: Procedure description for the Downlink RAN Status Transfer procedure may need to be refined.

8.4.7.3 Abnormal Conditions

Void.

8.5 Paging Procedures

8.5.1 Paging

8.5.1.1 General

The purpose of the Paging procedure is to enable the AMF to page a UE in the specific NG-RAN node.

8.5.1.2 Successful Operation

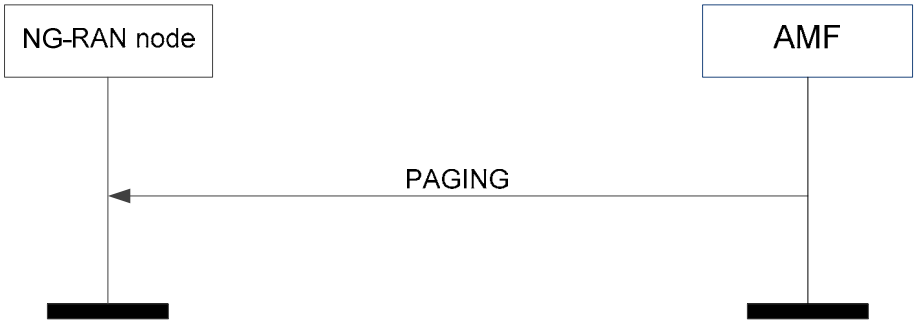

Figure 8.5.1.2-1: Paging

The AMF initiates the paging procedure by sending the PAGING message to the NG-RAN node.

At the reception of the PAGING message, the NG-RAN node shall perform paging of the UE in cells which belong to tracking areas as indicated in the *List of TAIs* IE.

The *Paging DRX* IE may be included in the PAGING message, and if present the NG-RAN node shall use it according to TS 38.304 [12].

For each cell that belongs to any of the tracking areas indicated in the *List of TAIs* IE, the NG-RAN node shall generate one page on the radio interface.

The *Paging Priority* IE may be included in the PAGING message, and if present the NG-RAN node may use it according to TS 23.501 [9].

If the *UE Radio Capability for Paging* IE is included in the PAGING message, the NG-RAN node may use it to apply specific paging schemes.

If the *Assistance Data for Recommended Cells* IE is included in the *Assistance Data for Paging* IE it may be used, together with the *Paging Attempt Information* IE if also present according to TS 38.300 [8].

If the *Next Paging Area Scope* IE is included in the *Paging Attempt Information* IE it may be used for paging the UE according to TS 38.300 [8].

If the *Paging Origin* IE is included in the PAGING message, the NG-RAN node shall transfer it to the UE according to TS 38.331 [18].

8.5.1.3 Abnormal Conditions

Void.

8.6 Transport of NAS Messages Procedures

8.6.1 Initial UE Message

8.6.1.1 General

The Initial UE Message procedure is used when the NG-RAN node has received from the radio interface the first uplink NAS message transmitted on an RRC connection to be forwarded to an AMF.

8.6.1.2 Successful Operation

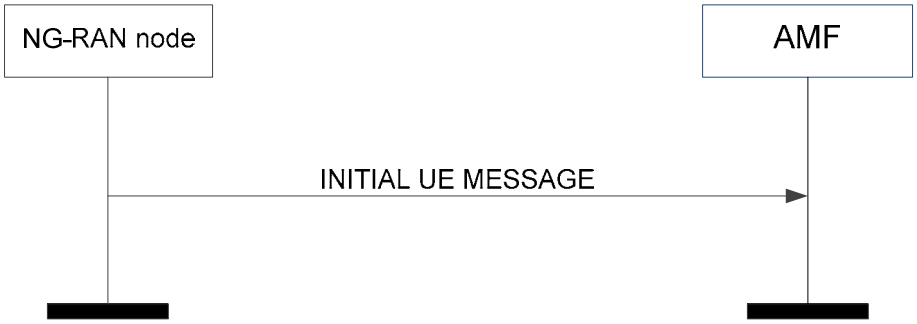

Figure 8.6.1.2-1: Initial UE message

The NG-RAN node initiates the procedure by sending an INITIAL UE MESSAGE message to the AMF. The NG-RAN node shall allocate a unique RAN UE NGAP ID to be used for the UE and the NG-RAN node shall include this identity in the INITIAL UE MESSAGE message.

The *NAS-PDU* IE contains a UE – AMF message that is transferred without interpretation in the NG-RAN node.

In case of network sharing, the selected PLMN is indicated by the *PLMN Identity* IE within the *TAI* IE included in the INITIAL UE MESSAGE message.

When the NG-RAN node has received from the radio interface the *5G-S-TMSI* IE, it shall include it in the INITIAL UE MESSAGE message.

If the *AMF Set ID* IE is included in the INITIAL UE MESSAGE message this indicates that the message is a rerouted message and the AMF shall, if supported, use the IE as described in TS 23.502 [10].

If the *UE Context Request* IE is included in the INITIAL UE MESSAGE message the AMF shall trigger an Initial Context Setup procedure towards the NG-RAN node.

8.6.1.3 Abnormal Conditions

Void.

8.6.2 Downlink NAS Transport

8.6.2.1 General

The Downlink NAS Transport procedure is used when the AMF only needs to send a NAS message transparently via the NG-RAN node to the UE, and a UE-associated logical NG-connection exists for the UE or the AMF has received the *RAN UE NGAP ID* IE in an INITIAL UE MESSAGE message either over this NG interface instance or another NG interface instance.

8.6.2.2 Successful Operation

Figure 8.6.2.2-1: Downlink NAS transport

The AMF initiates the procedure by sending a DOWNLINK NAS TRANSPORT message to the NG-RAN node. If the UE-associated logical NG-connection is not established, the AMF shall allocate a unique AMF UE NGAP ID to be used for the UE and include that in the DOWNLINK NAS TRANSPORT message; by receiving the *AMF UE NGAP ID* IE in the DOWNLINK NAS TRANSPORT message, the NG-RAN node establishes the UE-associated logical NG-connection.

If the *RAN Paging Priority* IE is included in the DOWNLINK NAS TRANSPORT message, the NG-RAN node may use it to determine a priority for paging the UE in RRC_INACTIVE state.

The *NAS-PDU* IE contains an AMF – UE message that is transferred without interpretation in the NG-RAN node.

If the *Mobility Restriction List* IE is contained in the DOWNLINK NAS TRANSPORT message, the NG-RAN node shall store this information in the UE context. The NG-RAN node shall use the information in the *Mobility Restriction List* IE if present in the DOWNLINK NAS TRANSPORT message to:

- determine a target for subsequent mobility action for which the NG-RAN node provides information about the target of the mobility action towards the UE;
- select a proper SCG during dual connectivity operation;
- assign proper RNA(s) for the UE when moving the UE to RRC_INACTIVE state.

If the *Mobility Restriction List* IE is not contained in the DOWNLINK NAS TRANSPORT message and there is no previously stored mobility restriction information, the NG-RAN node shall consider that no roaming and no access restriction apply to the UE.

If the *Index to RAT/Frequency Selection Priority* IE is included in the DOWNLINK NAS TRANSPORT message, the NG-RAN node shall, if supported, use it as defined in TS 23.501 [9].

If the *UE Aggregate Maximum Bit Rate* IE is included in the DOWNLINK NAS TRANSPORT message, the NG-RAN node shall store the UE Aggregate Maximum Bit Rate in the UE context, and use the received UE Aggregate Maximum Bit Rate for all non-GBR QoS flows for the concerned UE as specified in TS 23.501 [9].

If the *Old AMF* IE is included in the DOWNLINK NAS TRANSPORT message, the NG-RAN node shall consider that this UE-associated logical NG-connection was redirected to this AMF from another AMF identified by the *Old AMF* IE.

Interactions with Initial UE Message procedure:

The NG-RAN node shall use the *AMF UE NGAP ID* IE and *RAN UE NGAP ID* IE received in the DOWNLINK NAS TRANSPORT message as identification of the logical connection even if the *RAN UE NGAP ID* IE had been allocated in an INITIAL UE MESSAGE message sent over a different NG interface instance.

8.6.2.3 Abnormal Conditions

Void.

8.6.3 Uplink NAS Transport

8.6.3.1 General

The Uplink NAS Transport procedure is used when the NG-RAN node has received from the radio interface a NAS message to be forwarded to the AMF to which a UE-associated logical NG-connection for the UE exists.

8.6.3.2 Successful Operation

Figure 8.6.3.2-1: Uplink NAS transport

The NG-RAN node initiates the procedure by sending an UPLINK NAS TRANSPORT message to the AMF. The NG-RAN node shall include the TAI and CGI of the current cell in the *User Location Information* IE of every UPLINK NAS TRANSPORT message.

The *NAS-PDU* IE contains a UE – AMF message that is transferred without interpretation in the NG-RAN node.

8.6.3.3 Abnormal Conditions

Void.

8.6.4 NAS Non Delivery Indication

8.6.4.1 General

The NAS Non Delivery Indication procedure is used when the NG-RAN node decides not to start the delivery of a NAS message that has been received over a UE-associated logical NG-connection or the NG-RAN node is unable to ensure that the message has been received by the UE.

8.6.4.2 Successful Operation

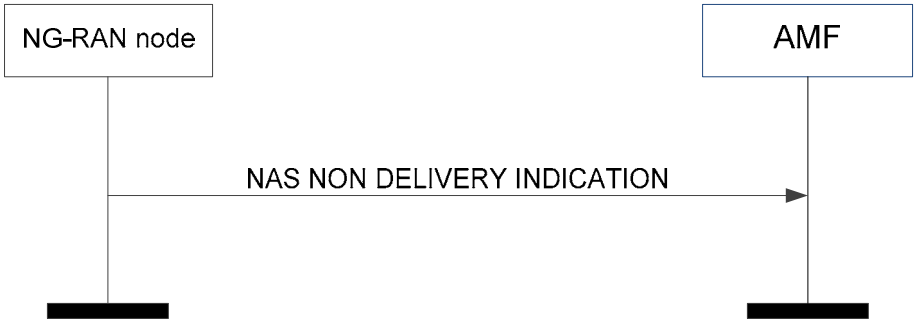

Figure 8.6.4.2-1: NAS non delivery indication

The NG-RAN node initiates the procedure by sending a NAS NON DELIVERY INDICATION message to the AMF. The NG-RAN node shall report the non-delivery of a NAS message by including the non-delivered NAS message within the *NAS-PDU* IE and an appropriate cause value within the *Cause* IE, e.g., "NG intra system handover triggered", "NG inter system handover triggered" or "Xn handover triggered".

8.6.4.3 Abnormal Conditions

Void.

8.6.5 Reroute NAS Request

8.6.5.1 General

The purpose of the Reroute NAS Request procedure is to enable the AMF to request for a rerouting of the INITIAL UE MESSAGE message to another AMF.

8.6.5.2 Successful Operation

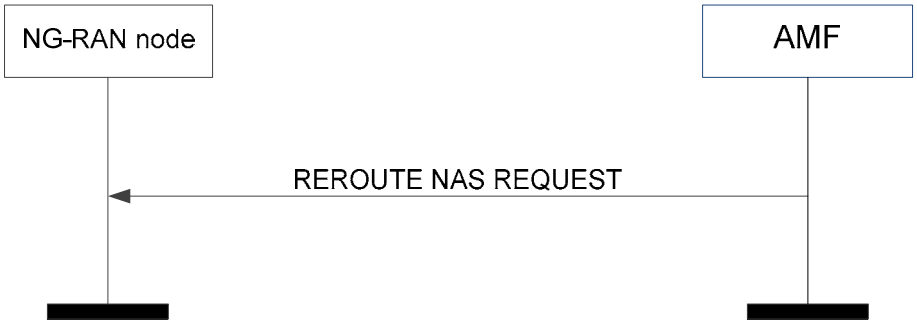

Figure 8.6.5.2-1: Reroute NAS request

The AMF initiates the procedure by sending a REROUTE NAS REQUEST message to the NG-RAN node. The NG-RAN node shall, if supported, reroute the INITIAL UE MESSAGE message to an AMF indicated by the *AMF Set ID* IE as described in TS 23.501 [9].

If the *Allowed NSSAI* IE is included in the REROUTE NAS REQUEST message, then the NG-RAN node shall, if supported, use it when selecting the AMF as defined in TS 23.502 [10].

8.6.5.3 Abnormal Conditions

Void.

8.7 Interface Management Procedures

8.7.1 NG Setup

8.7.1.1 General

The purpose of the NG Setup procedure is to exchange application level data needed for the NG-RAN node and the AMF to correctly interoperate on the NG-C interface. This procedure shall be the first NGAP procedure triggered after the TNL association has become operational. The procedure uses non-UE associated signalling.

8.7.1.2 Successful Operation

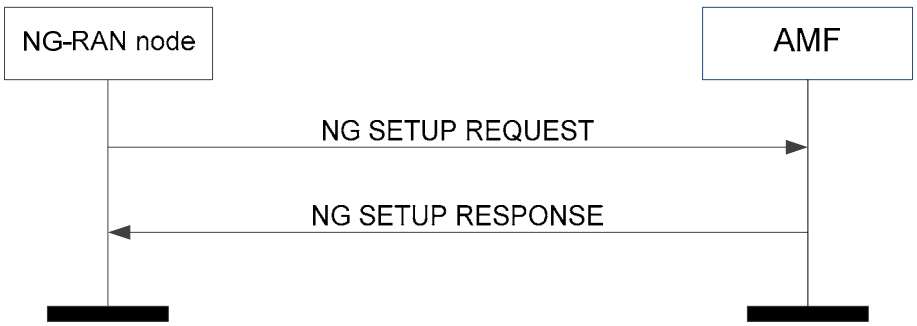

Figure 8.7.1.2-1: NG setup: successful operation

The NG-RAN node initiates the procedure by sending an NG SETUP REQUEST message including the appropriate data to the AMF. The AMF responds with an NG SETUP RESPONSE message including the appropriate data.

If the *AMF Name* IE is included in the NG SETUP RESPONSE message, the NG-RAN node shall, if supported, store the AMF name and use it to identify the AMF.

8.7.1.3 Unsuccessful Operation

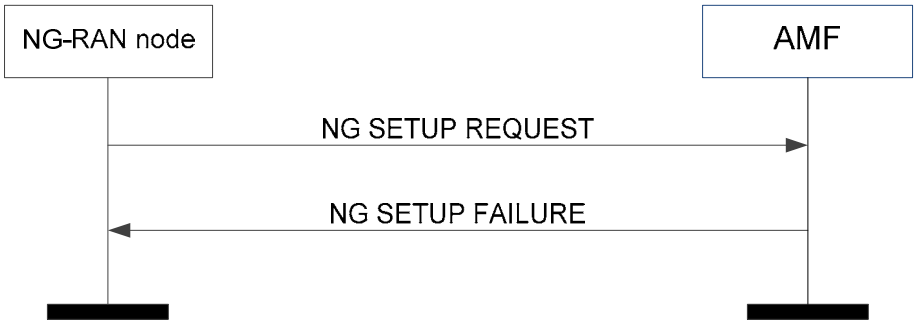

Figure 8.7.1.3-1: NG setup: unsuccessful operation

If the AMF cannot accept the setup, it should respond with an NG SETUP FAILURE message and appropriate cause value.

If the NG SETUP FAILURE message includes the *Time to Wait* IE, the NG-RAN node shall wait at least for the indicated time before reinitiating the NG Setup procedure towards the same AMF.

8.7.1.4 Abnormal Conditions

Void.

8.7.2 RAN Configuration Update

8.7.2.1 General

The purpose of the RAN Configuration Update procedure is to update application level configuration data needed for the NG-RAN node and the AMF to interoperate correctly on the NG-C interface. This procedure does not affect existing UE-related contexts, if any.

8.7.2.2 Successful Operation

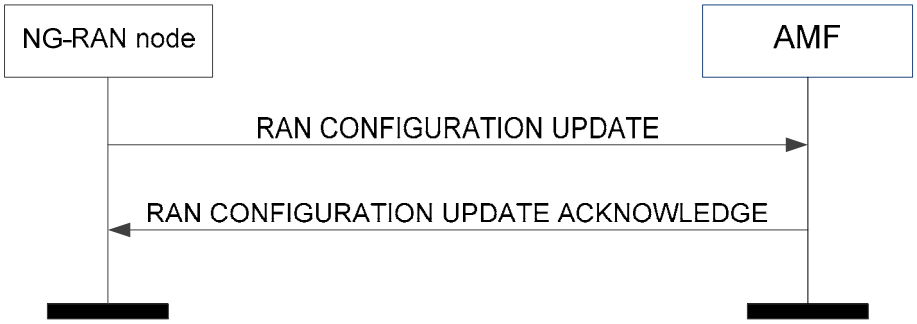

Figure 8.7.2.2-1: RAN configuration update: successful operation

The NG-RAN node initiates the procedure by sending a RAN CONFIGURATION UPDATE message to the AMF including an appropriate set of updated configuration data that it has just taken into operational use. The AMF responds with a RAN CONFIGURATION UPDATE ACKNOWLEDGE message to acknowledge that it successfully updated the configuration data.

If the *TAI Slice Support List* IE is included in the RAN CONFIGURATION UPDATE message, the AMF shall store the received values and use them for subsequent registration area management of the UE.

8.7.2.3 Unsuccessful Operation

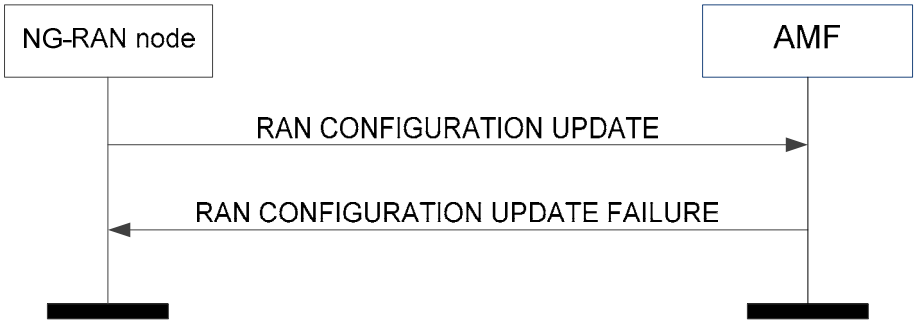

Figure 8.7.2.3-1: RAN configuration update: unsuccessful operation

If the AMF cannot accept the update, it shall respond with a RAN CONFIGURATION UPDATE FAILURE message and appropriate cause value.

8.7.2.4 Abnormal Conditions

Void.

8.7.3 AMF Configuration Update

8.7.3.1 General

The purpose of the AMF Configuration Update procedure is to update application level configuration data needed for the NG-RAN node and AMF to interoperate correctly on the NG-C interface. This procedure does not affect existing UE-related contexts, if any.

8.7.3.2 Successful Operation

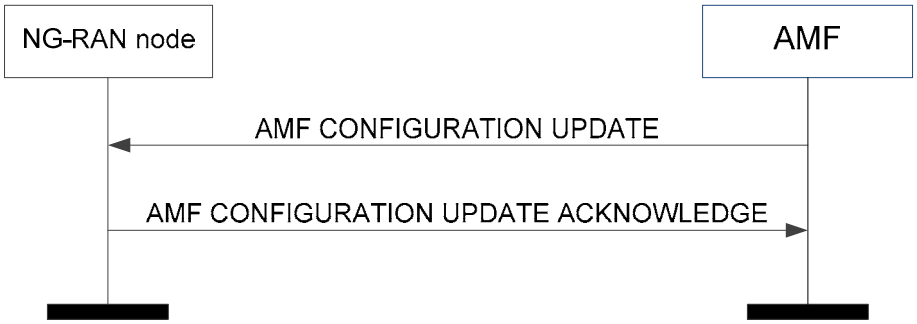

Figure 8.7.3.2-1: AMF configuration update: successful operation

The AMF initiates the procedure by sending an AMF CONFIGURATION UPDATE message including the appropriate updated configuration data to the NG-RAN node. The NG-RAN node responds with an AMF CONFIGURATION UPDATE ACKNOWLEDGE message to acknowledge that it successfully updated the configuration data.

If the *Slice Support List* IE is included in the AMF CONFIGURATION UPDATE message, the NG-RAN node shall overwrite the list of supported AMF slices for the PLMN Identity affected by the new list and use the received values for further network slice selection and AMF selection.

If the *AMF TNL Association to Add List* IE is contained in the AMF CONFIGURATION UPDATE message, the NG-RAN node shall, if supported, use it to establish the TNL association(s) with the AMF. The NG-RAN node shall report to the AMF, in the AMF CONFIGURATION UPDATE ACKNOWLEDGE message, the successful establishment of the TNL association(s) with the AMF as follows:

- A list of successfully established TNL associations shall be included in the *AMF TNL Association Setup List* IE;
- A list of TNL associations that failed to be established shall be included in the *AMF TNL Association Failed to Setup List* IE.

If the *AMF TNL Association to Remove List* IE is contained in the AMF CONFIGURATION UPDATE message the NG-RAN node shall, if supported, initiate removal of the TNL association(s) indicated by the received AMF Transport Layer Information towards the AMF.

If the *AMF Name* IE is included in the AMF CONFIGURATION UPDATE message, the NG-RAN node shall, if supported, overwrite the previously stored AMF name and use it to identify the AMF.

If the *Served GUAMI List* IE is included in the AMF CONFIGURATION UPDATE message, the NG-RAN node shall, if supported, overwrite the whole list of GUAMIs served by the AMF by the new list and use the received values for further AMF management as defined in TS 23.501 [9].

If the *Relative AMF Capacity* IE is included in the AMF CONFIGURATION UPDATE message, the NG-RAN node may use it as defined in TS 23.501 [9].

If the *AMF TNL Association to Update List* IE is contained in the AMF CONFIGURATION UPDATE message the NG-RAN node shall, if supported, update the TNL association(s) indicated by the received AMF Transport Layer Information towards the AMF.

If the *TNL Association Usage* IE or the *TNL Association Weight Factor* IE is included in the *AMF TNL Association to Add List* IE or the *AMF TNL Association to Update List* IE, the NG-RAN node shall, if supported, consider it as defined in TS 23.502 [10].

8.7.3.3 Unsuccessful Operation

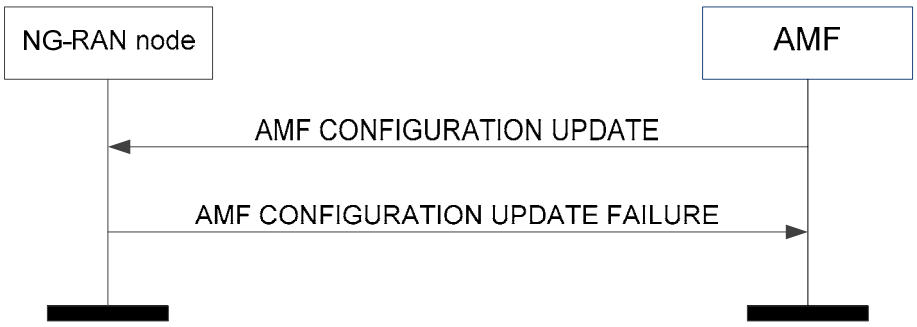

Figure 8.7.3.3-1: AMF configuration update: unsuccessful operation

If the NG-RAN node cannot accept the update, it shall respond with an AMF CONFIGURATION UPDATE FAILURE message and appropriate cause value.

8.7.3.4 Abnormal Conditions

Void.

8.7.4 NG Reset

8.7.4.1 General

The purpose of the NG Reset procedure is to initialise or re-initialise the RAN, or part of RAN NGAP UE-related contexts, in the event of a failure in the 5GC or vice versa. This procedure does not affect the application level configuration data exchanged during, e.g., the NG Setup procedure. The procedure uses non-UE associated signalling.

8.7.4.2 Successful Operation

8.7.4.2.1 NG Reset initiated by the AMF

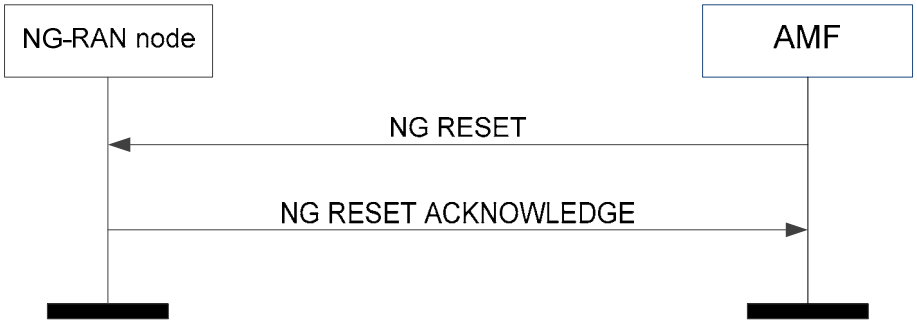

Figure 8.7.4.2.1-1: NG reset initiated by the AMF: successful operation

In the event of a failure at the AMF which has resulted in the loss of some or all transaction reference information, an NG RESET message shall be sent to the NG-RAN node.

At reception of the NG RESET message the NG-RAN node shall release all allocated resources on NG and Uu related to the UE association(s) indicated explicitly or implicitly in the NG RESET message and remove the indicated UE contexts including NGAP ID.

After the NG-RAN node has released all assigned NG resources and the UE NGAP IDs for all indicated UE associations which can be used for new UE-associated logical NG-connections over the NG interface, the NG-RAN node shall respond with the NG RESET ACKNOWLEDGE message. The NG-RAN node does not need to wait for the release of radio resources to be completed before returning the NG RESET ACKNOWLEDGE message.

If the NG RESET message contains the *UE-associated Logical NG-connection List* IE, then:

- The NG-RAN node shall use the *AMF UE NGAP ID* IE and/or the *RAN UE NGAP ID* IE to explicitly identify the UE association(s) to be reset.

- The NG-RAN node shall include in the NG RESET ACKNOWLEDGE message, for each UE association to be reset, the *UE-associated Logical NG-connection Item* IE in the *UE-associated Logical NG-connection List* IE. The *UE-associated Logical NG-connection Item* IEs shall be in the same order as received in the NG RESET message and shall include also unknown UE-associated logical NG-connections. Empty *UE-associated Logical NG-connection Item* IEs, received in the NG RESET message, may be omitted in the NG RESET ACKNOWLEDGE message.

- If the *AMF UE NGAP ID* IE is included in the *UE-associated Logical NG-connection Item* IE for a UE association, the NG-RAN node shall include the *AMF UE NGAP ID* IE in the corresponding *UE-associated Logical NG-connection Item* IE in the NG RESET ACKNOWLEDGE message.

- If the *RAN UE NGAP ID* IE is included in the *UE-associated Logical NG-connection Item* IE for a UE association, the NG-RAN node shall include the *RAN UE NGAP ID* IE in the corresponding *UE-associated Logical NG-connection Item* IE in the NG RESET ACKNOWLEDGE message.

Interactions with other procedures:

If the NG RESET message is received, any other ongoing procedure (except for another NG Reset procedure) on the same NG interface related to a UE association, indicated explicitly or implicitly in the NG RESET message, shall be aborted.

8.7.4.2.2 NG Reset initiated by the NG-RAN node

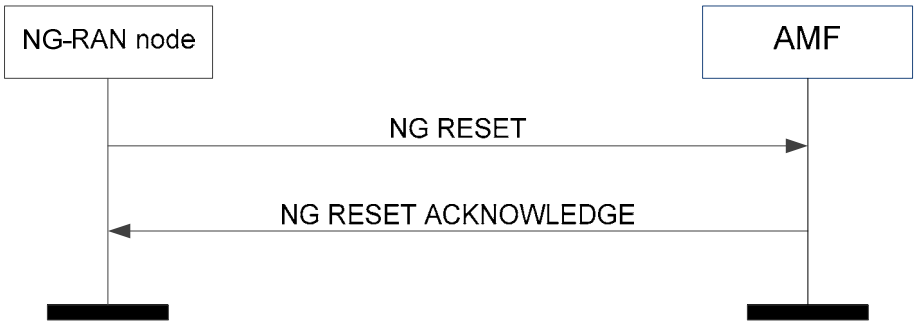

Figure 8.7.4.2.2-1: NG reset initiated by the NG-RAN node: successful operation

In the event of a failure at the NG-RAN node which has resulted in the loss of some or all transaction reference information, an NG RESET message shall be sent to the AMF.

At reception of the NG RESET message the AMF shall release all allocated resources on NG related to the UE association(s) indicated explicitly or implicitly in the NG RESET message and remove the NGAP ID for the indicated UE associations.

After the AMF has released all assigned NG resources and the UE NGAP IDs for all indicated UE associations which can be used for new UE-associated logical NG-connections over the NG interface, the AMF shall respond with the NG RESET ACKNOWLEDGE message.

If the NG RESET message contains the *UE-associated Logical NG-connection List* IE, then:

- The AMF shall use the *AMF UE NGAP ID* IE and/or the *RAN UE NGAP ID* IE to explicitly identify the UE association(s) to be reset.
- The AMF shall include in the NG RESET ACKNOWLEDGE message, for each UE association to be reset, the *UE-associated Logical NG-connection Item* IE in the *UE-associated Logical NG-connection List* IE. The *UE-associated Logical NG-connection Item* IEs shall be in the same order as received in the NG RESET message and shall include also unknown UE-associated logical NG-connections. Empty *UE-associated Logical NG-connection Item* IEs, received in the NG RESET message, may be omitted in the NG RESET ACKNOWLEDGE message.
- If the *AMF UE NGAP ID* IE is included in the *UE-associated Logical NG-connection Item* IE for a UE association, the AMF shall include the *AMF UE NGAP ID* IE in the corresponding *UE-associated Logical NG-connection Item* IE in the NG RESET ACKNOWLEDGE message.
- If the *RAN UE NGAP ID* IE is included in a *UE-associated Logical NG-connection Item* IE for a UE association, the AMF shall include the *RAN UE NGAP ID* IE in the corresponding *UE-associated Logical NG-connection Item* IE in the NG RESET ACKNOWLEDGE message.

Interactions with other procedures:

If the NG RESET message is received, any other ongoing procedure (except for another NG Reset procedure) on the same NG interface related to a UE association, indicated explicitly or implicitly in the NG RESET message, shall be aborted.

8.7.4.3 Unsuccessful Operation

Not applicable.

8.7.4.4 Abnormal Conditions

8.7.4.4.1 Abnormal Condition at the 5GC

If the NG RESET message includes the *UE-associated Logical NG-connection List* IE, but neither the *AMF UE NGAP ID* IE nor the *RAN UE NGAP ID* IE is present for a *UE-associated Logical NG-connection Item* IE, then the AMF shall ignore the *UE-associated Logical NG-connection Item* IE. The AMF may return the empty *UE-associated Logical NG-*

connection Item IE in the *UE-associated Logical NG-connection List* IE in the NG RESET ACKNOWLEDGE message.

8.7.4.4.2 Abnormal Condition at the NG-RAN

If the NG RESET message includes the *UE-associated Logical NG-connection List* IE, but neither the *AMF UE NGAP ID* IE nor the *RAN UE NGAP ID* IE is present for a *UE-associated Logical NG-connection Item* IE, then the NG-RAN node shall ignore the *UE-associated Logical NG-connection Item* IE. The NG-RAN node may return the empty *UE-associated Logical NG-connection Item* IE in the *UE-associated Logical NG-connection List* IE in the NG RESET ACKNOWLEDGE message.

8.7.4.4.3 Crossing of NG RESET Messages

If an NG Reset procedure is ongoing in the NG-RAN node and the NG-RAN node receives an NG RESET message from the peer entity on the same NG interface related to one or several UE associations previously requested to be reset, indicated explicitly or implicitly in the received NG RESET message, the NG-RAN node shall respond with the NG RESET ACKNOWLEDGE message as described in 8.7.4.2.1.

If an NG Reset procedure is ongoing in the AMF and the AMF receives an NG RESET message from the peer entity on the same NG interface related to one or several UE associations previously requested to be reset, indicated explicitly or implicitly in the received NG RESET message, the AMF shall respond with the NG RESET ACKNOWLEDGE message as described in 8.7.4.2.2.

8.7.5 Error Indication

8.7.5.1 General

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

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

8.7.5.2 Successful Operation

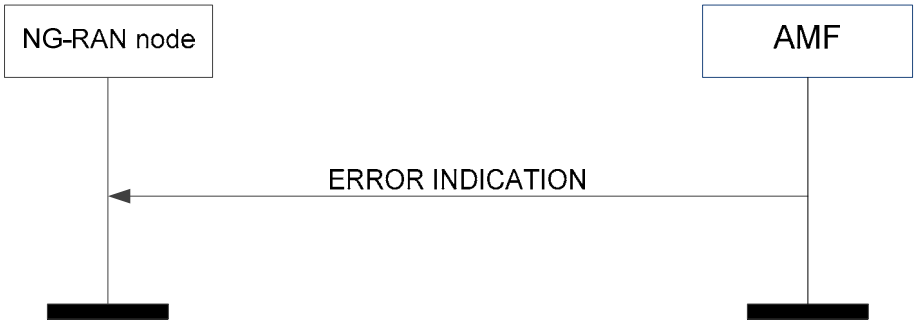

Figure 8.7.5.2-1: Error indication initiated by the AMF

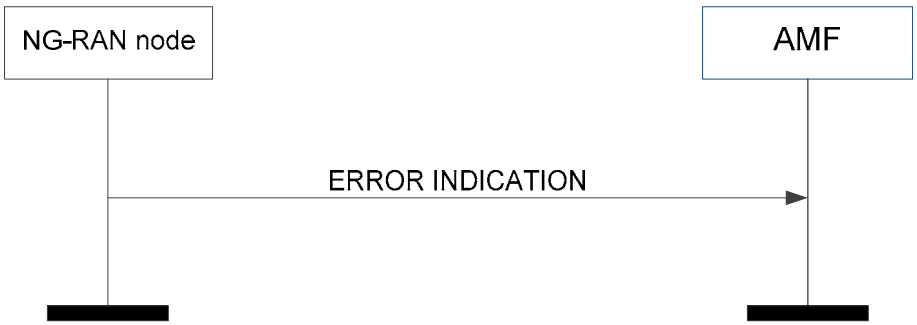

Figure 8.7.5.2-2: Error indication initiated by the NG-RAN node

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

The ERROR INDICATION message shall contain at least either the *Cause* IE or the *Criticality Diagnostics* IE. In case the Error Indication procedure is triggered by utilising UE-associated signalling the *AMF UE NGAP ID* IE and the *RAN UE NGAP ID* IE shall be included in the ERROR INDICATION message. If one or both of the *AMF UE NGAP ID* IE and the *RAN UE NGAP ID* IE are not correct, the cause shall be set to an appropriate value, e.g., "Unknown or already allocated AMF UE NGAP ID", "Unknown or already allocated RAN UE NGAP ID" or "Unknown or inconsistent pair of UE NGAP ID".

8.7.5.3 Abnormal Conditions

Void.

8.7.6 AMF Status Indication

8.7.6.1 General

The purpose of the AMF Status Indication procedure is to support AMF management functions.

8.7.6.2 Successful Operation

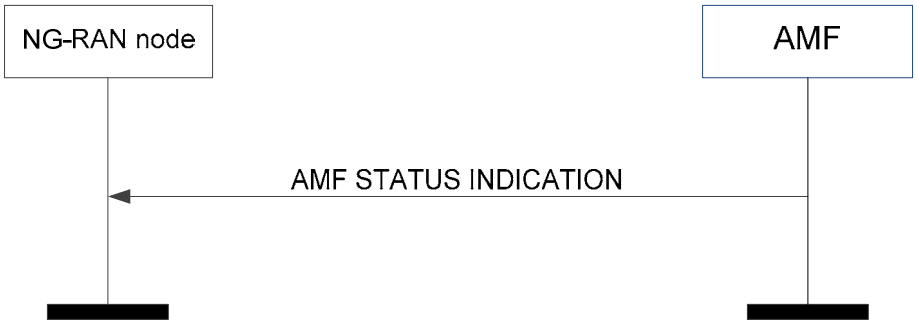

Figure 8.7.6.2-1: AMF status indication

The AMF initiates the procedure by sending an AMF STATUS INDICATION message to the NG-RAN node.

Upon receipt of the AMF STATUS INDICATION message, the NG-RAN node shall consider the indicated GUAMI(s) will be unavailable and perform AMF reselection as defined in TS 23.501 [9].

The NG-RAN node shall, if supported, act accordingly as specified in TS 23.501 [9], based on the presence or absence of the *Timer Approach for GUAMI Removal* IE.

If the *Backup AMF Name* IE is included in the AMF STATUS INDICATION message, the NG-RAN node shall, if supported, perform AMF reselection considering the AMF as indicated by the *Backup AMF Name* IE.

8.7.6.3 Abnormal Conditions

Void.

8.8 Configuration Transfer Procedures

8.8.1 Uplink RAN Configuration Transfer

8.8.1.1 General

The purpose of the Uplink RAN Configuration Transfer procedure is to transfer RAN configuration information from the NG-RAN node to the AMF. The AMF does not interpret the transferred RAN configuration information. This procedure uses non-UE associated signalling.

8.8.1.2 Successful Operation

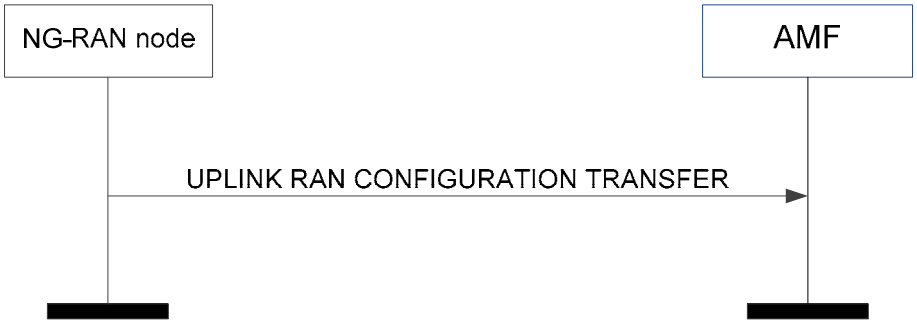

Figure 8.8.1.2-1: Uplink RAN configuration transfer

The NG-RAN node initiates the procedure by sending the UPLINK RAN CONFIGURATION TRANSFER message to the AMF.

If the AMF receives the *SON Configuration Transfer* IE, it shall transparently transfer the *SON Configuration Transfer* IE towards the NG-RAN node indicated in the *Target RAN Node ID* IE which is included in the *SON Configuration Transfer* IE.

8.8.1.3 Abnormal Conditions

Void.

8.8.2 Downlink RAN Configuration Transfer

8.8.2.1 General

The purpose of the Downlink RAN Configuration Transfer procedure is to transfer RAN configuration information from the AMF to the NG-RAN node. This procedure uses non-UE associated signalling.

8.8.2.2 Successful Operation

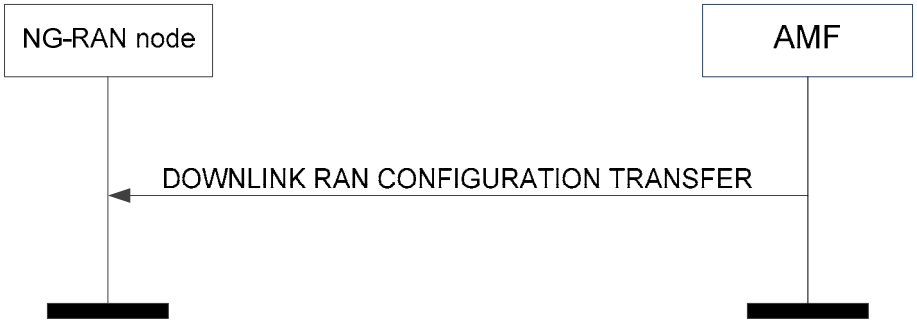

Figure 8.8.2.2-1: Downlink RAN configuration transfer

The procedure is initiated with an DOWNLINK RAN CONFIGURATION TRANSFER message sent from the AMF to the NG-RAN node.

If the NG-RAN node receives, in the *SON Configuration Transfer* IE, the *SON Information* IE containing the *SON Information Request* IE, it may transfer back the requested information towards the NG-RAN node indicated in the *Source RAN Node ID* IE of the *SON Configuration Transfer* IE by initiating the Uplink RAN Configuration Transfer procedure.

If the NG-RAN node receives, in the *SON Configuration Transfer* IE, the *Xn TNL Configuration Info* IE containing the *Xn Extended Transport Layer Addresses* IE, it may use it as part of its ACL functionality configuration actions, if such ACL functionality is deployed.

If the NG-RAN node receives, in the *SON Configuration Transfer* IE, the *SON Information* IE containing the *SON Information Reply* IE including the *Xn TNL Configuration Info* IE as an answer to a former request, it may use it to initiate the Xn TNL establishment.

In case the *IP-Sec Transport Layer Address* IE is present and the *GTP Transport Layer Addresses* IE within the *Xn Extended Transport Layer Addresses* IE is not empty, GTP traffic is conveyed within an IP-Sec tunnel terminated at the IP-Sec tunnel endpoint given in 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 endpoints given by the list of addresses in the *Xn GTP Transport Layer Addresses* IE within the *Xn Extended Transport Layer Addresses* IE.

In case the *Xn 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 endpoint given in the *IP-Sec Transport Layer Address* IE, within the *Xn Extended Transport Layer Addresses* IE.

If the NG-RAN node is configured to use one IPsec tunnel for all NG and Xn traffic (IPsec star topology) then the traffic to the peer NG-RAN node shall be routed through this IPsec tunnel and the *IP-Sec Transport Layer Address* IE shall be ignored.

8.8.2.3 Abnormal Conditions

Void.

8.9 Warning Message Transmission Procedures

8.9.1 Write-Replace Warning

8.9.1.1 General

The purpose of Write-Replace Warning procedure is to start or overwrite the broadcasting of warning messages. The procedure uses non UE-associated signalling.

8.9.1.2 Successful Operation

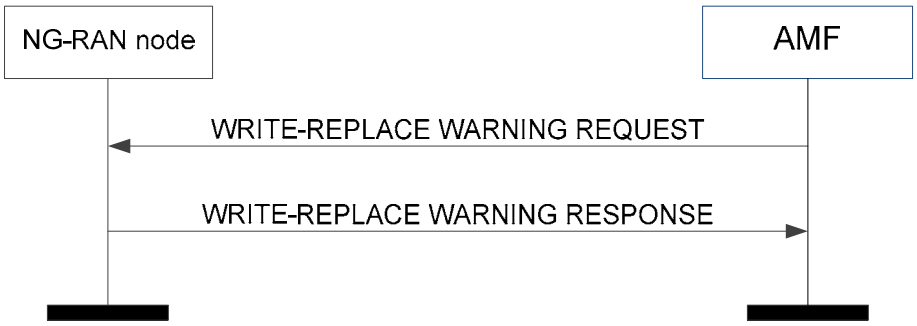

Figure 8.9.1.2-1: Write-Replace Warning procedure: successful operation

The AMF initiates the procedure by sending a WRITE-REPLACE WARNING REQUEST message to the NG-RAN node.

Upon receipt of the WRITE-REPLACE WARNING REQUEST message, the NG-RAN node shall prioritise its resources to process the warning message.

If, in a certain area, broadcast of a warning message is already ongoing and the NG-RAN node receives a WRITE-REPLACE WARNING REQUEST message with *Message Identifier* IE and/or *Serial Number* IE which are different from those in the warning message being broadcast, and if the *Concurrent Warning Message Indicator* IE is not present, the NG-RAN node shall replace the warning message being broadcast with the newly received one for that area.

If the NG-RAN node receives a WRITE-REPLACE WARNING REQUEST message with a warning message identified by the *Message Identifier* IE and *Serial Number* IE and if there are no prior warning messages being broadcast in any of the warning areas indicated in the *Warning Area List* IE, the NG-RAN node shall broadcast the received warning message for those area(s).

If, in a certain area, broadcast of one or more warning messages are already ongoing and the NG-RAN node receives a WRITE-REPLACE WARNING REQUEST message with a *Message Identifier* IE and/or *Serial Number* IE which are different from those in any of the warning messages being broadcast, and if the *Concurrent Warning Message Indictor* IE is present, the NG-RAN node shall schedule the received warning message for broadcast, for that area.

If the *Concurrent Warning Message Indicator* IE is present and if a value "0" is received in the *Number of Broadcast Requested* IE, the NG-RAN node shall broadcast the received warning message indefinitely until requested otherwise to stop broadcasting, except if the *Repetition Period* IE is set to "0".

If, in a certain area, broadcast of one or more warning messages are already ongoing and the NG-RAN node receives a WRITE-REPLACE WARNING REQUEST message with *Message Identifier* IE and *Serial Number* IE which correspond to one of the warning messages already being broadcast in that area, the NG-RAN node shall not start a new broadcast or replace an existing one but it shall still reply by sending a WRITE-REPLACE WARNING RESPONSE message which includes the *Broadcast Completed Area List* IE set according to the ongoing broadcast.

If the *Warning Area List* IE is not included in the WRITE-REPLACE WARNING REQUEST message, the NG-RAN node shall broadcast the indicated message in all of the cells within the NG-RAN node.

If the *Warning Type* IE is included in the WRITE-REPLACE WARNING REQUEST message, the NG-RAN node shall broadcast the Primary Notification irrespective of the setting of the *Repetition Period* IE and the *Number of Broadcasts Requested* IE, and process the Primary Notification according to TS 36.331 [21] and TS 38.331 [18].

If the *Warning Security Information* IE is included in the WRITE-REPLACE WARNING REQUEST message, the NG-RAN node shall send this IE together with the *Warning Type* IE in the Primary Notification.

If the *Data Coding Scheme* IE and the *Warning Message Contents* IE are both included in the WRITE-REPLACE WARNING REQUEST message, the NG-RAN node shall schedule a broadcast of the warning message according to the value of the *Repetition Period* IE and the *Number of Broadcasts Requested* IE and process the warning message according to TS 36.331 [21] and TS 38.331 [18].

The NG-RAN node acknowledges the WRITE-REPLACE WARNING REQUEST message by sending a WRITE-REPLACE WARNING RESPONSE message to the AMF.

If the *Broadcast Completed Area List* IE is not included in the WRITE-REPLACE WARNING RESPONSE message, the AMF shall consider that the broadcast is unsuccessful in all the cells within the NG-RAN node.

8.9.1.3 Unsuccessful Operation

Not applicable.

8.9.1.4 Abnormal Conditions

If the *Concurrent Warning Message Indicator* IE is not present and if a value "0" is received in the *Number of Broadcast Requested* IE, the NG-RAN node shall not broadcast the received secondary notification.

If the *Concurrent Warning Message Indicator* IE is included and if a value "0" is received in the *Repetition Period* IE, the NG-RAN node shall not broadcast the received warning message except if the *Number of Broadcast Requested* IE is set to "1".

If the *Concurrent Warning Message Indicator* IE is not included and if a value "0" is received in the *Repetition Period* IE, the NG-RAN node shall not broadcast the received secondary notification except if the *Number of Broadcast Requested* IE is set to "1".

8.9.2 PWS Cancel

8.9.2.1 General

The purpose of the PWS Cancel procedure is to cancel an already ongoing broadcast of a warning message. The procedure uses non UE-associated signalling.

8.9.2.2 Successful Operation

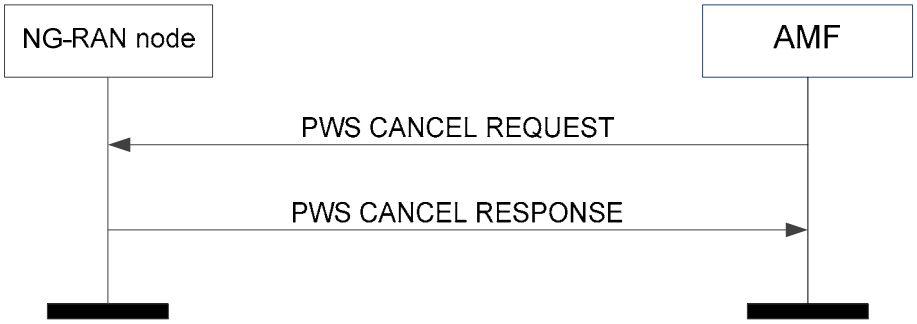

Figure 8.9.2.2-1: PWS Cancel procedure: successful operation

The AMF initiates the procedure by sending a PWS CANCEL REQUEST message to the NG-RAN node.

If the NG-RAN node receives a PWS CANCEL REQUEST message and broadcast of the warning message identified by the *Message Identifier* and *Serial Number* IE is ongoing in an area indicated within the *Warning Area List* IE, the NG-RAN node shall stop broadcasting the warning message within that area and discard the warning message for that area.

If the *Warning Area List* IE is not included in the PWS CANCEL REQUEST message, the NG-RAN node shall stop broadcasting and discard the warning message identified by the *Message Identifier* IE and the *Serial Number* IE in all of the cells in the NG-RAN node.

The NG-RAN node shall acknowledge the PWS CANCEL REQUEST message by sending the PWS CANCEL RESPONSE message, with the *Message Identifier* IE and the *Serial Number* IE copied from the PWS CANCEL REQUEST message and shall, if there is an area to report where an ongoing broadcast was stopped successfully, include the *Broadcast Cancelled Area List* IE.

If an area included in the *Warning Area List* IE in the PWS CANCEL REQUEST message does not appear in the *Broadcast Cancelled Area List* IE, the AMF shall consider that the NG-RAN node had no ongoing broadcast to stop for the same *Message Identifier* and *Serial Number* in that area.

If the *Broadcast Cancelled Area List* IE is not included in the PWS CANCEL RESPONSE message, the AMF shall consider that the NG-RAN node had no ongoing broadcast to stop for the same *Message Identifier* and *Serial Number*.

If the *Cancel-All Warning Messages Indicator* IE is present in the PWS CANCEL REQUEST message, then the NG-RAN node shall stop broadcasting and discard all warning messages for the area as indicated in the *Warning Area List* IE or in all the cells of the NG-RAN node if the *Warning Area List* IE is not included. The NG-RAN node shall acknowledge the PWS CANCEL REQUEST message by sending the PWS CANCEL RESPONSE message, with the *Message Identifier* IE and the *Serial Number* IE copied from the PWS CANCEL REQUEST message and shall, if there is area to report where an ongoing broadcast was stopped successfully, include the *Broadcast Cancelled Area List* IE with the *Number of Broadcasts* IE set to 0.

8.9.2.3 Unsuccessful Operation

Not applicable.

8.9.2.4 Abnormal Conditions

Void.

8.9.3 PWS Restart Indication

8.9.3.1 General

The purpose of the PWS Cancel procedure is to cancel an already ongoing broadcast of a warning message. The procedure uses non UE-associated signalling.

8.9.3.2 Successful Operation

Figure 8.9.3.2-1: PWS restart indication

The NG-RAN node initiates the procedure by sending a PWS RESTART INDICATION message to the AMF. On receipt of a PWS RESTART INDICATION message, the AMF shall act as defined in TS 23.007 [20].

If the Emergency Area ID is available, the NG-RAN node shall also include it in the *Emergency Area ID List for Restart* IE.

8.9.3.3 Abnormal Conditions

Void.

8.9.4 PWS Failure Indication

8.9.4.1 General

The purpose of the PWS Failure Indication procedure is to inform the AMF that ongoing PWS operation for one or more cells of the NG-RAN node has failed. The procedure uses non UE-associated signalling.

8.9.4.2 Successful Operation

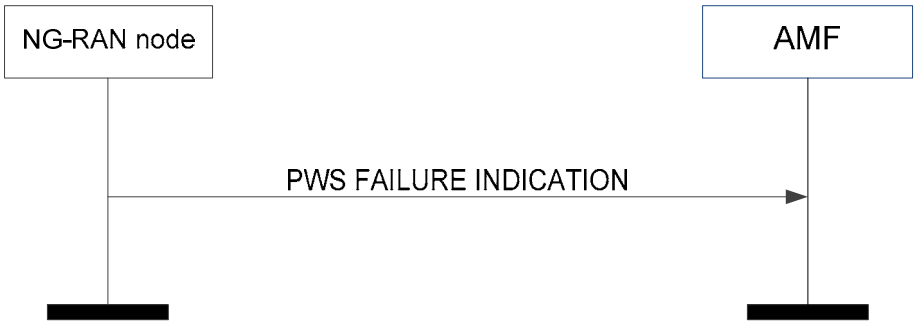

Figure 8.9.4.2-1: PWS failure indication

The NG-RAN node initiates the procedure by sending a PWS FAILURE INDICATION message to the AMF. On receipt of a PWS FAILURE INDICATION message, the AMF shall act as defined in TS 23.041 [22].

8.9.4.3 Abnormal Conditions

Void.

8.10 NRPPa Transport Procedures

8.10.1 General

The purpose of the NRPPa Transport procedure is to carry NRPPa signalling (defined in TS 38.455 [19]) between the NG-RAN node and the LMF over the NG interface as defined in TS 38.455 [19]. The procedure may use UE-associated signalling or non-UE associated signalling. The UE-associated signalling is used to support E-CID positioning of a

specific UE. The non-UE associated signalling is used to obtain assistance data from an NG-RAN node to support OTDOA positioning for any UE.

8.10.2 Successful Operations

8.10.2.1 DOWNLINK UE ASSOCIATED NRPPA TRANSPORT

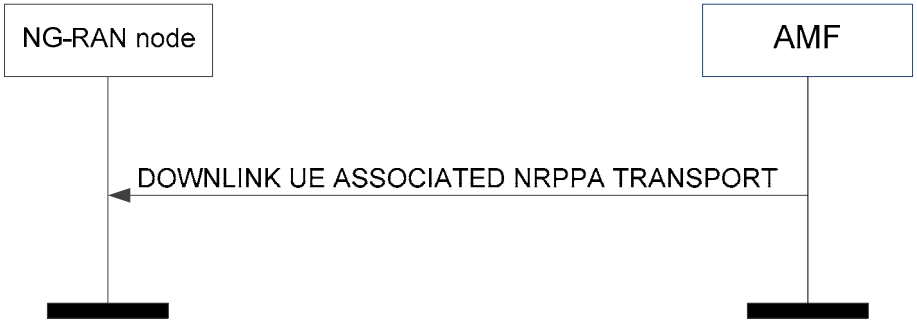

Figure 8.10.2.1-1: Downlink UE-associated NRPPa transport

The AMF initiates the procedure by sending the DOWNLINK UE ASSOCIATED NRPPA TRANSPORT message to the NG-RAN node.

8.10.2.2 UPLINK UE ASSOCIATED NRPPA TRANSPORT

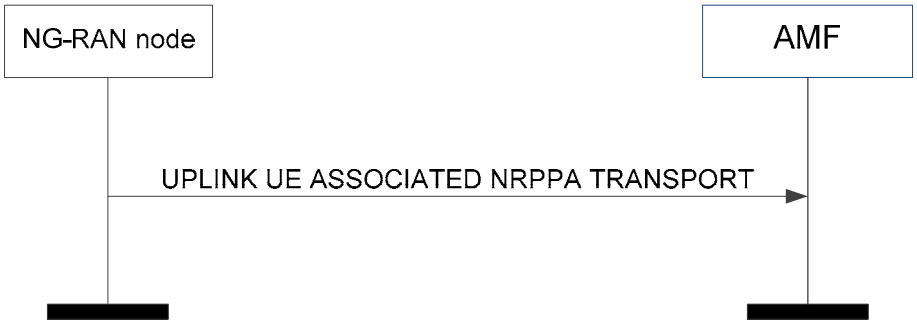

Figure 8.10.2.2-1: Uplink UE-associated NRPPa transport

The NG-RAN node initiates the procedure by sending the UPLINK UE ASSOCIATED NRPPA TRANSPORT message to the AMF.

8.10.2.3 DOWNLINK NON UE ASSOCIATED NRPPA TRANSPORT

Figure 8.10.2.3-1: Downlink non UE-associated NRPPa transport

The AMF initiates the procedure by sending the DOWNLINK NON UE ASSOCIATED NRPPA TRANSPORT message to the NG-RAN node.

8.10.2.4 UPLINK NON UE ASSOCIATED NRPPA TRANSPORT

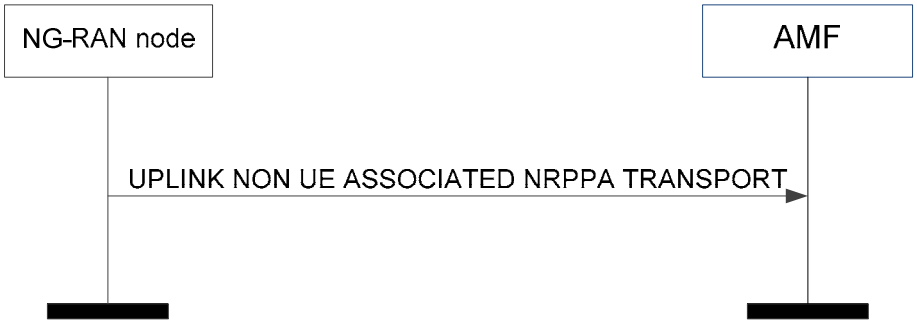

Figure 8.10.2.4-1: Uplink non UE-associated NRPPa transport

The NG-RAN node initiates the procedure by sending the UPLINK NON UE ASSOCIATED NRPPA TRANSPORT message to the AMF.

8.10.3 Unsuccessful Operations

Not applicable.

8.10.4 Abnormal Conditions

If an AMF receives an UPLINK UE ASSOCIATED NRPPA TRANSPORT message with an unknown Routing ID for the UE, the AMF shall ignore the message.

If an AMF receives an UPLINK NON UE ASSOCIATED NRPPA TRANSPORT message indicating an unknown or unreachable Routing ID, the AMF shall ignore the message.

8.11 Trace Procedures

8.11.1 Trace Start

8.11.1.1 General

The purpose of the Trace Start procedure is to allow the AMF to request the NG-RAN node to initiate a trace session for a UE. The procedure uses UE-associated signalling. If no UE-associated logical NG-connection exists, the UE-associated logical NG-connection shall be established as part of the procedure.

8.11.1.2 Successful Operation

Figure 8.11.1.2-1: Trace start

The AMF initiates the procedure by sending a TRACE START message. Upon reception of the TRACE START message, the NG-RAN node shall initiate the requested trace session as described in TS 32.422 [11].

Interactions with other procedures:

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

8.11.1.3 Abnormal Conditions

Void.

8.11.2 Trace Failure Indication

8.11.2.1 General

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

8.11.2.2 Successful Operation

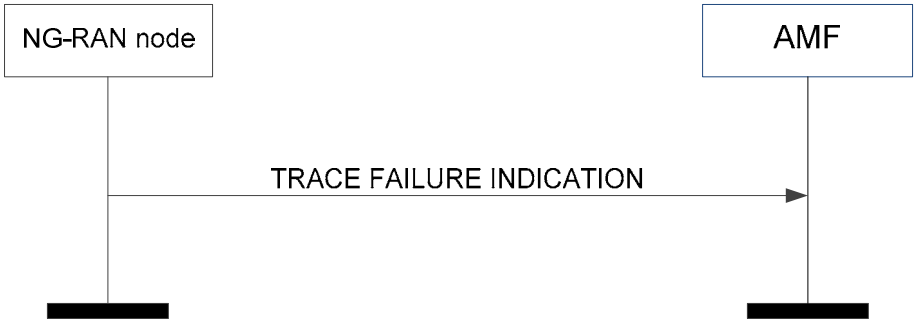

Figure 8.11.2.2-1: Trace failure indication

The NG-RAN node initiates the procedure by sending a TRACE FAILURE INDICATION message. Upon reception of the TRACE FAILURE INDICATION message, the AMF shall take appropriate actions based on the failure reason indicated by the *Cause* IE.

8.11.2.3 Abnormal Conditions

Void.

8.11.3 Deactivate Trace

8.11.3.1 General

The purpose of the Deactivate Trace procedure is to allow the AMF to request the NG-RAN node to stop the trace session for the indicated trace reference.

8.11.3.2 Successful Operation

Figure 8.11.3.2-1: Deactivate trace

The AMF initiates the procedure by sending a DEACTIVATE TRACE message to the NG-RAN node as described in TS 32.422 [11]. Upon reception of the DEACTIVATE TRACE message, the NG-RAN node shall stop the trace session for the indicated trace reference in the *NG-RAN Trace ID* IE.

Interactions with other procedures:

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

8.11.3.3 Abnormal Conditions

Void.

8.11.4 Cell Traffic Trace

8.11.4.1 General

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

8.11.4.2 Successful Operation

Figure 8.11.4.2-1: Cell traffic trace

The NG-RAN node initiates the procedure by sending a CELL TRAFFIC TRACE message.

8.11.4.3 Abnormal Conditions

Void.

8.12 Location Reporting Procedures

8.12.1 Location Reporting Control

8.12.1.1 General

The purpose of the Location Reporting Control procedure is to allow the AMF to request the NG-RAN node to report the UE's current location, or the UE's last known location with time stamp, or the UE's presence in the area of interest while in CN-CONNECTED as specified in TS 23.501 [9] and TS 23.502 [10]. The procedure uses UE-associated signalling.

8.12.1.2 Successful Operation

Figure 8.12.1.2-1: Location reporting control

The AMF initiates the procedure by sending a LOCATION REPORTING CONTROL message to the NG-RAN node. On receipt of the LOCATION REPORTING CONTROL message the NG-RAN node shall perform the requested location reporting control action for the UE.

The *Location Reporting Request Type* IE indicates to the NG-RAN node whether:

- to report directly;
- to report upon change of serving cell;
- to report UE presence in the area of interest;
- to stop reporting at change of serving cell; or
- to stop reporting UE presence in the area of interest.

NOTE: The list of location reporting request types may need to be refined.

If the *Area Of Interest Information* IE is included in the LOCATION REPORTING CONTROL message, the NG-RAN node shall store this information and use it to track the UE's presence in the area of interest as defined in TS 23.502 [10].

8.12.1.3 Abnormal Conditions

Void.

8.12.2 Location Report Failure Indication

8.12.2.1 General

The purpose of the Location Report Failure Indication procedure is to allow the NG-RAN node to inform the AMF that the Location Reporting Control procedure has failed. The procedure uses UE-associated signalling.

8.12.2.2 Successful Operation

Figure 8.12.2.2-1: Location reporting failure

The NG-RAN node initiates the procedure by sending a LOCATION REPORTING FAILURE message to the AMF. Upon reception of the LOCATION REPORT FAILURE INDICATION message the AMF shall, based on the failure reason indicated by the *Cause* IE, take appropriate action.

8.12.2.3 Abnormal Conditions

Void.

8.12.3 Location Report

8.12.3.1 General

The purpose of the Location Report procedure is to provide the UE's current location, the UE's last known location with time stamp, or the UE's presence in the area of interest to the AMF. The procedure uses UE-associated signalling.

8.12.3.2 Successful Operation

Figure 8.12.3.2-1: Location reporting failure

The NG-RAN node initiates the procedure by generating a LOCATION REPORT message. The LOCATION REPORT message may be used as a response to the LOCATION REPORTING CONTROL message.

8.12.3.3 Abnormal Conditions

Void.

8.13 UE TNLA Binding Procedures

8.13.1 UE TNLA Binding Release

8.13.1.1 General

The purpose of the UE TNLA Binding Release procedure is to request the NG-RAN node to release the NGAP UE TNLA binding, while requesting the NG-RAN node to maintain NG-U (user plane connectivity) and UE context information as specified in TS 23.502 [10]. The procedure uses UE associated signalling.

8.13.1.2 Successful Operation

Figure 8.13.1.2-1: UE TNLA binding release request

At reception of the UE TNLA BINDING RELEASE REQUEST message, the NG-RAN node shall release the UE TNLA binding for the UEs indicated in the UE TNLA BINDING RELEASE REQUEST message. The NG-RAN node shall keep the NG-U (user plane connectivity) and UE context information for those UEs.

Interactions with other procedures:

If the UE TNLA BINDING RELEASE REQUEST message is received, any other ongoing procedure (except for the NG Reset procedure or another UE TNLA Binding Release procedure) on the same NG interface related to a UE indicated in the UE TNLA BINDING RELEASE REQUEST message shall be aborted.

8.13.1.3 Abnormal Conditions

Void.

8.14 UE Capability Management Procedures

8.14.1 UE Capability Info Indication

8.14.1.1 General

The purpose of the UE Capability Info Indication procedure is to enable the NG-RAN node to provide to the AMF UE capability-related information. The procedure uses UE associated signalling.

8.14.1.2 Successful Operation

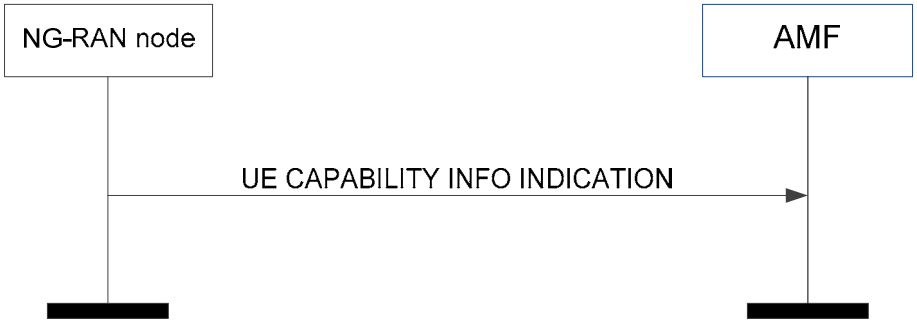

Figure 8.14.1.2-1: UE capability info indication

The NG-RAN node controlling a UE-associated logical NG connection initiates the procedure by sending a UE CAPABILITY INFO INDICATION message to the AMF including the UE capability information.

The UE CAPABILITY INFO INDICATION message may also include paging specific UE capability information within the *UE Radio Capability for Paging* IE.

The UE capability information received by the AMF shall replace previously stored corresponding UE capability information in the AMF for the UE, as described in TS 23.501 [9].

8.14.1.3 Abnormal Conditions

Void.

8.14.2 UE Radio Capability Check

8.14.2.1 General

The purpose of the UE Radio Capability Check procedure is for the AMF to request the NG-RAN node to derive and provide an indication to the AMF on whether the UE radio capabilities are compatible with the network configuration for IMS voice. The procedure uses UE-associated signalling.

8.14.2.2 Successful Operation

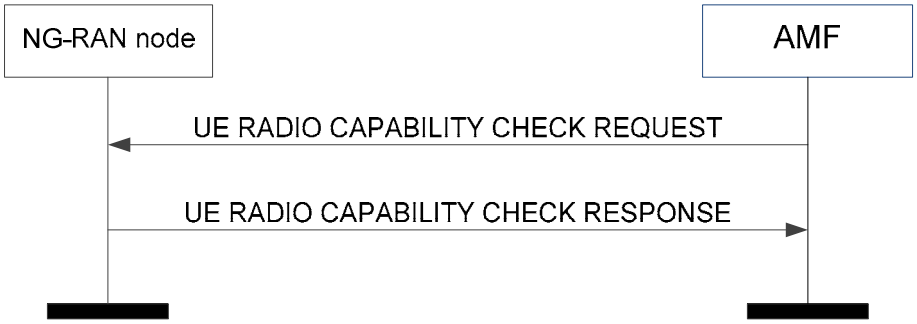

Figure 8.14.2.2-1: UE radio capability check procedure: successful operation

The AMF initiates the procedure by sending a UE RADIO CAPABILITY CHECK REQUEST message. If the UE-associated logical NG-connection is not established, the AMF shall allocate a unique AMF UE NGAP ID to be used for the UE and include the *AMF UE NGAP ID* IE in the UE RADIO CAPABILITY CHECK REQUEST message; by receiving the *AMF UE NGAP ID* IE in the UE RADIO CAPABILITY CHECK REQUEST message, the NG-RAN node establishes the UE-associated logical NG-connection.

Upon receipt of the UE RADIO CAPABILITY CHECK REQUEST message, the NG-RAN node checks whether the UE radio capabilities are compatible with the network configuration for IMS voice, and responds with a UE RADIO CAPABILITY CHECK RESPONSE message, as defined in TS 23.502 [10].

If the *UE Radio Capability* IE is contained in the UE RADIO CAPABILITY CHECK REQUEST message, the NG-RAN node shall use it to determine the value of the *IMS Voice Support Indicator* IE to be included in the UE RADIO CAPABILITY CHECK RESPONSE message.

8.14.2.3 Unsuccessful Operation

Not applicable.

8.14.2.4 Abnormal Conditions

Void.

9 Elements for NGAP Communication

9.0 General

Subclauses 9.2 and 9.3 present the NGAP message and IE definitions in tabular format. The corresponding ASN.1 definition is presented in subclause 9.4. In case there is contradiction between the tabular format and the ASN.1 definition, the ASN.1 shall take precedence, except for the definition of conditions for the presence of conditional IEs, where the tabular format shall take precedence.

The messages have been defined in accordance to the guidelines specified in TR 25.921 [7].

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

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

9.1 Tabular Format Contents

9.1.1 Presence

All IEs are marked mandatory, optional or conditional according to table 4.

Table 9.1.1-1: Meaning of content within "Presence" column

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

9.1.2 Criticality

Each IE or group of IEs may have criticality information applied to it according to table 5.

Table 9.1.2-1: Meaning of content within "Criticality" column

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

9.1.3 Range

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

9.1.4 Assigned Criticality

The Assigned Criticality column provides the actual criticality information as defined in subclause 10.3.2, if applicable.

9.2 Message Functional Definition and Content

9.2.1 PDU Session Management Messages

9.2.1.1 PDU SESSION RESOURCE SETUP REQUEST

This message is sent by the AMF and is used to request the NG-RAN node to assign resources on Uu and NG-U for one or several PDU session resources.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
RAN Paging Priority	O		9.3.3.15		YES	ignore
NAS-PDU	O		9.3.3.4		YES	reject
PDU Session Resource Setup Request List		*1*			YES	reject
>PDU Session Resource Setup Request Item IEs		*1..<maxnoofPDUSessions>*			EACH	reject
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session NAS-PDU	O		9.3.3.4		-	
>>S-NSSAI	M		9.3.1.24		-	
>>PDU Session Resource Setup Request Transfer	M		OCTET STRING	Containing the *PDU Session Resource Setup Request Transfer* IE specified in subclause 9.3.4.1.	-	

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.1.2 PDU SESSION RESOURCE SETUP RESPONSE

This message is sent by the NG-RAN node as a response to the request to assign resources on Uu and NG-U for one or several PDU session resources.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
PDU Session Resource Setup Response List		*0..1*			YES	ignore
>PDU Session Resource Setup Response Item IEs		*1..<maxnoofPDUSessions>*			EACH	ignore
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Setup Response Transfer	M		OCTET STRING	Containing the *PDU Session Resource Setup Response Transfer* IE specified in subclause 9.3.4.2.	-	
>>Additional PDU Session Resource Setup Response Transfer	O		OCTET STRING	Providing additional PDU Session Resource Setup Response information in case of an additional NG-U GTP-U tunnel. Containing the *PDU Session Resource Setup Response Transfer* IE specified in subclause 9.3.4.2.	-	
PDU Session Resource Failed to Setup List	O		PDU Session List 9.3.1.11		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.1.3 PDU SESSION RESOURCE RELEASE COMMAND

This message is sent by the AMF and is used to request the NG-RAN node to release already established PDU session resources for a given UE.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
RAN Paging Priority	O		9.3.3.15		YES	ignore
NAS-PDU	O		9.3.3.4		YES	ignore
PDU Session Resource to Release List	M		PDU Session List 9.3.1.11		YES	ignore

9.2.1.4 PDU SESSION RESOURCE RELEASE RESPONSE

This message is sent by the NG-RAN node as a response to the request to release already established PDU session resources for a given UE.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
User Location Information	O		9.3.1.16		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.2.1.5 PDU SESSION RESOURCE MODIFY REQUEST

This message is sent by the AMF and is used to request the NG-RAN node to enable modifications of already established PDU session resources for a given UE.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
RAN Paging Priority	O		9.3.3.15		YES	ignore
PDU Session Resource Modify Request List		*1*			YES	reject
>PDU Session Resource Modify Request Item IEs		*1..<maxnoofPDUSessions>*			EACH	reject
>>PDU Session ID	M		9.3.1.50		-	
>>NAS-PDU	O		9.3.3.4		-	
>>PDU Session Resource Modify Request Transfer	M		OCTET STRING	Containing the *PDU Session Resource Modify Request Transfer* IE specified in subclause 9.3.4.3.	-	

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.1.6 PDU SESSION RESOURCE MODIFY RESPONSE

This message is sent by the NG-RAN node and is used to report the outcome of the request from the PDU SESSION RESOURCE MODIFY REQUEST message.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
PDU Session Resource Modify Response List		*0..1*			YES	ignore
>PDU Session Resource Modify Response Item IEs		*1..<maxnoofPDUSessions>*			EACH	ignore
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Modify Response Transfer	M		OCTET STRING	Containing the *PDU Session Resource Modify Response Transfer* IE specified in subclause 9.3.4.4.	-	
PDU Session Resource Failed to Modify List	O		PDU Session List 9.3.1.11		YES	ignore
User Location Information	O		9.3.1.16		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.1.7 PDU SESSION RESOURCE NOTIFY

This message is sent by the NG-RAN node to notify that the already established QoS flow(s) or PDU session resource(s) for a given UE are released or not fulfilled anymore or fulfilled again by the NG-RAN node.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
PDU Session Resource Notify List		*0..1*			YES	reject
>PDU Session Resource Notify Item IEs		*1..<maxnoofPDUSessions>*			EACH	reject
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Notify Transfer	M		OCTET STRING	Containing the *PDU Session Resource Notify Transfer* IE specified in subclause 9.3.4.5.	-	
PDU Session Resource Released List	O		PDU Session List 9.3.1.11		YES	ignore
User Location Information	O		9.3.1.16		YES	ignore

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.1.8 PDU SESSION RESOURCE MODIFY INDICATION

This message is sent by the NG-RAN node and is used to request the AMF to enable modifications of already established PDU session resources for a given UE.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
PDU Session Resource Modify Indication List		*1*			YES	reject
>PDU Session Resource Modify Indication Item IEs		*1..<maxnoofPDUSessions>*			EACH	reject
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Modify Indication Transfer	M		OCTET STRING	Containing the *PDU Session Resource Modify Indication Transfer* IE specified in subclause 9.3.4.6.	-	

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.1.9 PDU SESSION RESOURCE MODIFY CONFIRM

This message is sent by the AMF and is used to confirm the outcome of the request from the PDU SESSION RESOURCE MODIFY INDICATION message.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
PDU Session Resource Modify Confirm List		*1*			YES	ignore
>PDU Session Resource Modify Confirm Item IEs		*1..<maxnoofPDUSessions>*			EACH	ignore
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Modify Confirm Transfer	M		OCTET STRING	Containing the *PDU Session Resource Modify Confirm Transfer* IE specified in subclause 9.3.4.7.	-	
Criticality Diagnostics	O		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.2 UE Context Management Messages

9.2.2.1 INITIAL CONTEXT SETUP REQUEST

This message is sent by the AMF to request the setup of a UE context.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
Old AMF	O		AMF Name 9.3.3.22		YES	reject
UE Aggregate Maximum Bit Rate	C-ifPDUsessionResourceSetup		9.3.1.58		YES	reject
RRC Inactive Assistance Information	O		9.3.1.15		YES	ignore
GUAMI	M		9.3.3.3		YES	reject
PDU Session Resource Setup Request List		*0..1*			YES	reject
>PDU Session Resource Setup Request Item IEs		*1..<maxnoofPDUSessions>*			EACH	reject
>>PDU Session ID	M		9.3.1.50		-	
>>NAS-PDU	O		9.3.3.4		-	
>>S-NSSAI	M		9.3.1.24		-	
>>PDU Session Resource Setup Request Transfer	M		OCTET STRING	Containing the *PDU Session Resource Setup Request Transfer* IE specified in subclause 9.3.4.1.	-	
Allowed NSSAI	M		9.3.1.31	Indicates the S-NSSAIs permitted by the network	YES	ignore
UE Security Capabilities	M		9.3.1.86		YES	reject
Security Key	M		9.3.1.87		YES	reject
Trace Activation	O		9.3.1.14		YES	ignore
Mobility Restriction List	O		9.3.1.85		YES	ignore
UE Radio Capability	O		9.3.1.74		YES	ignore
Index to RAT/Frequency Selection Priority	O		9.3.1.61		YES	ignore
Masked IMEISV	O		9.3.1.54		YES	ignore
NAS-PDU	O		9.3.3.4		YES	ignore
Emergency Fallback Indicator	O		9.3.1.26		YES	reject

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

Condition	Explanation
ifPDUsessionResourceSetup	This IE shall be present if the *PDU Session Resource Setup List* IE is present.

9.2.2.2 INITIAL CONTEXT SETUP RESPONSE

This message is sent by the NG-RAN node to confirm the setup of a UE context.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
PDU Session Resource Setup Response List		*0..1*			YES	ignore
>PDU Session Resource Setup Response Item IEs		*1..<maxnoofPDUSessions>*			EACH	ignore
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Setup Response Transfer	M		OCTET STRING		-	
>>Additional PDU Session Resource Setup Response Transfer	O		OCTET STRING	Providing additional PDU Session Resource Setup Response information in case of an additional NG-U GTP-U tunnel. Containing the *PDU Session Resource Setup Response Transfer* IE specified in subclause 9.3.4.2.	-	
PDU Session Resource Failed to Setup List	O		PDU Session List 9.3.1.11		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.2.3 INITIAL CONTEXT SETUP FAILURE

This message is sent by the NG-RAN node to indicate that the setup of the UE context was unsuccessful.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
Cause	M		9.3.1.2		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.2.2.4 UE CONTEXT RELEASE REQUEST

This message is sent by the NG-RAN node to request the release of the UE-associated logical NG-connection over the NG interface.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
Cause	M		9.3.1.2		YES	ignore

9.2.2.5 UE CONTEXT RELEASE COMMAND

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

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
CHOICE *UE NGAP IDs*	M				YES	reject
>UE NGAP ID pair						
>>AMF UE NGAP ID	M		9.3.3.1		-	
>>RAN UE NGAP ID	M		9.3.3.2		-	
>AMF UE NGAP ID						
>>AMF UE NGAP ID	M		9.3.3.1		-	
RAN Paging Priority	O		9.3.3.15		YES	ignore
Cause	M		9.3.1.2		YES	ignore

9.2.2.6 UE CONTEXT RELEASE COMPLETE

This message is sent by the NG-RAN node to confirm the release of the UE-associated logical NG-connection over the NG interface.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
User Location Information	O		9.3.1.16		YES	ignore
Information on Recommended Cells and RAN Nodes for Paging	O		OCTET STRING	This IE may need to be refined	YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.2.2.7 UE CONTEXT MODIFICATION REQUEST

This message is sent by the AMF to provide UE Context information changes to the NG-RAN node.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
RAN Paging Priority	O		9.3.3.15		YES	ignore
Security Key	O		9.3.1.87		YES	reject
Index to RAT/Frequency Selection Priority	O		9.3.1.61		YES	ignore
UE Aggregate Maximum Bit Rate	O		9.3.1.58		YES	ignore
UE Security Capabilities	O		9.3.1.86		YES	reject
RRC Inactive Assistance Information	O		9.3.1.15		YES	ignore
Emergency Fallback Indicator	O		9.3.1.26		YES	reject
New AMF UE NGAP ID	O		AMF UE NGAP ID 9.3.3.1		YES	ignore

9.2.2.8 UE CONTEXT MODIFICATION RESPONSE

This message is sent by the NG-RAN node to confirm the performed UE context updates.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.2.2.9 UE CONTEXT MODIFICATION FAILURE

This message is sent by the NG-RAN node in case the performed UE context update is not successful.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
Cause	M		9.3.1.2		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.2.3 UE Mobility Management Messages

9.2.3.1 HANDOVER REQUIRED

This message is sent by the source NG-RAN node to the AMF to request the preparation of resources at the target.

Direction: NG-RAN node → AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
Handover Type	M		9.3.1.22		YES	reject
Cause	M		9.3.1.2		YES	ignore
Target ID	M		9.3.1.25		YES	reject
Direct Forwarding Path Availability	O		9.3.1.64		YES	ignore
PDU Session Resource List		*1*			YES	reject
>PDU Session Resource Item IEs		*1..<maxnoofPDUSessions>*			EACH	reject
>>PDU Session ID	M		9.3.1.50		-	
>>S-NSSAI	M		9.3.1.24		-	
>>Handover Required Transfer	M		OCTET STRING	Containing the *PDU Session Resource Setup Request Transfer* IE specified in subclause 9.3.4.1.	-	
>>PDU Session Resource Subject to Handover	M		OCTET STRING	This IE may need to be refined	-	
Source to Target Transparent Container	M		9.3.1.20		YES	reject

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.3.2 HANDOVER COMMAND

This message is sent by the AMF to inform the source NG-RAN node that resources for the handover have been prepared at the target side.

Direction: AMF→ NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
Handover Type	M		9.3.1.22		YES	reject
PDU Session Resource Subject to Forwarding List		*0..1*			YES	ignore
>PDU Session Resource Subject to Forwarding Item IEs		*1..<maxnoofPDUSessions>*			EACH	ignore
>>PDU Session ID	M		9.3.1.50		-	
>>Handover Command Transfer	O		OCTET STRING	Containing the *Handover Command Transfer* IE specified in subclause 9.3.4.10.	-	
PDU Session Resource to Release List	O		PDU Session List 9.3.1.11		YES	ignore
Target to Source Transparent Container	M		9.3.1.21		YES	reject
Criticality Diagnostics	O		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.3.3 HANDOVER PREPARATION FAILURE

This message is sent by the AMF to inform the source NG-RAN node that the Handover Preparation has failed.

Direction: AMF → NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
Cause	M		9.3.1.2		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.2.3.4 HANDOVER REQUEST

This message is sent by the AMF to the target NG-RAN node to request the preparation of resources.

Direction: AMF → NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	reject
Handover Type	M		9.3.1.22		YES	reject
Cause	M		9.3.1.2		YES	ignore
UE Aggregate Maximum Bit Rate	M		9.3.1.58		YES	reject
RRC Inactive Assistance Information	O		9.3.1.15		YES	ignore
UE Security Capabilities	M		9.3.1.86		YES	reject
Security Context	M		9.3.1.88		YES	reject
K_{AMF} Change Indicator	O		9.3.1.55		YES	reject
NASC	O		NAS-PDU 9.3.3.4	NAS Container (NASC) as specified in TS 24.501 [26].	YES	reject
PDU Session Resource Setup List		*1*			YES	reject
>PDU Session Resource Setup Item IEs		*1..<maxnoofPDUSessions>*			EACH	reject
>>PDU Session ID	M		9.3.1.50		-	
>>S-NSSAI	M		9.3.1.24		-	
>>Handover Request Transfer	M		OCTET STRING	Containing the *PDU Session Resource Setup Request Transfer* IE specified in subclause 9.3.4.1.	-	
Trace Activation	O		9.3.1.14		YES	ignore
Masked IMEISV	O		9.3.1.54		YES	ignore
Source to Target Transparent Container	M		9.3.1.20		YES	reject
Mobility Restriction List	O		9.3.1.85		YES	ignore
Location Reporting Request Type	O		9.3.1.65		YES	ignore

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.3.5 HANDOVER REQUEST ACKNOWLEDGE

This message is sent by the target NG-RAN node to inform the AMF about the prepared resources at the target.

Direction: NG-RAN node → AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2	Allocated at the target NG-RAN node.	YES	ignore
PDU Session Resource Admitted List		*1*			YES	ignore
>PDU Session Resource Admitted Item IEs		*1..<maxnoofPDUSessions>*			EACH	ignore
>>PDU Session ID	M		9.3.1.50		-	
>>Handover Request Acknowledge Transfer	M		OCTET STRING	Containing the *Handover Request Acknowledge Transfer* IE specified in subclause 9.3.4.11.	-	
PDU Session Resource Failed to Setup List	O		PDU Session List 9.3.1.11		YES	ignore
Target to Source Transparent Container	M		9.3.1.21		YES	reject
Criticality Diagnostics	O		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.3.6 HANDOVER FAILURE

This message is sent by the target NG-RAN node to inform the AMF that the preparation of resources has failed.

Direction: NG-RAN node → AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
Cause	M		9.3.1.2		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.2.3.7 HANDOVER NOTIFY

This message is sent by the target NG-RAN node to inform the AMF that the UE has been identified in the target cell and the handover has been completed.

Direction: NG-RAN node → AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
User Location Information	M		9.3.1.16		YES	ignore

9.2.3.8 PATH SWITCH REQUEST

This message is sent by the NG-RAN node to inform the AMF of the new serving NG-RAN node and to transfer some NG-U DL tunnel termination point(s) to the SMF via the AMF for one or multiple PDU session resources.

Direction: NG-RAN node → AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
Source AMF UE NGAP ID	M		AMF UE NGAP ID 9.3.3.1		YES	reject
User Location Information	M		9.3.1.16		YES	ignore
UE Security Capabilities	M		9.3.1.86		YES	ignore
PDU Session Resource to be Switched in Downlink List		*1*			YES	reject
>PDU Session Resource to be Switched in Downlink Item IEs		*1..<maxnoofPDUSessions>*			EACH	reject
>>PDU Session ID	M		9.3.1.50		-	
>>Path Switch Request Transfer	M		OCTET STRING	Containing the *Path Switch Request Transfer* IE specified in subclause 9.3.4.8.	-	
PDU Session Resource Failed to Setup List	O		PDU Session List 9.3.1.11		YES	ignore

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.3.9 PATH SWITCH REQUEST ACKNOWLEDGE

This message is sent by the AMF to inform the NG-RAN node that the path switch has been successfully completed in the 5GC.

Direction: AMF → NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
UE Security Capabilities	O		9.3.1.86		YES	reject
Security Context	M		9.3.1.88		YES	reject
K_{AMF} Change Indicator	O		9.3.1.55		YES	reject
PDU Session Resource to be Switched in Uplink List		*0..1*			YES	ignore
>PDU Session Resource to be Switched in Uplink Item IEs		*1..<maxnoofPDUSessions>*			EACH	ignore
>>PDU Session ID	M		9.3.1.50		-	
>>Path Switch Request Acknowledge Transfer	M		OCTET STRING	Containing the *Path Switch Request Acknowledge Transfer* IE specified in subclause 9.3.4.9.	-	
PDU Session Resource Released List	O		PDU Session List 9.3.1.11		YES	ignore
RRC Inactive Assistance Information	O		9.3.1.15		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.2.3.10 PATH SWITCH REQUEST FAILURE

This message is sent by the AMF to inform the NG-RAN node that a failure has occurred in the 5GC during the Path Switch Request procedure.

Direction: AMF → NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
Cause	M		9.3.1.2		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.2.3.11 HANDOVER CANCEL

This message is sent by the source NG-RAN node to the AMF to request the cancellation of an ongoing handover.

Direction: NG-RAN node → AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
Cause	M		9.3.1.2		YES	ignore

9.2.3.12 HANDOVER CANCEL ACKNOWLEDGE

This message is sent by the AMF to the source NG-RAN node to confirm that the ongoing handover was cancelled.

Direction: AMF → NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.2.3.13 UPLINK RAN STATUS TRANSFER

Direction: NG-RAN node → AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
RAN Status Transfer Transparent Container	M		OCTET STRING	This IE may need to be refined	YES	reject

9.2.3.14 DOWNLINK RAN STATUS TRANSFER

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
RAN Status Transfer Transparent Container	M		OCTET STRING	This IE may need to be refined	YES	reject

9.2.4 Paging Messages

9.2.4.1 PAGING

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

Direction: AMF → gNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
UE Identity Index Value	M		INTEGER (0..63)	This IE may need to be refined	YES	ignore
UE Paging Identity	M		9.3.3.18		YES	ignore
Paging DRX	O		INTEGER (0..63)	This IE may need to be refined	YES	ignore
List of TAIs		*1*			YES	ignore
>TAI List Item		*1..<maxnoofTAIs>*			EACH	ignore
>>TAI	M		9.3.3.11		-	
Paging Priority	O		9.3.1.78		YES	ignore
UE Radio Capability for Paging	O		9.3.1.68		YES	ignore
Assistance Data for Paging	O		9.3.1.69		YES	ignore
Paging Origin	O		9.3.3.22		YES	ignore

Range bound	Explanation
maxnoofTAIs	Maximum no. of TAIs. Value is 16.

9.2.5 NAS Transport Messages

9.2.5.1 INITIAL UE MESSAGE

This message is sent by the NG-RAN node to transfer the initial layer 3 message to the AMF over the NG interface.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	reject
NAS-PDU	M		9.3.3.4		YES	reject
User Location Information	M		9.3.1.16		YES	reject
RRC Establishment Cause	O		OCTET STRING	This IE may need to be refined, including its presence	YES	ignore
5G-S-TMSI	O		9.3.3.20		YES	reject
GUAMI	O		9.3.3.3		YES	reject
AMF Set ID	O		9.3.3.12		YES	ignore
UE Context Request	O		ENUMERATED (requested, ...)	Indicates that a UE context including security information needs to be setup at the NG-RAN.	YES	ignore

9.2.5.2 DOWNLINK NAS TRANSPORT

This message is sent by the AMF and is used for carrying NAS information over the NG interface.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
Old AMF	O		AMF Name 9.3.3.22		YES	reject
RAN Paging Priority	O		9.3.3.15		YES	ignore
NAS-PDU	M		9.3.3.4		YES	reject
Mobility Restriction List	O		9.3.1.85		YES	ignore
Index to RAT/Frequency Selection Priority	O		9.3.1.61		YES	ignore
UE Aggregate Maximum Bit Rate	O		9.3.1.58		YES	ignore

9.2.5.3 UPLINK NAS TRANSPORT

This message is sent by the NG-RAN node and is used for carrying NAS information over the NG interface.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
NAS-PDU	M		9.3.3.4		YES	reject
User Location Information	M		9.3.1.16		YES	ignore

9.2.5.4 NAS NON DELIVERY INDICATION

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

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
NAS-PDU	M		9.3.3.4		YES	ignore
Cause	M		9.3.1.2		YES	ignore

9.2.5.5 REROUTE NAS REQUEST

This message is sent by the AMF in order to request for a rerouting of the INITIAL UE MESSAGE to another AMF.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
AMF UE NGAP ID	O		9.3.3.1		YES	ignore
NGAP Message	M		OCTET STRING	Contains the INITIAL UE MESSAGE	YES	reject
AMF Set ID	M		9.3.3.12		YES	reject
Allowed NSSAI	O		9.3.1.31		YES	ignore

9.2.6 Interface Management Messages

9.2.6.1 NG SETUP REQUEST

This message is sent by the NG-RAN node to transfer application layer information for an NG-C interface instance.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
Global RAN Node ID	M		9.3.1.5		YES	reject
RAN Node Name	O		PrintableString (SIZE(1..150, …))		YES	ignore
Supported TA List		*1*		Supported TAs in the NG-RAN node.	GLOBAL	reject
>Supported TA Item IEs		*1..<maxnoofTACs>*				
>>TAC	M		9.3.3.10	Broadcast TAC	-	
>>Broadcast PLMN List		*1*			-	
>>>Broadcast PLMN Item IEs		*1..<maxnoofBPLMNs>*				
>>>>PLMN Identity	M		9.3.3.5	Broadcast PLMN	-	
>>>>TAI Slice Support List	M		Slice Support List 9.3.1.17	Supported S-NSSAIs per TA.	-	
Default Paging DRX	M		INTEGER (0..63)	This IE may need to be refined	YES	ignore

Range bound	Explanation
maxnoofTACs	Maximum no. of TACs. Value is 256.
maxnoofBPLMNs	Maximum no. of Broadcast PLMNs. Value is 12.

9.2.6.2 NG SETUP RESPONSE

This message is sent by the AMF to transfer application layer information for an NG-C interface instance.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF Name	M		AMF Name 9.3.3.21		YES	reject
Served GUAMI List		*1*			GLOBAL	reject
>**Served GUAMI Item IEs**		*1..<maxnoofServedGUAMIs>*			-	
>>GUAMI	M		9.3.3.3		-	
>>Backup AMF Name	O		AMF Name 9.3.3.21		-	
Relative AMF Capacity	M		9.3.1.32		YES	ignore
PLMN Support List		*1*			GLOBAL	reject
>PLMN Support Item IEs		*1..<maxnoofPLMNs>*			-	
>>PLMN Identity	M		9.3.3.5		-	
>>Slice Support List	M		9.3.1.17	Supported S-NSSAIs per PLMN	-	
Criticality Diagnostics	O		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofServedGUAMIs	Maximum no. of GUAMIs served by an AMF. Value is 256.
maxnoofPLMNs	Maximum no. of PLMNs per message. Value is 12.

9.2.6.3 NG SETUP FAILURE

This message is sent by the AMF to indicate NG setup failure.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
Cause	M		9.3.1.2		YES	ignore
Time to Wait	O		9.3.1.56		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.2.6.4 RAN CONFIGURATION UPDATE

This message is sent by the NG-RAN node to transfer updated application layer information for an NG-C interface instance.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
RAN Node Name	O		PrintableString (SIZE(1..150, …))		YES	ignore
Supported TA List		*0..1*		Supported TAs in the NG-RAN node.	GLOBAL	reject
>Supported TA Item IEs		*1..<maxnoofTACs>*				
>>TAC	M		9.3.3.10	Broadcast TAC	-	
>>Broadcast PLMN List		*1*			-	
>>>Broadcast PLMN Item IEs		*1..<maxnoofBPLMNs>*				
>>>>PLMN Identity	M		9.3.3.5	Broadcast PLMN	-	
>>>>TAI Slice Support List	M		Slice Support List 9.3.1.17	Supported S-NSSAIs per TA.	YES	ignore
Default Paging DRX	O		INTEGER (0..63)	This IE may need to be refined	YES	ignore

Range bound	Explanation
maxnoofTACs	Maximum no. of TACs. Value is 256.
maxnoofBPLMNs	Maximum no. of Broadcast PLMNs. Value is 12.

9.2.6.5 RAN CONFIGURATION UPDATE ACKNOWLEDGE

This message is sent by the AMF to acknowledge the NG-RAN node transfer of updated information for an NG-C interface instance.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.2.6.6 RAN CONFIGURATION UPDATE FAILURE

This message is sent by the AMF to indicate RAN configuration update failure.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
Cause	M		9.3.1.2		YES	ignore
Time to Wait	O		9.3.1.56		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.2.6.7 AMF CONFIGURATION UPDATE

This message is sent by the AMF to transfer updated information for an NG-C interface instance.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF Name	O		9.3.3.21		YES	reject
Served GUAMI List		*0..1*			GLOBAL	reject
>**Served GUAMI Item IEs**		*1..<maxnoofServedGUAMIs>*			-	
>>GUAMI	M		9.3.3.3		-	
>>Backup AMF Name	O		AMF Name 9.3.3.21		-	
Relative AMF Capacity	O		9.3.1.32		YES	ignore
PLMN Support List		*0..1*			GLOBAL	reject
>PLMN Support Item IEs		*1..<maxnoofPLMNs>*			-	
>>PLMN Identity	M		9.3.3.5		-	
>>Slice Support List	M		9.3.1.17	Supported S-NSSAIs per PLMN	-	
AMF TNL Association to Add List		*0..1*			YES	ignore
>AMF TNL Association to Add Item IEs		*1..<maxnoofTNLAssociations>*			EACH	ignore
>>AMF TNL Association Address	M		CP Transport Layer Information 9.3.2.6	AMF Transport Layer information used to set up the new TNL association.	-	
>>TNL Association Usage	O		ENUMERATED (ue, non-ue, both, …)	Indicates whether the TNL association is only used for UE-associated signalling, or non-UE-associated signalling, or both.	-	
>>TNL Association Weight Factor	M		INTEGER (0..255)	Value 0 indicates the TNL association is not permitted for the initial NGAP message. If the value for each TNL association is the same, it indicates the deployments that rely solely on 5GC-based load balancing.	-	
AMF TNL Association to Remove List		*0..1*			YES	ignore
>AMF TNL Association to Remove Item IEs		*1..<maxnoofTNLAssociations>*			EACH	ignore
>>AMF TNL Association Address	M		CP Transport Layer Information 9.3.2.6	AMF Transport Layer information used to identify the TNL association to be removed.	-	
AMF TNL Association to Update List		*0..1*			YES	ignore
>AMF TNL Association to Update Item IEs		*1..<maxnoofTNLAssociations>*			EACH	ignore

>>AMF TNL Association Address	M		CP Transport Layer Information 9.3.2.6	AMF Transport Layer information used to identify the TNL association to be updated.	-	
>>TNL Association Usage	O		ENUMERATED (ue, non-ue, both, …)	Indicates whether the TNL association is only used for UE-associated signalling, or non-UE-associated signalling, or both.	-	
>>TNL Association Weight Factor	O		INTEGER (0..255)	Value 0 indicates the TNL association is not permitted for the initial NGAP message. If the value for each TNL association is the same, it indicates the deployments that rely solely on 5GC-based load balancing.	-	

Range bound	Explanation
maxnoofServedGUAMIs	Maximum no. of GUAMIs served by an AMF. Value is 256.
maxnoofPLMNs	Maximum no. of PLMNs per message. Value is 12.
maxnoofTNLAssociations	Maximum no. of TNL Associations between the NG-RAN node and the AMF. Value is 32.

9.2.6.8 AMF CONFIGURATION UPDATE ACKNOWLEDGE

This message is sent by the NG-RAN node to acknowledge the AMF transfer of updated information for an NG-C interface instance.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF TNL Association Setup List		*0..1*			YES	ignore
>AMF TNL Association Setup Item IEs		*1..<maxnoofTNLAssociations>*			EACH	ignore
>>AMF TNL Association Address	M		CP Transport Layer Information 9.3.2.6	Previously received AMF Transport Layer information for the TNL association.	-	
AMF TNL Association Failed to Setup List	O		TNL Association List 9.3.2.7		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofTNLAssociations	Maximum no. of TNL Associations between the NG-RAN node and the AMF. Value is 32.

9.2.6.9 AMF CONFIGURATION UPDATE FAILURE

This message is sent by the NG-RAN node to indicate AMF configuration update failure.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
Cause	M		9.3.1.2		YES	ignore
Time to Wait	O		9.3.1.56		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.2.6.10 AMF STATUS INDICATION

This message is sent by the AMF to support AMF management functions.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
Unavailable GUAMI List		*1*		Indicates the GUAMIs configured to be unavailable at the AMF	GLOBAL	reject
>Unavailable GUAMI Item IEs		*1..<maxnoofServedGUAMIs>*			-	
>>GUAMI	M		9.3.3.3		-	
>>Timer Approach for GUAMI Removal	O		ENUMERATED (apply timer, ...)		-	
>>Backup AMF Name	O		AMF Name 9.3.3.21		-	

Range bound	Explanation
maxnoofServedGUAMIs	Maximum no. of GUAMIs served by an AMF. Value is 256.

9.2.6.11 NG RESET

This message is sent by both the NG-RAN node and the AMF to request that the NG interface, or parts of the NG interface, be reset.

Direction: NG-RAN node → AMF and AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
Cause	M		9.3.1.2		YES	ignore
CHOICE *Reset Type*	M				YES	reject
>NG interface						
>>Reset All	M		ENUMERATED (Reset all, …)		-	
>Part of NG interface						
>>UE-associated Logical NG-Connection List		*1*			-	
>>>UE-associated Logical NG-Connection Item		*1..<maxnoofNGConnectionsToReset>*			EACH	reject
>>>>AMF UE NGAP ID	O		9.3.3.1		-	
>>>>RAN UE NGAP ID	O		9.3.3.2		-	

Range bound	Explanation
maxnoofNGConnectionsToReset	Maximum no. of UE-associated logical NG-connections allowed to reset in one message. Value is 8192.

9.2.6.12 NG RESET ACKNOWLEDGE

This message is sent by both the NG-RAN node and the AMF as a response to an NG RESET message.

Direction: NG-RAN node → AMF and AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
UE-associated Logical NG-Connection List		*0..1*			YES	ignore
>UE-associated Logical NG-Connection Item		*1..<maxnoofNGConnectionsToReset>*			EACH	ignore
>>AMF UE NGAP ID	O		9.3.3.1		-	
>>RAN UE NGAP ID	O		9.3.3.2		-	
Criticality Diagnostics	O		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofNGConnectionsToReset	Maximum no. of UE-associated logical NG-connections allowed to reset in one message. Value is 8192.

9.2.6.13 ERROR INDICATION

This message is sent by both the NG-RAN node and the AMF to indicate that some error has been detected in the node.

Direction: NG-RAN node → AMF and AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	O		9.3.3.1		YES	ignore
RAN UE NGAP ID	O		9.3.3.2		YES	ignore
Cause	O		9.3.1.2		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.2.7 Configuration Transfer Messages

9.2.7.1 UPLINK RAN CONFIGURATION TRANSFER

This message is sent by the NG-RAN node in order to transfer RAN configuration information.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
SON Configuration Transfer	O		9.3.3.6		YES	ignore

9.2.7.2 DOWNLINK RAN CONFIGURATION TRANSFER

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

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
SON Configuration Transfer	O		9.3.3.6		YES	ignore

9.2.8 Warning Message Transmission Messages

9.2.8.1 WRITE-REPLACE WARNING REQUEST

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

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
Message Identifier	M		9.3.1.35		YES	reject
Serial Number	M		9.3.1.36		YES	reject
Warning Area List	O		9.3.1.37		YES	ignore
Repetition Period	M		9.3.1.49		YES	reject
Number of Broadcasts Requested	M		9.3.1.38		YES	reject
Warning Type	O		9.3.1.39		YES	ignore
Warning Security Information	O		9.3.1.40		YES	ignore
Data Coding Scheme	O		9.3.1.41		YES	ignore
Warning Message Contents	O		9.3.1.42		YES	ignore
Concurrent Warning Message Indicator	O		9.3.1.46		YES	reject

9.2.8.2 WRITE-REPLACE WARNING RESPONSE

This message is sent by the NG-RAN node to acknowledge the AMF on the start or overwrite request of a warning message.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
Message Identifier	M		9.3.1.35		YES	reject
Serial Number	M		9.3.1.36		YES	reject
Broadcast Completed Area List	O		9.3.1.43		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.2.8.3 PWS CANCEL REQUEST

This message is forwarded by the AMF to the NG-RAN node to cancel an already ongoing broadcast of a warning message.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
Message Identifier	M		9.3.1.35		YES	reject
Serial Number	M		9.3.1.36		YES	reject
Warning Area List	O		9.3.1.37		YES	ignore
Cancel-All Warning Messages Indicator	O		9.3.1.47		YES	reject

9.2.8.4 PWS CANCEL RESPONSE

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

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
Message Identifier	M		9.3.1.35		YES	reject
Serial Number	M		9.3.1.36		YES	reject
Broadcast Cancelled Area List	O		9.3.1.44		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.2.8.5 PWS RESTART INDICATION

This message is sent by the NG-RAN node to inform the AMF that PWS information for some or all cells of the NG-RAN node are available for reloading from the CBC if needed.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
CHOICE *Cell List for Restart*	M				YES	reject
>E-UTRA						
>>E-UTRA Cell List for Restart		*1..<maxnoofCellsinngeNB>*			EACH	reject
>>>E-UTRA CGI	M		9.3.1.9		-	
>NR						
>>NR Cell List for Restart		*1..<maxnoofCellsingNB>*			EACH	reject
>>>NR CGI	M		9.3.1.7		-	
Global RAN Node ID	M		9.3.1.5		YES	reject
TAI List for Restart		*1..<maxnoofTAIforRestart>*			EACH	reject
>TAI	M		9.3.3.11		-	
Emergency Area ID List for Restart		*0..<maxnoofEAIforRestart>*			EACH	reject
>Emergency Area ID	M		9.3.1.48		-	

Range bound	Explanation
maxnoofCellsinngeNB	Maximum no. of cells that can be served by an ng-eNB. Value is 256.
maxnoofCellsingNB	Maximum no. of cells that can be served by a gNB. Value is 16384.
maxnoofTAIforRestart	Maximum no. of TAIs subject for reloading warning message broadcast. Value is 2048.
maxnoofEAIforRestart	Maximum no. of Emergency Area IDs subject for reloading warning message broadcast. Value is 256.

9.2.8.6 PWS FAILURE INDICATION

This message is sent by the NG-RAN node to inform the AMF that ongoing PWS operation for one or more cells of the NG-RAN node has failed.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
CHOICE *PWS Failed Cell List*	M				YES	reject
>E-UTRA						
>>PWS Failed E-UTRA Cell List		*1..<maxnoofCellsinngeNB>*			EACH	reject
>>>E-UTRA CGI	M		9.3.1.9		-	
>NR						
>>PWS Failed NR Cell List		*1..<maxnoofCellsingNB>*			EACH	reject
>>>NR CGI	M		9.3.1.7		-	
Global RAN Node ID	M		9.3.1.5		YES	reject

Range bound	Explanation
maxnoofCellsinngeNB	Maximum no. of cells that can be served by an ng-eNB. Value is 256.
maxnoofCellsingNB	Maximum no. of cells that can be served by a gNB. Value is 16384.

9.2.9 NRPPa Transport Messages

9.2.9.1 DOWNLINK UE ASSOCIATED NRPPA TRANSPORT

This message is sent by the AMF and is used for carrying NRPPa message over the NG interface.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
Routing ID	M		9.3.3.13		YES	reject
NRPPa-PDU	M		9.3.3.14		YES	reject

9.2.9.2 UPLINK UE ASSOCIATED NRPPA TRANSPORT

This message is sent by the NG-RAN node and is used for carrying NRPPa message over the NG interface.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
Routing ID	M		9.3.3.13		YES	reject
NRPPa-PDU	M		9.3.3.14		YES	reject

9.2.9.3 DOWNLINK NON UE ASSOCIATED NRPPA TRANSPORT

This message is sent by the AMF and is used for carrying NRPPa message over the NG interface.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
Routing ID	M		9.3.3.13		YES	reject
NRPPa-PDU	M		9.3.3.14		YES	reject

9.2.9.4 UPLINK NON UE ASSOCIATED NRPPA TRANSPORT

This message is sent by the NG-RAN node and is used for carrying NRPPa message over the NG interface.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
Routing ID	M		9.3.3.13		YES	reject
NRPPa-PDU	M		9.3.3.14		YES	reject

9.2.10 Trace Messages

9.2.10.1 TRACE START

This message is sent by the AMF to initiate a trace session for a UE.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
Trace Activation	M		9.3.1.14		YES	ignore

9.2.10.2 TRACE FAILURE INDICATION

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

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
NG-RAN Trace ID	M		OCTET STRING (SIZE(8))	As per NG-RAN Trace ID in *Trace Activation* IE	YES	ignore
Cause	M		9.3.1.2		YES	ignore

9.2.10.3 DEACTIVATE TRACE

This message is sent by the AMF to deactivate a trace session.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
NG-RAN Trace ID	M		OCTET STRING (SIZE(8))	As per NG-RAN Trace ID in *Trace Activation* IE	YES	ignore

9.2.10.4 CELL TRAFFIC TRACE

This message is sent by the NG-RAN node to transfer trace specific information.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
NG-RAN Trace ID	M		OCTET STRING (SIZE(8))	This IE is composed of the following: Trace Reference defined in TS 32.422 [11] (leftmost 6 octets, with PLMN information encoded as in 9.3.3.5), and Trace Recording Session Reference defined in TS 32.422 [11] (last 2 octets).	YES	ignore
NG-RAN CGI	M		9.3.1.73		YES	ignore
Trace Collection Entity IP Address	M		Transport Layer Address 9.3.2.4	Defined in TS 32.422 [11]	YES	ignore

9.2.11 Location Reporting Messages

9.2.11.1 LOCATION REPORTING CONTROL

This message is used by the AMF to request the NG-RAN node to report the location of the UE.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
Location Reporting Request Type	M		9.3.1.65		YES	ignore

9.2.11.2 LOCATION REPORTING FAILURE INDICATION

This message is sent by the NG-RAN node and is used to indicate the failure of location reporting.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
Cause	M		9.3.1.2		YES	ignore

9.2.11.3 LOCATION REPORT

This message is used to provide the UE's location.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
User Location Information	M		9.3.1.16		YES	ignore
Time Stamp	O		9.3.1.75		YES	ignore
UE Presence in Area of Interest List	O		9.3.1.67		YES	ignore
Location Reporting Request Type	M		9.3.1.65	Contains the Location Reporting Request Type to which the Location Report refers.	YES	ignore

9.2.12 UE TNLA Binding Messages

9.2.12.1 UE TNLA BINDING RELEASE REQUEST

This message is sent by the AMF to request the NG-RAN node to release the TNLA binding for the respective UE.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject

9.2.13 UE Capability Management Messages

9.2.13.1 UE CAPABILITY INFO INDICATION

This message is sent by the NG-RAN node to provide UE capability related information to the AMF.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	ignore
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
UE Radio Capability	M		9.3.1.74		YES	ignore
UE Radio Capability for Paging	O		9.3.1.68		YES	ignore

9.2.13.2 UE RADIO CAPABILITY CHECK REQUEST

This message is sent by the AMF to request the NG-RAN node to check the compatibility between the UE radio capabilities and network configuration on IMS voice.

Direction: AMF → NG-RAN node

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	reject
RAN UE NGAP ID	M		9.3.3.2		YES	reject
UE Radio Capability	O		9.3.1.74		YES	ignore

9.2.13.3 UE RADIO CAPABILITY CHECK RESPONSE

This message is sent by the NG-RAN node to report IMS voice compatibility between the UE radio capabilities and network configuration.

Direction: NG-RAN node → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.3.1.1		YES	reject
AMF UE NGAP ID	M		9.3.3.1		YES	ignore
RAN UE NGAP ID	M		9.3.3.2		YES	ignore
IMS Voice Support Indicator	M		9.3.1.89		YES	reject
Criticality Diagnostics	O		9.3.1.3		YES	ignore

9.3 Information Element Definitions

9.3.1 Radio Network Layer Related IEs

9.3.1.1 Message Type

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Procedure Code	M		INTEGER (0..255)	
Type of Message	M		CHOICE (Initiating Message, Successful Outcome, Unsuccessful Outcome, …)	

9.3.1.2 Cause

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Cause Group*	M			
>Radio Network Layer				
>>Radio Network Layer Cause	M		ENUMERATED (Unspecified, TXnRELOCOverall expiry, Successful handover, Release due to NG-RAN generated reason, Release due to 5GC generated reason, Handover cancelled, Partial handover, Handover failure in target 5GC/NG-RAN node or target system, Handover target not allowed, TNGRELOCoverall expiry, TNGRELOCprep expiry, Cell not available, Unknown target ID, No radio resources available in target cell, Unknown local UE NGAP ID, Inconsistent remote UE NGAP ID, Handover desirable for radio reasons, Time critical handover, Resource optimisation handover, Reduce load in serving cell, User inactivity, Radio connection with UE lost, Load balancing TAU required, Radio resources not available, Invalid QoS combination, Failure in the radio interface procedure, Interaction with other procedure, Unknown PDU Session ID, Unknown QoS Flow ID, Multiple PDU Session ID Instances, Multiple QoS Flow ID Instances, Encryption and/or integrity protection algorithms not supported, NG intra system handover triggered, NG inter system handover triggered, Xn handover triggered, Not supported 5QI value, UE context transfer, IMS voice EPS fallback or RAT fallback triggered, UP integrity protection not possible, UP confidentiality protection not possible, Slice not supported, UE in RRC_INACTIVE state not reachable, …)	
>Transport Layer				
>>Transport Layer Cause	M		ENUMERATED (Transport resource unavailable, Unspecified, …)	
>NAS				

>>NAS Cause	M		ENUMERATED (Normal release, Authentication failure, Deregister, Unspecified, …)	
>Protocol				
>>Protocol Cause	M		ENUMERATED (Transfer syntax error, Abstract syntax error (reject), Abstract syntax error (ignore and notify), Message not compatible with receiver state, Semantic error, Abstract syntax error (falsely constructed message), Unspecified, …)	
>Miscellaneous				
>>Miscellaneous Cause	M		ENUMERATED (Control processing overload, Not enough user plane processing resources, Hardware failure, O&M intervention, Unknown PLMN, Unspecified, …)	

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

Radio Network Layer cause	Meaning
Unspecified	Sent for radio network layer cause when none of the specified cause values applies.
TXnRELOCOverall expiry	The timer guarding the handover that takes place over Xn has abnormally expired.
Successful handover	Successful handover.
Release due to NG-RAN generated reason	Release is initiated due to NG-RAN generated reason.
Release due to 5GC generated reason	Release is initiated due to 5GC generated reason.
Handover cancelled	The reason for the action is cancellation of Handover.
Partial handover	Provides a reason for the handover cancellation. The HANDOVER COMMAND message from AMF contained *PDU Session Resource to Release List* IE or *QoS flow to Release List* and the source NG-RAN node estimated service continuity for the UE would be better by not proceeding with handover towards this particular target NG-RAN node.
Handover failure in target 5GC/ NG-RAN node or target system	The handover failed due to a failure in target 5GC/NG-RAN node or target system.
Handover target not allowed	Handover to the indicated target cell is not allowed for the UE in question.
$TNG_{RELOCoverall}$ expiry	The reason for the action is expiry of timer $TNG_{RELOCoverall}$.
$TNG_{RELOCprep}$ expiry	Handover Preparation procedure is cancelled when timer $TNG_{RELOCprep}$ expires.
Cell not available	The concerned cell is not available.
Unknown target ID	Handover rejected because the target ID is not known to the AMF.
No radio resources available in target cell	Load on target cell is too high.
Unknown local UE NGAP ID	The action failed because the receiving node does not recognise the local UE NGAP ID.
Inconsistent remote UE NGAP ID	The action failed because the receiving node considers that the received remote UE NGAP ID is inconsistent.
Handover desirable for radio reasons	The reason for requesting handover is radio related.
Time critical handover	Handover is requested for time critical reason i.e., this cause value is reserved to represent all critical cases where the connection is likely to be dropped if handover is not performed.
Resource optimisation handover	The reason for requesting handover is to improve the load distribution with the neighbour cells.
Reduce load in serving cell	Load on serving cell needs to be reduced. When applied to handover preparation, it indicates the handover is triggered due to load balancing.
User inactivity	The action is requested due to user inactivity on all PDU sessions, e.g., NG is requested to be released in order to optimise the radio resources. This cause value may need to be refined, taking into account cause values for RRC_INACTIVE.
Radio connection with UE lost	The action is requested due to losing the radio connection to the UE.
Load balancing TAU required	The action is requested for all load balancing and offload cases in the AMF.
Radio resources not available	No requested radio resources are available.
Invalid QoS combination	The action was failed because of invalid QoS combination. This cause value may need to be refined.
Failure in the radio interface procedure	Radio interface procedure has failed.
Interaction with other procedure	The action is due to an ongoing interaction with another procedure.
Unknown PDU Session ID	The action failed because the PDU Session ID is unknown in the NG-RAN node.
Unknown QoS Flow ID	The action failed because the QoS Flow ID is unknown in the NG-RAN node.
Multiple PDU Session ID instances	The action failed because multiple instance of the same PDU Session had been provided to the NG-RAN node.
Multiple QoS Flow ID instances	The action failed because multiple instances of the same QoS flow had been provided to the NG-RAN node.
Encryption and/or integrity protection algorithms not supported	The NG-RAN node is unable to support any of the encryption and/or integrity protection algorithms supported by the UE.
NG intra system handover triggered	The action is due to a NG intra system handover that has been triggered.
NG inter system handover triggered	The action is due to a NG inter system handover that has been triggered.
Xn handover triggered	The action is due to an Xn handover that has been triggered.
Not supported 5QI value	The QoS flow setup failed because the requested 5QI is not supported.
UE context transfer	The action is due to a UE resumes from the NG-RAN node different from the one which sent the UE into RRC_INACTIVE state.
IMS voice EPS fallback or RAT fallback triggered	The setup of QoS flow is failed due to EPS fallback or RAT fallback for IMS voice using handover or redirection.

UP integrity protection not possible	The PDU session cannot be accepted according to the required user plane integrity protection policy.
UP confidentiality protection not possible	The PDU session cannot be accepted according to the required user plane confidentiality protection policy.
Slice not supported	Slice not supported.
UE in RRC_INACTIVE state not reachable	The action is requested due to RAN paging failure.

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

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

Protocol cause	Meaning
Transfer syntax error	The received message included a transfer syntax error.
Abstract syntax error (reject)	The received message included an abstract syntax error and the concerning criticality indicated "reject".
Abstract syntax error (ignore and notify)	The received message included an abstract syntax error and the concerning criticality indicated "ignore and notify".
Message not compatible with receiver state	The received message was not compatible with the receiver state.
Semantic error	The received message included a semantic error.
Abstract syntax error (falsely constructed message)	The received message contained IEs or IE groups in wrong order or with too many occurrences.
Unspecified	Sent when none of the above cause values applies but still the cause is Protocol related.

Miscellaneous cause	Meaning
Control processing overload	Control processing overload.
Not enough user plane processing resources	Not enough resources are available related to user plane processing.
Hardware failure	Action related to hardware failure.
O&M intervention	The action is due to O&M intervention.
Unknown PLMN	The AMF does not identify any PLMN provided by the NG-RAN node.
Unspecified failure	Sent when none of the above cause values applies and the cause is not related to any of the categories Radio Network Layer, Transport Network Layer, NAS or Protocol.

9.3.1.3 Criticality Diagnostics

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

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Procedure Code	O		INTEGER (0..255)	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)	Used only if the Criticality Diagnostics is part of Error Indication procedure.
Procedure Criticality	O		ENUMERATED (reject, ignore, notify)	Used for reporting the Criticality of the Triggering message (Procedure).
Information Element Criticality Diagnostics		*0..<maxnoofErrors>*		
>IE Criticality	M		ENUMERATED (reject, ignore, notify)	Used for reporting the criticality of the triggering IE. The value 'ignore' shall not be used.
>IE ID	M		INTEGER (0..65535)	The IE ID of the not understood or missing IE.
>Type of Error	M		ENUMERATED (not understood, missing, …)	

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

9.3.1.4 Bit Rate

This IE indicates the number of bits delivered by NG-RAN in UL or to NG-RAN 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 QoS flow, or an aggregate maximum bit rate.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Bit Rate	M		INTEGER (0..4,000,000,000,000, …)	The unit is: bit/s

9.3.1.5 Global RAN Node ID

This IE is used to globally identify an NG-RAN node (see TS 38.300 [8]).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *NG-RAN node*	M			
>gNB				
>>Global gNB ID	M		9.3.1.6	
>ng-eNB				
>>Global ng-eNB ID	M		9.3.1.8	
>N3IWF				
>> Global N3IWF ID	M		9.3.1.57	

9.3.1.6 Global gNB ID

This IE is used to globally identify a gNB (see TS 38.300 [8]).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.3.3.5	
CHOICE *gNB ID*	M			
>gNB ID				
>>gNB ID	M		BIT STRING (SIZE(22..32))	Equal to the leftmost bits of the *NR Cell Identity* IE contained in the *NR CGI* IE of each cell served by the gNB.

9.3.1.7 NR CGI

This IE is used to globally identify an NR cell (see TS 38.300 [8]).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.3.3.5	
NR Cell Identity	M		BIT STRING (SIZE(36))	The leftmost bits of the *NR Cell Identity* IE correspond to the gNB ID (defined in subclause 9.3.1.6).

9.3.1.8 Global ng-eNB ID

This IE is used to globally identify an ng-eNB (see TS 38.300 [8]).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.3.3.5	
CHOICE *ng-eNB ID*	M			
>Macro ng-eNB ID				
>>Macro ng-eNB ID	M		BIT STRING (SIZE(20))	Equal to the 20 leftmost bits of the *E-UTRA Cell Identity* IE contained in the *E-UTRA CGI* IE of each cell served by the ng-eNB.
>Short Macro ng-eNB ID				
>>Short Macro ng-eNB ID	M		BIT STRING (SIZE(18))	Equal to the 18 leftmost bits of the *E-UTRA Cell Identity* IE contained in the *E-UTRA CGI* IE of each cell served by the ng-eNB.
>Long Macro ng-eNB ID				
>>Long Macro ng-eNB ID	M		BIT STRING (SIZE(21))	Equal to the 21 leftmost bits of the *E-UTRA Cell Identity* IE contained in the *E-UTRA CGI* IE of each cell served by the ng-eNB.

9.3.1.9 E-UTRA CGI

This IE is used to globally identify an E-UTRA cell (see TS 36.300 [17]).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.3.3.5	
E-UTRA Cell Identity	M		BIT STRING (SIZE(28))	The leftmost bits of the *E-UTRA Cell Identity* IE correspond to the ng-eNB ID (defined in subclause 9.3.1.8).

9.3.1.10 GBR QoS Flow Information

This IE indicates QoS parameters for a GBR QoS flow for downlink and uplink.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Maximum Flow Bit Rate Downlink	M		Bit Rate 9.3.1.4	Maximum Bit Rate in DL. Details in TS 23.501 [9].
Maximum Flow Bit Rate Uplink	M		Bit Rate 9.3.1.4	Maximum Bit Rate in UL. Details in TS 23.501 [9].
Guaranteed Flow Bit Rate Downlink	M		Bit Rate 9.3.1.4	Guaranteed Bit Rate (provided there is data to deliver) in DL. Details in TS 23.501 [9].
Guaranteed Flow Bit Rate Uplink	M		Bit Rate 9.3.1.4	Guaranteed Bit Rate (provided there is data to deliver). Details in TS 23.501 [9].
Notification Control	O		ENUMERATED (notification enabled, ...)	Details in TS 23.501 [9].
Maximum Packet Loss Rate Downlink	O		Packet Loss Rate 9.3.1.79	Indicates the maximum rate for lost packets that can be tolerated in the downlink direction. Details in TS 23.501 [9].
Maximum Packet Loss Rate Uplink	O		Packet Loss Rate 9.3.1.79	Indicates the maximum rate for lost packets that can be tolerated in the uplink direction. Details in TS 23.501 [9].

9.3.1.11 PDU Session List

This IE contains a list of PDU sessions with a cause value. It is used for example to indicate failed PDU session(s) or PDU session(s) to be released.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PDU Session Item IEs		*1..<maxnoofPDUSessions>*		
>PDU Session ID	M		9.3.1.50	
>Cause	M		9.3.1.2	

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.

9.3.1.12 QoS Flow Level QoS Parameters

This IE defines the QoS parameters to be applied to a QoS flow.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *QoS Characteristics*	M			
>Non-dynamic 5QI				
>>Non Dynamic 5QI Descriptor	M		9.3.1.28	
>Dynamic 5QI				
>>Dynamic 5QI Descriptor	M		9.3.1.18	
Allocation and Retention Priority	M		9.3.1.19	
GBR QoS Flow Information	O		9.3.1.10	This IE shall be present for GBR QoS Flows only.
Reflective QoS Attribute	O		ENUMERATED (subject to, …)	Details in TS 23.501 [9]. This IE may be present in case of non-GBR QoS flows and shall be ignored otherwise.
Additional QoS Flow Information	O		ENUMERATED (more likely, …)	This IE indicates that traffic for this QoS flow is likely to appear more often than traffic for other flows established for the PDU session. This IE may be present in case of non-GBR QoS flows and shall be ignored otherwise.
PPI	O		INTEGER (1..8, …)	Paging Policy Indicator used in PPD (Paging Policy Differentiation). See details in TS 23.501 [9]. This IE applies to PDU sessions of IP type.

9.3.1.13 QoS Flow List

This IE contains a list of QoS flows with a cause value. It is used for example to indicate failed QoS flow(s) or QoS flow(s) to be released.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
QoS Flow Item IEs		*1..<maxnoofQoSFlows>*		
>QoS Flow Indicator	M		9.3.1.51	
>Cause	M		9.3.1.2	

Range bound	Explanation
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.

9.3.1.14 Trace Activation

This IE defines parameters related to a trace session activation.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
NG-RAN Trace ID	M		OCTET STRING (SIZE(8))	This IE is composed of the following: Trace Reference defined in TS 32.422 [11] (leftmost 6 octets, with PLMN information encoded as in 9.3.3.1), and Trace Recording Session Reference defined in TS 32.422 [11] (last 2 octets).
Interfaces to Trace	M		BIT STRING (SIZE(8))	Each position in the bitmap represents an NG-RAN node interface: first bit = NG-C, second bit = Xn-C, third bit = Uu, fourth bit = F1-C, fifth bit = E1: other bits reserved for future use. Value '1' indicates 'should be traced'. Value '0' indicates 'should not be traced'.
Trace Depth	M		ENUMERATED (minimum, medium, maximum, minimumWithoutVendorSpecificExtension, mediumWithoutVendorSpecificExtension, maximumWithoutVendorSpecificExtension, …)	Defined in TS 32.422 [11].
Trace Collection Entity IP Address	M		Transport Layer Address 9.3.2.4	Defined in TS 32.422 [11]

9.3.1.15 RRC Inactive Assistance Information

This IE provides assistance information for RRC_INACTIVE state.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Identity Index Value	M		INTEGER (0..63)	This IE may need to be refined
UE Specific DRX	O		INTEGER (0..63)	This IE may need to be refined
Periodic Registration Update Timer	M		INTEGER (0..63)	This IE may need to be refined
MICO Mode Indication	O		9.3.1.23	
List of TAIs		*1*		
>TAI List Item		*1..<maxnoofTAIs>*		
>>TAI	M		9.3.3.11	

Range bound	Explanation
maxnoofTAIs	Maximum no. of TAIs. Value is 16.

9.3.1.16 User Location Information

This IE is used to provide location information of the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *User Location Information*	M			
>E-UTRA user location information				
>>TAI	M		9.3.3.11	
>>E-UTRA CGI	M		9.3.1.9	
>NR user location information				
>>TAI	M		9.3.3.11	
>>NR CGI	M		9.3.1.7	
>N3IWF user location information				
>>IP Address	M		Transport Layer Address 9.3.2.4	UE's local IP address used to reach the N3IWF
>>Port Number	O		OCTET STRING (SIZE(2))	UDP or TCP source port number if NAT is detected.

9.3.1.17 Slice Support List

This IE indicates the list of supported slices.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Slice Support Item IEs		*1..<maxnoofSliceItems>*		
>S-NSSAI	M		9.3.1.24	

Range bound	Explanation
maxnoofSliceItems	Maximum no. of signalled slice support items. Value is 1024.

9.3.1.18 Dynamic 5QI Descriptor

This IE indicates the QoS Characteristics for a Non-standardised or not pre-configured 5QI for downlink and uplink.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Priority Level	M		9.3.1.84	Priority Level is specified in TS 23.501 [9].
Packet Delay Budget	M		9.3.1.80	Packet Delay Budget is specified in TS 23.501 [9].
Packet Error Rate	M		9.3.1.81	Packet Error Rate is specified in TS 23.501 [9].
Delay Critical	C-ifGBRflow		ENUMERATED (delay critical, non-delay critical)	Indicates whether the GBR QoS flow is delay critical as specified in TS 23.501 [9].
Averaging Window	C-ifGBRflow		9.3.1.82	Averaging Window is specified in TS 23.501 [9].
Maximum Data Burst Volume	O		9.3.1.83	Maximum Data Burst Volume is specified in TS 23.501 [9].

Condition	Explanation
ifGBRflow	This IE shall be present if the *GBR QoS Flow Information* IE is present in the *QoS Flow Level QoS Parameters* IE.

9.3.1.19 Allocation and Retention Priority

This IE specifies the relative importance of a QoS flow compared to other QoS flows for allocation and retention of NG-RAN resources.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Priority Level	M		INTEGER (1..15)	**Desc**.: This IE defines the relative importance of a resource request (see TS 23.501 [9]). **Usage**: Values are ordered in decreasing order of priority, i.e., with 1 as the highest priority and 15 as the lowest priority. Further usage is defined in TS 23.501 [9].
Pre-emption Capability	M		ENUMERATED (shall not trigger pre-emption, may trigger pre-emption)	**Desc.:** This IE indicates the pre-emption capability of the request on other QoS flows. **Usage**: The QoS flow shall not pre-empt other QoS flows or, the QoS flow may pre-empt other QoS flows. The Pre-emption Capability indicator applies to the allocation of resources for a QoS flow and as such it provides the trigger to the pre-emption procedures/processes of the NG-RAN node.
Pre-emption Vulnerability	M		ENUMERATED (not pre-emptable, pre-emptable)	**Desc.**: This IE indicates the vulnerability of the QoS flow to pre-emption of other QoS flows. **Usage**: The QoS flow shall not be pre-empted by other QoS flows or the QoS flow may be pre-empted by other QoS flows. The Pre-emption Vulnerability indicator applies for the entire duration of the QoS flow, unless modified and as such indicates whether the QoS flow is a target of the pre-emption procedures/processes of the NG-RAN node.

9.3.1.20 Source to Target Transparent Container

This IE is used to transparently pass radio related information from the handover source to the handover target through the core network; it is produced by the source RAN node and is transmitted to the target RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Source to Target Transparent Container	M		OCTET STRING	This IE includes a transparent container from the source RAN node to the target RAN node. The octets of the OCTET STRING are encoded according to the specifications of the target system. Note: In the current version of the specification, this IE may carry either the *Source NG-RAN Node to Target NG-RAN Node Transparent Container* IE or the *Source eNB to Target eNB Transparent Container* IE as defined in TS 36.413 [16].

9.3.1.21 Target to Source Transparent Container

This IE is used to transparently pass radio related information from the handover target to the handover source through the core network; it is produced by the target RAN node and is transmitted to the source RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Target to Source Transparent Container	M		OCTET STRING	This IE includes a transparent container from the target RAN node to the source RAN node. The octets of the OCTET STRING are encoded according to the specifications of the target system. Note: In the current version of the specification, this IE may carry either the *Target NG-RAN Node to Source NG-RAN Node Transparent Container* IE or the *Target eNB to Source eNB Transparent Container* IE as defined in TS 36.413 [16].

9.3.1.22 Handover Type

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Handover Type	M		ENUMERATED (Intra5GS, 5GStoEPS, EPSto5GS, …)	Intra5GS: NG-RAN node to NG-RAN node 5GStoEPS: NG-RAN node to eNB EPSto5GS: eNB to NG-RAN node

9.3.1.23 MICO Mode Indication

This IE indicates that the UE is configured with MICO mode by the AMF.

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

9.3.1.24 S-NSSAI

This IE indicates the S-NSSAI.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SST	M		OCTET STRING (SIZE(1))	
SD	O		OCTET STRING (SIZE(3))	

9.3.1.25 Target ID

This IE identifies the target for the handover.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Target ID*	M			
>NG-RAN				
>>Global RAN Node ID	M		9.3.1.5	
>>Selected TAI	M		TAI 9.3.3.11	
>E-UTRAN				
>>Global eNB ID	M		Global ng-eNB ID 9.3.1.8	
>>Selected EPS TAI	M		EPS TAI 9.3.3.17	

9.3.1.26 Emergency Fallback Indicator

The IE indicates emergency service fallback.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Emergency Fallback Indicator	M		ENUMERATED (emergency fallback requested, …)	

9.3.1.27 Security Indication

This IE contains the user plane integrity protection indication and confidentiality protection indication which indicates the requirements on UP integrity protection and ciphering for corresponding PDU sessions, respectively.

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

9.3.1.28 Non Dynamic 5QI Descriptor

This IE indicates the QoS Characteristics for a standardized or pre-configured 5QI for downlink and uplink.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
5QI	M		INTEGER (0..255)	5QI is specified in TS 23.501 [9].
Priority Level	O		9.3.1.84	Priority Level is specified in TS 23.501 [9]. When included, it overrides standardized or pre-configured value.
Averaging Window	O		9.3.1.82	This IE applies to GBR QoS flows only. Averaging Window is specified in TS 23.501 [9]. When included, it overrides standardized or pre-configured value.
Maximum Data Burst Volume	O		9.3.1.83	Maximum Data Burst Volume is specified in TS 23.501 [9]. When included, it overrides standardized or pre-configured value.

9.3.1.29 Source NG-RAN Node to Target NG-RAN Node Transparent Container

This IE is produced by the source NG-RAN node and is transmitted to the target NG-RAN node. For inter-system handovers to 5G, the IE is transmitted from the external handover source to the target NG-RAN node.

This IE is transparent to the 5GC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RRC Container	M		OCTET STRING	Includes the RRC *HandoverPreparationInformation* message as defined in TS 38.331 [18] if the target is a gNB. Includes the RRC *HandoverPreparationInformation* message as defined in TS 36.331 [21] if the target is an ng-eNB.
PDU Session Resource Information List		*0..1*		For intra-system handovers in NG-RAN.
>PDU Session Resource Information Item IEs		*1..<maxnoofPDUSessions>*		
>>PDU Session ID	M		9.3.1.50	
>>QoS Flow Information List		*1*		
>>>QoS Flow Information Item IEs		*1..<maxnoofQoSFlows>*		
>>>>QoS Flow Indicator	M		9.3.1.51	
>>>>DL Forwarding	O		9.3.1.33	
>>DRBs to QoS Flows Mapping List			9.3.1.34	
E-RAB Information List		*0..1*		For inter-system handovers to 5G.
>E-RAB Information Item IEs		*1..<maxnoofE-RABs>*		
>>E-RAB ID	M		9.3.2.3	
>>DL Forwarding	O		9.3.1.33	
Target Cell ID	M		NG-RAN CGI 9.3.1.73	
Index to RAT/Frequency Selection Priority	O		9.3.1.61	

Range bound	Explanation
maxnoofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.
maxnoofE-RABs	Maximum no. of E-RABs allowed towards one UE. Value is 256.

9.3.1.30 Target NG-RAN Node to Source NG-RAN Node Transparent Container

This IE is produced by the target NG-RAN node and is transmitted to the source NG-RAN node. For inter-system handovers to 5G, the IE is transmitted from the target NG-RAN node to the external relocation source.

This IE is transparent to the 5GC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RRC Container	M		OCTET STRING	Includes the RRC *HandoverCommand* message as defined in TS 38.331 [18] if the target is a gNB. Includes the RRC *HandoverCommand* message as defined in TS 36.331 [21] if the target is an ng-eNB.

9.3.1.31 Allowed NSSAI

This IE contains the allowed NSSAI.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Allowed S-NSSAI List		*1*		
>Allowed S-NSSAI Item IEs		*1..<maxnoofAllowedS-NSSAIs>*		
>>S-NSSAI	M		9.3.1.24	

Range bound	Explanation
maxnoofAllowedS-NSSAIs	Maximum no. of allowed S-NSSAI. Value is 8.

9.3.1.32 Relative AMF Capacity

This IE indicates the relative processing capacity of an AMF with respect to the other AMFs in the AMF Set in order to load-balance AMFs within an AMF Set defined in TS 23.501 [9].

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

9.3.1.33 DL Forwarding

This IE indicates that the QoS flow or 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, …)	

9.3.1.34 DRBs to QoS Flows Mapping List

This IE contains a list of DRBs containing information about the mapped QoS flows.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DRBs to QoS Flows Mapping Item IEs		*1..<maxnoofDRBs>*		
>DRB ID	M		9.3.1.53	
>QoS Flow Mapping List		*1*		Contains information of the QoS flows mapped to the DRB
>>QoS Flow Mapping Item IEs		*1..<maxnoofQoSFlows>*		
>>>QoS Flow Indicator	M		9.3.1.51	

Range bound	Explanation
maxnoofDRBs	Maximum no. of DRBs allowed towards one UE. Value is 32.
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.

9.3.1.35 Message Identifier

This IE identifies the warning message. It is set by the AMF and transferred to the UE by the NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Message Identifier	M		BIT STRING (SIZE(16))	This IE is set by the 5GC, transferred to the UE by the NG-RAN node. The NG-RAN node shall treat it as an identifier of the message.

9.3.1.36 Serial Number

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

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

9.3.1.37 Warning Area List

This IE indicates the areas where the warning message needs to be broadcast or cancelled.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Warning Area*	M			
>E-UTRA Cell IDs				
>>EUTRA CGI List for Warning		*1..<maxnoofCellIDforWarning>*		
>>>E-UTRA CGI	M		9.3.1.9	
>NR Cell IDs				
>>NR CGI List for Warning		*1..<maxnoofCellIDforWarning>*		
>>>NR CGI	M		9.3.1.7	
>TAIs for Warning				
>>TAI List for Warning		*1..<maxnoofTAIforWarning>*		
>>>TAI	M		9.3.3.11	
>Emergency Area IDs				
>>Emergency Area ID List		*1..<maxnoofEmergencyAreaID>*		
>>>Emergency Area ID	M		9.3.1.48	

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

9.3.1.38 Number of Broadcasts Requested

This IE indicates the number of times a message is to be broadcast.

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

9.3.1.39 Warning Type

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

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

9.3.1.40 Warning Security Information

This IE provides the security information needed for securing the Primary Notification.

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

9.3.1.41 Data Coding Scheme

This IE identifies the alphabet or coding employed for the message characters and message handling at the UE (it is passed transparently from the 5GC to the UE).

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

9.3.1.42 Warning Message Contents

This IE contains user information, e.g., the message with warning contents, and will be broadcast over the radio interface.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Warning Message Contents	M		OCTET STRING (SIZE(1..9600))	

9.3.1.43 Broadcast Completed Area List

This IE indicates the areas where either resources are available to perform the broadcast or where broadcast is performed successfully.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Broadcast Completed Area*	M			
>Cell ID Broadcast E-UTRA				
>>Completed Cell List		*1..<maxnoofCellIDforWarning>*		
>>>E-UTRA CGI	M		9.3.1.9	
>TAI Broadcast E-UTRA				
>>TAI Broadcast		*1..<maxnoofTAIforWarning>*		
>>>TAI	M		9.3.3.11	
>>>Completed Cell in TAI List		*1..<maxnoofCellinTAI>*		
>>>>E-UTRA CGI	M		9.3.1.9	
>Emergency Area ID Broadcast E-UTRA				
>>Emergency Area ID Broadcast		*1..<maxnoofEmergencyAreaID>*		
>>>Emergency Area ID	M		9.3.1.48	
>>>Completed Cell in Emergency Area ID List		*1..<maxnoofCellinEAI>*		
>>>>E-UTRA CGI	M		9.3.1.9	
>Cell ID Broadcast NR				
>>Completed Cell List		*1..<maxnoofCellIDforWarning>*		
>>>NR-CGI	M		9.3.1.7	
>TAI Broadcast NR				
>>TAI Broadcast		*1..<maxnoofTAIforWarning>*		
>>>TAI	M		9.3.3.11	
>>>Completed Cell in TAI List		*1..<maxnoofCellinTAI>*		
>>>>NR-CGI	M		9.3.1.7	
>Emergency Area ID Broadcast NR				
>>Emergency Area ID Broadcast		*1..<maxnoofEmergencyAreaID>*		
>>>Emergency Area ID	M		9.3.1.48	
>>>Completed Cell in Emergency Area ID List		*1..<maxnoofCellinEAI>*		
>>>>NR-CGI	M		9.3.1.7	

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

9.3.1.44 Broadcast Cancelled Area List

This IE indicates the areas where broadcast was stopped successfully.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Broadcast Cancelled Area*	M			
>Cell ID Cancelled E-UTRA				
>>Cancelled Cell List		*1..<maxnoofCellIDforWarning>*		
>>>E-UTRA CGI	M		9.3.1.9	
>>>Number of Broadcasts	M		9.3.1.45	
>TAI Cancelled E-UTRA				
>>TAI Cancelled		*1..<maxnoofTAIforWarning >*		
>>>TAI	M		9.3.3.11	
>>>**Cancelled Cell in TAI List**		*1..<maxnoofCellinTAI>*		
>>>>E-UTRA CGI	M		9.3.1.9	
>>>>Number of Broadcasts	M		9.3.1.45	
>Emergency Area ID Cancelled E-UTRA				
>>Emergency Area ID Cancelled		*1..<maxnoofEmergencyAreaID>*		
>>>Emergency Area ID	M		9.3.1.48	
>>>**Cancelled Cell in Emergency Area ID List**		*1..<maxnoofCellinEAI>*		
>>>>E-UTRA CGI	M		9.3.1.9	
>>>>Number of Broadcasts	M		9.3.1.45	
>Cell ID Cancelled NR				
>>Cancelled Cell List		*1..<maxnoofCellIDforWarning>*		
>>>NR-CGI	M		9.3.1.7	
>>>Number of Broadcasts	M		9.3.1.45	
>TAI Cancelled NR				
>>TAI Cancelled		*1..<maxnoofTAIforWarning >*		
>>>TAI	M		9.3.3.11	
>>>**Cancelled Cell in TAI List**		*1..<maxnoofCellinTAI>*		
>>>>NR-CGI	M		9.3.1.7	
>>>>Number of Broadcasts	M		9.3.1.45	
>Emergency Area ID Cancelled NR				
>>Emergency Area ID Cancelled		*1..<maxnoofEmergencyAreaID>*		
>>>Emergency Area ID	M		9.3.1.48	
>>>**Cancelled Cell in Emergency Area ID List**		*1..<maxnoofCellinEAI>*		
>>>>NR-CGI	M		9.3.1.7	
>>>>Number of Broadcasts	M		9.3.1.45	

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

9.3.1.45 Number of Broadcasts

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

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

9.3.1.46 Concurrent Warning Message Indicator

This IE indicates to the NG-RAN node that the received warning message is a new message to be scheduled for concurrent broadcast with any other ongoing broadcast of warning messages.

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

9.3.1.47 Cancel-All Warning Messages Indicator

This IE indicates to the NG-RAN node to stop all already ongoing broadcast of warning messages in the NG-RAN node or in an area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cancel-All Warning Messages Indicator	M		ENUMERATED (true)	

9.3.1.48 Emergency Area ID

This IE is used to indicate the area which has the emergency impact.

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

9.3.1.49 Repetition Period

This IE indicates the periodicity of the warning message to be broadcast.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Repetition Period	M		INTEGER (0..2^{17}-1)	The unit of value 1 to 2^{17}-1 is [second].

9.3.1.50 PDU Session ID

This IE identifies a PDU Session for a UE. The definition and use of the PDU Session ID is specified in TS 23.501 [9].

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

9.3.1.51 QoS Flow Indicator

This IE identifies a QoS flow within a PDU Session. The definition and use of the QoS Flow Indicator is specified in TS 23.501 [9].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
QoS Flow Indicator	M		INTEGER (0..63, …)	

9.3.1.52 PDU Session Type

This IE indicates the PDU Session Type as specified in TS 23.501 [9].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PDU Session Type	M		ENUMERATED (Ipv4, Ipv6, Ipv4v6, ethernet, unstructured, ...)	

9.3.1.53 DRB ID

This IE contains the DRB ID.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DRB ID	M		INTEGER (1..32, …)	

9.3.1.54 Masked IMEISV

This IE 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 [23] with the last 4 digits of the SNR masked by setting the corresponding bits to 1. The first to fourth bits correspond to the first digit of the IMEISV, the fifth to eighth bits correspond to the second digit of the IMEISV, and so on.

9.3.1.55 K_{AMF} Change Indicator

This IE indicates if the K_AFM_CI information is present or not.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
K_{AMF} Change Indicator	M		ENUMERATED (true, …)	

9.3.1.56 Time to Wait

This IE defines the minimum allowed waiting time.

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

9.3.1.57 Global N3IWF ID

This IE is used to globally identify an N3IWF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.3.3.5	
CHOICE *N3IWF ID*	M			
>N3IWF ID				
>>N3IWF ID	M		BIT STRING (SIZE(16))	

9.3.1.58 UE Aggregate Maximum Bit Rate

This IE is applicable for all non-GBR QoS flows per UE which is defined for the downlink and the uplink direction and a subscription parameter provided by the AMF to the NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Aggregate Maximum Bit Rate				Applicable for Non-GBR QoS flows.
>UE Aggregate Maximum Bit Rate Downlink	M		Bit Rate 9.3.1.4	This IE indicates the UE Aggregate Maximum Bit Rate as specified in TS 23.501 [9] in the downlink direction.
>UE Aggregate Maximum Bit Rate Uplink	M		Bit Rate 9.3.1.4	This IE indicates the UE Aggregate Maximum Bit Rate as specified in TS 23.501 [9] in the uplink direction.

9.3.1.59 Security Result

This IE indicates whether the security policy indicated as "preferred" in the *Security Indication* IE is performed or not.

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

9.3.1.60 User Plane Security Information

This IE indicates user plane security information related to security policy.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Security Result	M		9.3.1.59	
Security Indication	M		9.3.1.27	

9.3.1.61 Index to RAT/Frequency Selection Priority

This IE is used to define local configuration for RRM strategies such as camp priorities in Idle mode and control of inter-RAT/inter-frequency handover in Active mode (see TS 23.501 [9]).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Index to RAT/Frequency Selection Priority	M		INTEGER (1..256, …)	

9.3.1.62 Data Forwarding Accepted

This IE indicates that the NG-RAN node accepts the proposed DL data forwarding for the QoS flow which is subject to data forwarding.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Data Forwarding Accepted	M		ENUMERATED (data forwarding accepted, …)	

9.3.1.63 Data Forwarding Not Possible

This IE indicates that the 5GC decided that the corresponding PDU session will not be subject to data forwarding.

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

9.3.1.64 Direct Forwarding Path Availability

This IE indicates whether a direct forwarding path is available.

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

9.3.1.65 Location Reporting Request Type

This IE indicates the type of location request to be handled by the NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Event Type	M		ENUMERATED (direct, change of service cell, UE presence in the area of interest, stop change of service cell, stop UE presence in the area of interest, cancel location reporting for the UE, …)	
Report Area	M		ENUMERATED (cell, …)	
Area of Interest List		*0..1*		
>Area of Interest Item IEs		*1..<maxnoofAoI>*		
>>Area of Interest	M		9.3.1.66	
>>Location Reporting Reference ID	O		9.3.1.76	
Location Reporting Reference ID to be Cancelled	C-ifEventTypeisStopUEPresinAoI		Location Reporting Reference ID 9.3.1.76	

Range bound	Explanation
maxnoofAoI	Maximum no. of areas of interest. Value is 64.

Condition	Explanation
ifEventTypeisStopUEPresinAoI	This IE shall be present if the *Event Type* IE is set to "stop UE presence in the area of interest".

9.3.1.66 Area of Interest

This IE indicates the area of interest.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Area of Interest TAI List		*1*		
>Area of Interest TAI Item		*1..<maxnoofAoI>*		
>>TAI	M		9.3.3.11	

Range bound	Explanation
maxnoofAoI	Maximum no. of areas of interest. Value is 64.

9.3.1.67 UE Presence in Area of Interest List

This IE indicates the UE presence in the area of interest.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Presence in Area of Interest Item IEs		*1..<maxnoofAoI>*		
>Location Reporting Reference ID	M		9.3.1.76	
>UE Presence	M		ENUMERATED (in, out, unknown, …)	

Range bound	Explanation
maxnoofAoI	Maximum no. of areas of interest. Value is 64.

9.3.1.68 UE Radio Capability for Paging

This IE contains paging specific UE Radio Capability information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Radio Capability for Paging	M		OCTET STRING	RRC Container, as defined in TS 38.331 [18].

9.3.1.69 Assistance Data for Paging

This IE provides assistance information for paging optimisation.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Assistance Data for Recommended Cells	O		9.3.1.70	
Paging Attempt Information	O		9.3.1.72	

9.3.1.70 Assistance Data for Recommended Cells

This IE provides assistance information for paging in recommended cells.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Recommended Cells for Paging	M		9.3.1.71	

9.3.1.71 Recommended Cells for Paging

This IE contains the recommended cells for paging.

This IE is transparent to the 5GC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Recommended Cell List		*1*		
>Recommended Cell Item IEs		*1..<maxnoofRecommendedCells>*		Includes visited and non-visited cells, where visited cells are listed in the order the UE visited them with the most recent cell being the first in the list. Non-visited cells are included immediately after the visited cell they are associated with.
>>NG-RAN CGI	M		9.3.1.73	
>>Time Stayed in Cell	O		INTEGER (0..4095)	This is included for visited cells and indicates the time a UE stayed in a cell in seconds. If the UE stays in a cell more than 4095 seconds, this IE is set to 4095.

Range bound	Explanation
maxnoofRecommendedCells	Maximum no. of recommended Cells. Value is 16.

9.3.1.72 Paging Attempt Information

This IE includes information related to the paging count over NG.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Paging Attempt Count	M		INTEGER (1..16, ...)	Shall be set as specified in TS 38.300 [8].
Intended Number of Paging Attempts	M		INTEGER (1..16, …)	Intended number of paging attempts (see TS 38.300 [8]).
Next Paging Area Scope	O		ENUMERATED (same, changed, …)	Indicates whether the paging area scope will change or not at next paging attempt. Usage specified in TS 38.300 [8].

9.3.1.73 NG-RAN CGI

This IE is used to globally identify a cell in NG-RAN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *NG-RAN CGI*	M			
>NR				
>>NR CGI	M		9.3.1.7	
>E-UTRA				
>>E-UTRA CGI	M		9.3.1.9	

9.3.1.74 UE Radio Capability

This IE contains UE Radio Capability information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Radio Capability	M		OCTET STRING	RRC Container, as defined in TS 38.331 [18].

9.3.1.75 Time Stamp

This IE contains UTC time information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Time Stamp	M		OCTET STRING (SIZE(4))	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 [25]. It indicates the UTC time when the location information was generated.

9.3.1.76 Location Reporting Reference ID

This IE contains the Location Reporting Reference ID.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Location Reporting Reference ID	M		INTEGER (1..64, …)	

9.3.1.77 Data Forwarding Response DRB List

This IE indicates data forwarding related information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Data Forwarding Response DRB Item IEs		*1..<maxnoofDRBs>*		
>DRB ID	M		9.3.1.53	
>DL Forwarding UP TNL Information	O		UP Transport Layer Information 9.3.2.2	
>UL Forwarding UP TNL Information	O		UP Transport Layer Information 9.3.2.2	

Range bound	Explanation
maxnoofDRBs	Maximum no. of DRBs allowed towards one UE. Value is 32.

9.3.1.78 Paging Priority

This element indicates the paging priority for paging a UE.

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

9.3.1.79 Packet Loss Rate

This IE indicates the Packet Loss Rate.

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

9.3.1.80 Packet Delay Budget

This IE indicates the Packet Delay Budget.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Packet Delay Budget	M		INTEGER (0..63)	This IE may need to be refined

9.3.1.81 Packet Error Rate

This IE indicates the Packet Error Rate.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Packet Error Rate	M		INTEGER (0..63)	This IE may need to be refined

9.3.1.82 Averaging Window

This IE indicates the Averaging Window.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Averaging Window	M		INTEGER (0..63)	This IE may need to be refined

9.3.1.83 Maximum Data Burst Volume

This IE indicates the Maximum Data Burst Volume.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Maximum Data Burst Volume	M		INTEGER (0..63)	This IE may need to be refined

9.3.1.84 Priority Level

This IE indicates the Priority Level.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Priority Level	M		INTEGER (1..127)	This IE may need to be refined

9.3.1.85 Mobility Restriction List

This IE defines roaming or access restrictions for subsequent mobility action for which the NR-RAN provides information about the target of the mobility action towards the UE, e.g., handover, or for SCG selection during dual connectivity operation or for assigning proper RNAs. If the NG-RAN receives the *Mobility Restriction List* IE, it shall overwrite previously received mobility restriction information. NG-RAN behaviour upon receiving this IE is specified in TS 23.501 [9].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Serving PLMN	M		PLMN Identity 9.3.3.5	
Equivalent PLMNs		*0..<maxnoofEPLMNs>*		Allowed PLMNs in addition to Serving PLMN. This list corresponds to the list of "equivalent PLMNs" as defined in TS 24.501 [26]. 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		9.3.3.5	
RAT Restrictions		*0..<maxnoofEPLMNsPlusOne>*		This IE contains RAT restriction related information as specified in TS 23.501 [9].
>PLMN Identity	M		9.3.3.5	
>RAT Restriction Information	M		BIT STRING { e-UTRA (0), nR (1) } (SIZE(8, …))	Each position in the bitmap represents a RAT. If a bit is set to "1", the respective RAT is restricted for the UE. If a bit is set to "0", the respective RAT is not restricted for the UE. This version of the specification does not use bits 2-7, the sending node shall set bits 2-7 to "0", the receiving node shall ignore bits 2-7.
Forbidden Area Information		*0..<maxnoofEPLMNsPlusOne>*		This IE contains Forbidden Area information as specified in TS 23.501 [9].
>PLMN Identity	M		9.3.3.5	
>Forbidden TACs		*1..<maxnoofForbTACs>*		
>>TAC	M		9.3.3.10	The TAC of the forbidden TAI.
Service Area Information		*0..<maxnoofEPLMNsPlusOne>*		This IE contains Service Area Restriction information as specified in TS 23.501 [9].
>PLMN Identity	M		9.3.3.5	
>Allowed TACs		*0..<maxnoofAllowedAreas>*		
>>TAC	M		9.3.3.10	The TAC of the allowed TAI.
>Not Allowed TACs		*0..<maxnoofAllowedAreas>*		
>>TAC	M		9.3.3.10	The TAC of the not-allowed TAI.

Range bound	Explanation
maxnoofEPLMNs	Maximum no. of equivalent PLMNs. Value is 15.
maxnoofEPLMNsPlusOne	Maximum no. of allowed PLMNs. Value is 16.
maxnoofForbTACs	Maximum no. of forbidden Tracking Area Codes. Value is 4096.
maxnoofAllowedAreas	Maximum no. of allowed or not allowed Tracking Areas. Value is 16.

9.3.1.86 UE Security Capabilities

This IE defines the supported algorithms for encryption and integrity protection in the UE.

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 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 33.501 [13].
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 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 33.501 [13].
E-UTRA Encryption Algorithms	M		BIT STRING (SIZE(16, …))	Each position in the bitmap represents an encryption algorithm: "all bits equal to 0" – UE supports no other algorithm than EEA0, "first bit" – 128-EEA1, "second bit" – 128-EEA2, "third bit" – 128-EEA3, other bits reserved for future use. Value '1' indicates support and value '0' indicates no support of the algorithm. Algorithms are defined in TS 33.401 [27].
E-UTRA Integrity Protection Algorithms	M		BIT STRING (SIZE(16, …))	Each position in the bitmap represents an encryption algorithm: "all bits equal to 0" – UE supports no other algorithm than EIA0, "first bit" – 128-EIA1, "second bit" – 128-EIA2, "third bit" – 128-EIA3, other bits reserved for future use. Value '1' indicates support and value '0' indicates no support of the algorithm. Algorithms are defined in TS 33.401 [27].

9.3.1.87 Security Key

This IE is used to apply security in the NG-RAN for different scenarios as defined in TS 33.501 [13].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Security Key	M		BIT STRING (SIZE(256))	Key material for NG-RAN node or Next Hop Key as defined in TS 33.501 [13]

9.3.1.88 Security Context

This IE provides security related parameters to the NG-RAN node which are used to derive security keys for user plane traffic and RRC signalling messages and for security parameter generation for subsequent mobility, see TS 33.501 [13].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Next Hop Chaining Count	M		INTEGER (0..7)	Next Hop Chaining Counter (NCC) defined in TS 33.501 [13].
Next-Hop NH	M		Security Key 9.3.1.87	The NH together with the NCC is used to derive the security configuration as defined in TS 33.501 [13].

9.3.1.89 IMS Voice Support Indicator

This IE is set by the NG-RAN node to indicate whether the UE radio capabilities are compatible with the network configuration for IMS voice.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
IMS Voice Support Indicator	M		ENUMERATED (Supported, Not Supported, …)	

9.3.2 Transport Network Layer Related IEs

9.3.2.1 UP TNL Information

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice *UP TNL Information*	M			
>Single TNL Info				
>>UP Transport Layer Information	M		9.3.2.2	
>Multiple TNL Info				
>>TNL Information List		*1*		
>>>TNL Information Item IEs		*1..<maxnoofMultiConnectivities>*		
>>>>UP Transport Layer Information	M		9.3.2.2	
>>>>Associated QoS Flow List		*1*		
>>>>>Associated QoS Flow Item IEs		*1..<maxnoofQoSFlows*		
>>>>>>QoS Flow Indicator	M		9.3.1.51	

Range bound	Explanation
maxnoofMultiConnectivities	Maximum no. of connectivity allowed for a UE. Value is 8. The current version of the specification supports up to 2 connectivity.
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.

9.3.2.2 UP Transport Layer Information

This IE is used to provide the NG user plane transport layer information associated with a PDU session for an NG-RAN node – AMF pair. In this release it corresponds to an IP address and a GTP Tunnel Endpoint Identifier.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *UP Transport Layer Information*	M			
>GTP tunnel				
>>Endpoint IP Address	M		Transport Layer Address 9.3.2.4	
>>GTP-TEID	M		9.3.2.5	

9.3.2.3 E-RAB ID

This IE is the identifier of the LTE E-RAB.

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

9.3.2.4 Transport Layer Address

This IE is an IP address.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Transport Layer Address	M		BIT STRING (SIZE(1..160, …))	The Radio Network Layer is not supposed to interpret the address information. It should pass it to the Transport Layer for interpretation. For details, see TS 38.414 [14].

9.3.2.5 GTP-TEID

This IE is the GTP Tunnel Endpoint Identifier to be used for the user plane transport between the NG-RAN node and the UPF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
GTP-TEID	M		OCTET STRING (SIZE(4))	For details and range, see TS 29.281 [15].

9.3.2.6 CP Transport Layer Information

This IE is used to provide the NG control plane transport layer information associated with an NG-RAN node – AMF pair.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *CP Transport Layer Information*				
>Endpoint-IP-address				
>>Endpoint IP Address	M		Transport Layer Address 9.3.2.4	

9.3.2.7 TNL Association List

This IE contains a list of TNL associations. It is used for example to indicate failed TNL association(s).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
TNL Association Item IEs		*1..<maxnoofTNLAssociations>*		
>TNL Association Address	M		CP Transport Layer Information 9.3.2.6	
>Cause	M		9.3.1.2	

Range bound	Explanation
maxnoofTNLAssociations	Maximum no. of TNL Associations between the NG-RAN node and the AMF. Value is 32.

9.3.3 NAS Related IEs

9.3.3.1 AMF UE NGAP ID

This IE uniquely identifies the UE association over the NG interface within the AMF.

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

9.3.3.2 RAN UE NGAP ID

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

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

9.3.3.3 GUAMI

This IE indicates the AMF identity.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.3.3.5	
AMF Region ID	M		OCTET STRING (SIZE(2))	
AMF Set ID	M		9.3.3.12	
AMF Pointer	M		9.3.3.19	

9.3.3.4 NAS-PDU

This IE contains a 5GC – UE or UE – 5GC message that is transferred without interpretation in the NG-RAN node.

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

9.3.3.5 PLMN Identity

This IE indicates the PLMN Identity.

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

9.3.3.6 SON Configuration Transfer

This IE contains the configuration information, used by e.g., SON functionality, and additionally includes the NG-RAN node identifier of the destination of this configuration information and the NG-RAN node identifier of the source of this information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Target RAN Node ID	M			
>Global RAN Node ID	M		9.3.1.5	
>Selected TAI	M		TAI 9.3.3.11	
Source RAN Node ID	M			
>Global RAN Node ID	M		9.3.1.5	
>Selected TAI	M		TAI 9.3.3.11	
SON Information	M		9.3.3.7	
Xn TNL Configuration Info	C-ifSONInformationRequest		9.3.3.9	Source NG-RAN node Xn TNL Configuration Info.

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

9.3.3.7 SON Information

This IE identifies the nature of the configuration information transferred, i.e., a request, a reply or a report.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *SON Information*	M			
>SON Information Request				
>>SON Information Request	M		ENUMERATED (Xn TNL Configuration Info, …)	
>SON Information Reply				
>>SON Information Reply	M		9.3.3.8	

9.3.3.8 SON Information Reply

This IE contains the configuration information to be replied to the NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Xn TNL Configuration Info	O		9.3.3.9	

9.3.3.9 Xn TNL Configuration Info

This IE is used for signalling Xn TNL Configuration information for automatic Xn SCTP association establishment.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Xn Transport Layer Addresses		*1..<maxnoofXnTLAs>*		
>Transport Layer Address	M		9.3.2.4	Transport Layer Addresses for Xn SCTP endpoint.
Xn Extended Transport Layer Addresses		*0..<maxnoofXnExtTLAs>*		
>IP-Sec Transport Layer Address	O		Transport Layer Address 9.3.2.4	Transport Layer Addresses for IP-Sec endpoint.
>**Xn GTP Transport Layer Addresses**		*0..<maxnoofXnGTP-TLAs>*		
>>GTP Transport Layer Address	M		Transport Layer Address 9.3.2.4	GTP Transport Layer Addresses for GTP end-points (used for data forwarding over Xn).

Range bound	Explanation
maxnoofXnTLAs	Maximum no. of Xn Transport Layer Addresses for an SCTP end-point. Value is 2.
maxnoofXnExtTLAs	Maximum no. of Xn Extended Transport Layer Addresses in the message. Value is 16.
maxnoofXnGTP-TLAs	Maximum no. of Xn GTP Transport Layer Addresses for a GTP end-point in the message. Value is 16.

9.3.3.10 TAC

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

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

9.3.3.11 TAI

This IE is used to uniquely identify a Tracking Area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.3.3.5	
TAC	M		9.3.3.10	

9.3.3.12 AMF Set ID

This IE is used to uniquely identify an AMF Set within the AMF Region.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
AMF Set ID	M		BIT STRING (SIZE(4))	

9.3.3.13 Routing ID

This IE is used to identify an LMF within the 5GC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Routing ID	M		OCTET STRING	

9.3.3.14 NRPPa-PDU

This IE contains an NG-RAN node – LMF or LMF – NG-RAN node message that is transferred without interpretation in the AMF.

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

9.3.3.15 RAN Paging Priority

This IE contains the service priority as defined in TS 23.501 [9].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAN Paging Priority	M		INTEGER (1..256)	

9.3.3.16 EPS TAC

This IE is used to uniquely identify an EPS Tracking Area Code.

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

9.3.3.17 EPS TAI

This IE is used to uniquely identify an EPS Tracking Area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.3.3.5	
EPS TAC	M		9.3.3.16	

9.3.3.18 UE Paging Identity

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *UE Paging Identity*	M			
>5G-S-TMSI				
>>5G-S-TMSI	M		9.3.3.20	

9.3.3.19 AMF Pointer

This IE is used to uniquely identify an AMF within the AMF Set.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
AMF Pointer	M		BIT STRING (SIZE(4))	

9.3.3.20 5G-S-TMSI

This IE is used for security reasons, to hide the identity of a subscriber.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
AMF Set ID	M		9.3.3.12	
AMF Pointer	M		9.3.3.19	
5G-TMSI	M		OCTET STRING (SIZE(4))	5G-TMSI is unique within the AMF that allocated it.

9.3.3.21 AMF Name

This IE is used to uniquely identify the AMF (see TS 38.300 [8]). It may also be used as a human readable name of the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
AMF Name	M		PrintableString (SIZE(1..150, …))	

9.3.3.22 Paging Origin

This IE indicates whether Paging is originated due to the PDU sessions from the non-3GPP access.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Paging Origin	M		ENUMERATED (non-3GPP, …)	

9.3.4 SMF Related IEs

9.3.4.1 PDU Session Resource Setup Request Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PDU Session Aggregate Maximum Bit Rate	M		Bit Rate 9.3.1.4	
UL NG-U UP TNL Information	M		UP Transport Layer Information 9.3.2.2	UPF endpoint of the NG-U transport bearer, for delivery of UL PDUs.
Additional UL NG-U UP TNL Information	O		UP Transport Layer Information 9.3.2.2	UPF endpoint of the additional NG-U transport bearer, for delivery of UL PDUs.
Data Forwarding Not Possible	O		9.3.1.63	
PDU Session Type	M		9.3.1.52	
Security Indication	O		9.3.1.27	
QoS Flow Setup Request List		*1*		
>QoS Flow Setup Request Item IEs		*1..<maxnoofQoSFlows>*		
>>QoS Flow Indicator	M		9.3.1.51	
>>QoS Flow Level QoS Parameters	M		9.3.1.12	
>>E-RAB ID	O		9.3.2.3	

Range bound	Explanation
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.

9.3.4.2 PDU Session Resource Setup Response Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL NG-U UP TNL Information	M		UP Transport Layer Information 9.3.2.2	NG-RAN node endpoint of the NG-U transport bearer, for delivery of DL PDUs.
Security Result	O		9.3.1.59	
QoS Flow Setup Response List		*1*		
>QoS Flow Setup Response Item IEs		*1..<maxnoofQoSFlows>*		
>>QoS Flow Indicator	M		9.3.1.51	
QoS Flow Failed to Setup List	O		QoS Flow List 9.3.1.13	

Range bound	Explanation
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.

9.3.4.3 PDU Session Resource Modify Request Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PDU Session Aggregate Maximum Bit Rate	O		Bit Rate 9.3.1.4	
UL NG-U UP TNL Information	O		UP Transport Layer Information 9.3.2.2	UPF endpoint of the NG-U transport bearer, for delivery of UL PDUs.
QoS Flow Add or Modify Request List		*0..1*		
>QoS Flow Add or Modify Request Item IEs		*1..<maxnoofQoSFlows>*		
>>QoS Flow Indicator	M		9.3.1.51	
>>QoS Flow Level QoS Parameters	O		9.3.1.12	The presence of this IE may need to be refined
>>E-RAB ID	O		9.3.2.3	
QoS Flow to Release List	O		QoS Flow List 9.3.1.13	

Range bound	Explanation
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.

9.3.4.4 PDU Session Resource Modify Response Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL NG-U UP TNL Information	O		UP Transport Layer Information 9.3.2.2	NG-RAN node endpoint of the NG-U transport bearer, for delivery of DL PDUs.
QoS Flow Add or Modify Response List		*0..1*		
>QoS Flow Add or Modify Response Item IEs		*1..<maxnoofQoSFlows>*		
>>QoS Flow Indicator	M		9.3.1.51	
QoS Flow Failed to Add or Modify List	O		QoS Flow List 9.3.1.13	

Range bound	Explanation
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.

9.3.4.5 PDU Session Resource Notify Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
QoS Flow Notify List		*0..1*		
>QoS Flow Notify Item IEs		*1..<maxnoofQoSFlows>*		
>>QoS Flow Indicator	M		9.3.1.51	
>>Notification Cause	M		ENUMERATED (fullfilled, not fulfilled, …)	
QoS Flow Released List	O		QoS Flow List 9.3.1.13	

Range bound	Explanation
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.

9.3.4.6 PDU Session Resource Modify Indication Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL UP TNL Information	O		UP TNL Information 9.3.2.1	One or multiple RAN Transport Layer Information

9.3.4.7 PDU Session Resource Modify Confirm Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
QoS Flow Modify Confirm List		*1*		
>QoS Flow Modify Confirm Item IEs		*1..<maxnoofQoSFlows>*		
>>QoS Flow Indicator	M		9.3.1.51	
QoS Flow Failed to Modify List	O		QoS Flow List 9.3.1.13	

Range bound	Explanation
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.

9.3.4.8 Path Switch Request Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL NG-U UP TNL Information	M		UP Transport Layer Information 9.3.2.2	NG-RAN node endpoint of the NG-U transport bearer, for delivery of DL PDUs.
User Plane Security Information	O		9.3.1.60	
QoS Flow Accepted List		*1*		
>QoS Flow Accepted Item IEs		*1..<maxnoofQoSFlows>*		
>>QoS Flow Indicator	M		9.3.1.51	

Range bound	Explanation
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.

9.3.4.9 Path Switch Request Acknowledge Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UL NG-U UP TNL Information	M		UP Transport Layer Information 9.3.2.2	UPF endpoint of the NG-U transport bearer, for delivery of UL PDUs.
Security Indication	O		9.3.1.27	

9.3.4.10 Handover Command Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL Forwarding UP TNL Information	O		UP Transport Layer Information 9.3.2.2	To deliver forwarded DL PDUs.
QoS Flow to be Forwarded List		*1*		
>QoS Flow to be Forwarded Item IEs		*1..<maxnoofQoSFlows>*		
>>QoS Flow Indicator	M		9.3.1.51	
Data Forwarding Response DRB List	O		9.3.1.77	

Range bound	Explanation
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.

9.3.4.11 Handover Request Acknowledge Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL NG-U UP TNL Information	M		UP Transport Layer Information 9.3.2.2	NG-RAN node endpoint of the NG-U transport bearer, for delivery of DL PDUs.
DL Forwarding UP TNL Information	O		UP Transport Layer Information 9.3.2.2	To deliver forwarded DL PDUs.
Security Result	O		9.3.1.59	
QoS Flow Setup Response List		*1*		
>QoS Flow Setup Response Item IEs		*1..<maxnoofQoSFlows>*		
>>QoS Flow Indicator	M		9.3.1.51	
>>Data Forwarding Accepted	O		9.3.1.62	
QoS Flow Failed to Setup List	O		QoS Flow List 9.3.1.13	
Data Forwarding Response DRB List	O		9.3.1.77	

Range bound	Explanation
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.

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

9.4.1 General

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

The ASN.1 definition specifies the structure and content of NGAP messages. NGAP 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 NGAP message according to the PDU definitions module and with the following additional rules:

- IEs shall be ordered (in an IE container) in the order they appear in object set definitions.
- Object set definitions specify how many times IEs may appear. An IE shall appear exactly once if the presence field in an object has value "mandatory". An IE may appear at most once if the presence field in an object has value "optional" or "conditional". If in a tabular format there is multiplicity specified for an IE (i.e., an IE list)

then in the corresponding ASN.1 definition the list definition is separated into two parts. The first part defines an IE container list where the list elements reside. The second part defines list elements. The IE container list appears as an IE of its own. For this version of the standard an IE container list may contain only one kind of list elements.

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

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

9.4.2 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 interoperability;

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

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

9.4.3 Elementary Procedure Definitions

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

NGAP-PDU-Descriptions  {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
ngran-Access (22) modules (3) ngap (1) version1 (1) ngap-PDU-Descriptions (0)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS

    Criticality,
    ProcedureCode
FROM NGAP-CommonDataTypes

    AMFConfigurationUpdate,
    AMFConfigurationUpdateAcknowledge,
    AMFConfigurationUpdateFailure,
    AMFStatusIndication,
    CellTrafficTrace,
    DeactivateTrace,
    DownlinkNASTransport,
    DownlinkNonUEAssociatedNRPPaTransport,
    DownlinkRANConfigurationTransfer,
    DownlinkRANStatusTransfer,
    DownlinkUEAssociatedNRPPaTransport,
    ErrorIndication,
    HandoverCancel,
    HandoverCancelAcknowledge,
    HandoverCommand,
    HandoverFailure,
    HandoverNotify,
    HandoverPreparationFailure,
    HandoverRequest,
    HandoverRequestAcknowledge,
    HandoverRequired,
    InitialContextSetupFailure,
    InitialContextSetupRequest,
    InitialContextSetupResponse,
    InitialUEMessage,
```

```
    LocationReport,
    LocationReportingControl,
    LocationReportingFailureIndication,
    NASNonDeliveryIndication,
    NGReset,
    NGResetAcknowledge,
    NGSetupFailure,
    NGSetupRequest,
    NGSetupResponse,
    Paging,
    PathSwitchRequest,
    PathSwitchRequestAcknowledge,
    PathSwitchRequestFailure,
    PDUSessionResourceModifyConfirm,
    PDUSessionResourceModifyIndication,
    PDUSessionResourceModifyRequest,
    PDUSessionResourceModifyResponse,
    PDUSessionResourceNotify,
    PDUSessionResourceReleaseCommand,
    PDUSessionResourceReleaseResponse,
    PDUSessionResourceSetupRequest,
    PDUSessionResourceSetupResponse,
    PrivateMessage,
    PWSCancelRequest,
    PWSCancelResponse,
    PWSFailureIndication,
    PWSRestartIndication,
    RANConfigurationUpdate,
    RANConfigurationUpdateAcknowledge,
    RANConfigurationUpdateFailure,
    RerouteNASRequest,
    TraceFailureIndication,
    TraceStart,
    UECapabilityInfoIndication,
    UEContextModificationFailure,
    UEContextModificationRequest,
    UEContextModificationResponse,
    UEContextReleaseCommand,
    UEContextReleaseComplete,
    UEContextReleaseRequest,
    UERadioCapabilityCheckRequest,
    UERadioCapabilityCheckResponse,
    UETNLABindingReleaseRequest,
    UplinkNASTransport,
    UplinkNonUEAssociatedNRPPaTransport,
    UplinkRANConfigurationTransfer,
    UplinkRANStatusTransfer,
    UplinkUEAssociatedNRPPaTransport,
    WriteReplaceWarningRequest,
    WriteReplaceWarningResponse
FROM NGAP-PDU-Contents

    id-AMFConfigurationUpdate,
    id-AMFStatusIndication,
```

```
    id-CellTrafficTrace,
    id-DeactivateTrace,
    id-DownlinkNASTransport,
    id-DownlinkNonUEAssociatedNRPPaTransport,
    id-DownlinkRANConfigurationTransfer,
    id-DownlinkRANStatusTransfer,
    id-DownlinkUEAssociatedNRPPaTransport,
    id-ErrorIndication,
    id-HandoverCancel,
    id-HandoverNotification,
    id-HandoverPreparation,
    id-HandoverResourceAllocation,
    id-InitialContextSetup,
    id-InitialUEMessage,
    id-LocationReport,
    id-LocationReportingControl,
    id-LocationReportingFailureIndication,
    id-NASNonDeliveryIndication,
    id-NGReset,
    id-NGSetup,
    id-Paging,
    id-PathSwitchRequest,
    id-PDUSessionResourceModify,
    id-PDUSessionResourceModifyIndication,
    id-PDUSessionResourceNotify,
    id-PDUSessionResourceRelease,
    id-PDUSessionResourceSetup,
    id-PrivateMessage,
    id-PWSCancel,
    id-PWSFailureIndication,
    id-PWSRestartIndication,
    id-RANConfigurationUpdate,
    id-RerouteNASRequest,
    id-TraceFailureIndication,
    id-TraceStart,
    id-UECapabilityInfoIndication,
    id-UEContextModification,
    id-UEContextRelease,
    id-UEContextReleaseRequest,
    id-UERadioCapabilityCheck,
    id-UETNLABindingRelease,
    id-UplinkNASTransport,
    id-UplinkNonUEAssociatedNRPPaTransport,
    id-UplinkRANConfigurationTransfer,
    id-UplinkRANStatusTransfer,
    id-UplinkUEAssociatedNRPPaTransport,
    id-WriteReplaceWarning
FROM NGAP-Constants;

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

```
NGAP-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
--
-- **************************************************************

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

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

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

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

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

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

NGAP-ELEMENTARY-PROCEDURES-CLASS-1 NGAP-ELEMENTARY-PROCEDURE ::= {
    aMFConfigurationUpdate                      |
    handoverCancel                              |
    handoverPreparation                         |
    handoverResourceAllocation                  |
    initialContextSetup                         |
    nGReset                                     |
    nGSetup                                     |
    pathSwitchRequest                           |
    pDUSessionResourceModify                    |
    pDUSessionResourceModifyIndication          |
    pDUSessionResourceRelease                   |
    pDUSessionResourceSetup                     |
    pWSCancel                                   |
    rANConfigurationUpdate                      |
    uEContextModification                       |
    uEContextRelease                            |
    uERadioCapabilityCheck                      |
    writeReplaceWarning
}

NGAP-ELEMENTARY-PROCEDURES-CLASS-2 NGAP-ELEMENTARY-PROCEDURE ::= {
    aMFStatusIndication                         |
    cellTrafficTrace                            |
    deactivateTrace                             |
    downlinkNASTransport                        |
    downlinkNonUEAssociatedNRPPaTransport       |
    downlinkRANConfigurationTransfer            |
    downlinkRANStatusTransfer                   |
    downlinkUEAssociatedNRPPaTransport          |
    errorIndication                             |
    handoverNotification                        |
    initialUEMessage                            |
    locationReport                              |
    locationReportingControl                    |
    locationReportingFailureIndication          |
    nASNonDeliveryIndication                    |
    paging                                      |
    pDUSessionResourceNotify                    |
    privateMessage                              |
    pWSFailureIndication                        |
    pWSRestartIndication                        |
    rerouteNASRequest                           |
    traceFailureIndication                      |
    traceStart                                  |
    uECapabilityInfoIndication                  |
    uEContextReleaseRequest                     |
    uETNLABindingRelease                        |
```

```
    uplinkNASTransport                          |
    uplinkNonUEAssociatedNRPPaTransport         |
    uplinkRANConfigurationTransfer              |
    uplinkRANStatusTransfer                     |
    uplinkUEAssociatedNRPPaTransport
}

-- ************************************************************
--
-- Interface Elementary Procedures
--
-- ************************************************************

aMFConfigurationUpdate NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      AMFConfigurationUpdate
    SUCCESSFUL OUTCOME      AMFConfigurationUpdateAcknowledge
    UNSUCCESSFUL OUTCOME    AMFConfigurationUpdateFailure
    PROCEDURE CODE          id-AMFConfigurationUpdate
    CRITICALITY             reject
}

aMFStatusIndication NGAP-ELEMENTARY-PROCEDURE ::={
    INITIATING MESSAGE      AMFStatusIndication
    PROCEDURE CODE          id-AMFStatusIndication
    CRITICALITY             ignore
}

cellTrafficTrace NGAP-ELEMENTARY-PROCEDURE ::={
    INITIATING MESSAGE      CellTrafficTrace
    PROCEDURE CODE          id-CellTrafficTrace
    CRITICALITY             ignore
}

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

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

downlinkNonUEAssociatedNRPPaTransport NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DownlinkNonUEAssociatedNRPPaTransport
    PROCEDURE CODE          id-DownlinkNonUEAssociatedNRPPaTransport
    CRITICALITY             ignore
}

downlinkRANConfigurationTransfer NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DownlinkRANConfigurationTransfer
    PROCEDURE CODE          id-DownlinkRANConfigurationTransfer
```

```
    CRITICALITY             ignore
}

downlinkRANStatusTransfer NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DownlinkRANStatusTransfer
    PROCEDURE CODE          id-DownlinkRANStatusTransfer
    CRITICALITY             ignore
}

downlinkUEAssociatedNRPPaTransport NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DownlinkUEAssociatedNRPPaTransport
    PROCEDURE CODE          id-DownlinkUEAssociatedNRPPaTransport
    CRITICALITY             ignore
}

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

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

handoverNotification NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      HandoverNotify
    PROCEDURE CODE          id-HandoverNotification
    CRITICALITY             ignore
}

handoverPreparation NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      HandoverRequired
    SUCCESSFUL OUTCOME      HandoverCommand
    UNSUCCESSFUL OUTCOME    HandoverPreparationFailure
    PROCEDURE CODE          id-HandoverPreparation
    CRITICALITY             reject
}

handoverResourceAllocation NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      HandoverRequest
    SUCCESSFUL OUTCOME      HandoverRequestAcknowledge
    UNSUCCESSFUL OUTCOME    HandoverFailure
    PROCEDURE CODE          id-HandoverResourceAllocation
    CRITICALITY             reject
}

initialContextSetup NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      InitialContextSetupRequest
    SUCCESSFUL OUTCOME      InitialContextSetupResponse
    UNSUCCESSFUL OUTCOME    InitialContextSetupFailure
```

```
    PROCEDURE CODE          id-InitialContextSetup
    CRITICALITY             reject
}

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

locationReport NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      LocationReport
    PROCEDURE CODE          id-LocationReport
    CRITICALITY             ignore
}

locationReportingControl NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      LocationReportingControl
    PROCEDURE CODE          id-LocationReportingControl
    CRITICALITY             ignore
}

locationReportingFailureIndication NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      LocationReportingFailureIndication
    PROCEDURE CODE          id-LocationReportingFailureIndication
    CRITICALITY             ignore
}

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

nGReset NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      NGReset
    SUCCESSFUL OUTCOME      NGResetAcknowledge
    PROCEDURE CODE          id-NGReset
    CRITICALITY             reject
}

nGSetup NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      NGSetupRequest
    SUCCESSFUL OUTCOME      NGSetupResponse
    UNSUCCESSFUL OUTCOME    NGSetupFailure
    PROCEDURE CODE          id-NGSetup
    CRITICALITY             reject
}

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

```
pathSwitchRequest NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PathSwitchRequest
    SUCCESSFUL OUTCOME      PathSwitchRequestAcknowledge
    UNSUCCESSFUL OUTCOME    PathSwitchRequestFailure
    PROCEDURE CODE          id-PathSwitchRequest
    CRITICALITY             reject
}

pDUSessionResourceModify NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PDUSessionResourceModifyRequest
    SUCCESSFUL OUTCOME      PDUSessionResourceModifyResponse
    PROCEDURE CODE          id-PDUSessionResourceModify
    CRITICALITY             reject
}

pDUSessionResourceModifyIndication NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PDUSessionResourceModifyIndication
    SUCCESSFUL OUTCOME      PDUSessionResourceModifyConfirm
    PROCEDURE CODE          id-PDUSessionResourceModifyIndication
    CRITICALITY             reject
}

pDUSessionResourceNotify NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PDUSessionResourceNotify
    PROCEDURE CODE          id-PDUSessionResourceNotify
    CRITICALITY             ignore
}

pDUSessionResourceRelease NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PDUSessionResourceReleaseCommand
    SUCCESSFUL OUTCOME      PDUSessionResourceReleaseResponse
    PROCEDURE CODE          id-PDUSessionResourceRelease
    CRITICALITY             reject
}

pDUSessionResourceSetup NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PDUSessionResourceSetupRequest
    SUCCESSFUL OUTCOME      PDUSessionResourceSetupResponse
    PROCEDURE CODE          id-PDUSessionResourceSetup
    CRITICALITY             reject
}

privateMessage NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PrivateMessage
    PROCEDURE CODE          id-PrivateMessage
    CRITICALITY             ignore
}

pWSCancel NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PWSCancelRequest
    SUCCESSFUL OUTCOME      PWSCancelResponse
    PROCEDURE CODE          id-PWSCancel
    CRITICALITY             reject
```

```
}

pWSFailureIndication NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PWSFailureIndication
    PROCEDURE CODE          id-PWSFailureIndication
    CRITICALITY             ignore
}

pWSRestartIndication NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PWSRestartIndication
    PROCEDURE CODE          id-PWSRestartIndication
    CRITICALITY             ignore
}

rANConfigurationUpdate NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      RANConfigurationUpdate
    SUCCESSFUL OUTCOME      RANConfigurationUpdateAcknowledge
    UNSUCCESSFUL OUTCOME    RANConfigurationUpdateFailure
    PROCEDURE CODE          id-RANConfigurationUpdate
    CRITICALITY             reject
}

rerouteNASRequest NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      RerouteNASRequest
    PROCEDURE CODE          id-RerouteNASRequest
    CRITICALITY             reject
}

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

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

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

uEContextModification NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UEContextModificationRequest
    SUCCESSFUL OUTCOME      UEContextModificationResponse
    UNSUCCESSFUL OUTCOME    UEContextModificationFailure
    PROCEDURE CODE          id-UEContextModification
    CRITICALITY             reject
}
```

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

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

uERadioCapabilityCheck NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UERadioCapabilityCheckRequest
    SUCCESSFUL OUTCOME      UERadioCapabilityCheckResponse
    PROCEDURE CODE          id-UERadioCapabilityCheck
    CRITICALITY             reject
}

uETNLABindingRelease NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UETNLABindingReleaseRequest
    PROCEDURE CODE          id-UETNLABindingRelease
    CRITICALITY             ignore
}

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

uplinkNonUEAssociatedNRPPaTransport NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkNonUEAssociatedNRPPaTransport
    PROCEDURE CODE          id-UplinkNonUEAssociatedNRPPaTransport
    CRITICALITY             ignore
}

uplinkRANConfigurationTransfer NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkRANConfigurationTransfer
    PROCEDURE CODE          id-UplinkRANConfigurationTransfer
    CRITICALITY             ignore
}

uplinkRANStatusTransfer NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkRANStatusTransfer
    PROCEDURE CODE          id-UplinkRANStatusTransfer
    CRITICALITY             ignore
}

uplinkUEAssociatedNRPPaTransport NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkUEAssociatedNRPPaTransport
    PROCEDURE CODE          id-UplinkUEAssociatedNRPPaTransport
    CRITICALITY             ignore
```

```
}

writeReplaceWarning NGAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      WriteReplaceWarningRequest
    SUCCESSFUL OUTCOME      WriteReplaceWarningResponse
    PROCEDURE CODE          id-WriteReplaceWarning
    CRITICALITY             reject
}

END
```

9.4.4 PDU Definitions

```
-- **************************************************************
--
-- PDU definitions for NGAP.
--
-- **************************************************************

NGAP-PDU-Contents {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
ngran-Access (22) modules (3) ngap (1) version1 (1) ngap-PDU-Contents (1) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS

    AllowedNSSAI,
    AMFName,
    AMFSetID,
    AMF-UE-NGAP-ID,
    AssistanceDataForPaging,
    BroadcastCancelledAreaList,
    BroadcastCompletedAreaList,
    CancelAllWarningMessages,
    Cause,
    CellIDListForRestart,
    ConcurrentWarningMessageInd,
    CPTransportLayerInformation,
    CriticalityDiagnostics,
    DataCodingScheme,
    DirectForwardingPathAvailability,
    EmergencyAreaIDListForRestart,
    EmergencyFallbackIndicator,
    EUTRA-CGI,
```

```
    FiveG-S-TMSI,
    GlobalRANNodeID,
    GUAMI,
    HandoverCommandTransfer,
    HandoverRequestAcknowledgeTransfer,
    HandoverType,
    IMSVoiceSupportIndicator,
    IndexToRFSP,
    InfoOnRecommendedCellsAndRANNodesForPaging,
    KamfChangeInd,
    LocationReportingRequestType,
    MaskedIMEISV,
    MessageIdentifier,
    MobilityRestrictionList,
    NAS-PDU,
    NGRAN-CGI,
    NGRANTraceID,
    NR-CGI,
    NRPPa-PDU,
    NumberOfBroadcastsRequested,
    PagingDRX,
    PagingOrigin,
    PagingPriority,
    PathSwitchRequestAcknowledgeTransfer,
    PathSwitchRequestTransfer,
    PDUSessionID,
    PDUSessionList,
    PDUSessionResourceModifyConfirmTransfer,
    PDUSessionResourceModifyIndicationTransfer,
    PDUSessionResourceModifyRequestTransfer,
    PDUSessionResourceModifyResponseTransfer,
    PDUSessionResourceNotifyTransfer,
    PDUSessionResourceSetupRequestTransfer,
    PDUSessionResourceSetupResponseTransfer,
    PDUSessionResourceSubjectToHandover,
    PLMNSupportList,
    PWSFailedCellIDList,
    RANNodeName,
    RANPagingPriority,
    RANStatusTransfer-TransparentContainer,
    RAN-UE-NGAP-ID,
    RelativeAMFCapacity,
    RepetitionPeriod,
    RoutingID,
    RRCEstablishmentCause,
    RRCInactiveAssistanceInformation,
    SecurityContext,
    SecurityKey,
    SerialNumber,
    ServedGUAMIList,
    SliceSupportList,
    S-NSSAI,
    SONConfigurationTransfer,
    SourceToTarget-TransparentContainer,
```

```
    SupportedTAList,
    TAI,
    TAIListForRestart,
    TargetID,
    TargetToSource-TransparentContainer,
    TimeStamp,
    TimeToWait,
    TNLAssociationList,
    TNLAssociationUsage,
    TNLAssociationWeightFactor,
    TraceActivation,
    TransportLayerAddress,
    UEAggregateMaximumBitRate,
    UE-associatedLogicalNG-ConnectionItem,
    UEContextRequest,
    UEIdentityIndexValue,
    UE-NGAP-IDs,
    UEPagingIdentity,
    UEPresenceInAreaOfInterestList,
    UERadioCapability,
    UERadioCapabilityForPaging,
    UESecurityCapabilities,
    UnavailableGUAMIList,
    UserLocationInformation,
    WarningAreaList,
    WarningMessageContents,
    WarningSecurityInfo,
    WarningType
FROM NGAP-IEs

    PrivateIE-Container{},
    ProtocolExtensionContainer{},
    ProtocolIE-Container{},
    ProtocolIE-ContainerList{},
    ProtocolIE-ContainerPair{},
    ProtocolIE-SingleContainer{},
    NGAP-PRIVATE-IES,
    NGAP-PROTOCOL-EXTENSION,
    NGAP-PROTOCOL-IES,
    NGAP-PROTOCOL-IES-PAIR
FROM NGAP-Containers

    id-AllowedNSSAI,
    id-AMFName,
    id-AMFSetID,
    id-AMF-TNLAssociationFailedToSetupList,
    id-AMF-TNLAssociationSetupItem,
    id-AMF-TNLAssociationSetupList,
    id-AMF-TNLAssociationToAddItem,
    id-AMF-TNLAssociationToAddList,
    id-AMF-TNLAssociationToRemoveItem,
    id-AMF-TNLAssociationToRemoveList,
    id-AMF-TNLAssociationToUpdateItem,
    id-AMF-TNLAssociationToUpdateList,
```

```
    id-AMF-UE-NGAP-ID,
    id-AssistanceDataForPaging,
    id-BroadcastCancelledAreaList,
    id-BroadcastCompletedAreaList,
    id-CancelAllWarningMessages,
    id-Cause,
    id-CellIDListForRestart,
    id-ConcurrentWarningMessageInd,
    id-CriticalityDiagnostics,
    id-DataCodingScheme,
    id-DefaultPagingDRX,
    id-DirectForwardingPathAvailability,
    id-EmergencyAreaIDListForRestart,
    id-EmergencyFallbackIndicator,
    id-EUTRA-CGI,
    id-FiveG-S-TMSI,
    id-GlobalRANNodeID,
    id-GUAMI,
    id-HandoverType,
    id-IMSVoiceSupportIndicator,
    id-IndexToRFSP,
    id-InfoOnRecommendedCellsAndRANNodesForPaging,
    id-KamfChangeInd,
    id-LocationReportingRequestType,
    id-MaskedIMEISV,
    id-MessageIdentifier,
    id-MobilityRestrictionList,
    id-NAS-PDU,
    id-NASC,
    id-NewAMF-UE-NGAP-ID,
    id-NGAP-Message,
    id-NGRAN-CGI,
    id-NGRANTraceID,
    id-NR-CGI,
    id-NRPPa-PDU,
    id-NumberOfBroadcastsRequested,
    id-OldAMF,
    id-PagingDRX,
    id-PagingOrigin,
    id-PagingPriority,
    id-PDUSessionResourceAdmittedItem,
    id-PDUSessionResourceAdmittedList,
    id-PDUSessionResourceFailedToModifyListModRes,
    id-PDUSessionResourceFailedToSetupList,
    id-PDUSessionResourceItemHORqd,
    id-PDUSessionResourceListHORqd,
    id-PDUSessionResourceModifyItemModCfm,
    id-PDUSessionResourceModifyItemModInd,
    id-PDUSessionResourceModifyItemModReq,
    id-PDUSessionResourceModifyItemModRes,
    id-PDUSessionResourceModifyListModCfm,
    id-PDUSessionResourceModifyListModInd,
    id-PDUSessionResourceModifyListModReq,
    id-PDUSessionResourceModifyListModRes,
```

```
    id-PDUSessionResourceNotifyItem,
    id-PDUSessionResourceNotifyList,
    id-PDUSessionResourceReleasedList,
    id-PDUSessionResourceSetupItemCxtReq,
    id-PDUSessionResourceSetupItemCxtRes,
    id-PDUSessionResourceSetupItemHOReq,
    id-PDUSessionResourceSetupItemSUReq,
    id-PDUSessionResourceSetupItemSURes,
    id-PDUSessionResourceSetupListCxtReq,
    id-PDUSessionResourceSetupListCxtRes,
    id-PDUSessionResourceSetupListHOReq,
    id-PDUSessionResourceSetupListSUReq,
    id-PDUSessionResourceSetupListSURes,
    id-PDUSessionResourceSubjectToForwardingItem,
    id-PDUSessionResourceSubjectToForwardingList,
    id-PDUSessionResourceToBeSwitchedDLItem,
    id-PDUSessionResourceToBeSwitchedDLList,
    id-PDUSessionResourceToBeSwitchedULItem,
    id-PDUSessionResourceToBeSwitchedULList,
    id-PDUSessionResourceToReleaseList,
    id-PLMNSupportList,
    id-PWSFailedCellIDList,
    id-RANNodeName,
    id-RANPagingPriority,
    id-RANStatusTransfer-TransparentContainer,
    id-RAN-UE-NGAP-ID,
    id-RelativeAMFCapacity,
    id-RepetitionPeriod,
    id-ResetType,
    id-RoutingID,
    id-RRCEstablishmentCause,
    id-RRCInactiveAssistanceInformation,
    id-SecurityContext,
    id-SecurityKey,
    id-SerialNumber,
    id-ServedGUAMIList,
    id-SliceSupportList,
    id-SONConfigurationTransferDL,
    id-SONConfigurationTransferUL,
    id-SourceAMF-UE-NGAP-ID,
    id-SourceToTarget-TransparentContainer,
    id-SupportedTAList,
    id-TAI,
    id-TAIItem,
    id-TAIList,
    id-TAIListForRestart,
    id-TargetID,
    id-TargetToSource-TransparentContainer,
    id-TimeStamp,
    id-TimeToWait,
    id-TraceActivation,
    id-TraceCollectionEntityIPAddress,
    id-UEAggregateMaximumBitRate,
    id-UE-associatedLogicalNG-ConnectionItem,
```

```
    id-UE-associatedLogicalNG-ConnectionListResAck,
    id-UEContextRequest,
    id-UEIdentityIndexValue,
    id-UE-NGAP-IDs,
    id-UEPagingIdentity,
    id-UEPresenceInAreaOfInterestList,
    id-UERadioCapability,
    id-UERadioCapabilityForPaging,
    id-UESecurityCapabilities,
    id-UnavailableGUAMIList,
    id-UserLocationInformation,
    id-WarningAreaList,
    id-WarningMessageContents,
    id-WarningSecurityInfo,
    id-WarningType,
    maxnoofNGConnectionsToReset,
    maxnoofTAIs,
    maxnoofTNLAssociations,
    maxnoofPDUSessions
FROM NGAP-Constants;

-- **************************************************************
--
-- PDU SESSION MANAGEMENT ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- PDU Session Resource Setup Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- PDU SESSION RESOURCE SETUP REQUEST
--
-- **************************************************************

PDUSessionResourceSetupRequest ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PDUSessionResourceSetupRequestIEs} },
    ...
}

PDUSessionResourceSetupRequestIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY reject  TYPE AMF-UE-NGAP-ID                     PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY reject  TYPE RAN-UE-NGAP-ID                     PRESENCE mandatory   }|
    { ID id-RANPagingPriority                       CRITICALITY ignore  TYPE RANPagingPriority                  PRESENCE optional    }|
    { ID id-NAS-PDU                                 CRITICALITY reject  TYPE NAS-PDU                            PRESENCE optional    }|
    { ID id-PDUSessionResourceSetupListSUReq        CRITICALITY reject  TYPE PDUSessionResourceSetupListSUReq    PRESENCE mandatory   },
    ...
}

PDUSessionResourceSetupListSUReq ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer { {PDUSessionResourceSetupItemSUReqIEs} }
```

```
PDUSessionResourceSetupItemSUReqIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceSetupItemSUReq        CRITICALITY reject  TYPE PDUSessionResourceSetupItemSUReq PRESENCE mandatory   },
    ...
}

PDUSessionResourceSetupItemSUReq ::= SEQUENCE {
    pDUSessionID                                PDUSessionID,
    pDUSessionNAS-PDU                           NAS-PDU                                         OPTIONAL,
    s-NSSAI                                     S-NSSAI,
    pDUSessionResourceSetupRequestTransfer      OCTET STRING (CONTAINING PDUSessionResourceSetupRequestTransfer),
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceSetupItemSUReq-ExtIEs} }  OPTIONAL,
    ...
}

PDUSessionResourceSetupItemSUReq-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- PDU SESSION RESOURCE SETUP RESPONSE
--
-- **************************************************************

PDUSessionResourceSetupResponse ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PDUSessionResourceSetupResponseIEs} },
    ...
}

PDUSessionResourceSetupResponseIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY ignore  TYPE AMF-UE-NGAP-ID                     PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY ignore  TYPE RAN-UE-NGAP-ID                     PRESENCE mandatory   }|
    { ID id-PDUSessionResourceSetupListSURes        CRITICALITY ignore  TYPE PDUSessionResourceSetupListSURes    PRESENCE optional    }|
    { ID id-PDUSessionResourceFailedToSetupList     CRITICALITY ignore  TYPE PDUSessionList                      PRESENCE optional    }|
    { ID id-CriticalityDiagnostics                  CRITICALITY ignore  TYPE CriticalityDiagnostics              PRESENCE optional    },
    ...
}

PDUSessionResourceSetupListSURes ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer { {PDUSessionResourceSetupItemSUResIEs} }

PDUSessionResourceSetupItemSUResIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceSetupItemSURes        CRITICALITY ignore  TYPE PDUSessionResourceSetupItemSURes    PRESENCE mandatory   },
    ...
}

PDUSessionResourceSetupItemSURes ::= SEQUENCE {
    pDUSessionID                                        PDUSessionID,
    pDUSessionResourceSetupResponseTransfer             OCTET STRING (CONTAINING PDUSessionResourceSetupResponseTransfer),
    additionalPDUSessionResourceSetupResponseTransfer   OCTET STRING (CONTAINING PDUSessionResourceSetupResponseTransfer)     OPTIONAL,
    iE-Extensions                                    ProtocolExtensionContainer { {PDUSessionResourceSetupItemSURes-ExtIEs} }  OPTIONAL,
    ...
}
```

```
PDUSessionResourceSetupItemSURes-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- PDU Session Resource Release Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- PDU SESSION RESOURCE RELEASE COMMAND
--
-- **************************************************************

PDUSessionResourceReleaseCommand ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PDUSessionResourceReleaseCommandIEs} },
    ...
}

PDUSessionResourceReleaseCommandIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                      CRITICALITY reject  TYPE AMF-UE-NGAP-ID          PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                      CRITICALITY reject  TYPE RAN-UE-NGAP-ID          PRESENCE mandatory   }|
    { ID id-RANPagingPriority                   CRITICALITY ignore  TYPE RANPagingPriority       PRESENCE optional    }|
    { ID id-NAS-PDU                             CRITICALITY ignore  TYPE NAS-PDU                 PRESENCE optional    }|
    { ID id-PDUSessionResourceToReleaseList     CRITICALITY ignore  TYPE PDUSessionList          PRESENCE mandatory   },
    ...
}

-- **************************************************************
--
-- PDU SESSION RESOURCE RELEASE RESPONSE
--
-- **************************************************************

PDUSessionResourceReleaseResponse ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PDUSessionResourceReleaseResponseIEs} },
    ...
}

PDUSessionResourceReleaseResponseIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY ignore  TYPE AMF-UE-NGAP-ID              PRESENCE mandatory }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY ignore  TYPE RAN-UE-NGAP-ID              PRESENCE mandatory }|
    { ID id-UserLocationInformation     CRITICALITY ignore  TYPE UserLocationInformation     PRESENCE optional  }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- PDU Session Resource Modify Elementary Procedure
--
-- **************************************************************
```

```
-- **************************************************************
--
-- PDU SESSION RESOURCE MODIFY REQUEST
--
-- **************************************************************

PDUSessionResourceModifyRequest ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PDUSessionResourceModifyRequestIEs} },
    ...
}

PDUSessionResourceModifyRequestIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY reject  TYPE AMF-UE-NGAP-ID                     PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY reject  TYPE RAN-UE-NGAP-ID                     PRESENCE mandatory   }|
    { ID id-RANPagingPriority                       CRITICALITY ignore  TYPE RANPagingPriority                  PRESENCE optional    }|
    { ID id-PDUSessionResourceModifyListModReq      CRITICALITY reject  TYPE PDUSessionResourceModifyListModReq  PRESENCE mandatory   },
    ...
}

PDUSessionResourceModifyListModReq ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer {
{PDUSessionResourceModifyItemModReqIEs} }

PDUSessionResourceModifyItemModReqIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceModifyItemModReq      CRITICALITY reject  TYPE PDUSessionResourceModifyItemModReq  PRESENCE mandatory   },
    ...
}

PDUSessionResourceModifyItemModReq ::= SEQUENCE {
    pDUSessionID                                PDUSessionID,
    nAS-PDU                                     NAS-PDU                                                 OPTIONAL,
    pDUSessionResourceModifyRequestTransfer     OCTET STRING (CONTAINING PDUSessionResourceModifyRequestTransfer),
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceModifyItemModReq-ExtIEs} }   OPTIONAL,
    ...
}

PDUSessionResourceModifyItemModReq-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- PDU SESSION RESOURCE MODIFY RESPONSE
--
-- **************************************************************

PDUSessionResourceModifyResponse ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PDUSessionResourceModifyResponseIEs} },
    ...
}

PDUSessionResourceModifyResponseIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY ignore  TYPE AMF-UE-NGAP-ID                     PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY ignore  TYPE RAN-UE-NGAP-ID                     PRESENCE mandatory   }|
```

```
    { ID id-PDUSessionResourceModifyListModRes              CRITICALITY ignore  TYPE PDUSessionResourceModifyListModRes  PRESENCE optional    }|
    { ID id-PDUSessionResourceFailedToModifyListModRes      CRITICALITY ignore  TYPE PDUSessionList                      PRESENCE optional    }|
    { ID id-UserLocationInformation                         CRITICALITY ignore  TYPE UserLocationInformation            PRESENCE optional    }|
    { ID id-CriticalityDiagnostics                          CRITICALITY ignore  TYPE CriticalityDiagnostics             PRESENCE optional    },
    ...
}

PDUSessionResourceModifyListModRes ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer {
{PDUSessionResourceModifyItemModResIEs} }

PDUSessionResourceModifyItemModResIEs   NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceModifyItemModRes              CRITICALITY ignore  TYPE PDUSessionResourceModifyItemModRes  PRESENCE mandatory   },
    ...
}

PDUSessionResourceModifyItemModRes ::= SEQUENCE {
    pDUSessionID                                PDUSessionID,
    pDUSessionResourceModifyResponseTransfer    OCTET STRING (CONTAINING PDUSessionResourceModifyResponseTransfer),
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceModifyItemModRes-ExtIEs} }   OPTIONAL,
    ...
}

PDUSessionResourceModifyItemModRes-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- PDU Session Resource Notify Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- PDU SESSION RESOURCE NOTIFY
--
-- **************************************************************

PDUSessionResourceNotify ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PDUSessionResourceNotifyIEs} },
    ...
}

PDUSessionResourceNotifyIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                      CRITICALITY reject  TYPE AMF-UE-NGAP-ID                 PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                      CRITICALITY reject  TYPE RAN-UE-NGAP-ID                 PRESENCE mandatory   }|
    { ID id-PDUSessionResourceNotifyList        CRITICALITY reject  TYPE PDUSessionResourceNotifyList   PRESENCE optional    }|
    { ID id-PDUSessionResourceReleasedList      CRITICALITY ignore  TYPE PDUSessionList                 PRESENCE optional    }|
    { ID id-UserLocationInformation             CRITICALITY ignore  TYPE UserLocationInformation        PRESENCE optional    },
    ...
}

PDUSessionResourceNotifyList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer { {PDUSessionResourceNotifyItemIEs} }
```

```
PDUSessionResourceNotifyItemIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceNotifyItem        CRITICALITY reject  TYPE PDUSessionResourceNotifyItem     PRESENCE mandatory   },
    ...
}

PDUSessionResourceNotifyItem ::= SEQUENCE {
    pDUSessionID                        PDUSessionID,
    pDUSessionResourceNotifyTransfer    OCTET STRING (CONTAINING PDUSessionResourceNotifyTransfer),
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceNotifyItem-ExtIEs} }    OPTIONAL,
    ...
}

PDUSessionResourceNotifyItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- PDU Session Resource Modify Indication Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- PDU SESSION RESOURCE MODIFY INDICATION
--
-- **************************************************************

PDUSessionResourceModifyIndication ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PDUSessionResourceModifyIndicationIEs} },
    ...
}

PDUSessionResourceModifyIndicationIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY reject  TYPE AMF-UE-NGAP-ID                         PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY reject  TYPE RAN-UE-NGAP-ID                         PRESENCE mandatory   }|
    { ID id-PDUSessionResourceModifyListModInd      CRITICALITY reject  TYPE PDUSessionResourceModifyListModInd     PRESENCE mandatory   },
    ...
}

PDUSessionResourceModifyListModInd ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer {
{PDUSessionResourceModifyItemModIndIEs} }

PDUSessionResourceModifyItemModIndIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceModifyItemModInd      CRITICALITY reject  TYPE PDUSessionResourceModifyItemModInd     PRESENCE mandatory   },
    ...
}

PDUSessionResourceModifyItemModInd ::= SEQUENCE {
    pDUSessionID                                    PDUSessionID,
    pDUSessionResourceModifyIndicationTransfer      OCTET STRING (CONTAINING PDUSessionResourceModifyIndicationTransfer),
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceModifyItemModInd-ExtIEs} }   OPTIONAL,
    ...
}
```

```
PDUSessionResourceModifyItemModInd-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- PDU SESSION RESOURCE MODIFY CONFIRM
--
-- **************************************************************

PDUSessionResourceModifyConfirm ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PDUSessionResourceModifyConfirmIEs} },
    ...
}

PDUSessionResourceModifyConfirmIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY ignore  TYPE AMF-UE-NGAP-ID                         PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY ignore  TYPE RAN-UE-NGAP-ID                         PRESENCE mandatory   }|
    { ID id-PDUSessionResourceModifyListModCfm      CRITICALITY ignore  TYPE PDUSessionResourceModifyListModCfm     PRESENCE mandatory   }|
    { ID id-CriticalityDiagnostics                  CRITICALITY ignore  TYPE CriticalityDiagnostics                 PRESENCE optional    },
    ...
}

PDUSessionResourceModifyListModCfm ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer {
{PDUSessionResourceModifyItemModCfmIEs} }

PDUSessionResourceModifyItemModCfmIEs   NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceModifyItemModCfm      CRITICALITY reject  TYPE PDUSessionResourceModifyItemModCfm     PRESENCE mandatory   },
    ...
}

PDUSessionResourceModifyItemModCfm ::= SEQUENCE {
    pDUSessionID                                PDUSessionID,
    pDUSessionResourceModifyConfirmTransfer     OCTET STRING (CONTAINING PDUSessionResourceModifyConfirmTransfer),
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceModifyItemModCfm-ExtIEs} }   OPTIONAL,
    ...
}

PDUSessionResourceModifyItemModCfm-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- UE CONTEXT MANAGEMENT ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- Initial Context Setup Elementary Procedure
--
-- **************************************************************
```

```
-- **************************************************************
--
-- INITIAL CONTEXT SETUP REQUEST
--
-- **************************************************************

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

InitialContextSetupRequestIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY reject  TYPE AMF-UE-NGAP-ID                          PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY reject  TYPE RAN-UE-NGAP-ID                          PRESENCE mandatory   }|
    { ID id-OldAMF                                  CRITICALITY reject  TYPE AMFName                                 PRESENCE optional    }|
    { ID id-UEAggregateMaximumBitRate               CRITICALITY reject  TYPE UEAggregateMaximumBitRate               PRESENCE conditional }|
    { ID id-RRCInactiveAssistanceInformation        CRITICALITY ignore  TYPE RRCInactiveAssistanceInformation        PRESENCE optional    }|
    { ID id-GUAMI                                   CRITICALITY reject  TYPE GUAMI                                   PRESENCE mandatory   }|
    { ID id-PDUSessionResourceSetupListCxtReq       CRITICALITY reject  TYPE PDUSessionResourceSetupListCxtReq        PRESENCE optional    }|
    { ID id-AllowedNSSAI                            CRITICALITY ignore  TYPE AllowedNSSAI                            PRESENCE mandatory   }|
    { ID id-UESecurityCapabilities                  CRITICALITY reject  TYPE UESecurityCapabilities                  PRESENCE mandatory   }|
    { ID id-SecurityKey                             CRITICALITY reject  TYPE SecurityKey                             PRESENCE mandatory   }|
    { ID id-TraceActivation                         CRITICALITY ignore  TYPE TraceActivation                         PRESENCE optional    }|
    { ID id-MobilityRestrictionList                 CRITICALITY ignore  TYPE MobilityRestrictionList                 PRESENCE optional    }|
    { ID id-UERadioCapability                       CRITICALITY ignore  TYPE UERadioCapability                       PRESENCE optional    }|
    { ID id-IndexToRFSP                             CRITICALITY ignore  TYPE IndexToRFSP                             PRESENCE optional    }|
    { ID id-MaskedIMEISV                            CRITICALITY ignore  TYPE MaskedIMEISV                            PRESENCE optional    }|
    { ID id-NAS-PDU                                 CRITICALITY ignore  TYPE NAS-PDU                                 PRESENCE optional    }|
    { ID id-EmergencyFallbackIndicator              CRITICALITY reject  TYPE EmergencyFallbackIndicator              PRESENCE optional    },
    ...
}

PDUSessionResourceSetupListCxtReq ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer { {PDUSessionResourceSetupItemCxtReqIEs}
}

PDUSessionResourceSetupItemCxtReqIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceSetupItemCxtReq       CRITICALITY reject  TYPE PDUSessionResourceSetupItemCxtReq        PRESENCE mandatory   },
    ...
}

PDUSessionResourceSetupItemCxtReq ::= SEQUENCE {
    pDUSessionID                                PDUSessionID,
    nAS-PDU                                     NAS-PDU                                             OPTIONAL,
    s-NSSAI                                     S-NSSAI,
    pDUSessionResourceSetupRequestTransfer      OCTET STRING (CONTAINING PDUSessionResourceSetupRequestTransfer),
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceSetupItemCxtReq-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceSetupItemCxtReq-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
-- **************************************************************
--
-- INITIAL CONTEXT SETUP RESPONSE
--
-- **************************************************************

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

InitialContextSetupResponseIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY ignore  TYPE AMF-UE-NGAP-ID                         PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY ignore  TYPE RAN-UE-NGAP-ID                         PRESENCE mandatory   }|
    { ID id-PDUSessionResourceSetupListCxtRes       CRITICALITY ignore  TYPE PDUSessionResourceSetupListCxtRes      PRESENCE optional    }|
    { ID id-PDUSessionResourceFailedToSetupList     CRITICALITY ignore  TYPE PDUSessionList                         PRESENCE optional    }|
    { ID id-CriticalityDiagnostics                  CRITICALITY ignore  TYPE CriticalityDiagnostics                 PRESENCE optional    },
    ...
}

PDUSessionResourceSetupListCxtRes ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer { {PDUSessionResourceSetupItemCxtResIEs}
}

PDUSessionResourceSetupItemCxtResIEs    NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceSetupItemCxtRes    CRITICALITY ignore TYPE PDUSessionResourceSetupItemCxtRes PRESENCE mandatory },
    ...
}

PDUSessionResourceSetupItemCxtRes ::= SEQUENCE {
    pDUSessionID                                        PDUSessionID,
    pDUSessionResourceSetupResponseTransfer             OCTET STRING (CONTAINING PDUSessionResourceSetupResponseTransfer),
    additionalPDUSessionResourceSetupResponseTransfer   OCTET STRING (CONTAINING PDUSessionResourceSetupResponseTransfer)     OPTIONAL,
    iE-Extensions                                     ProtocolExtensionContainer { {PDUSessionResourceSetupItemCxtRes-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceSetupItemCxtRes-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- INITIAL CONTEXT SETUP FAILURE
--
-- **************************************************************

InitialContextSetupFailure ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {InitialContextSetupFailureIEs} },
    ...
}

InitialContextSetupFailureIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY ignore  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY ignore  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory  }|
```

```
    { ID id-Cause                     CRITICALITY ignore  TYPE Cause                     PRESENCE mandatory  }|
    { ID id-CriticalityDiagnostics    CRITICALITY ignore  TYPE CriticalityDiagnostics    PRESENCE optional   },
    ...
}

-- **************************************************************
--
-- UE Context Release Request Elementary Procedure
--
-- **************************************************************

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

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

UEContextReleaseRequest-IEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID      CRITICALITY reject  TYPE AMF-UE-NGAP-ID     PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID      CRITICALITY reject  TYPE RAN-UE-NGAP-ID     PRESENCE mandatory  }|
    { ID id-Cause               CRITICALITY ignore  TYPE Cause              PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- UE Context Release Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- UE CONTEXT RELEASE COMMAND
--
-- **************************************************************

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

UEContextReleaseCommand-IEs NGAP-PROTOCOL-IES ::= {
    { ID id-UE-NGAP-IDs             CRITICALITY reject  TYPE UE-NGAP-IDs            PRESENCE mandatory  }|
    { ID id-RANPagingPriority       CRITICALITY ignore  TYPE RANPagingPriority      PRESENCE optional   }|
    { ID id-Cause                   CRITICALITY ignore  TYPE Cause                  PRESENCE mandatory  },
    ...
}

-- **************************************************************
```

```
--
-- UE CONTEXT RELEASE COMPLETE
--
-- **************************************************************

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

UEContextReleaseComplete-IEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                              CRITICALITY ignore  TYPE AMF-UE-NGAP-ID                              PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                              CRITICALITY ignore  TYPE RAN-UE-NGAP-ID                              PRESENCE mandatory   }|
    { ID id-UserLocationInformation                     CRITICALITY ignore  TYPE UserLocationInformation                     PRESENCE optional    }|
    { ID id-InfoOnRecommendedCellsAndRANNodesForPaging  CRITICALITY ignore  TYPE InfoOnRecommendedCellsAndRANNodesForPaging  PRESENCE optional    }|
    { ID id-CriticalityDiagnostics                      CRITICALITY ignore  TYPE CriticalityDiagnostics                      PRESENCE optional    },
    ...
}

-- **************************************************************
--
-- UE Context Modification Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- UE CONTEXT MODIFICATION REQUEST
--
-- **************************************************************

UEContextModificationRequest ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {UEContextModificationRequestIEs} },
    ...
}

UEContextModificationRequestIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY reject  TYPE AMF-UE-NGAP-ID                    PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY reject  TYPE RAN-UE-NGAP-ID                    PRESENCE mandatory   }|
    { ID id-RANPagingPriority                       CRITICALITY ignore  TYPE RANPagingPriority                 PRESENCE optional    }|
    { ID id-SecurityKey                             CRITICALITY reject  TYPE SecurityKey                       PRESENCE optional    }|
    { ID id-IndexToRFSP                             CRITICALITY ignore  TYPE IndexToRFSP                       PRESENCE optional    }|
    { ID id-UEAggregateMaximumBitRate               CRITICALITY ignore  TYPE UEAggregateMaximumBitRate          PRESENCE optional    }|
    { ID id-UESecurityCapabilities                  CRITICALITY reject  TYPE UESecurityCapabilities             PRESENCE optional    }|
    { ID id-RRCInactiveAssistanceInformation        CRITICALITY ignore  TYPE RRCInactiveAssistanceInformation   PRESENCE optional    }|
    { ID id-EmergencyFallbackIndicator              CRITICALITY reject  TYPE EmergencyFallbackIndicator         PRESENCE optional    }|
    { ID id-NewAMF-UE-NGAP-ID                       CRITICALITY ignore  TYPE AMF-UE-NGAP-ID                    PRESENCE optional    },
    ...
}

-- **************************************************************
--
-- UE CONTEXT MODIFICATION RESPONSE
--
```

```
-- ************************************************************

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

UEContextModificationResponseIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY ignore  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY ignore  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional   },
    ...
}

-- ************************************************************
--
-- UE CONTEXT MODIFICATION FAILURE
--
-- ************************************************************

UEContextModificationFailure ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {UEContextModificationFailureIEs} },
    ...
}

UEContextModificationFailureIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY ignore  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY ignore  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory  }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional   },
    ...
}

-- ************************************************************
--
-- UE MOBILITY MANAGEMENT ELEMENTARY PROCEDURES
--
-- ************************************************************

-- ************************************************************
--
-- Handover Preparation Elementary Procedure
--
-- ************************************************************

-- ************************************************************
--
-- HANDOVER REQUIRED
--
-- ************************************************************

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

```
}

HandoverRequiredIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY reject  TYPE AMF-UE-NGAP-ID                          PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY reject  TYPE RAN-UE-NGAP-ID                          PRESENCE mandatory   }|
    { ID id-HandoverType                            CRITICALITY reject  TYPE HandoverType                            PRESENCE mandatory   }|
    { ID id-Cause                                   CRITICALITY ignore  TYPE Cause                                   PRESENCE mandatory   }|
    { ID id-TargetID                                CRITICALITY reject  TYPE TargetID                                PRESENCE mandatory   }|
    { ID id-DirectForwardingPathAvailability        CRITICALITY ignore  TYPE DirectForwardingPathAvailability        PRESENCE optional    }|
    { ID id-PDUSessionResourceListHORqd             CRITICALITY reject  TYPE PDUSessionResourceListHORqd             PRESENCE mandatory   }|
    { ID id-SourceToTarget-TransparentContainer     CRITICALITY reject  TYPE SourceToTarget-TransparentContainer     PRESENCE mandatory   },
    ...
}

PDUSessionResourceListHORqd ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer { {PDUSessionResourceItemHORqdIEs} }

PDUSessionResourceItemHORqdIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceItemHORqd             CRITICALITY reject  TYPE PDUSessionResourceItemHORqd             PRESENCE mandatory   },
    ...
}

PDUSessionResourceItemHORqd ::= SEQUENCE {
    pDUSessionID                    PDUSessionID,
    s-NSSAI                         S-NSSAI,
    handoverRequiredTransfer        OCTET STRING (CONTAINING PDUSessionResourceSetupRequestTransfer),
    pDUSessionResourceSubjectToHandover     PDUSessionResourceSubjectToHandover,
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceItemHORqd-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceItemHORqd-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- HANDOVER COMMAND
--
-- **************************************************************

HandoverCommand ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {HandoverCommandIEs} },
    ...
}

HandoverCommandIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                              CRITICALITY reject  TYPE AMF-UE-NGAP-ID                              PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                              CRITICALITY reject  TYPE RAN-UE-NGAP-ID                              PRESENCE mandatory   }|
    { ID id-HandoverType                                CRITICALITY reject  TYPE HandoverType                                PRESENCE mandatory   }|
    { ID id-PDUSessionResourceSubjectToForwardingList   CRITICALITY ignore  TYPE PDUSessionResourceSubjectToForwardingList  PRESENCE optional    }|
    { ID id-PDUSessionResourceToReleaseList             CRITICALITY ignore  TYPE PDUSessionList                              PRESENCE optional    }|
    { ID id-TargetToSource-TransparentContainer         CRITICALITY reject  TYPE TargetToSource-TransparentContainer         PRESENCE mandatory   }|
    { ID id-CriticalityDiagnostics                      CRITICALITY ignore  TYPE CriticalityDiagnostics                      PRESENCE optional    },
    ...
```

```
}

PDUSessionResourceSubjectToForwardingList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer {
{PDUSessionResourceSubjectToForwardingItemIEs} }

PDUSessionResourceSubjectToForwardingItemIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceSubjectToForwardingItem    CRITICALITY reject TYPE PDUSessionResourceSubjectToForwardingItem  PRESENCE mandatory   },
    ...
}

PDUSessionResourceSubjectToForwardingItem ::= SEQUENCE {
    pDUSessionID                        PDUSessionID,
    handoverCommandTransfer             OCTET STRING (CONTAINING HandoverCommandTransfer)                 OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceSubjectToForwardingItem-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceSubjectToForwardingItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- HANDOVER PREPARATION FAILURE
--
-- **************************************************************

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

HandoverPreparationFailureIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY ignore  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY ignore  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory  }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional   },
    ...
}

-- **************************************************************
--
-- Handover Resource Allocation Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- HANDOVER REQUEST
--
-- **************************************************************

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

```
    ...
}

HandoverRequestIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY reject  TYPE AMF-UE-NGAP-ID                          PRESENCE mandatory   }|
    { ID id-HandoverType                            CRITICALITY reject  TYPE HandoverType                        PRESENCE mandatory   }|
    { ID id-Cause                                   CRITICALITY ignore  TYPE Cause                               PRESENCE mandatory   }|
    { ID id-UEAggregateMaximumBitRate               CRITICALITY reject  TYPE UEAggregateMaximumBitRate           PRESENCE mandatory   }|
    { ID id-RRCInactiveAssistanceInformation        CRITICALITY ignore  TYPE RRCInactiveAssistanceInformation    PRESENCE optional    }|
    { ID id-UESecurityCapabilities                  CRITICALITY reject  TYPE UESecurityCapabilities              PRESENCE mandatory   }|
    { ID id-SecurityContext                         CRITICALITY reject  TYPE SecurityContext                     PRESENCE mandatory   }|
    { ID id-KamfChangeInd                           CRITICALITY reject  TYPE KamfChangeInd                       PRESENCE optional    }|
    { ID id-NASC                                    CRITICALITY reject  TYPE NAS-PDU                             PRESENCE optional    }|
    { ID id-PDUSessionResourceSetupListHOReq        CRITICALITY reject  TYPE PDUSessionResourceSetupListHOReq     PRESENCE mandatory   }|
    { ID id-TraceActivation                         CRITICALITY ignore  TYPE TraceActivation                     PRESENCE optional    }|
    { ID id-MaskedIMEISV                            CRITICALITY ignore  TYPE MaskedIMEISV                        PRESENCE optional    }|
    { ID id-SourceToTarget-TransparentContainer     CRITICALITY reject  TYPE SourceToTarget-TransparentContainer PRESENCE mandatory   }|
    { ID id-MobilityRestrictionList                 CRITICALITY ignore  TYPE MobilityRestrictionList             PRESENCE optional    }|
    { ID id-LocationReportingRequestType            CRITICALITY ignore  TYPE LocationReportingRequestType        PRESENCE optional    },
    ...
}

PDUSessionResourceSetupListHOReq ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer { {PDUSessionResourceSetupItemHOReqIEs} }

PDUSessionResourceSetupItemHOReqIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceSetupItemHOReq        CRITICALITY reject  TYPE PDUSessionResourceSetupItemHOReq    PRESENCE mandatory   },
    ...
}

PDUSessionResourceSetupItemHOReq ::= SEQUENCE {
    pDUSessionID                PDUSessionID,
    s-NSSAI                     S-NSSAI,
    handoverRequestTransfer     OCTET STRING (CONTAINING PDUSessionResourceSetupRequestTransfer),
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceSetupItemHOReq-ExtIEs} }  OPTIONAL,
    ...
}

PDUSessionResourceSetupItemHOReq-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- HANDOVER REQUEST ACKNOWLEDGE
--
-- **************************************************************

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

HandoverRequestAcknowledgeIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY ignore  TYPE AMF-UE-NGAP-ID                      PRESENCE mandatory   }|
```

```
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY ignore  TYPE RAN-UE-NGAP-ID                          PRESENCE mandatory   }|
    { ID id-PDUSessionResourceAdmittedList          CRITICALITY ignore  TYPE PDUSessionResourceAdmittedList         PRESENCE mandatory   }|
    { ID id-PDUSessionResourceFailedToSetupList     CRITICALITY ignore  TYPE PDUSessionList                          PRESENCE optional    }|
    { ID id-TargetToSource-TransparentContainer     CRITICALITY reject  TYPE TargetToSource-TransparentContainer    PRESENCE mandatory   }|
    { ID id-CriticalityDiagnostics                  CRITICALITY ignore  TYPE CriticalityDiagnostics                 PRESENCE optional    },
    ...
}

PDUSessionResourceAdmittedList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer { {PDUSessionResourceAdmittedItemIEs} }

PDUSessionResourceAdmittedItemIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceAdmittedItem          CRITICALITY ignore  TYPE PDUSessionResourceAdmittedItem         PRESENCE mandatory   },
    ...
}

PDUSessionResourceAdmittedItem ::= SEQUENCE {
    pDUSessionID                            PDUSessionID,
    handoverRequestAcknowledgeTransfer      OCTET STRING (CONTAINING HandoverRequestAcknowledgeTransfer),
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceAdmittedItem-ExtIEs} }  OPTIONAL,
    ...
}

PDUSessionResourceAdmittedItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- HANDOVER FAILURE
--
-- **************************************************************

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

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

-- **************************************************************
--
-- Handover Notification Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- HANDOVER NOTIFY
--
```

```
-- ************************************************************

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

HandoverNotifyIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY reject  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY reject  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-UserLocationInformation     CRITICALITY ignore  TYPE UserLocationInformation    PRESENCE optional   },
    ...
}

-- ************************************************************
--
-- Path Switch Request Elementary Procedure
--
-- ************************************************************

-- ************************************************************
--
-- PATH SWITCH REQUEST
--
-- ************************************************************

PathSwitchRequest ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { { PathSwitchRequestIEs} },
    ...
}

PathSwitchRequestIEs NGAP-PROTOCOL-IES ::= {
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY reject  TYPE RAN-UE-NGAP-ID                         PRESENCE mandatory  }|
    { ID id-SourceAMF-UE-NGAP-ID                    CRITICALITY reject  TYPE AMF-UE-NGAP-ID                         PRESENCE mandatory  }|
    { ID id-UserLocationInformation                 CRITICALITY ignore  TYPE UserLocationInformation                PRESENCE mandatory  }|
    { ID id-UESecurityCapabilities                  CRITICALITY ignore  TYPE UESecurityCapabilities                 PRESENCE mandatory  }|
    { ID id-PDUSessionResourceToBeSwitchedDLList    CRITICALITY reject  TYPE PDUSessionResourceToBeSwitchedDLList   PRESENCE mandatory  }|
    { ID id-PDUSessionResourceFailedToSetupList     CRITICALITY ignore  TYPE PDUSessionList                         PRESENCE optional   },
    ...
}

PDUSessionResourceToBeSwitchedDLList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer {
{PDUSessionResourceToBeSwitchedDLItemIEs} }

PDUSessionResourceToBeSwitchedDLItemIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceToBeSwitchedDLItem    CRITICALITY reject  TYPE PDUSessionResourceToBeSwitchedDLItem   PRESENCE mandatory  },
    ...
}

PDUSessionResourceToBeSwitchedDLItem ::= SEQUENCE {
    pDUSessionID                PDUSessionID,
    pathSwitchRequestTransfer   OCTET STRING (CONTAINING PathSwitchRequestTransfer),
    iE-Extensions       ProtocolExtensionContainer { { PDUSessionResourceToBeSwitchedDLItem-ExtIEs} }   OPTIONAL,
    ...
```

```
}

PDUSessionResourceToBeSwitchedDLItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- PATH SWITCH REQUEST ACKNOWLEDGE
--
-- **************************************************************

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

PathSwitchRequestAcknowledgeIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                              CRITICALITY ignore  TYPE AMF-UE-NGAP-ID                          PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                              CRITICALITY ignore  TYPE RAN-UE-NGAP-ID                          PRESENCE mandatory   }|
    { ID id-UESecurityCapabilities                      CRITICALITY reject  TYPE UESecurityCapabilities                  PRESENCE optional    }|
    { ID id-SecurityContext                             CRITICALITY reject  TYPE SecurityContext                         PRESENCE mandatory   }|
    { ID id-KamfChangeInd                               CRITICALITY reject  TYPE KamfChangeInd                           PRESENCE optional    }|
    { ID id-PDUSessionResourceToBeSwitchedULList        CRITICALITY ignore  TYPE PDUSessionResourceToBeSwitchedULList    PRESENCE optional    }|
    { ID id-PDUSessionResourceReleasedList              CRITICALITY ignore  TYPE PDUSessionList                          PRESENCE optional    }|
    { ID id-RRCInactiveAssistanceInformation            CRITICALITY ignore  TYPE RRCInactiveAssistanceInformation        PRESENCE optional    }|
    { ID id-CriticalityDiagnostics                      CRITICALITY ignore  TYPE CriticalityDiagnostics                  PRESENCE optional    },
    ...
}

PDUSessionResourceToBeSwitchedULList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF ProtocolIE-SingleContainer {
{PDUSessionResourceToBeSwitchedULItemIEs} }

PDUSessionResourceToBeSwitchedULItemIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionResourceToBeSwitchedULItem        CRITICALITY reject  TYPE PDUSessionResourceToBeSwitchedULItem    PRESENCE mandatory   },
    ...
}

PDUSessionResourceToBeSwitchedULItem ::= SEQUENCE {
    pDUSessionID                    PDUSessionID,
    pathSwitchRequestTransfer       OCTET STRING (CONTAINING PathSwitchRequestAcknowledgeTransfer),
    iE-Extensions       ProtocolExtensionContainer { { PDUSessionResourceToBeSwitchedULItem-ExtIEs} }   OPTIONAL,
    ...
}

PDUSessionResourceToBeSwitchedULItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- PATH SWITCH REQUEST FAILURE
--
-- **************************************************************
```

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

PathSwitchRequestFailureIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY ignore  TYPE AMF-UE-NGAP-ID                PRESENCE mandatory }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY ignore  TYPE RAN-UE-NGAP-ID                PRESENCE mandatory }|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                         PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics        PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- Handover Cancellation Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- HANDOVER CANCEL
--
-- **************************************************************

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

HandoverCancelIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID      CRITICALITY reject  TYPE AMF-UE-NGAP-ID     PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID      CRITICALITY reject  TYPE RAN-UE-NGAP-ID     PRESENCE mandatory  }|
    { ID id-Cause               CRITICALITY ignore  TYPE Cause              PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- HANDOVER CANCEL ACKNOWLEDGE
--
-- **************************************************************

HandoverCancelAcknowledge ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { { HandoverCancelAcknowledgeIEs} },
    ...
}

HandoverCancelAcknowledgeIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY ignore  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY ignore  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional },
    ...
```

```
}

-- **************************************************************
--
-- Uplink RAN Status Transfer Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- UPLINK RAN STATUS TRANSFER
--
-- **************************************************************

UplinkRANStatusTransfer ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {UplinkRANStatusTransferIEs} },
    ...
}

UplinkRANStatusTransferIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY reject  TYPE AMF-UE-NGAP-ID                          PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY reject  TYPE RAN-UE-NGAP-ID                          PRESENCE mandatory   }|
    { ID id-RANStatusTransfer-TransparentContainer      CRITICALITY reject  TYPE RANStatusTransfer-TransparentContainer     PRESENCE mandatory   },
    ...
}

-- **************************************************************
--
-- Downlink RAN Status Transfer Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- DOWNLINK RAN STATUS TRANSFER
--
-- **************************************************************

DownlinkRANStatusTransfer ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {DownlinkRANStatusTransferIEs} },
    ...
}

DownlinkRANStatusTransferIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                          CRITICALITY reject  TYPE AMF-UE-NGAP-ID                          PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                          CRITICALITY reject  TYPE RAN-UE-NGAP-ID                          PRESENCE mandatory   }|
    { ID id-RANStatusTransfer-TransparentContainer      CRITICALITY reject  TYPE RANStatusTransfer-TransparentContainer     PRESENCE mandatory   },
    ...
}

-- **************************************************************
--
-- PAGING ELEMENTARY PROCEDURE
--
```

```
-- ****************************************************************

-- ****************************************************************
--
-- PAGING
--
-- ****************************************************************

Paging ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PagingIEs} },
    ...
}

PagingIEs NGAP-PROTOCOL-IES ::= {
    { ID id-UEIdentityIndexValue            CRITICALITY ignore  TYPE UEIdentityIndexValue        PRESENCE mandatory  }|
    { ID id-UEPagingIdentity                CRITICALITY ignore  TYPE UEPagingIdentity            PRESENCE mandatory  }|
    { ID id-PagingDRX                       CRITICALITY ignore  TYPE PagingDRX                   PRESENCE optional   }|
    { ID id-TAIList                         CRITICALITY ignore  TYPE TAIList                     PRESENCE mandatory  }|
    { ID id-PagingPriority                  CRITICALITY ignore  TYPE PagingPriority              PRESENCE optional   }|
    { ID id-UERadioCapabilityForPaging      CRITICALITY ignore  TYPE UERadioCapabilityForPaging  PRESENCE optional   }|
    { ID id-PagingOrigin                    CRITICALITY ignore  TYPE PagingOrigin                PRESENCE optional   }|
    { ID id-AssistanceDataForPaging         CRITICALITY ignore  TYPE AssistanceDataForPaging     PRESENCE optional   },
    ...
}

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

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

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

TAIItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ****************************************************************
--
-- NAS TRANSPORT ELEMENTARY PROCEDURES
--
-- ****************************************************************

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

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

InitialUEMessage-IEs NGAP-PROTOCOL-IES ::= {
    { ID id-RAN-UE-NGAP-ID              CRITICALITY reject  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-NAS-PDU                     CRITICALITY reject  TYPE NAS-PDU                     PRESENCE mandatory  }|
    { ID id-UserLocationInformation     CRITICALITY reject  TYPE UserLocationInformation     PRESENCE mandatory  }|
    { ID id-RRCEstablishmentCause       CRITICALITY ignore  TYPE RRCEstablishmentCause       PRESENCE optional   }|
    { ID id-FiveG-S-TMSI                CRITICALITY reject  TYPE FiveG-S-TMSI                PRESENCE optional   }|
    { ID id-GUAMI                       CRITICALITY reject  TYPE GUAMI                       PRESENCE optional   }|
    { ID id-AMFSetID                    CRITICALITY ignore  TYPE AMFSetID                    PRESENCE optional   }|
    { ID id-UEContextRequest            CRITICALITY ignore  TYPE UEContextRequest            PRESENCE optional   },
    ...
}

-- **************************************************************
--
-- DOWNLINK NAS TRANSPORT
--
-- **************************************************************

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

DownlinkNASTransport-IEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                  CRITICALITY reject  TYPE AMF-UE-NGAP-ID              PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID                  CRITICALITY reject  TYPE RAN-UE-NGAP-ID              PRESENCE mandatory  }|
    { ID id-OldAMF                          CRITICALITY reject  TYPE AMFName                     PRESENCE optional   }|
    { ID id-RANPagingPriority               CRITICALITY ignore  TYPE RANPagingPriority           PRESENCE optional   }|
    { ID id-NAS-PDU                         CRITICALITY reject  TYPE NAS-PDU                     PRESENCE mandatory  }|
    { ID id-MobilityRestrictionList         CRITICALITY ignore  TYPE MobilityRestrictionList     PRESENCE optional   }|
    { ID id-IndexToRFSP                     CRITICALITY ignore  TYPE IndexToRFSP                 PRESENCE optional   }|
    { ID id-UEAggregateMaximumBitRate       CRITICALITY ignore  TYPE UEAggregateMaximumBitRate   PRESENCE optional   },
    ...
}

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

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

UplinkNASTransport-IEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY reject  TYPE AMF-UE-NGAP-ID              PRESENCE mandatory }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY reject  TYPE RAN-UE-NGAP-ID              PRESENCE mandatory }|
```

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

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

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

NASNonDeliveryIndication-IEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID      CRITICALITY reject  TYPE AMF-UE-NGAP-ID     PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID      CRITICALITY reject  TYPE RAN-UE-NGAP-ID     PRESENCE mandatory  }|
    { ID id-NAS-PDU             CRITICALITY ignore  TYPE NAS-PDU            PRESENCE mandatory  }|
    { ID id-Cause               CRITICALITY ignore  TYPE Cause              PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- REROUTE NAS REQUEST
--
-- **************************************************************

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

RerouteNASRequest-IEs NGAP-PROTOCOL-IES ::= {
    { ID id-RAN-UE-NGAP-ID          CRITICALITY reject  TYPE RAN-UE-NGAP-ID         PRESENCE mandatory  }|
    { ID id-AMF-UE-NGAP-ID          CRITICALITY ignore  TYPE AMF-UE-NGAP-ID         PRESENCE optional   }|
    { ID id-NGAP-Message            CRITICALITY reject  TYPE OCTET STRING           PRESENCE mandatory  }|
    { ID id-AMFSetID                CRITICALITY reject  TYPE AMFSetID               PRESENCE mandatory  }|
    { ID id-AllowedNSSAI            CRITICALITY ignore  TYPE AllowedNSSAI           PRESENCE optional   },
    ...
}

-- **************************************************************
--
-- INTERFACE MANAGEMENT ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- NG Setup Elementary Procedure
--
```

```
-- **************************************************************

-- **************************************************************
--
-- NG SETUP REQUEST
--
-- **************************************************************

NGSetupRequest ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {NGSetupRequestIEs} },
    ...
}

NGSetupRequestIEs NGAP-PROTOCOL-IES ::= {
    { ID id-GlobalRANNodeID         CRITICALITY reject  TYPE GlobalRANNodeID    PRESENCE mandatory  }|
    { ID id-RANNodeName             CRITICALITY ignore  TYPE RANNodeName        PRESENCE optional   }|
    { ID id-SupportedTAList         CRITICALITY reject  TYPE SupportedTAList    PRESENCE mandatory  }|
    { ID id-DefaultPagingDRX        CRITICALITY ignore  TYPE PagingDRX          PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- NG SETUP RESPONSE
--
-- **************************************************************

NGSetupResponse ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {NGSetupResponseIEs} },
    ...
}

NGSetupResponseIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMFName                     CRITICALITY reject  TYPE AMFName                    PRESENCE mandatory  }|
    { ID id-ServedGUAMIList             CRITICALITY reject  TYPE ServedGUAMIList            PRESENCE mandatory  }|
    { ID id-RelativeAMFCapacity         CRITICALITY ignore  TYPE RelativeAMFCapacity        PRESENCE mandatory  }|
    { ID id-PLMNSupportList             CRITICALITY reject  TYPE PLMNSupportList            PRESENCE mandatory  }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional   },
    ...
}

-- **************************************************************
--
-- NG SETUP FAILURE
--
-- **************************************************************

NGSetupFailure ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {NGSetupFailureIEs} },
    ...
}

NGSetupFailureIEs NGAP-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   },
    ...
}

-- **************************************************************
--
-- RAN Configuration Update Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- RAN CONFIGURATION UPDATE
--
-- **************************************************************

RANConfigurationUpdate ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {RANConfigurationUpdateIEs} },
    ...
}

RANConfigurationUpdateIEs NGAP-PROTOCOL-IES ::= {
    { ID id-RANNodeName             CRITICALITY ignore  TYPE RANNodeName            PRESENCE optional  }|
    { ID id-SupportedTAList         CRITICALITY reject  TYPE SupportedTAList        PRESENCE optional  }|
    { ID id-DefaultPagingDRX        CRITICALITY ignore  TYPE PagingDRX              PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- RAN CONFIGURATION UPDATE ACKNOWLEDGE
--
-- **************************************************************

RANConfigurationUpdateAcknowledge ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {RANConfigurationUpdateAcknowledgeIEs} },
    ...
}

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

-- **************************************************************
--
-- RAN CONFIGURATION UPDATE FAILURE
--
-- **************************************************************

RANConfigurationUpdateFailure ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {RANConfigurationUpdateFailureIEs} },
    ...
```

```
}

RANConfigurationUpdateFailureIEs NGAP-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   },
...
}

-- **************************************************************
--
-- AMF Configuration Update Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- AMF CONFIGURATION UPDATE
--
-- **************************************************************

AMFConfigurationUpdate ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {AMFConfigurationUpdateIEs} },
    ...
}

AMFConfigurationUpdateIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMFName                             CRITICALITY reject  TYPE AMFName                            PRESENCE optional    }|
    { ID id-ServedGUAMIList                     CRITICALITY reject  TYPE ServedGUAMIList                    PRESENCE optional    }|
    { ID id-RelativeAMFCapacity                 CRITICALITY ignore  TYPE RelativeAMFCapacity                PRESENCE optional    }|
    { ID id-PLMNSupportList                     CRITICALITY reject  TYPE PLMNSupportList                    PRESENCE optional    }|
    { ID id-AMF-TNLAssociationToAddList         CRITICALITY ignore  TYPE AMF-TNLAssociationToAddList        PRESENCE optional    }|
    { ID id-AMF-TNLAssociationToRemoveList      CRITICALITY ignore  TYPE AMF-TNLAssociationToRemoveList     PRESENCE optional    }|
    { ID id-AMF-TNLAssociationToUpdateList      CRITICALITY ignore  TYPE AMF-TNLAssociationToUpdateList     PRESENCE optional    },
    ...
}

AMF-TNLAssociationToAddList ::= SEQUENCE (SIZE(1..maxnoofTNLAssociations)) OF ProtocolIE-SingleContainer { {AMF-TNLAssociationToAddItemIEs} }

AMF-TNLAssociationToAddItemIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-TNLAssociationToAddItem         CRITICALITY reject  TYPE AMF-TNLAssociationToAddItem    PRESENCE mandatory   },
    ...
}

AMF-TNLAssociationToAddItem ::= SEQUENCE {
    aMF-TNLAssociationAddress           CPTransportLayerInformation,
    tNLAssociationUsage                 TNLAssociationUsage                             OPTIONAL,
    tNLAssociationWeightFactor          TNLAssociationWeightFactor,
    iE-Extensions       ProtocolExtensionContainer { {AMF-TNLAssociationToAddItem-ExtIEs} } OPTIONAL,
    ...
}

AMF-TNLAssociationToAddItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}

AMF-TNLAssociationToRemoveList ::= SEQUENCE (SIZE(1..maxnoofTNLAssociations)) OF ProtocolIE-SingleContainer { {AMF-TNLAssociationToRemoveItemIEs} }

AMF-TNLAssociationToRemoveItemIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-TNLAssociationToRemoveItem          CRITICALITY reject  TYPE AMF-TNLAssociationToRemoveItem     PRESENCE mandatory   },
    ...
}

AMF-TNLAssociationToRemoveItem ::= SEQUENCE {
    aMF-TNLAssociationAddress       CPTransportLayerInformation,
    iE-Extensions       ProtocolExtensionContainer { {AMF-TNLAssociationToRemoveItem-ExtIEs} }  OPTIONAL,
    ...
}

AMF-TNLAssociationToRemoveItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AMF-TNLAssociationToUpdateList ::= SEQUENCE (SIZE(1..maxnoofTNLAssociations)) OF ProtocolIE-SingleContainer { {AMF-TNLAssociationToUpdateItemIEs} }

AMF-TNLAssociationToUpdateItemIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-TNLAssociationToUpdateItem          CRITICALITY reject  TYPE AMF-TNLAssociationToUpdateItem     PRESENCE mandatory   },
    ...
}

AMF-TNLAssociationToUpdateItem ::= SEQUENCE {
    aMF-TNLAssociationAddress           CPTransportLayerInformation,
    tNLAssociationUsage                 TNLAssociationUsage                                 OPTIONAL,
    tNLAssociationWeightFactor          TNLAssociationWeightFactor                          OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {AMF-TNLAssociationToUpdateItem-ExtIEs} }  OPTIONAL,
    ...
}

AMF-TNLAssociationToUpdateItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- AMF CONFIGURATION UPDATE ACKNOWLEDGE
--
-- **************************************************************

AMFConfigurationUpdateAcknowledge ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {AMFConfigurationUpdateAcknowledgeIEs} },
    ...
}

AMFConfigurationUpdateAcknowledgeIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-TNLAssociationSetupList             CRITICALITY ignore  TYPE AMF-TNLAssociationSetupList        PRESENCE optional    }|
    { ID id-AMF-TNLAssociationFailedToSetupList     CRITICALITY ignore  TYPE TNLAssociationList                 PRESENCE optional    }|
    { ID id-CriticalityDiagnostics                  CRITICALITY ignore  TYPE CriticalityDiagnostics             PRESENCE optional    },
    ...
```

```
}

AMF-TNLAssociationSetupList ::= SEQUENCE (SIZE(1..maxnoofTNLAssociations)) OF ProtocolIE-SingleContainer { {AMF-TNLAssociationSetupItemIEs} }

AMF-TNLAssociationSetupItemIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-TNLAssociationSetupItem         CRITICALITY reject  TYPE AMF-TNLAssociationSetupItem    PRESENCE mandatory   },
    ...
}

AMF-TNLAssociationSetupItem ::= SEQUENCE {
    aMF-TNLAssociationAddress       CPTransportLayerInformation,
    iE-Extensions       ProtocolExtensionContainer { {AMF-TNLAssociationSetupItem-ExtIEs} } OPTIONAL,
    ...
}

AMF-TNLAssociationSetupItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- AMF CONFIGURATION UPDATE FAILURE
--
-- **************************************************************

AMFConfigurationUpdateFailure ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {AMFConfigurationUpdateFailureIEs} },
    ...
}

AMFConfigurationUpdateFailureIEs NGAP-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   },
    ...
}

-- **************************************************************
--
-- AMF Status Indication Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- AMF STATUS INDICATION
--
-- **************************************************************

AMFStatusIndication ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {AMFStatusIndicationIEs} },
    ...
}
```

```
AMFStatusIndicationIEs NGAP-PROTOCOL-IES ::= {
    { ID id-UnavailableGUAMIList        CRITICALITY reject  TYPE UnavailableGUAMIList       PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- NG Reset Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- NG RESET
--
-- **************************************************************

NGReset ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {NGResetIEs} },
    ...
}

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

ResetType ::= CHOICE {
    nG-Interface            ResetAll,
    partOfNG-Interface      UE-associatedLogicalNG-ConnectionListRes,
    ...
}

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

UE-associatedLogicalNG-ConnectionListRes ::= SEQUENCE (SIZE(1..maxnoofNGConnectionsToReset)) OF ProtocolIE-SingleContainer { {UE-
associatedLogicalNG-ConnectionItemResIEs} }

UE-associatedLogicalNG-ConnectionItemResIEs NGAP-PROTOCOL-IES ::= {
    { ID id-UE-associatedLogicalNG-ConnectionItem   CRITICALITY reject  TYPE UE-associatedLogicalNG-ConnectionItem    PRESENCE mandatory},
    ...
}

-- **************************************************************
--
-- NG RESET ACKNOWLEDGE
--
-- **************************************************************

NGResetAcknowledge ::= SEQUENCE {
```

```
    protocolIEs     ProtocolIE-Container        { {NGResetAcknowledgeIEs} },
    ...
}

NGResetAcknowledgeIEs NGAP-PROTOCOL-IES ::= {
    { ID id-UE-associatedLogicalNG-ConnectionListResAck     CRITICALITY ignore  TYPE UE-associatedLogicalNG-ConnectionListResAck  PRESENCE optional
    }|
    { ID id-CriticalityDiagnostics                          CRITICALITY ignore  TYPE CriticalityDiagnostics                      PRESENCE optional
    },
    ...
}

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

UE-associatedLogicalNG-ConnectionItemResAck NGAP-PROTOCOL-IES ::= {
    { ID id-UE-associatedLogicalNG-ConnectionItem           CRITICALITY ignore  TYPE UE-associatedLogicalNG-ConnectionItem        PRESENCE
mandatory },
    ...
}

-- **************************************************************
--
-- Error Indication Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- ERROR INDICATION
--
-- **************************************************************

ErrorIndication ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {ErrorIndicationIEs} },
    ...
}

ErrorIndicationIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY ignore  TYPE AMF-UE-NGAP-ID             PRESENCE optional   }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY ignore  TYPE RAN-UE-NGAP-ID             PRESENCE optional   }|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE optional   }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional   },
    ...
}

-- **************************************************************
--
-- CONFIGURATION TRANSFER ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
```

```
-- UPLINK RAN CONFIGURATION TRANSFER
--
-- **************************************************************

UplinkRANConfigurationTransfer ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {UplinkRANConfigurationTransferIEs} },
    ...
}

UplinkRANConfigurationTransferIEs NGAP-PROTOCOL-IES ::= {
    { ID id-SONConfigurationTransferUL      CRITICALITY ignore  TYPE SONConfigurationTransfer   PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- DOWNLINK RAN CONFIGURATION TRANSFER
--
-- **************************************************************

DownlinkRANConfigurationTransfer ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {DownlinkRANConfigurationTransferIEs} },
    ...
}

DownlinkRANConfigurationTransferIEs NGAP-PROTOCOL-IES ::= {
    { ID id-SONConfigurationTransferDL      CRITICALITY ignore  TYPE SONConfigurationTransfer   PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- WARNING MESSAGE TRANSMISSION ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- Write-Replace Warning Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- WRITE-REPLACE WARNING REQUEST
--
-- **************************************************************

WriteReplaceWarningRequest ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {WriteReplaceWarningRequestIEs} },
    ...
}

WriteReplaceWarningRequestIEs NGAP-PROTOCOL-IES ::= {
```

```
    { ID id-MessageIdentifier              CRITICALITY reject  TYPE MessageIdentifier              PRESENCE mandatory  }|
    { ID id-SerialNumber                   CRITICALITY reject  TYPE SerialNumber                   PRESENCE mandatory  }|
    { ID id-WarningAreaList                CRITICALITY ignore  TYPE WarningAreaList                PRESENCE optional   }|
    { ID id-RepetitionPeriod               CRITICALITY reject  TYPE RepetitionPeriod               PRESENCE mandatory  }|
    { ID id-NumberOfBroadcastsRequested    CRITICALITY reject  TYPE NumberOfBroadcastsRequested    PRESENCE mandatory  }|
    { ID id-WarningType                    CRITICALITY ignore  TYPE WarningType                    PRESENCE optional   }|
    { ID id-WarningSecurityInfo            CRITICALITY ignore  TYPE WarningSecurityInfo            PRESENCE optional   }|
    { ID id-DataCodingScheme               CRITICALITY ignore  TYPE DataCodingScheme               PRESENCE optional   }|
    { ID id-WarningMessageContents         CRITICALITY ignore  TYPE WarningMessageContents         PRESENCE optional   }|
    { ID id-ConcurrentWarningMessageInd    CRITICALITY reject  TYPE ConcurrentWarningMessageInd    PRESENCE optional   },
    ...
}

-- **************************************************************
--
-- WRITE-REPLACE WARNING RESPONSE
--
-- **************************************************************

WriteReplaceWarningResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {WriteReplaceWarningResponseIEs} },
    ...
}

WriteReplaceWarningResponseIEs NGAP-PROTOCOL-IES ::= {
    { ID id-MessageIdentifier              CRITICALITY reject  TYPE MessageIdentifier              PRESENCE mandatory  }|
    { ID id-SerialNumber                   CRITICALITY reject  TYPE SerialNumber                   PRESENCE mandatory  }|
    { ID id-BroadcastCompletedAreaList     CRITICALITY ignore  TYPE BroadcastCompletedAreaList     PRESENCE optional   }|
    { ID id-CriticalityDiagnostics         CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional   },
    ...
}

-- **************************************************************
--
-- PWS Cancel Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- PWS CANCEL REQUEST
--
-- **************************************************************

PWSCancelRequest ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PWSCancelRequestIEs} },
    ...
}

PWSCancelRequestIEs NGAP-PROTOCOL-IES ::= {
    { ID id-MessageIdentifier           CRITICALITY reject  TYPE MessageIdentifier              PRESENCE mandatory }|
    { ID id-SerialNumber                CRITICALITY reject  TYPE SerialNumber                   PRESENCE mandatory }|
    { ID id-WarningAreaList             CRITICALITY ignore  TYPE WarningAreaList                PRESENCE optional  }|
    { ID id-CancelAllWarningMessages    CRITICALITY reject  TYPE CancelAllWarningMessages       PRESENCE optional  },
```

```
    ...
}

-- **************************************************************
--
-- PWS CANCEL RESPONSE
--
-- **************************************************************

PWSCancelResponse ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PWSCancelResponseIEs} },
    ...
}

PWSCancelResponseIEs NGAP-PROTOCOL-IES ::= {
    { ID id-MessageIdentifier           CRITICALITY reject  TYPE MessageIdentifier              PRESENCE mandatory }|
    { ID id-SerialNumber                CRITICALITY reject  TYPE SerialNumber                   PRESENCE mandatory }|
    { ID id-BroadcastCancelledAreaList  CRITICALITY ignore  TYPE BroadcastCancelledAreaList     PRESENCE optional  }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- PWS Restart Indication Elementary Procedure
--
-- **************************************************************

-- **************************************************************
--
-- PWS RESTART INDICATION
--
-- **************************************************************

PWSRestartIndication ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PWSRestartIndicationIEs} },
    ...
}

PWSRestartIndicationIEs NGAP-PROTOCOL-IES ::= {
    { ID id-CellIDListForRestart            CRITICALITY reject  TYPE CellIDListForRestart           PRESENCE mandatory   }|
    { ID id-GlobalRANNodeID                 CRITICALITY reject  TYPE GlobalRANNodeID                PRESENCE mandatory   }|
    { ID id-TAIListForRestart               CRITICALITY reject  TYPE TAIListForRestart              PRESENCE mandatory   }|
    { ID id-EmergencyAreaIDListForRestart   CRITICALITY reject  TYPE EmergencyAreaIDListForRestart  PRESENCE optional    },
    ...
}

-- **************************************************************
--
-- PWS Failure Indication Elementary Procedure
--
-- **************************************************************

-- **************************************************************
```

```
--
-- PWS FAILURE INDICATION
--
-- **************************************************************

PWSFailureIndication ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {PWSFailureIndicationIEs} },
    ...
}

PWSFailureIndicationIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PWSFailedCellIDList         CRITICALITY reject  TYPE PWSFailedCellIDList    PRESENCE mandatory }|
    { ID id-GlobalRANNodeID             CRITICALITY reject  TYPE GlobalRANNodeID        PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- NRPPA TRANSPORT ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- DOWNLINK UE ASSOCIATED NRPPA TRANSPORT
--
-- **************************************************************

DownlinkUEAssociatedNRPPaTransport ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {DownlinkUEAssociatedNRPPaTransportIEs} },
    ...
}

DownlinkUEAssociatedNRPPaTransportIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID          CRITICALITY reject  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory }|
    { ID id-RAN-UE-NGAP-ID          CRITICALITY reject  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory }|
    { ID id-RoutingID               CRITICALITY reject  TYPE RoutingID                  PRESENCE mandatory }|
    { ID id-NRPPa-PDU               CRITICALITY reject  TYPE NRPPa-PDU                  PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- UPLINK UE ASSOCIATED NRPPA TRANSPORT
--
-- **************************************************************

UplinkUEAssociatedNRPPaTransport ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {UplinkUEAssociatedNRPPaTransportIEs} },
    ...
}

UplinkUEAssociatedNRPPaTransportIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID          CRITICALITY reject  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory }|
```

```
    { ID id-RAN-UE-NGAP-ID          CRITICALITY reject  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory }|
    { ID id-RoutingID               CRITICALITY reject  TYPE RoutingID                  PRESENCE mandatory }|
    { ID id-NRPPa-PDU               CRITICALITY reject  TYPE NRPPa-PDU                  PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- DOWNLINK NON UE ASSOCIATED NRPPA TRANSPORT
--
-- **************************************************************

DownlinkNonUEAssociatedNRPPaTransport ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {DownlinkNonUEAssociatedNRPPaTransportIEs} },
    ...
}

DownlinkNonUEAssociatedNRPPaTransportIEs NGAP-PROTOCOL-IES ::= {
    { ID id-RoutingID               CRITICALITY reject  TYPE RoutingID                  PRESENCE mandatory }|
    { ID id-NRPPa-PDU               CRITICALITY reject  TYPE NRPPa-PDU                  PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- UPLINK NON UE ASSOCIATED NRPPA TRANSPORT
--
-- **************************************************************

UplinkNonUEAssociatedNRPPaTransport ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {UplinkNonUEAssociatedNRPPaTransportIEs} },
    ...
}

UplinkNonUEAssociatedNRPPaTransportIEs NGAP-PROTOCOL-IES ::= {
    { ID id-RoutingID               CRITICALITY reject  TYPE RoutingID                  PRESENCE mandatory }|
    { ID id-NRPPa-PDU               CRITICALITY reject  TYPE NRPPa-PDU                  PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- TRACE ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- TRACE START
--
-- **************************************************************

TraceStart ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {TraceStartIEs} },
```

```
    ...
}

TraceStartIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY reject  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY reject  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-TraceActivation             CRITICALITY ignore  TYPE TraceActivation            PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- TRACE FAILURE INDICATION
--
-- **************************************************************

TraceFailureIndication ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {TraceFailureIndicationIEs} },
    ...
}

TraceFailureIndicationIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY reject  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY reject  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-NGRANTraceID                CRITICALITY ignore  TYPE NGRANTraceID               PRESENCE mandatory  }|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- DEACTIVATE TRACE
--
-- **************************************************************

DeactivateTrace ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {DeactivateTraceIEs} },
    ...
}

DeactivateTraceIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID              CRITICALITY reject  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID              CRITICALITY reject  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory  }|
    { ID id-NGRANTraceID                CRITICALITY ignore  TYPE NGRANTraceID               PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- CELL TRAFFIC TRACE
--
-- **************************************************************

CellTrafficTrace ::= SEQUENCE {
```

```
    protocolIEs     ProtocolIE-Container        { {CellTrafficTraceIEs} },
    ...
}

CellTrafficTraceIEs NGAP-PROTOCOL-IES ::= {
    {ID id-AMF-UE-NGAP-ID                   CRITICALITY reject  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory }|
    {ID id-RAN-UE-NGAP-ID                   CRITICALITY reject  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory }|
    {ID id-NGRANTraceID                     CRITICALITY ignore  TYPE NGRANTraceID               PRESENCE mandatory }|
    {ID id-NGRAN-CGI                        CRITICALITY ignore  TYPE NGRAN-CGI                  PRESENCE mandatory }|
    {ID id-TraceCollectionEntityIPAddress   CRITICALITY ignore  TYPE TransportLayerAddress      PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- LOCATION REPORTING ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- LOCATION REPORTING CONTROL
--
-- **************************************************************

LocationReportingControl ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {LocationReportingControlIEs} },
    ...
}

LocationReportingControlIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                  CRITICALITY reject  TYPE AMF-UE-NGAP-ID                 PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                  CRITICALITY reject  TYPE RAN-UE-NGAP-ID                 PRESENCE mandatory   }|
    { ID id-LocationReportingRequestType    CRITICALITY ignore  TYPE LocationReportingRequestType   PRESENCE mandatory   },
    ...
}

-- **************************************************************
--
-- LOCATION REPORTING FAILURE INDICATION
--
-- **************************************************************

LocationReportingFailureIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {LocationReportingFailureIndicationIEs} },
    ...
}

LocationReportingFailureIndicationIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID          CRITICALITY reject  TYPE AMF-UE-NGAP-ID             PRESENCE mandatory}|
    { ID id-RAN-UE-NGAP-ID          CRITICALITY reject  TYPE RAN-UE-NGAP-ID             PRESENCE mandatory}|
    { ID id-Cause                   CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory},
    ...
}
```

```
-- **************************************************************
--
-- LOCATION REPORT
--
-- **************************************************************

LocationReport ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {LocationReportIEs} },
    ...
}

LocationReportIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                      CRITICALITY reject  TYPE AMF-UE-NGAP-ID                     PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                      CRITICALITY reject  TYPE RAN-UE-NGAP-ID                     PRESENCE mandatory   }|
    { ID id-UserLocationInformation             CRITICALITY ignore  TYPE UserLocationInformation            PRESENCE mandatory   }|
    { ID id-TimeStamp                           CRITICALITY ignore  TYPE TimeStamp                          PRESENCE optional    }|
    { ID id-UEPresenceInAreaOfInterestList      CRITICALITY ignore  TYPE UEPresenceInAreaOfInterestList      PRESENCE optional    }|
    { ID id-LocationReportingRequestType        CRITICALITY ignore  TYPE LocationReportingRequestType        PRESENCE mandatory   },
    ...
}

-- **************************************************************
--
-- UE TNLA BINDING ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- UE TNLA BINDING RELEASE REQUEST
--
-- **************************************************************

UETNLABindingReleaseRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {UETNLABindingReleaseRequestIEs} },
    ...
}

UETNLABindingReleaseRequestIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID      CRITICALITY reject  TYPE AMF-UE-NGAP-ID     PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID      CRITICALITY reject  TYPE RAN-UE-NGAP-ID     PRESENCE mandatory  },
    ...
}

-- **************************************************************
--
-- UE CAPABILITY MANAGEMENT ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- UE CAPABILITY INFO INDICATION
```

```
--
-- ********************************************************

UECapabilityInfoIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {UECapabilityInfoIndicationIEs} },
    ...
}

UECapabilityInfoIndicationIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                  CRITICALITY reject  TYPE AMF-UE-NGAP-ID              PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                  CRITICALITY reject  TYPE RAN-UE-NGAP-ID              PRESENCE mandatory   }|
    { ID id-UERadioCapability               CRITICALITY ignore  TYPE UERadioCapability           PRESENCE mandatory   }|
    { ID id-UERadioCapabilityForPaging      CRITICALITY ignore  TYPE UERadioCapabilityForPaging  PRESENCE optional    },
    ...
}

-- ********************************************************
--
-- UE Radio Capability Check Elementary Procedure
--
-- ********************************************************

-- ********************************************************
--
-- UE RADIO CAPABILITY CHECK REQUEST
--
-- ********************************************************

UERadioCapabilityCheckRequest ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {UERadioCapabilityCheckRequestIEs} },
    ...
}

UERadioCapabilityCheckRequestIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID          CRITICALITY reject  TYPE AMF-UE-NGAP-ID         PRESENCE mandatory  }|
    { ID id-RAN-UE-NGAP-ID          CRITICALITY reject  TYPE RAN-UE-NGAP-ID         PRESENCE mandatory  }|
    { ID id-UERadioCapability       CRITICALITY ignore  TYPE UERadioCapability      PRESENCE optional   },
    ...
}

-- ********************************************************
--
-- UE RADIO CAPABILITY CHECK RESPONSE
--
-- ********************************************************

UERadioCapabilityCheckResponse ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        { {UERadioCapabilityCheckResponseIEs} },
    ...
}

UERadioCapabilityCheckResponseIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMF-UE-NGAP-ID                  CRITICALITY ignore  TYPE AMF-UE-NGAP-ID              PRESENCE mandatory   }|
    { ID id-RAN-UE-NGAP-ID                  CRITICALITY ignore  TYPE RAN-UE-NGAP-ID              PRESENCE mandatory   }|
```

```
    { ID id-IMSVoiceSupportIndicator        CRITICALITY reject  TYPE IMSVoiceSupportIndicator     PRESENCE mandatory   }|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics       PRESENCE optional    },
    ...
}

-- **************************************************************
--
-- PRIVATE MESSAGE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- PRIVATE MESSAGE
--
-- **************************************************************

PrivateMessage ::= SEQUENCE {
    privateIEs      PrivateIE-Container     { { PrivateMessageIEs } },
    ...
}

PrivateMessageIEs NGAP-PRIVATE-IES ::= {
    ...
}

END
```

9.4.5 Information Element Definitions

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

NGAP-IEs {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
ngran-Access (22) modules (3) ngap (1) version1 (1) ngap-IEs (2) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

    maxnoofAllowedAreas,
    maxnoofAllowedS-NSSAIs,
    maxnoofBPLMNs,
    maxnoofCellIDforWarning,
    maxnoofCellinEAI,
    maxnoofCellsingNB,
```

```
    maxnoofCellsinngeNB,
    maxnoofCellinTAI,
    maxnoofDRBs,
    maxnoofEmergencyAreaID,
    maxnoofEAIforRestart,
    maxnoofEPLMNs,
    maxnoofEPLMNsPlusOne,
    maxnoofE-RABs,
    maxnoofErrors,
    maxnoofForbTACs,
    maxnoofMultiConnectivities,
    maxnoofPDUSessions,
    maxnoofPLMNs,
    maxnoofQosFlows,
    maxnoofRecommendedCells,
    maxnoofAoI,
    maxnoofServedGUAMIs,
    maxnoofSliceItems,
    maxnoofTACs,
    maxnoofTAIs,
    maxnoofTAIforRestart,
    maxnoofTAIforWarning,
    maxnoofTNLAssociations,
    maxnoofXnExtTLAs,
    maxnoofXnGTP-TLAs,
    maxnoofXnTLAs
FROM NGAP-Constants

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

    ProtocolExtensionContainer{},
    NGAP-PROTOCOL-EXTENSION,
    ProtocolIE-SingleContainer{},
    NGAP-PROTOCOL-IES
FROM NGAP-Containers;

-- A

AdditionalQosFlowInformation ::= ENUMERATED {
    more-likely,
    ...
}

AllocationAndRetentionPriority ::= SEQUENCE {
    priorityLevelARP                PriorityLevelARP,
    pre-emptionCapability           Pre-emptionCapability,
    pre-emptionVulnerability        Pre-emptionVulnerability,
    iE-Extensions       ProtocolExtensionContainer { {AllocationAndRetentionPriority-ExtIEs} } OPTIONAL,
    ...
}
```

```
AllocationAndRetentionPriority-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AllowedNSSAI ::= SEQUENCE (SIZE(1..maxnoofAllowedS-NSSAIs)) OF AllowedNSSAI-Item

AllowedNSSAI-Item ::= SEQUENCE {
    s-NSSAI             S-NSSAI,
    iE-Extensions       ProtocolExtensionContainer { {AllowedNSSAI-Item-ExtIEs} } OPTIONAL,
    ...
}

AllowedNSSAI-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AllowedTACs ::= SEQUENCE (SIZE(1..maxnoofAllowedAreas)) OF TAC

AMFName ::= PrintableString (SIZE(1..150, ...))

AMFPointer ::= BIT STRING (SIZE(4))

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

AMFSetID ::= BIT STRING (SIZE(4))

AMF-UE-NGAP-ID ::= INTEGER (0..4294967295)

AreaOfInterest ::= SEQUENCE {
    areaOfInterestTAIList       AreaOfInterestTAIList,
    iE-Extensions       ProtocolExtensionContainer { {AreaOfInterest-ExtIEs} }  OPTIONAL,
    ...
}

AreaOfInterest-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AreaOfInterestList ::= SEQUENCE (SIZE(1..maxnoofAoI)) OF AreaOfInterestItem

AreaOfInterestItem ::= SEQUENCE {
    areaOfInterest                  AreaOfInterest,
    locationReportingReferenceID        LocationReportingReferenceID                OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {AreaOfInterestItem-ExtIEs} }  OPTIONAL,
    ...
}

AreaOfInterestItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AreaOfInterestTAIList ::= SEQUENCE (SIZE(1..maxnoofAoI)) OF AreaOfInterestTAIItem
```

```
AreaOfInterestTAIItem ::= SEQUENCE {
    tAI                 TAI,
    iE-Extensions       ProtocolExtensionContainer { {AreaOfInterestTAIItem-ExtIEs} }   OPTIONAL,
    ...
}

AreaOfInterestTAIItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AssistanceDataForPaging ::= SEQUENCE {
    assistanceDataForRecommendedCells       AssistanceDataForRecommendedCells           OPTIONAL,
    pagingAttemptInformation                PagingAttemptInformation                    OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {AssistanceDataForPaging-ExtIEs} } OPTIONAL,
    ...
}

AssistanceDataForPaging-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AssistanceDataForRecommendedCells ::= SEQUENCE {
    recommendedCellsForPaging       RecommendedCellsForPaging,
    iE-Extensions       ProtocolExtensionContainer { {AssistanceDataForRecommendedCells-ExtIEs} } OPTIONAL,
    ...
}

AssistanceDataForRecommendedCells-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AssociatedQosFlowList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF AssociatedQosFlowItem

AssociatedQosFlowItem ::= SEQUENCE {
    qosFlowIndicator        QosFlowIndicator,
    iE-Extensions       ProtocolExtensionContainer { {AssociatedQosFlowItem-ExtIEs} } OPTIONAL,
    ...
}

AssociatedQosFlowItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AveragingWindow ::= INTEGER (0..63)     -- This IE may need to be refined

-- B

BitRate ::= INTEGER (0..4000000000000, ...)

BroadcastCancelledAreaList ::= CHOICE {
    cellIDCancelledEUTRA                CellIDCancelledEUTRA,
    tAICancelledEUTRA                   TAICancelledEUTRA,
    emergencyAreaIDCancelledEUTRA       EmergencyAreaIDCancelledEUTRA,
    cellIDCancelledNR                   CellIDCancelledNR,
```

```
    tAICancelledNR                      TAICancelledNR,
    emergencyAreaIDCancelledNR          EmergencyAreaIDCancelledNR,
    ...
}

BroadcastCompletedAreaList ::= CHOICE {
    cellIDBroadcastEUTRA                CellIDBroadcastEUTRA,
    tAIBroadcastEUTRA                   TAIBroadcastEUTRA,
    emergencyAreaIDBroadcastEUTRA       EmergencyAreaIDBroadcastEUTRA,
    cellIDBroadcastNR                   CellIDBroadcastNR,
    tAIBroadcastNR                      TAIBroadcastNR,
    emergencyAreaIDBroadcastNR          EmergencyAreaIDBroadcastNR,
    ...
}

BroadcastPLMNList ::= SEQUENCE (SIZE(1..maxnoofBPLMNs)) OF BroadcastPLMNItem

BroadcastPLMNItem ::= SEQUENCE {
    pLMNIdentity            PLMNIdentity,
    tAISliceSupportList     SliceSupportList,
    iE-Extensions       ProtocolExtensionContainer { {BroadcastPLMNItem-ExtIEs} } OPTIONAL,
    ...
}

BroadcastPLMNItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- C

CancelAllWarningMessages ::= ENUMERATED {true}

CancelledCellsInEAI-EUTRA ::= SEQUENCE (SIZE(1..maxnoofCellinEAI)) OF CancelledCellsInEAI-EUTRA-Item

CancelledCellsInEAI-EUTRA-Item ::= SEQUENCE {
    eUTRA-CGI               EUTRA-CGI,
    numberOfBroadcasts      NumberOfBroadcasts,
    iE-Extensions       ProtocolExtensionContainer { {CancelledCellsInEAI-EUTRA-Item-ExtIEs} } OPTIONAL,
    ...
}

CancelledCellsInEAI-EUTRA-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CancelledCellsInEAI-NR ::= SEQUENCE (SIZE(1..maxnoofCellinEAI)) OF CancelledCellsInEAI-NR-Item

CancelledCellsInEAI-NR-Item ::= SEQUENCE {
    nR-CGI                  NR-CGI,
    numberOfBroadcasts      NumberOfBroadcasts,
    iE-Extensions       ProtocolExtensionContainer { {CancelledCellsInEAI-NR-Item-ExtIEs} } OPTIONAL,
    ...
}
```

```
CancelledCellsInEAI-NR-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CancelledCellsInTAI-EUTRA ::= SEQUENCE (SIZE(1..maxnoofCellinTAI)) OF CancelledCellsInTAI-EUTRA-Item

CancelledCellsInTAI-EUTRA-Item ::= SEQUENCE {
    eUTRA-CGI               EUTRA-CGI,
    numberOfBroadcasts      NumberOfBroadcasts,
    iE-Extensions       ProtocolExtensionContainer { {CancelledCellsInTAI-EUTRA-Item-ExtIEs} } OPTIONAL,
    ...
}

CancelledCellsInTAI-EUTRA-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CancelledCellsInTAI-NR ::= SEQUENCE (SIZE(1..maxnoofCellinTAI)) OF CancelledCellsInTAI-NR-Item

CancelledCellsInTAI-NR-Item ::= SEQUENCE{
    nR-CGI                  NR-CGI,
    numberOfBroadcasts      NumberOfBroadcasts,
    iE-Extensions       ProtocolExtensionContainer { {CancelledCellsInTAI-NR-Item-ExtIEs} } OPTIONAL,
    ...
}

CancelledCellsInTAI-NR-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

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

CauseNas ::= ENUMERATED {
    normal-release,
    authentication-failure,
    deregister,
    unspecified,
```

```
    ...
}

CauseProtocol ::= ENUMERATED {
    transfer-syntax-error,
    abstract-syntax-error-reject,
    abstract-syntax-error-ignore-and-notify,
    message-not-compatible-with-receiver-state,
    semantic-error,
    abstract-syntax-error-falsely-constructed-message,
    unspecified,
    ...
}

CauseRadioNetwork ::= ENUMERATED {
    unspecified,
    txnrelocoverall-expiry,
    successful-handover,
    release-due-to-ngran-generated-reason,
    release-due-to-5gc-generated-reason,
    handover-cancelled,
    partial-handover,
    ho-failure-in-target-5GC-ngran-node-or-target-system,
    ho-target-not-allowed,
    tngrelocoverall-expiry,
    tngrelocprep-expiry,
    cell-not-available,
    unknown-targetID,
    no-radio-resources-available-in-target-cell,
    unknown-local-UE-NGAP-ID,
    inconsistent-remote-UE-NGAP-ID,
    handover-desirable-for-radio-reason,
    time-critical-handover,
    resource-optimisation-handover,
    reduce-load-in-serving-cell,
    user-inactivity,
    radio-connection-with-ue-lost,
    load-balancing-tau-required,
    radio-resources-not-available,
    invalid-qos-combination,
    failure-in-radio-interface-procedure,
    interaction-with-other-procedure,
    unknown-PDU-session-ID,
    unkown-qos-flow-ID,
    multiple-PDU-session-ID-instances,
    multiple-qos-flow-ID-instances,
    encryption-and-or-integrity-protection-algorithms-not-supported,
    ng-intra-system-handover-triggered,
    ng-inter-system-handover-triggered,
    xn-handover-triggered,
    not-supported-5QI-value,
    ue-context-transfer,
    ims-voice-eps-fallback-or-rat-fallback-triggered,
    up-integrity-protection-not-possible,
```

```
    up-confidentiality-protection-not-possible,
    slice-not-supported,
    ue-in-rrc-inactive-state-not-reachable,
    ...
}

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

CellIDBroadcastEUTRA ::= SEQUENCE (SIZE(1..maxnoofCellIDforWarning)) OF CellIDBroadcastEUTRA-Item

CellIDBroadcastEUTRA-Item ::= SEQUENCE {
    eUTRA-CGI           EUTRA-CGI,
    iE-Extensions       ProtocolExtensionContainer { {CellIDBroadcastEUTRA-Item-ExtIEs} } OPTIONAL,
    ...
}

CellIDBroadcastEUTRA-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CellIDBroadcastNR ::= SEQUENCE (SIZE(1..maxnoofCellIDforWarning)) OF CellIDBroadcastNR-Item

CellIDBroadcastNR-Item ::= SEQUENCE {
    nR-CGI              NR-CGI,
    iE-Extensions       ProtocolExtensionContainer { {CellIDBroadcastNR-Item-ExtIEs} } OPTIONAL,
    ...
}

CellIDBroadcastNR-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CellIDCancelledEUTRA ::= SEQUENCE (SIZE(1..maxnoofCellIDforWarning)) OF CellIDCancelledEUTRA-Item

CellIDCancelledEUTRA-Item ::= SEQUENCE {
    eUTRA-CGI               EUTRA-CGI,
    numberOfBroadcasts      NumberOfBroadcasts,
    iE-Extensions       ProtocolExtensionContainer { {CellIDCancelledEUTRA-Item-ExtIEs} } OPTIONAL,
    ...
}

CellIDCancelledEUTRA-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CellIDCancelledNR ::= SEQUENCE (SIZE(1..maxnoofCellIDforWarning)) OF CellIDCancelledNR-Item

CellIDCancelledNR-Item ::= SEQUENCE {
    nR-CGI                  NR-CGI,
    numberOfBroadcasts      NumberOfBroadcasts,
```

```
    iE-Extensions       ProtocolExtensionContainer { {CellIDCancelledNR-Item-ExtIEs} } OPTIONAL,
    ...
}

CellIDCancelledNR-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CellIDListForRestart ::= CHOICE {
    eUTRA-CGIListforRestart     EUTRA-CGIList,
    nR-CGIListforRestart        NR-CGIList,
    ...
}

CompletedCellsInEAI-EUTRA ::= SEQUENCE (SIZE(1..maxnoofCellinEAI)) OF CompletedCellsInEAI-EUTRA-Item

CompletedCellsInEAI-EUTRA-Item ::= SEQUENCE {
    eUTRA-CGI           EUTRA-CGI,
    iE-Extensions       ProtocolExtensionContainer { {CompletedCellsInEAI-EUTRA-Item-ExtIEs} } OPTIONAL,
    ...
}

CompletedCellsInEAI-EUTRA-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CompletedCellsInEAI-NR ::= SEQUENCE (SIZE(1..maxnoofCellinEAI)) OF CompletedCellsInEAI-NR-Item

CompletedCellsInEAI-NR-Item ::= SEQUENCE {
    nR-CGI              NR-CGI,
    iE-Extensions       ProtocolExtensionContainer { {CompletedCellsInEAI-NR-Item-ExtIEs} } OPTIONAL,
    ...
}

CompletedCellsInEAI-NR-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CompletedCellsInTAI-EUTRA ::= SEQUENCE (SIZE(1..maxnoofCellinTAI)) OF CompletedCellsInTAI-EUTRA-Item

CompletedCellsInTAI-EUTRA-Item ::= SEQUENCE{
    eUTRA-CGI           EUTRA-CGI,
    iE-Extensions       ProtocolExtensionContainer { {CompletedCellsInTAI-EUTRA-Item-ExtIEs} } OPTIONAL,
    ...
}

CompletedCellsInTAI-EUTRA-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CompletedCellsInTAI-NR ::= SEQUENCE (SIZE(1..maxnoofCellinTAI)) OF CompletedCellsInTAI-NR-Item

CompletedCellsInTAI-NR-Item ::= SEQUENCE{
    nR-CGI              NR-CGI,
```

```
    iE-Extensions       ProtocolExtensionContainer { {CompletedCellsInTAI-NR-Item-ExtIEs} } OPTIONAL,
    ...
}

CompletedCellsInTAI-NR-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

ConcurrentWarningMessageInd ::= ENUMERATED {true}

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

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

CPTransportLayerInformation ::= CHOICE {
    endpointIPAddress       TransportLayerAddress,
    ...
}

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

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

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

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

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

```
-- D

DataCodingScheme ::= BIT STRING (SIZE(8))

DataForwardingAccepted ::= ENUMERATED {
    data-forwarding-accepted,
    ...
}

DataForwardingNotPossible ::= ENUMERATED {
    data-forwarding-not-possible,
    ...
}

DataForwardingResponseDRBList ::= SEQUENCE (SIZE(1..maxnoofDRBs)) OF DataForwardingResponseDRBItem

DataForwardingResponseDRBItem ::= SEQUENCE {
    dRB-ID                              DRB-ID,
    dLForwardingUP-TNLInformation       UPTransportLayerInformation                             OPTIONAL,
    uLForwardingUP-TNLInformation       UPTransportLayerInformation                             OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer {{DataForwardingResponseDRBItem-ExtIEs}}     OPTIONAL,
    ...
}

DataForwardingResponseDRBItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

DelayCritical ::= ENUMERATED {
    delay-critical,
    non-delay-critical,
    ...
}

DLForwarding ::= ENUMERATED {
    dl-forwarding-proposed,
    ...
}

DirectForwardingPathAvailability ::= ENUMERATED {
    direct-path-available,
    ...
}

DRB-ID ::= INTEGER (1..32, ...)

DRBsToQosFlowsMappingList ::= SEQUENCE (SIZE(1..maxnoofDRBs)) OF DRBsToQosFlowsMappingItem

DRBsToQosFlowsMappingItem ::= SEQUENCE {
    dRB-ID                              DRB-ID,
    qosFlowMappingList                  QosFlowMappingList,
    iE-Extensions       ProtocolExtensionContainer {{DRBsToQosFlowsMappingItem-ExtIEs}}     OPTIONAL,
    ...
```

```
}

DRBsToQosFlowsMappingItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

Dynamic5QIDescriptor ::= SEQUENCE {
    priorityLevelQos            PriorityLevelQos,
    packetDelayBudget           PacketDelayBudget,
    packetErrorRate             PacketErrorRate,
    delayCritical               DelayCritical                                       OPTIONAL,
    averagingWindow             AveragingWindow                                     OPTIONAL,
    maximumDataBurstVolume      MaximumDataBurstVolume                              OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {Dynamic5QIDescriptor-ExtIEs} }    OPTIONAL,
    ...
}

Dynamic5QIDescriptor-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- E

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

EmergencyAreaIDBroadcastEUTRA ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaIDBroadcastEUTRA-Item

EmergencyAreaIDBroadcastEUTRA-Item ::= SEQUENCE {
    emergencyAreaID                 EmergencyAreaID,
    completedCellsInEAI-EUTRA       CompletedCellsInEAI-EUTRA,
    iE-Extensions       ProtocolExtensionContainer { {EmergencyAreaIDBroadcastEUTRA-Item-ExtIEs} } OPTIONAL,
    ...
}

EmergencyAreaIDBroadcastEUTRA-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

EmergencyAreaIDBroadcastNR ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaIDBroadcastNR-Item

EmergencyAreaIDBroadcastNR-Item ::= SEQUENCE {
    emergencyAreaID             EmergencyAreaID,
    completedCellsInEAI-NR      CompletedCellsInEAI-NR,
    iE-Extensions       ProtocolExtensionContainer { {EmergencyAreaIDBroadcastNR-Item-ExtIEs} } OPTIONAL,
    ...
}

EmergencyAreaIDBroadcastNR-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

EmergencyAreaIDCancelledEUTRA ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaIDCancelledEUTRA-Item

EmergencyAreaIDCancelledEUTRA-Item ::= SEQUENCE {
```

```
    emergencyAreaID                 EmergencyAreaID,
    cancelledCellsInEAI-EUTRA       CancelledCellsInEAI-EUTRA,
    iE-Extensions       ProtocolExtensionContainer { {EmergencyAreaIDCancelledEUTRA-Item-ExtIEs} } OPTIONAL,
    ...
}

EmergencyAreaIDCancelledEUTRA-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

EmergencyAreaIDCancelledNR ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaIDCancelledNR-Item

EmergencyAreaIDCancelledNR-Item ::= SEQUENCE {
    emergencyAreaID             EmergencyAreaID,
    cancelledCellsInEAI-NR      CancelledCellsInEAI-NR,
    iE-Extensions       ProtocolExtensionContainer { {EmergencyAreaIDCancelledNR-Item-ExtIEs} } OPTIONAL,
    ...
}

EmergencyAreaIDCancelledNR-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

EmergencyAreaIDList ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaID

EmergencyAreaIDListForRestart ::= SEQUENCE (SIZE(1..maxnoofEAIforRestart)) OF EmergencyAreaID

EmergencyFallbackIndicator ::= ENUMERATED {
    emergency-fallback-requested,
    ...
}

EquivalentPLMNs ::= SEQUENCE (SIZE(1..maxnoofEPLMNs)) OF PLMNIdentity

EPS-TAC ::= OCTET STRING (SIZE(2))

EPS-TAI ::= SEQUENCE {
    pLMNIdentity        PLMNIdentity,
    ePS-TAC             EPS-TAC,
    iE-Extensions       ProtocolExtensionContainer { {EPS-TAI-ExtIEs} } OPTIONAL,
    ...
}

EPS-TAI-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RAB-ID ::= INTEGER (0..15, ...)

E-RABInformationList ::= SEQUENCE (SIZE(1..maxnoofE-RABs)) OF E-RABInformationItem

E-RABInformationItem ::= SEQUENCE {
    e-RAB-ID            E-RAB-ID,
    dLForwarding        DLForwarding                                        OPTIONAL,
```

```
    iE-Extensions       ProtocolExtensionContainer { {E-RABInformationItem-ExtIEs} }    OPTIONAL,
    ...
}

E-RABInformationItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

EUTRA-CGI ::= SEQUENCE {
    pLMNIdentity            PLMNIdentity,
    eUTRACellIdentity       EUTRACellIdentity,
    iE-Extensions       ProtocolExtensionContainer { {EUTRA-CGI-ExtIEs} } OPTIONAL,
    ...
}

EUTRA-CGI-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

EUTRA-CGIList ::= SEQUENCE (SIZE(1..maxnoofCellsinngeNB)) OF EUTRA-CGI

EUTRA-CGIListForWarning ::= SEQUENCE (SIZE(1..maxnoofCellIDforWarning)) OF EUTRA-CGI

EUTRAencryptionAlgorithms ::= BIT STRING (SIZE(16, ...))

EUTRAintegrityProtectionAlgorithms ::= BIT STRING (SIZE(16, ...))

EventType ::= ENUMERATED {
    direct,
    change-of-serve-cell,
    ue-presence-in-area-of-interest,
    stop-change-of-serve-cell,
    stop-ue-presence-in-area-of-interest,
    cancel-location-reporting-for-the-ue,
    ...
}

-- F

FiveG-S-TMSI ::= SEQUENCE {
    aMFSetID            AMFSetID,
    aMFPointer          AMFPointer,
    fiveG-TMSI          FiveG-TMSI,
    iE-Extensions       ProtocolExtensionContainer { {FiveG-S-TMSI-ExtIEs} }    OPTIONAL,
    ...
}

FiveG-S-TMSI-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

FiveG-TMSI ::= OCTET STRING (SIZE(4))
```

```
FiveQI ::= INTEGER (0..255)

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

ForbiddenAreaInformation-Item ::= SEQUENCE {
    pLMNIdentity        PLMNIdentity,
    forbiddenTACs       ForbiddenTACs,
    iE-Extensions       ProtocolExtensionContainer { {ForbiddenAreaInformation-Item-ExtIEs} } OPTIONAL,
    ...
}

ForbiddenAreaInformation-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

-- G

GBR-QosInformation ::= SEQUENCE {
    maximumFlowBitRateDL        BitRate,
    maximumFlowBitRateUL        BitRate,
    guaranteedFlowBitRateDL     BitRate,
    guaranteedFlowBitRateUL     BitRate,
    notificationControl         NotificationControl                             OPTIONAL,
    maximumPacketLossRateDL     PacketLossRate                                  OPTIONAL,
    maximumPacketLossRateUL     PacketLossRate                                  OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {GBR-QosInformation-ExtIEs} }  OPTIONAL,
    ...
}

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

GlobalGNB-ID ::= SEQUENCE {
    pLMNIdentity        PLMNIdentity,
    gNB-ID              GNB-ID,
    iE-Extensions       ProtocolExtensionContainer { {GlobalGNB-ID-ExtIEs} } OPTIONAL,
    ...
}

GlobalGNB-ID-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

GlobalN3IWF-ID ::= SEQUENCE {
    pLMNIdentity        PLMNIdentity,
    n3IWF-ID            N3IWF-ID,
    iE-Extensions       ProtocolExtensionContainer { {GlobalN3IWF-ID-ExtIEs} } OPTIONAL,
    ...
}

GlobalN3IWF-ID-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
```

```
    ...
}

GlobalNgENB-ID ::= SEQUENCE {
    pLMNIdentity        PLMNIdentity,
    ngENB-ID            NgENB-ID,
    iE-Extensions       ProtocolExtensionContainer { {GlobalNgENB-ID-ExtIEs} } OPTIONAL,
    ...
}

GlobalNgENB-ID-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

GlobalRANNodeID ::= CHOICE {
    globalGNB-ID        GlobalGNB-ID,
    globalNgENB-ID      GlobalNgENB-ID,
    globalN3IWF-ID      GlobalN3IWF-ID,
    ...
}

GNB-ID ::= CHOICE {
    gNB-ID      BIT STRING (SIZE(22..32)),
    ...
}

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

GTPTunnel ::= SEQUENCE {
    transportLayerAddress       TransportLayerAddress,
    gTP-TEID                    GTP-TEID,
    iE-Extensions       ProtocolExtensionContainer { {GTPTunnel-ExtIEs} } OPTIONAL,
    ...
}

GTPTunnel-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

GUAMI ::= SEQUENCE {
    pLMNIdentity        PLMNIdentity,
    aMFRegionID         AMFRegionID,
    aMFSetID            AMFSetID,
    aMFPointer          AMFPointer,
    iE-Extensions       ProtocolExtensionContainer { {GUAMI-ExtIEs} } OPTIONAL,
    ...
}

GUAMI-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- H
```

```
HandoverCommandTransfer ::= SEQUENCE {
    dLForwardingUP-TNLInformation       UPTransportLayerInformation                     OPTIONAL,
    qosFlowToBeForwardedList            QosFlowToBeForwardedList,
    dataForwardingResponseDRBList       DataForwardingResponseDRBList                   OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {HandoverCommandTransfer-ExtIEs} } OPTIONAL,
    ...
}

HandoverCommandTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

HandoverRequestAcknowledgeTransfer ::= SEQUENCE {
    dL-NGU-UP-TNLInformation            UPTransportLayerInformation,
    dLForwardingUP-TNLInformation       UPTransportLayerInformation                                 OPTIONAL,
    securityResult                      SecurityResult                                              OPTIONAL,
    qosFlowSetupResponseList            QosFlowSetupResponseListHOReqAck,
    qosFlowFailedToSetupList            QosFlowList                                                 OPTIONAL,
    dataForwardingResponseDRBList       DataForwardingResponseDRBList                               OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {HandoverRequestAcknowledgeTransfer-ExtIEs} }  OPTIONAL,
    ...
}

HandoverRequestAcknowledgeTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

MobilityRestrictionList ::= SEQUENCE {
    servingPLMN                 PLMNIdentity,
    equivalentPLMNs             EquivalentPLMNs                                     OPTIONAL,
    rATRestrictions             RATRestrictions                                     OPTIONAL,
    forbiddenAreaInformation    ForbiddenAreaInformation                            OPTIONAL,
    serviceAreaInformation      ServiceAreaInformation                              OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {MobilityRestrictionList-ExtIEs} } OPTIONAL,
    ...
}

MobilityRestrictionList-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

HandoverType ::= ENUMERATED {
    intra5gs,
    fivegs-to-eps,
    eps-to-5gs,
    ...
}

-- I

IMSVoiceSupportIndicator ::= ENUMERATED {
    supported,
    not-supported,
```

```
    ...
}

IndexToRFSP ::= INTEGER (1..256, ...)

InfoOnRecommendedCellsAndRANNodesForPaging ::= OCTET STRING     -- This IE may need to be refined

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

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

IntendedNumberOfPagingAttempts ::= INTEGER (1..16, ...)

InterfacesToTrace ::= BIT STRING (SIZE(8))

-- J
-- K

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

-- L

LocationReportingReferenceID ::= INTEGER (1..64, ...)

LocationReportingRequestType ::= SEQUENCE {
    eventType                                   EventType,
    reportArea                                  ReportArea,
    areaOfInterestList                          AreaOfInterestList                          OPTIONAL,
    locationReportingReferenceIDToBeCancelled   LocationReportingReferenceID                OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {LocationReportingRequestType-ExtIEs} }    OPTIONAL,
    ...
}

LocationReportingRequestType-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- M

MaskedIMEISV ::= BIT STRING (SIZE(64))

MaximumDataBurstVolume ::= INTEGER (0..63)      -- This IE may need to be refined
```

```
MessageIdentifier ::= BIT STRING (SIZE(16))

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

MultipleTNLInformation ::= SEQUENCE {
    tNLInformationList      TNLInformationList,
    iE-Extensions       ProtocolExtensionContainer { {MultipleTNLInformation-ExtIEs} }  OPTIONAL,
    ...
}

MultipleTNLInformation-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- N

N3IWF-ID ::= CHOICE {
    n3IWF-ID                BIT STRING (SIZE(16)),
    ...
}

NAS-PDU ::= OCTET STRING

NextHopChainingCount ::= INTEGER (0..7)

NextPagingAreaScope ::= ENUMERATED {
    same,
    changed,
    ...
}

NgENB-ID ::= CHOICE {
    macroNgENB-ID           BIT STRING (SIZE(20)),
    shortMacroNgENB-ID      BIT STRING (SIZE(18)),
    longMacroNgENB-ID       BIT STRING (SIZE(21)),
    ...
}

NGRAN-CGI ::= CHOICE {
    nR-CGI          NR-CGI,
    eUTRA-CGI       EUTRA-CGI,
    ...
}

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

NonDynamic5QIDescriptor ::= SEQUENCE {
    fiveQI                      FiveQI,
    priorityLevelQos            PriorityLevelQos                                    OPTIONAL,
    averagingWindow             AveragingWindow                                     OPTIONAL,
```

```
    maximumDataBurstVolume      MaximumDataBurstVolume                                  OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {NonDynamic5QIDescriptor-ExtIEs} } OPTIONAL,
    ...
}

NonDynamic5QIDescriptor-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

NotAllowedTACs ::= SEQUENCE (SIZE(1..maxnoofAllowedAreas)) OF TAC

NotificationCause ::= ENUMERATED {
    fulfilled,
    not-fulfilled,
    ...
}

NotificationControl ::= ENUMERATED {
    notification-enabled,
    ...
}

NRCellIdentity ::= BIT STRING (SIZE(36))

NR-CGI ::= SEQUENCE {
    pLMNIdentity        PLMNIdentity,
    nRCellIdentity      NRCellIdentity,
    iE-Extensions       ProtocolExtensionContainer { {NR-CGI-ExtIEs} } OPTIONAL,
    ...
}

NR-CGI-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

NR-CGIList ::= SEQUENCE (SIZE(1..maxnoofCellsingNB)) OF NR-CGI

NR-CGIListForWarning ::= SEQUENCE (SIZE(1..maxnoofCellIDforWarning)) OF NR-CGI

NrencryptionAlgorithms ::= BIT STRING (SIZE(16, ...))

NrintegrityProtectionAlgorithms ::= BIT STRING (SIZE(16, ...))

NRPPa-PDU ::= OCTET STRING

NumberOfBroadcasts ::= INTEGER (0..65535)

NumberOfBroadcastsRequested ::= INTEGER (0..65535)

-- O
-- P

PacketDelayBudget ::= INTEGER (0..63)   -- This IE may need to be refined
```

```
PacketErrorRate ::= INTEGER (0..63)     -- This IE may need to be refined

PacketLossRate ::= INTEGER (0..1000)

PagingAttemptInformation ::= SEQUENCE {
    pagingAttemptCount                  PagingAttemptCount,
    intendedNumberOfPagingAttempts      IntendedNumberOfPagingAttempts,
    nextPagingAreaScope                 NextPagingAreaScope                                 OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {PagingAttemptInformation-ExtIEs} }    OPTIONAL,
    ...
}

PagingAttemptInformation-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PagingAttemptCount ::= INTEGER (1..16, ...)

PagingDRX ::= INTEGER (0..63)       -- This IE may need to be refined

PagingOrigin ::= ENUMERATED {
    non-3gpp,
    ...
}

PagingPriority ::= ENUMERATED {
    priolevel1,
    priolevel2,
    priolevel3,
    priolevel4,
    priolevel5,
    priolevel6,
    priolevel7,
    priolevel8,
    ...
}

PathSwitchRequestAcknowledgeTransfer ::= SEQUENCE {
    uL-NGU-UP-TNLInformation        UPTransportLayerInformation,
    securityIndication              SecurityIndication                                      OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {PathSwitchRequestAcknowledgeTransfer-ExtIEs} } OPTIONAL,
    ...
}

PathSwitchRequestAcknowledgeTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PathSwitchRequestTransfer ::= SEQUENCE {
    dL-NGU-UP-TNLInformation            UPTransportLayerInformation,
    userPlaneSecurityInformation        UserPlaneSecurityInformation                        OPTIONAL,
    qosFlowAcceptedList                 QosFlowAcceptedList,
    iE-Extensions       ProtocolExtensionContainer { {PathSwitchRequestTransfer-ExtIEs} }   OPTIONAL,
    ...
```

```
}

PathSwitchRequestTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionID ::= INTEGER (0..255)

PDUSessionList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionItem

PDUSessionItem ::= SEQUENCE {
    pDUSessionID        PDUSessionID,
    cause               Cause,
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionItem-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceInformationList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceInformationItem

PDUSessionResourceInformationItem ::= SEQUENCE {
    pDUSessionID                    PDUSessionID,
    qosFlowInformationList          QosFlowInformationList,
    dRBsToQosFlowsMappingList       DRBsToQosFlowsMappingList                                       OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceInformationItem-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceInformationItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceModifyConfirmTransfer ::= SEQUENCE {
    qosFlowModifyConfirmList        QosFlowModifyConfirmList,
    qosFlowFailedToModifyList       QosFlowList                                                     OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceModifyConfirmTransfer-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceModifyConfirmTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceModifyRequestTransfer ::= SEQUENCE {
    pDUSessionAggregateMaximumBitRate       BitRate                                                 OPTIONAL,
    uL-NGU-UP-TNLInformation                UPTransportLayerInformation                             OPTIONAL,
    qosFlowAddOrModifyRequestList           QosFlowAddOrModifyRequestList                           OPTIONAL,
    qosFlowToReleaseList                    QosFlowList                                             OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceModifyRequestTransfer-ExtIEs} } OPTIONAL,
    ...
}
```

```
PDUSessionResourceModifyRequestTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceModifyResponseTransfer ::= SEQUENCE {
    dL-NGU-UP-TNLInformation            UPTransportLayerInformation                                     OPTIONAL,
    qosFlowAddOrModifyResponseList      QosFlowAddOrModifyResponseList                                  OPTIONAL,
    qosFlowFailedToAddOrModifyList      QosFlowList                                                     OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceModifyResponseTransfer-ExtIEs} }  OPTIONAL,
    ...
}

PDUSessionResourceModifyResponseTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceModifyIndicationTransfer ::= SEQUENCE {
    dL-UP-TNLInformation        UP-TNLInformation                                                       OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceModifyIndicationTransfer-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceModifyIndicationTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceNotifyTransfer ::= SEQUENCE {
    qosFlowNotifyList       QosFlowNotifyList                                               OPTIONAL,
    qosFlowReleasedList     QosFlowList                                                     OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceNotifyTransfer-ExtIEs} }  OPTIONAL,
    ...
}

PDUSessionResourceNotifyTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceSetupRequestTransfer ::= SEQUENCE {
    pDUSessionAggregateMaximumBitRate       BitRate,
    uL-NGU-UP-TNLInformation                UPTransportLayerInformation,
    additionalUL-NGU-UP-TNLInformation      UPTransportLayerInformation                             OPTIONAL,
    dataForwardingNotPossible               DataForwardingNotPossible                               OPTIONAL,
    pDUSessionType                          PDUSessionType,
    securityIndication                      SecurityIndication                                      OPTIONAL,
    qosFlowSetupRequestList                 QosFlowSetupRequestList,
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceSetupRequestTransfer-ExtIEs} }  OPTIONAL,
    ...
}

PDUSessionResourceSetupRequestTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
PDUSessionResourceSetupResponseTransfer ::= SEQUENCE {
    dL-NGU-UP-TNLInformation        UPTransportLayerInformation,
    securityResult                  SecurityResult                                                  OPTIONAL,
    qosFlowSetupResponseList        QosFlowSetupResponseListSURes,
    qosFlowFailedToSetupList        QosFlowList                                                     OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {PDUSessionResourceSetupResponseTransfer-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceSetupResponseTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceSubjectToHandover ::= OCTET STRING        -- This IE may need to be refined

PDUSessionType ::= ENUMERATED {
    ipv4,
    ipv6,
    ipv4v6,
    ethernet,
    unstructured,
    ...
}

PeriodicRegistrationUpdateTimer ::= INTEGER (0..63)     -- This IE may need to be refined

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

PLMNSupportList ::= SEQUENCE (SIZE(1..maxnoofPLMNs)) OF PLMNSupportItem

PLMNSupportItem ::= SEQUENCE {
    pLMNIdentity            PLMNIdentity,
    sliceSupportList        SliceSupportList,
    iE-Extensions       ProtocolExtensionContainer { {PLMNSupportItem-ExtIEs} } OPTIONAL,
    ...
}

PLMNSupportItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

PPI ::= INTEGER (1..8, ...)

Pre-emptionCapability ::= ENUMERATED {
    shall-not-trigger-pre-emption,
    may-trigger-pre-emption
}

Pre-emptionVulnerability ::= ENUMERATED {
    not-pre-emptable,
    pre-emptable
}
```

```
PriorityLevelARP ::= INTEGER (1..15)

PriorityLevelQos ::= INTEGER (1..127)       -- This IE may need to be refined

PWSFailedCellIDList ::= CHOICE {
    eUTRA-CGI-PWSFailedList     EUTRA-CGIList,
    nR-CGI-PWSFailedList        NR-CGIList,
    ...
}

-- Q

QosCharacteristics ::= CHOICE {
    nonDynamic5QI       NonDynamic5QIDescriptor,
    dynamic5QI          Dynamic5QIDescriptor,
    ...
}

QosFlowAcceptedList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowAcceptedItem

QosFlowAcceptedItem ::= SEQUENCE {
    qosFlowIndicator        QosFlowIndicator,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowAcceptedItem-ExtIEs} } OPTIONAL,
    ...
}

QosFlowAcceptedItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowAddOrModifyRequestList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowAddOrModifyRequestItem

QosFlowAddOrModifyRequestItem ::= SEQUENCE {
    qosFlowIndicator                QosFlowIndicator,
    qosFlowLevelQosParameters       QosFlowLevelQosParameters                                   OPTIONAL,     -- presence may need to be refined
    e-RAB-ID                        E-RAB-ID                                                    OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowAddOrModifyRequestItem-ExtIEs} }   OPTIONAL,
    ...
}

QosFlowAddOrModifyRequestItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowAddOrModifyResponseList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowAddOrModifyResponseItem

QosFlowAddOrModifyResponseItem ::= SEQUENCE {
    qosFlowIndicator        QosFlowIndicator,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowAddOrModifyResponseItem-ExtIEs} }  OPTIONAL,
    ...
}

QosFlowAddOrModifyResponseItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
```

```
    ...
}

QosFlowIndicator ::= INTEGER (0..63, ...)

QosFlowInformationList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowInformationItem

QosFlowInformationItem ::= SEQUENCE {
    qosFlowIndicator    QosFlowIndicator,
    dLForwarding        DLForwarding                                                OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowInformationItem-ExtIEs} }  OPTIONAL,
    ...
}

QosFlowInformationItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowLevelQosParameters ::= SEQUENCE {
    qosCharacteristics                  QosCharacteristics,
    allocationAndRetentionPriority      AllocationAndRetentionPriority,
    gBR-QosInformation                  GBR-QosInformation                              OPTIONAL,
    reflectiveQosAttribute              ReflectiveQosAttribute                          OPTIONAL,
    additionalQosFlowInformation        AdditionalQosFlowInformation                    OPTIONAL,
    pPI                                 PPI                                             OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowLevelQosParameters-ExtIEs} }   OPTIONAL,
    ...
}

QosFlowLevelQosParameters-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowItem

QosFlowItem ::= SEQUENCE {
    qosFlowIndicator        QosFlowIndicator,
    cause                   Cause,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowItem-ExtIEs} } OPTIONAL,
    ...
}

QosFlowItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowMappingList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowMappingItem

QosFlowMappingItem ::= SEQUENCE {
    qosFlowIndicator        QosFlowIndicator,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowMappingItem-ExtIEs} } OPTIONAL,
    ...
}
```

```
QosFlowMappingItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowModifyConfirmList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowModifyConfirmItem

QosFlowModifyConfirmItem ::= SEQUENCE {
    qosFlowIndicator        QosFlowIndicator,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowModifyConfirmItem-ExtIEs} }    OPTIONAL,
    ...
}

QosFlowModifyConfirmItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowNotifyList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowNotifyItem

QosFlowNotifyItem ::= SEQUENCE {
    qosFlowIndicator            QosFlowIndicator,
    notificationCause           NotificationCause,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowNotifyItem-ExtIEs} }   OPTIONAL,
    ...
}

QosFlowNotifyItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowSetupRequestList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowSetupRequestItem

QosFlowSetupRequestItem ::= SEQUENCE {
    qosFlowIndicator                QosFlowIndicator,
    qosFlowLevelQosParameters       QosFlowLevelQosParameters,
    e-RAB-ID                        E-RAB-ID                                            OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowSetupRequestItem-ExtIEs} } OPTIONAL,
    ...
}

QosFlowSetupRequestItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowSetupResponseListHOReqAck ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowSetupResponseItemHOReqAck

QosFlowSetupResponseItemHOReqAck ::= SEQUENCE {
    qosFlowIndicator            QosFlowIndicator,
    dataForwardingAccepted      DataForwardingAccepted                                      OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowSetupResponseItemHOReqAck-ExtIEs} }  OPTIONAL,
    ...
}

QosFlowSetupResponseItemHOReqAck-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}

QosFlowSetupResponseListSURes ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowSetupResponseItemSURes

QosFlowSetupResponseItemSURes ::= SEQUENCE {
    qosFlowIndicator        QosFlowIndicator,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowSetupResponseItemSURes-ExtIEs} } OPTIONAL,
    ...
}

QosFlowSetupResponseItemSURes-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowToBeForwardedList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowToBeForwardedItem

QosFlowToBeForwardedItem ::= SEQUENCE {
    qosFlowIndicator        QosFlowIndicator,
    iE-Extensions       ProtocolExtensionContainer { {QosFlowToBeForwardedItem-ExtIEs} }    OPTIONAL,
    ...
}

QosFlowToBeForwardedItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- R

RANNodeName ::= PrintableString (SIZE(1..150, ...))

RANPagingPriority ::= INTEGER (1..256)

RANStatusTransfer-TransparentContainer ::= OCTET STRING      -- This IE may need to be refined

RAN-UE-NGAP-ID ::= INTEGER (0..4294967295)

RATRestrictions ::= SEQUENCE (SIZE(0..maxnoofEPLMNsPlusOne)) OF RATRestrictions-Item

RATRestrictions-Item ::= SEQUENCE {
    pLMNIdentity                PLMNIdentity,
    rATRestrictionInformation       RATRestrictionInformation,
    iE-Extensions       ProtocolExtensionContainer { {RATRestrictions-Item-ExtIEs} }        OPTIONAL,
    ...
}

RATRestrictions-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

RATRestrictionInformation ::= BIT STRING (SIZE(8, ...))

RecommendedCellsForPaging ::= SEQUENCE {
    recommendedCellList         RecommendedCellList,
    iE-Extensions       ProtocolExtensionContainer { {RecommendedCellsForPaging-ExtIEs} }   OPTIONAL,
```

```
    ...
}

RecommendedCellsForPaging-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

RecommendedCellList ::= SEQUENCE (SIZE(1..maxnoofRecommendedCells)) OF RecommendedCellItem

RecommendedCellItem ::= SEQUENCE {
    nGRAN-CGI               NGRAN-CGI,
    timeStayedInCell        INTEGER (0..4095)       OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {RecommendedCellItem-ExtIEs} } OPTIONAL,
    ...
}

RecommendedCellItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

ReflectiveQosAttribute ::= ENUMERATED {
    subject-to,
    ...
}

ReferenceID ::= INTEGER (1..64, ...)

RelativeAMFCapacity ::= INTEGER (0..255)

ReportArea ::= ENUMERATED {
    cell,
    ...
}

RepetitionPeriod ::= INTEGER (0..131071)

RoutingID ::= OCTET STRING

RRCContainer ::= OCTET STRING

RRCEstablishmentCause ::= OCTET STRING      -- This IE may need to be refined

RRCInactiveAssistanceInformation ::= SEQUENCE {
    uEIdentityIndexValue                UEIdentityIndexValue,
    uESpecificDRX                       UESpecificDRX,
    periodicRegistrationUpdateTimer     PeriodicRegistrationUpdateTimer,
    mICOModeIndication                  MICOModeIndication,
    tAIList                             TAIList,
    iE-Extensions       ProtocolExtensionContainer { {RRCInactiveAssistanceInformation-ExtIEs} } OPTIONAL,
    ...
}

RRCInactiveAssistanceInformation-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}

-- S

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

SecurityContext ::= SEQUENCE {
    nextHopChainingCount        NextHopChainingCount,
    nextHopNH                   SecurityKey,
    iE-Extensions       ProtocolExtensionContainer { {SecurityContext-ExtIEs} } OPTIONAL,
    ...
}

SecurityContext-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

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

SecurityKey ::= BIT STRING (SIZE(256))

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

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

SerialNumber ::= BIT STRING (SIZE(16))

ServedGUAMIList ::= SEQUENCE (SIZE(1..maxnoofServedGUAMIs)) OF ServedGUAMIItem

ServedGUAMIItem ::= SEQUENCE {
    gUAMI               GUAMI,
    backupAMFName       AMFName                                                 OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {ServedGUAMIItem-ExtIEs} } OPTIONAL,
    ...
}

ServedGUAMIItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}

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

ServiceAreaInformation-Item ::= SEQUENCE {
    pLMNIdentity        PLMNIdentity,
    allowedTACs         AllowedTACs                                                 OPTIONAL,
    notAllowedTACs      NotAllowedTACs                                              OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {ServiceAreaInformation-Item-ExtIEs} }     OPTIONAL,
    ...
}

ServiceAreaInformation-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

SingleTNLInformation ::= SEQUENCE {
    uPTransportLayerInformation     UPTransportLayerInformation,
    iE-Extensions       ProtocolExtensionContainer { {SingleTNLInformation-ExtIEs} }    OPTIONAL,
    ...
}

SingleTNLInformation-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

SliceSupportList ::= SEQUENCE (SIZE(1..maxnoofSliceItems)) OF SliceSupportItem

SliceSupportItem ::= SEQUENCE {
    s-NSSAI             S-NSSAI,
    iE-Extensions       ProtocolExtensionContainer { {SliceSupportItem-ExtIEs} }    OPTIONAL,
    ...
}

SliceSupportItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

S-NSSAI ::= SEQUENCE {
    sST             SST,
    sD                  SD,
    iE-Extensions       ProtocolExtensionContainer { { S-NSSAI-ExtIEs} }    OPTIONAL,
    ...
}

S-NSSAI-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

SONConfigurationTransfer ::= SEQUENCE {
    targetRANNodeID             TargetRANNodeID,
    sourceRANNodeID             SourceRANNodeID,
    sONInformation              SONInformation,
    xnTNLConfigurationInfo      XnTNLConfigurationInfo,
```

```
    iE-Extensions       ProtocolExtensionContainer { {SONConfigurationTransfer-ExtIEs} }    OPTIONAL,
    ...
}

SONConfigurationTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

SONInformation ::= CHOICE {
    sONInformationRequest       SONInformationRequest,
    sONInformationReply         SONInformationReply,
    ...
}

SONInformationReply ::= SEQUENCE {
    xnTNLConfigurationInfo      XnTNLConfigurationInfo                                  OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {SONInformationReply-ExtIEs} } OPTIONAL,
    ...
}

SONInformationReply-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

SONInformationRequest ::= ENUMERATED {
    xn-TNL-configuration-info,
    ...
}

SourceNGRANNode-ToTargetNGRANNode-TransparentContainer ::= SEQUENCE {
    rRCContainer                            RRCContainer,
    pDUSessionResourceInformationList       PDUSessionResourceInformationList                                   OPTIONAL,
    e-RABInformationList                    E-RABInformationList                                                OPTIONAL,
    targetCell-ID                           NGRAN-CGI,
    indexToRFSP                             IndexToRFSP                                                         OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {SourceNGRANNode-ToTargetNGRANNode-TransparentContainer-ExtIEs} }OPTIONAL,
    ...
}

SourceNGRANNode-ToTargetNGRANNode-TransparentContainer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

SourceRANNodeID ::= SEQUENCE {
    globalRANNodeID     GlobalRANNodeID,
    selectedTAI         TAI,
    iE-Extensions       ProtocolExtensionContainer { {SourceRANNodeID-ExtIEs} } OPTIONAL,
    ...
}

SourceRANNodeID-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
SourceToTarget-TransparentContainer ::= OCTET STRING
-- This IE includes a transparent container from the source RAN node to the target RAN node.
-- The octets of the OCTET STRING are encoded according to the specifications of the target system.

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

SupportedTAList ::= SEQUENCE (SIZE(1..maxnoofTACs)) OF SupportedTAItem

SupportedTAItem ::= SEQUENCE {
    tAC                             TAC,
    broadcastPLMNList       BroadcastPLMNList,
    iE-Extensions       ProtocolExtensionContainer { {SupportedTAItem-ExtIEs} } OPTIONAL,
    ...
}

SupportedTAItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- T

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

TAI ::= SEQUENCE {
    pLMNIdentity        PLMNIdentity,
    tAC                 TAC,
    iE-Extensions       ProtocolExtensionContainer { {TAI-ExtIEs} } OPTIONAL,
    ...
}

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

TAIBroadcastEUTRA ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAIBroadcastEUTRA-Item

TAIBroadcastEUTRA-Item ::= SEQUENCE {
    tAI                             TAI,
    completedCellsInTAI-EUTRA       CompletedCellsInTAI-EUTRA,
    iE-Extensions       ProtocolExtensionContainer { {TAIBroadcastEUTRA-Item-ExtIEs} } OPTIONAL,
    ...
}

TAIBroadcastEUTRA-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

TAIBroadcastNR ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAIBroadcastNR-Item

TAIBroadcastNR-Item ::= SEQUENCE {
    tAI                         TAI,
    completedCellsInTAI-NR      CompletedCellsInTAI-NR,
    iE-Extensions       ProtocolExtensionContainer { {TAIBroadcastNR-Item-ExtIEs} } OPTIONAL,
    ...
```

```
}

TAIBroadcastNR-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

TAICancelledEUTRA ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAICancelledEUTRA-Item

TAICancelledEUTRA-Item ::= SEQUENCE {
    tAI                         TAI,
    cancelledCellsInTAI-EUTRA       CancelledCellsInTAI-EUTRA,
    iE-Extensions       ProtocolExtensionContainer { {TAICancelledEUTRA-Item-ExtIEs} } OPTIONAL,
    ...
}

TAICancelledEUTRA-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

TAICancelledNR ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAICancelledNR-Item

TAICancelledNR-Item ::= SEQUENCE {
    tAI                         TAI,
    cancelledCellsInTAI-NR      CancelledCellsInTAI-NR,
    iE-Extensions       ProtocolExtensionContainer { {TAICancelledNR-Item-ExtIEs} } OPTIONAL,
    ...
}

TAICancelledNR-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

TAIList ::= SEQUENCE (SIZE(1..maxnoofTAIs)) OF TAIItem

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

TAIItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

TAIListForRestart ::= SEQUENCE (SIZE(1..maxnoofTAIforRestart)) OF TAI

TAIListForWarning ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAI

TargeteNB-ID ::= SEQUENCE {
    globalENB-ID        GlobalNgENB-ID,
    selected-EPS-TAI    EPS-TAI,
    iE-Extensions       ProtocolExtensionContainer { {TargeteNB-ID-ExtIEs} } OPTIONAL,
    ...
}
```

```
TargeteNB-ID-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

TargetID ::= CHOICE {
    targetRANNodeID     TargetRANNodeID,
    targeteNB-ID        TargeteNB-ID,
    ...
}

TargetNGRANNode-ToSourceNGRANNode-TransparentContainer ::= SEQUENCE {
    rRCContainer        RRCContainer,
    iE-Extensions       ProtocolExtensionContainer { {TargetNGRANNode-ToSourceNGRANNode-TransparentContainer-ExtIEs} } OPTIONAL,
    ...
}

TargetNGRANNode-ToSourceNGRANNode-TransparentContainer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

TargetRANNodeID ::= SEQUENCE {
    globalRANNodeID     GlobalRANNodeID,
    selectedTAI         TAI,
    iE-Extensions       ProtocolExtensionContainer { {TargetRANNodeID-ExtIEs} } OPTIONAL,
    ...
}

TargetRANNodeID-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

TargetToSource-TransparentContainer ::= OCTET STRING
-- This IE includes a transparent container from the target RAN node to the source RAN node.
-- The octets of the OCTET STRING are encoded according to the specifications of the target system.

TimerApproachForGUAMIRemoval ::= ENUMERATED {
    apply-timer,
    ...
}

TimeStamp ::= OCTET STRING (SIZE(4))

TimeToWait ::= ENUMERATED {v1s, v2s, v5s, v10s, v20s, v60s, ...}

TNLAssociationList ::= SEQUENCE (SIZE(1..maxnoofTNLAssociations)) OF TNLAssociationItem

TNLAssociationItem ::= SEQUENCE {
    tNLAssociationAddress       CPTransportLayerInformation,
    cause                       Cause,
    iE-Extensions       ProtocolExtensionContainer { {TNLAssociationItem-ExtIEs} } OPTIONAL,
    ...
}
```

```
TNLAssociationItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

TNLAssociationUsage ::= ENUMERATED {
    ue,
    non-ue,
    both,
    ...
}

TNLAssociationWeightFactor ::= INTEGER (0..255)

TNLInformationList ::= SEQUENCE (SIZE(1..maxnoofMultiConnectivities)) OF TNLInformationItem

TNLInformationItem ::= SEQUENCE {
    uPTransportLayerInformation     UPTransportLayerInformation,
    associatedQoSFlowList           AssociatedQosFlowList,
    iE-Extensions       ProtocolExtensionContainer { {TNLInformationItem-ExtIEs} }  OPTIONAL,
    ...
}

TNLInformationItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

TraceActivation ::= SEQUENCE {
    nGRANTraceID                        NGRANTraceID,
    interfacesToTrace                   InterfacesToTrace,
    traceDepth                          TraceDepth,
    traceCollectionEntityIPAddress      TransportLayerAddress,
    iE-Extensions       ProtocolExtensionContainer { {TraceActivation-ExtIEs} } OPTIONAL,
    ...
}

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

TraceDepth ::= ENUMERATED {
    minimum,
    medium,
    maximum,
    minimumWithoutVendorSpecificExtension,
    mediumWithoutVendorSpecificExtension,
    maximumWithoutVendorSpecificExtension,
    ...
}

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

TypeOfError ::= ENUMERATED {
    not-understood,
    missing,
```

```
    ...
}

-- U

UEAggregateMaximumBitRate ::= SEQUENCE {
    uEAggregateMaximumBitRateDL     BitRate,
    uEAggregateMaximumBitRateUL     BitRate,
    iE-Extensions       ProtocolExtensionContainer { {UEAggregateMaximumBitRate-ExtIEs} } OPTIONAL,
    ...
}

UEAggregateMaximumBitRate-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

UE-associatedLogicalNG-ConnectionItem ::= SEQUENCE {
    aMF-UE-NGAP-ID      AMF-UE-NGAP-ID                                                      OPTIONAL,
    rAN-UE-NGAP-ID      RAN-UE-NGAP-ID                                                      OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {UE-associatedLogicalNG-ConnectionItem-ExtIEs} }   OPTIONAL,
    ...
}

UE-associatedLogicalNG-ConnectionItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

UEIdentityIndexValue ::= INTEGER (0..63)        -- This IE may need to be refined

UE-NGAP-IDs ::= CHOICE {
    uE-NGAP-ID-pair     UE-NGAP-ID-pair,
    aMF-UE-NGAP-ID      AMF-UE-NGAP-ID,
    ...
}

UE-NGAP-ID-pair ::= SEQUENCE{
    aMF-UE-NGAP-ID      AMF-UE-NGAP-ID,
    rAN-UE-NGAP-ID      RAN-UE-NGAP-ID,
    iE-Extensions       ProtocolExtensionContainer { {UE-NGAP-ID-pair-ExtIEs} } OPTIONAL,
    ...
}

UE-NGAP-ID-pair-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

UEPagingIdentity ::= CHOICE {
    fiveG-S-TMSI        FiveG-S-TMSI,
    ...
    }

UEPresence ::= ENUMERATED {in, out, unknown, ...}
```

```
UEPresenceInAreaOfInterestList ::= SEQUENCE (SIZE(1..maxnoofAoI)) OF UEPresenceInAreaOfInterestItem

UEPresenceInAreaOfInterestItem ::= SEQUENCE {
    locationReportingReferenceID        LocationReportingReferenceID,
    uEPresence                          UEPresence,
    iE-Extensions       ProtocolExtensionContainer { {UEPresenceInAreaOfInterestItem-ExtIEs} }  OPTIONAL,
    ...
}

UEPresenceInAreaOfInterestItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

UERadioCapability ::= OCTET STRING

UERadioCapabilityForPaging ::= OCTET STRING

UESecurityCapabilities ::= SEQUENCE {
    nRencryptionAlgorithms                  NrencryptionAlgorithms,
    nRintegrityProtectionAlgorithms         NrintegrityProtectionAlgorithms,
    eUTRAencryptionAlgorithms               EUTRAencryptionAlgorithms,
    eUTRAintegrityProtectionAlgorithms      EUTRAintegrityProtectionAlgorithms,

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

UESecurityCapabilities-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

UESpecificDRX ::= INTEGER (0..63)       -- This IE may need to be refined

UnavailableGUAMIList ::= SEQUENCE (SIZE(1..maxnoofServedGUAMIs)) OF UnavailableGUAMIItem

UnavailableGUAMIItem ::= SEQUENCE {
    gUAMI                               GUAMI,
    timerApproachForGUAMIRemoval        TimerApproachForGUAMIRemoval                    OPTIONAL,
    backupAMFName                       AMFName                                         OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {UnavailableGUAMIItem-ExtIEs} }    OPTIONAL,
    ...
}

UnavailableGUAMIItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

UP-TNLInformation ::= CHOICE {
    singleTNLInformation        SingleTNLInformation,
    multipleTNLInformation      MultipleTNLInformation,
    ...
}
```

```
UPTransportLayerInformation ::= CHOICE {
    gTPTunnel               GTPTunnel,
    ...
}

UserLocationInformation ::= CHOICE {
    userLocationInformationEUTRA    UserLocationInformationEUTRA,
    userLocationInformationNR       UserLocationInformationNR,
    userLocationInformationN3IWF    UserLocationInformationN3IWF,
    ...
}

UserLocationInformationEUTRA ::= SEQUENCE {
    eUTRA-CGI           EUTRA-CGI,
    tAI                 TAI,
    iE-Extensions       ProtocolExtensionContainer { { UserLocationInformationEUTRA-ExtIEs} }   OPTIONAL,
    ...
}

UserLocationInformationEUTRA-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

UserLocationInformationN3IWF ::= SEQUENCE {
    iPAddress           TransportLayerAddress,
    portNumber          PortNumber,
    iE-Extensions       ProtocolExtensionContainer { {UserLocationInformationN3IWF-ExtIEs} }    OPTIONAL,
    ...
}

UserLocationInformationN3IWF-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

UserLocationInformationNR ::= SEQUENCE {
    nR-CGI              NR-CGI,
    tAI                 TAI,
    iE-Extensions       ProtocolExtensionContainer { {UserLocationInformationNR-ExtIEs} }   OPTIONAL,
    ...
}

UserLocationInformationNR-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

UserPlaneSecurityInformation ::= SEQUENCE {
    securityResult          SecurityResult,
    securityIndication      SecurityIndication,
    iE-Extensions       ProtocolExtensionContainer { {UserPlaneSecurityInformation-ExtIEs} }    OPTIONAL,
    ...
}

UserPlaneSecurityInformation-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}

-- V
-- W

WarningAreaList ::= CHOICE {
    eUTRA-CGIListForWarning         EUTRA-CGIListForWarning,
    nR-CGIListForWarning            NR-CGIListForWarning,
    tAIListForWarning               TAIListForWarning,
    emergencyAreaIDList             EmergencyAreaIDList,
    ...
}

WarningMessageContents ::= OCTET STRING (SIZE(1..9600))

WarningSecurityInfo ::= OCTET STRING (SIZE(50))

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

-- X

XnExtTLAs ::= SEQUENCE (SIZE(1..maxnoofXnExtTLAs)) OF XnExtTLA-Item

XnExtTLA-Item ::= SEQUENCE {
    iPsecTLA                    TransportLayerAddress       OPTIONAL,
    gTP-TLAs                    XnGTP-TLAs                  OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {XnExtTLA-Item-ExtIEs} } OPTIONAL,
    ...
}

XnExtTLA-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

XnGTP-TLAs ::= SEQUENCE (SIZE(1..maxnoofXnGTP-TLAs)) OF TransportLayerAddress

XnTLAs ::= SEQUENCE (SIZE(1..maxnoofXnTLAs)) OF TransportLayerAddress

XnTNLConfigurationInfo ::= SEQUENCE {
    xnTransportLayerAddresses           XnTLAs,
    xnExtendedTransportLayerAddresses   XnExtTLAs                                           OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {XnTNLConfigurationInfo-ExtIEs} }  OPTIONAL,
    ...
}

XnTNLConfigurationInfo-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- Y
-- Z

END
```

9.4.6 Common Definitions

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

NGAP-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
ngran-Access (22) modules (3) ngap (1) version1 (1) ngap-CommonDataTypes (3) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

Criticality     ::= ENUMERATED { reject, ignore, notify }

Presence        ::= ENUMERATED { optional, conditional, mandatory }

PrivateIE-ID    ::= CHOICE {
    local               INTEGER (0..65535),
    global              OBJECT IDENTIFIER
}

ProcedureCode       ::= INTEGER (0..255)

ProtocolExtensionID ::= INTEGER (0..65535)

ProtocolIE-ID       ::= INTEGER (0..65535)

TriggeringMessage   ::= ENUMERATED { initiating-message, successful-outcome, unsuccessfull-outcome }

END
```

9.4.7 Constant Definitions

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

NGAP-Constants {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
ngran-Access (22) modules (3) ngap (1) version1 (1) ngap-Constants (4) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- **************************************************************
```

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

IMPORTS

    ProcedureCode,
    ProtocolIE-ID
FROM NGAP-CommonDataTypes;


-- *************************************************************
--
-- Elementary Procedures
--
-- *************************************************************

id-AMFConfigurationUpdate                   ProcedureCode ::= 0
id-AMFStatusIndication                      ProcedureCode ::= 1
id-CellTrafficTrace                         ProcedureCode ::= 2
id-DeactivateTrace                          ProcedureCode ::= 3
id-DownlinkNASTransport                     ProcedureCode ::= 4
id-DownlinkNonUEAssociatedNRPPaTransport    ProcedureCode ::= 5
id-DownlinkRANConfigurationTransfer         ProcedureCode ::= 6
id-DownlinkRANStatusTransfer                ProcedureCode ::= 7
id-DownlinkUEAssociatedNRPPaTransport       ProcedureCode ::= 8
id-ErrorIndication                          ProcedureCode ::= 9
id-HandoverCancel                           ProcedureCode ::= 10
id-HandoverNotification                     ProcedureCode ::= 11
id-HandoverPreparation                      ProcedureCode ::= 12
id-HandoverResourceAllocation               ProcedureCode ::= 13
id-InitialContextSetup                      ProcedureCode ::= 14
id-InitialUEMessage                         ProcedureCode ::= 15
id-LocationReportingControl                 ProcedureCode ::= 16
id-LocationReportingFailureIndication       ProcedureCode ::= 17
id-LocationReport                           ProcedureCode ::= 18
id-NASNonDeliveryIndication                 ProcedureCode ::= 19
id-NGReset                                  ProcedureCode ::= 20
id-NGSetup                                  ProcedureCode ::= 21
id-Paging                                   ProcedureCode ::= 22
id-PathSwitchRequest                        ProcedureCode ::= 23
id-PDUSessionResourceModify                 ProcedureCode ::= 24
id-PDUSessionResourceModifyIndication       ProcedureCode ::= 25
id-PDUSessionResourceRelease                ProcedureCode ::= 26
id-PDUSessionResourceSetup                  ProcedureCode ::= 27
id-PDUSessionResourceNotify                 ProcedureCode ::= 28
id-PrivateMessage                           ProcedureCode ::= 29
id-PWSCancel                                ProcedureCode ::= 30
id-PWSFailureIndication                     ProcedureCode ::= 31
id-PWSRestartIndication                     ProcedureCode ::= 32
id-RANConfigurationUpdate                   ProcedureCode ::= 33
id-RerouteNASRequest                        ProcedureCode ::= 34
id-TraceFailureIndication                   ProcedureCode ::= 35
```

```
id-TraceStart                               ProcedureCode ::= 36
id-UECapabilityInfoIndication               ProcedureCode ::= 37
id-UEContextModification                    ProcedureCode ::= 38
id-UEContextRelease                         ProcedureCode ::= 39
id-UEContextReleaseRequest                  ProcedureCode ::= 40
id-UERadioCapabilityCheck                   ProcedureCode ::= 41
id-UETNLABindingRelease                     ProcedureCode ::= 42
id-UplinkNASTransport                       ProcedureCode ::= 43
id-UplinkNonUEAssociatedNRPPaTransport      ProcedureCode ::= 44
id-UplinkRANConfigurationTransfer           ProcedureCode ::= 45
id-UplinkRANStatusTransfer                  ProcedureCode ::= 46
id-UplinkUEAssociatedNRPPaTransport         ProcedureCode ::= 47
id-WriteReplaceWarning                      ProcedureCode ::= 48

-- **************************************************************
--
-- Extension constants
--
-- **************************************************************

maxPrivateIEs                           INTEGER ::= 65535
maxProtocolExtensions                   INTEGER ::= 65535
maxProtocolIEs                          INTEGER ::= 65535

-- **************************************************************
--
-- Lists
--
-- **************************************************************

    maxnoofAllowedAreas                 INTEGER ::= 16
    maxnoofAllowedS-NSSAIs              INTEGER ::= 8
    maxnoofBPLMNs                       INTEGER ::= 12
    maxnoofCellIDforWarning             INTEGER ::= 65535
    maxnoofCellinEAI                    INTEGER ::= 65535
    maxnoofCellinTAI                    INTEGER ::= 65535
    maxnoofCellsingNB                   INTEGER ::= 16384
    maxnoofCellsinngeNB                 INTEGER ::= 256
    maxnoofDRBs                         INTEGER ::= 32
    maxnoofEmergencyAreaID              INTEGER ::= 65535
    maxnoofEAIforRestart                INTEGER ::= 256
    maxnoofEPLMNs                       INTEGER ::= 15
    maxnoofEPLMNsPlusOne                INTEGER ::= 16
    maxnoofE-RABs                       INTEGER ::= 256
    maxnoofErrors                       INTEGER ::= 256
    maxnoofForbTACs                     INTEGER ::= 4096
    maxnoofMultiConnectivities          INTEGER ::= 8
    maxnoofNGConnectionsToReset         INTEGER ::= 8192
    maxnoofPDUSessions                  INTEGER ::= 256
    maxnoofPLMNs                        INTEGER ::= 12
    maxnoofQosFlows                     INTEGER ::= 64
    maxnoofRecommendedCells             INTEGER ::= 16
    maxnoofAoI                          INTEGER ::= 64
    maxnoofServedGUAMIs                 INTEGER ::= 256
```

```
    maxnoofSliceItems                   INTEGER ::= 1024
    maxnoofTACs                         INTEGER ::= 256
    maxnoofTAIs                         INTEGER ::= 16
    maxnoofTAIforRestart                INTEGER ::= 2048
    maxnoofTAIforWarning                INTEGER ::= 65535
    maxnoofTNLAssociations              INTEGER ::= 32
    maxnoofXnExtTLAs                    INTEGER ::= 2
    maxnoofXnGTP-TLAs                   INTEGER ::= 16
    maxnoofXnTLAs                       INTEGER ::= 16

-- **************************************************************
--
-- IEs
--
-- **************************************************************

    id-AllowedNSSAI                                         ProtocolIE-ID ::= 0
    id-AMFName                                              ProtocolIE-ID ::= 1
    id-AMFSetID                                             ProtocolIE-ID ::= 2
    id-AMF-TNLAssociationFailedToSetupList                  ProtocolIE-ID ::= 3
    id-AMF-TNLAssociationSetupItem                          ProtocolIE-ID ::= 4
    id-AMF-TNLAssociationSetupList                          ProtocolIE-ID ::= 5
    id-AMF-TNLAssociationToAddItem                          ProtocolIE-ID ::= 6
    id-AMF-TNLAssociationToAddList                          ProtocolIE-ID ::= 7
    id-AMF-TNLAssociationToRemoveItem                       ProtocolIE-ID ::= 8
    id-AMF-TNLAssociationToRemoveList                       ProtocolIE-ID ::= 9
    id-AMF-TNLAssociationToUpdateItem                       ProtocolIE-ID ::= 10
    id-AMF-TNLAssociationToUpdateList                       ProtocolIE-ID ::= 11
    id-AMF-UE-NGAP-ID                                       ProtocolIE-ID ::= 12
    id-AssistanceDataForPaging                              ProtocolIE-ID ::= 13
    id-BroadcastCancelledAreaList                           ProtocolIE-ID ::= 14
    id-BroadcastCompletedAreaList                           ProtocolIE-ID ::= 15
    id-CancelAllWarningMessages                             ProtocolIE-ID ::= 16
    id-Cause                                                ProtocolIE-ID ::= 17
    id-CellIDListForRestart                                 ProtocolIE-ID ::= 18
    id-ConcurrentWarningMessageInd                          ProtocolIE-ID ::= 19
    id-CriticalityDiagnostics                               ProtocolIE-ID ::= 20
    id-DataCodingScheme                                     ProtocolIE-ID ::= 21
    id-DefaultPagingDRX                                     ProtocolIE-ID ::= 22
    id-DirectForwardingPathAvailability                     ProtocolIE-ID ::= 23
    id-EmergencyAreaIDListForRestart                        ProtocolIE-ID ::= 24
    id-EmergencyFallbackIndicator                           ProtocolIE-ID ::= 25
    id-EUTRA-CGI                                            ProtocolIE-ID ::= 26
    id-FiveG-S-TMSI                                         ProtocolIE-ID ::= 27
    id-GlobalRANNodeID                                      ProtocolIE-ID ::= 28
    id-GUAMI                                                ProtocolIE-ID ::= 29
    id-HandoverType                                         ProtocolIE-ID ::= 30
    id-IMSVoiceSupportIndicator                             ProtocolIE-ID ::= 31
    id-IndexToRFSP                                          ProtocolIE-ID ::= 32
    id-InfoOnRecommendedCellsAndRANNodesForPaging           ProtocolIE-ID ::= 33
    id-KamfChangeInd                                        ProtocolIE-ID ::= 34
    id-LocationReportingRequestType                         ProtocolIE-ID ::= 35
    id-MaskedIMEISV                                         ProtocolIE-ID ::= 36
    id-MessageIdentifier                                    ProtocolIE-ID ::= 37
```

```
    id-MobilityRestrictionList                          ProtocolIE-ID ::= 38
    id-NASC                                             ProtocolIE-ID ::= 39
    id-NAS-PDU                                          ProtocolIE-ID ::= 40
    id-NewAMF-UE-NGAP-ID                                ProtocolIE-ID ::= 41
    id-NGAP-Message                                     ProtocolIE-ID ::= 42
    id-NGRAN-CGI                                        ProtocolIE-ID ::= 43
    id-NGRANTraceID                                     ProtocolIE-ID ::= 44
    id-NR-CGI                                           ProtocolIE-ID ::= 45
    id-NRPPa-PDU                                        ProtocolIE-ID ::= 46
    id-NumberOfBroadcastsRequested                      ProtocolIE-ID ::= 47
    id-OldAMF                                           ProtocolIE-ID ::= 48
    id-PagingDRX                                        ProtocolIE-ID ::= 49
    id-PagingOrigin                                     ProtocolIE-ID ::= 50
    id-PagingPriority                                   ProtocolIE-ID ::= 51
    id-PDUSessionResourceAdmittedItem                   ProtocolIE-ID ::= 52
    id-PDUSessionResourceAdmittedList                   ProtocolIE-ID ::= 53
    id-PDUSessionResourceFailedToModifyListModRes       ProtocolIE-ID ::= 54
    id-PDUSessionResourceFailedToSetupList              ProtocolIE-ID ::= 55
    id-PDUSessionResourceItemHORqd                      ProtocolIE-ID ::= 56
    id-PDUSessionResourceListHORqd                      ProtocolIE-ID ::= 57
    id-PDUSessionResourceModifyItemModCfm               ProtocolIE-ID ::= 58
    id-PDUSessionResourceModifyItemModInd               ProtocolIE-ID ::= 59
    id-PDUSessionResourceModifyItemModReq               ProtocolIE-ID ::= 60
    id-PDUSessionResourceModifyItemModRes               ProtocolIE-ID ::= 61
    id-PDUSessionResourceModifyListModCfm               ProtocolIE-ID ::= 62
    id-PDUSessionResourceModifyListModInd               ProtocolIE-ID ::= 63
    id-PDUSessionResourceModifyListModReq               ProtocolIE-ID ::= 64
    id-PDUSessionResourceModifyListModRes               ProtocolIE-ID ::= 65
    id-PDUSessionResourceNotifyItem                     ProtocolIE-ID ::= 66
    id-PDUSessionResourceNotifyList                     ProtocolIE-ID ::= 67
    id-PDUSessionResourceReleasedList                   ProtocolIE-ID ::= 68
    id-PDUSessionResourceSetupItemCxtReq                ProtocolIE-ID ::= 69
    id-PDUSessionResourceSetupItemCxtRes                ProtocolIE-ID ::= 70
    id-PDUSessionResourceSetupItemHOReq                 ProtocolIE-ID ::= 71
    id-PDUSessionResourceSetupItemSUReq                 ProtocolIE-ID ::= 72
    id-PDUSessionResourceSetupItemSURes                 ProtocolIE-ID ::= 73
    id-PDUSessionResourceSetupListCxtReq                ProtocolIE-ID ::= 74
    id-PDUSessionResourceSetupListCxtRes                ProtocolIE-ID ::= 75
    id-PDUSessionResourceSetupListHOReq                 ProtocolIE-ID ::= 76
    id-PDUSessionResourceSetupListSUReq                 ProtocolIE-ID ::= 77
    id-PDUSessionResourceSetupListSURes                 ProtocolIE-ID ::= 78
    id-PDUSessionResourceSubjectToForwardingItem        ProtocolIE-ID ::= 79
    id-PDUSessionResourceSubjectToForwardingList        ProtocolIE-ID ::= 80
    id-PDUSessionResourceToBeSwitchedDLItem             ProtocolIE-ID ::= 81
    id-PDUSessionResourceToBeSwitchedDLList             ProtocolIE-ID ::= 82
    id-PDUSessionResourceToBeSwitchedULItem             ProtocolIE-ID ::= 83
    id-PDUSessionResourceToBeSwitchedULList             ProtocolIE-ID ::= 84
    id-PDUSessionResourceToReleaseList                  ProtocolIE-ID ::= 85
    id-PLMNSupportList                                  ProtocolIE-ID ::= 86
    id-PWSFailedCellIDList                              ProtocolIE-ID ::= 87
    id-RANNodeName                                      ProtocolIE-ID ::= 88
    id-RANPagingPriority                                ProtocolIE-ID ::= 89
    id-RANStatusTransfer-TransparentContainer           ProtocolIE-ID ::= 90
    id-RAN-UE-NGAP-ID                                   ProtocolIE-ID ::= 91
```

```
    id-RelativeAMFCapacity                                  ProtocolIE-ID ::= 92
    id-RepetitionPeriod                                     ProtocolIE-ID ::= 93
    id-ResetType                                            ProtocolIE-ID ::= 94
    id-RoutingID                                            ProtocolIE-ID ::= 95
    id-RRCEstablishmentCause                                ProtocolIE-ID ::= 96
    id-RRCInactiveAssistanceInformation                     ProtocolIE-ID ::= 97
    id-SecurityContext                                      ProtocolIE-ID ::= 98
    id-SecurityKey                                          ProtocolIE-ID ::= 99
    id-SerialNumber                                         ProtocolIE-ID ::= 100
    id-ServedGUAMIList                                      ProtocolIE-ID ::= 101
    id-SliceSupportList                                     ProtocolIE-ID ::= 102
    id-SONConfigurationTransferDL                           ProtocolIE-ID ::= 103
    id-SONConfigurationTransferUL                           ProtocolIE-ID ::= 104
    id-SourceAMF-UE-NGAP-ID                                 ProtocolIE-ID ::= 105
    id-SourceToTarget-TransparentContainer                  ProtocolIE-ID ::= 106
    id-SupportedTAList                                      ProtocolIE-ID ::= 107
    id-TAI                                                  ProtocolIE-ID ::= 108
    id-TAIItem                                              ProtocolIE-ID ::= 109
    id-TAIList                                              ProtocolIE-ID ::= 110
    id-TAIListForRestart                                    ProtocolIE-ID ::= 111
    id-TargetID                                             ProtocolIE-ID ::= 112
    id-TargetToSource-TransparentContainer                  ProtocolIE-ID ::= 113
    id-TimeStamp                                            ProtocolIE-ID ::= 114
    id-TimeToWait                                           ProtocolIE-ID ::= 115
    id-TraceActivation                                      ProtocolIE-ID ::= 116
    id-TraceCollectionEntityIPAddress                       ProtocolIE-ID ::= 117
    id-UEAggregateMaximumBitRate                            ProtocolIE-ID ::= 118
    id-UE-associatedLogicalNG-ConnectionItem                ProtocolIE-ID ::= 119
    id-UE-associatedLogicalNG-ConnectionListResAck          ProtocolIE-ID ::= 120
    id-UEContextRequest                                     ProtocolIE-ID ::= 121
    id-UEIdentityIndexValue                                 ProtocolIE-ID ::= 122
    id-UE-NGAP-IDs                                          ProtocolIE-ID ::= 123
    id-UEPagingIdentity                                     ProtocolIE-ID ::= 124
    id-UEPresenceInAreaOfInterestList                       ProtocolIE-ID ::= 125
    id-UERadioCapability                                    ProtocolIE-ID ::= 126
    id-UERadioCapabilityForPaging                           ProtocolIE-ID ::= 127
    id-UESecurityCapabilities                               ProtocolIE-ID ::= 128
    id-UnavailableGUAMIList                                 ProtocolIE-ID ::= 129
    id-UserLocationInformation                              ProtocolIE-ID ::= 130
    id-WarningAreaList                                      ProtocolIE-ID ::= 131
    id-WarningMessageContents                               ProtocolIE-ID ::= 132
    id-WarningSecurityInfo                                  ProtocolIE-ID ::= 133
    id-WarningType                                          ProtocolIE-ID ::= 134

END
```

9.4.8 Container Definitions

```
-- **************************************************************
--
-- Container definitions
--
-- **************************************************************
```

```
NGAP-Containers {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
ngran-Access (22) modules (3) ngap (1) version1 (1) ngap-Containers (5) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS

    Criticality,
    Presence,
    PrivateIE-ID,
    ProtocolExtensionID,
    ProtocolIE-ID
FROM NGAP-CommonDataTypes

    maxPrivateIEs,
    maxProtocolExtensions,
    maxProtocolIEs
FROM NGAP-Constants;

-- ************************************************************
--
-- Class Definition for Protocol IEs
--
-- ************************************************************

NGAP-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
--
-- ************************************************************
```

```
NGAP-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
--
-- **************************************************************

NGAP-PROTOCOL-EXTENSION ::= CLASS {
    &id             ProtocolExtensionID         UNIQUE,
    &criticality    Criticality,
    &Extension,
    &presence       Presence
}
WITH SYNTAX {
    ID              &id
    CRITICALITY     &criticality
    EXTENSION       &Extension
    PRESENCE        &presence
}

-- **************************************************************
--
-- Class Definition for Private IEs
--
-- **************************************************************

NGAP-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 {NGAP-PROTOCOL-IES : IesSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-Field {{IesSetParam}}

ProtocolIE-SingleContainer {NGAP-PROTOCOL-IES : IesSetParam} ::=
    ProtocolIE-Field {{IesSetParam}}

ProtocolIE-Field {NGAP-PROTOCOL-IES : IesSetParam} ::= SEQUENCE {
    id              NGAP-PROTOCOL-IES.&id               ({IesSetParam}),
    criticality     NGAP-PROTOCOL-IES.&criticality      ({IesSetParam}{@id}),
    value           NGAP-PROTOCOL-IES.&Value            ({IesSetParam}{@id})
}

-- ************************************************************
--
-- Container for Protocol IE Pairs
--
-- ************************************************************

ProtocolIE-ContainerPair {NGAP-PROTOCOL-IES-PAIR : IesSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-FieldPair {{IesSetParam}}

ProtocolIE-FieldPair {NGAP-PROTOCOL-IES-PAIR : IesSetParam} ::= SEQUENCE {
    id                  NGAP-PROTOCOL-IES-PAIR.&id                  ({IesSetParam}),
    firstCriticality    NGAP-PROTOCOL-IES-PAIR.&firstCriticality    ({IesSetParam}{@id}),
    firstValue          NGAP-PROTOCOL-IES-PAIR.&FirstValue          ({IesSetParam}{@id}),
    secondCriticality   NGAP-PROTOCOL-IES-PAIR.&secondCriticality   ({IesSetParam}{@id}),
    secondValue         NGAP-PROTOCOL-IES-PAIR.&SecondValue         ({IesSetParam}{@id})
}

-- ************************************************************
--
-- Container Lists for Protocol IE Containers
--
-- ************************************************************

ProtocolIE-ContainerList {INTEGER : lowerBound, INTEGER : upperBound, NGAP-PROTOCOL-IES : IesSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-SingleContainer {{IesSetParam}}

ProtocolIE-ContainerPairList {INTEGER : lowerBound, INTEGER : upperBound, NGAP-PROTOCOL-IES-PAIR : IesSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-ContainerPair {{IesSetParam}}

-- ************************************************************
--
```

```
-- Container for Protocol Extensions
--
-- ************************************************************

ProtocolExtensionContainer {NGAP-PROTOCOL-EXTENSION : ExtensionSetParam} ::=
    SEQUENCE (SIZE (1..maxProtocolExtensions)) OF
    ProtocolExtensionField {{ExtensionSetParam}}

ProtocolExtensionField {NGAP-PROTOCOL-EXTENSION : ExtensionSetParam} ::= SEQUENCE {
    id                  NGAP-PROTOCOL-EXTENSION.&id             ({ExtensionSetParam}),
    criticality         NGAP-PROTOCOL-EXTENSION.&criticality    ({ExtensionSetParam}{@id}),
    extensionValue      NGAP-PROTOCOL-EXTENSION.&Extension      ({ExtensionSetParam}{@id})
}

-- ************************************************************
--
-- Container for Private IEs
--
-- ************************************************************

PrivateIE-Container {NGAP-PRIVATE-IES : IesSetParam } ::=
    SEQUENCE (SIZE (1..maxPrivateIEs)) OF
    PrivateIE-Field {{IesSetParam}}

PrivateIE-Field {NGAP-PRIVATE-IES : IesSetParam} ::= SEQUENCE {
    id                  NGAP-PRIVATE-IES.&id                ({IesSetParam}),
    criticality         NGAP-PRIVATE-IES.&criticality       ({IesSetParam}{@id}),
    value               NGAP-PRIVATE-IES.&Value             ({IesSetParam}{@id})
}

END
```

9.5 Message Transfer Syntax

NGAP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax as specified in ITU-T Rec. X.691 [4].

9.6 Timers

$TNG_{RELOCprep}$

- Specifies the maximum time for the Handover Preparation procedure in the source NG-RAN node.

$TNG_{RELOCoverall}$

- Specifies the maximum time for the protection of the overall handover procedure in the source NG-RAN node.

$TXn_{RELOCOverall}$

- Specified in TS 38.423 [24].

10 Handling of Unknown, Unforeseen and Erroneous Protocol Data

10.1 General

Protocol Error cases can be divided into three classes:

- Transfer Syntax Error.
- Abstract Syntax Error.
- Logical Error.

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

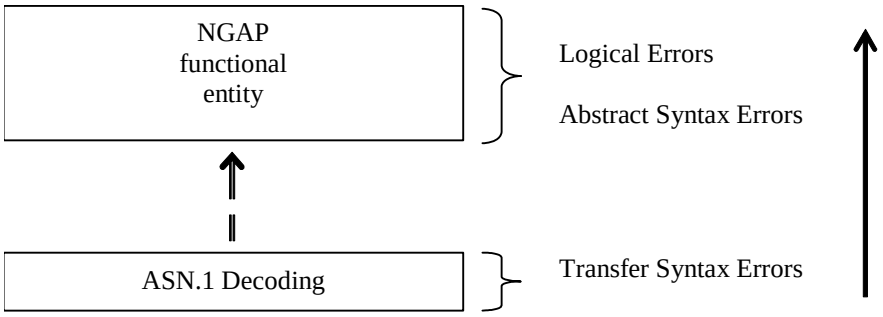

Figure 10.1-1: Protocol Errors in NGAP.

The information stated in subclauses 10.2, 10.3 and 10.4, to be included in the message used when reporting an error, is what at minimum shall be included. Other optional information elements within the message may also be included, if available. This is also valid for the case when the reporting is done with a response message. The latter is an exception to what is stated in subclause 4.1.

10.2 Transfer Syntax Error

A Transfer Syntax Error occurs when the receiver is not able to decode the received physical message. Transfer syntax errors are always detected in the process of ASN.1 decoding. If a Transfer Syntax Error occurs, the receiver should initiate Error Indication procedure with appropriate cause value for the Transfer Syntax protocol error.

Examples for Transfer Syntax Errors are:

- Violation of value ranges in ASN.1 definition of messages. E.g., if an IE has a defined value range of 0 to 10 (ASN.1: INTEGER (0..10)), and 12 will be received, then this will be treated as a transfer syntax error.
- Violation in list element constraints. E.g., if a list is defined as containing 1 to 10 elements, and 12 elements will be received, then this case will be handled as a transfer syntax error.
- Missing mandatory elements in ASN.1 SEQUENCE definitions (as sent by the originator of the message).
- Wrong order of elements in ASN.1 SEQUENCE definitions (as sent by the originator of the message).

10.3 Abstract Syntax Error

10.3.1 General

An Abstract Syntax Error occurs when the receiving functional NGAP entity:

1. receives IEs or IE groups that cannot be understood (unknown IE ID);
2. receives IEs for which the logical range is violated (e.g., ASN.1 definition: 0 to 15, the logical range is 0 to 10, while values 11 to 15 are undefined), and 12 will be received; this case will be handled as an abstract syntax error using criticality information sent by the originator of the message);

3. does not receive IEs or IE groups but according to the specified presence of the concerning object, the IEs or IE groups should have been present in the received message.

4. receives IEs or IE groups that are defined to be part of that message in wrong order or with too many occurrences of the same IE or IE group;

5. receives IEs or IE groups but according to the conditional presence of the concerning object and the specified condition, the IEs or IE groups should not have been present in the received message.

Cases 1 and 2 (not comprehended IE/IE group) are handled based on received Criticality information. Case 3 (missing IE/IE group) is handled based on Criticality information and Presence information for the missing IE/IE group specified in the version of the specification used by the receiver. Case 4 (IEs or IE groups in wrong order or with too many occurrences) and Case 5 (erroneously present conditional IEs or IE groups) result in rejecting the procedure.

If an Abstract Syntax Error occurs, the receiver shall read the remaining message and shall then for each detected Abstract Syntax Error that belong to cases 1-3 act according to the Criticality Information and Presence Information for the IE/IE group due to which Abstract Syntax Error occurred in accordance with subclauses 10.3.4 and 10.3.5. The handling of cases 4 and 5 is specified in subclause 10.3.6.

10.3.2 Criticality Information

In the NGAP messages there is criticality information set for individual IEs and/or IE groups. This criticality information instructs the receiver how to act when receiving an IE or an IE group that is not comprehended, i.e., the entire item (IE or IE group) which is not (fully or partially) comprehended shall be treated in accordance with its own criticality information as specified in subclause 10.3.4.

In addition, the criticality information is used in case of the missing IE/IE group abstract syntax error (see subclause 10.3.5).

The receiving node shall take different actions depending on the value of the Criticality Information. The three possible values of the Criticality Information for an IE/IE group are:

- Reject IE.

- Ignore IE and Notify Sender.

- Ignore IE.

The following rules restrict when a receiving entity may consider an IE, an IE group, or an EP not comprehended (not implemented), and when action based on criticality information is applicable:

1. IE or IE group: When one new or modified IE or IE group is implemented for one EP from a standard version, then other new or modified IEs or IE groups specified for that EP in that standard version shall be considered comprehended by a receiving entity (some may still remain unsupported).

2. EP: The comprehension of different Eps within a standard version or between different standard versions is not mandated. Any EP that is not supported may be considered not comprehended, even if another EP from that standard version is comprehended, and action based on criticality shall be applied.

10.3.3 Presence Information

For many IEs/IE groups which are optional according to the ASN.1 transfer syntax, NGAP specifies separately if the presence of these IEs/IE groups is optional or mandatory with respect to RNS application by means of the presence field of the concerning object of class NGAP-PROTOCOL-IES, NGAP-PROTOCOL-IES-PAIR, NGAP-PROTOCOL-EXTENSION or NGAP-PRIVATE-IES.

The presence field of the indicated classes supports three values:

1. Optional;

2. Conditional;

3. Mandatory.

If an IE/IE group is not included in a received message and the presence of the IE/IE group is mandatory or the presence is conditional and the condition is true according to the version of the specification used by the receiver, an abstract syntax error occurs due to a missing IE/IE group.

If an IE/IE group is included in a received message and the presence of the IE/IE group is conditional and the condition is false according to the version of the specification used by the receiver, an abstract syntax error occurs due to this erroneously present conditional IE/IE group.

10.3.4 Not comprehended IE/IE group

10.3.4.1 Procedure Code

The receiving node shall treat the different types of received criticality information of the *Procedure Code* IE according to the following:

Reject IE:

- If a message is received with a *Procedure Code* IE marked with "*Reject IE*" which the receiving node does not comprehend, the receiving node shall reject the procedure using the Error Indication procedure.

Ignore IE and Notify Sender:

- If a message is received with a *Procedure Code* IE marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the procedure and initiate the Error Indication procedure.

Ignore IE:

- If a message is received with a *Procedure Code* IE marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the procedure.

When using the Error Indication procedure to reject a procedure or to report an ignored procedure it shall include the *Procedure Code* IE, the *Triggering Message* IE, and the *Procedure Criticality* IE in the *Criticality Diagnostics* IE.

10.3.4.1A Type of Message

When the receiving node cannot decode the *Type of Message* IE, the Error Indication procedure shall be initiated with an appropriate cause value.

10.3.4.2 IEs other than the Procedure Code and Type of Message

The receiving node shall treat the different types of received criticality information of an IE/IE group other than the *Procedure Code* IE and *Type of Message* IE according to the following:

Reject IE:

- If a message *initiating* a procedure is received containing one or more IEs/IE group marked with "*Reject IE*" which the receiving node does not comprehend; none of the functional requests of the message shall be executed. The receiving node shall reject the procedure and report the rejection of one or more IEs/IE group using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- If a message *initiating* a procedure that does not have a message to report unsuccessful outcome is received containing one or more IEs/IE groups marked with "*Reject IE*" which the receiving node does not comprehend, the receiving node shall terminate the procedure and initiate the Error Indication procedure.

- If a *response* message is received containing one or more IEs marked with "*Reject IE*", that the receiving node does not comprehend, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

Ignore IE and Notify Sender:

- If a message *initiating* a procedure is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups, and report in the response message of the procedure that one or more IEs/IE groups have been ignored. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the response message, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- if a message *initiating* a procedure that does not have a message to report the outcome of the procedure is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups, and initiate the Error Indication procedure to report that one or more IEs/IE groups have been ignored.

- If a *response* message is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups and initiate the Error Indication procedure.

Ignore IE:

- If a message *initiating* a procedure is received containing one or more IEs/IE groups marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups and continue with the procedure as if the not comprehended IEs/IE groups were not received using the understood IEs/IE groups.

- If a *response* message is received containing one or more IEs/IE groups marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups and continue with the procedure as if the not comprehended IEs/IE groups were not received using the understood IEs/IE groups.

When reporting not comprehended IEs/IE groups marked with "*Reject IE*" or "*Ignore IE and Notify Sender*" using a response message defined for the procedure, the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

When reporting not comprehended IEs/IE groups marked with "*Reject IE*" or "*Ignore IE and Notify Sender*" using the Error Indication procedure, the *Procedure Code* IE, the *Triggering Message* IE, *Procedure Criticality* IE, and the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

10.3.5 Missing IE or IE group

The receiving node shall treat the missing IE/IE group according to the criticality information for the missing IE/IE group in the received message specified in the version of this specification used by the receiver:

Reject IE:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality "*Reject IE*"; none of the functional requests of the message shall be executed. The receiving node shall reject the procedure and report the missing IEs/IE groups using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- if a received message *initiating* a procedure that does not have a message to report unsuccessful outcome is missing one or more IEs/IE groups with specified criticality "*Reject IE*", the receiving node shall terminate the procedure and initiate the Error Indication procedure.

- if a received *response* message is missing one or more IEs/IE groups with specified criticality "*Reject IE*, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

Ignore IE and Notify Sender:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and report in the response message of the procedure that one or more IEs/IE groups were missing. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the response message, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- if a received message *initiating* a procedure that does not have a message to report the outcome of the procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and initiate the Error Indication procedure to report that one or more IEs/IE groups were missing.

- if a received *response* message is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and initiate the Error Indication procedure to report that one or more IEs/IE groups were missing.

Ignore IE:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message.

- if a received *response* message is missing one or more IEs/IE groups with specified criticality "*Ignore IE*", the receiving node shall ignore that those IEs/IE groups are missing and continue with the procedure based on the other IEs/IE groups present in the message.

When reporting missing IEs/IE groups with specified criticality "*Reject IE*" or "*Ignore IE and Notify Sender*" using a response message defined for the procedure, the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

When reporting missing IEs/IE groups with specified criticality "*Reject IE*" or "*Ignore IE and Notify Sender*" using the Error Indication procedure, the *Procedure Code* IE, the *Triggering Message* IE, *Procedure Criticality* IE, and the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

10.3.6 IEs or IE groups received in wrong order or with too many occurrences or erroneously present

If a message with IEs or IE groups in wrong order or with too many occurrences is received or if IEs or IE groups with a conditional presence are present when the condition is not met (i.e., erroneously present), the receiving node shall behave according to the following:

- If a message *initiating* a procedure is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, none of the functional requests of the message shall be executed. The receiving node shall reject the procedure and report the cause value "Abstract Syntax Error (Falsely Constructed Message)" using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- If a message *initiating* a procedure that does not have a message to report unsuccessful outcome is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, the receiving node shall terminate the procedure and initiate the Error Indication procedure, and use cause value "Abstract Syntax Error (Falsely Constructed Message)".

- If a *response* message is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

When determining the correct order only the IEs specified in the specification version used by the receiver shall be considered.

10.4 Logical Error

Logical error situations occur when a message is comprehended correctly, but the information contained within the message is not valid (i.e., semantic error), or describes a procedure which is not compatible with the state of the receiver. In these conditions, the following behaviour shall be performed (unless otherwise specified) as defined by the class of the elementary procedure, irrespective of the criticality information of the IEs/IE groups containing the erroneous values.

Class 1:

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

- Semantic Error.
- Message not compatible with receiver state.

Where the logical error is contained in a request message of a class 1 procedure, and the procedure does not have a message to report this unsuccessful outcome, the procedure shall be terminated and the Error Indication procedure shall be initiated with an appropriate cause value. The *Procedure Code* IE and the *Triggering Message* IE within the *Criticality Diagnostics* IE shall then be included in order to identify the message containing the logical error.

Where the logical error exists in a response message of a class 1 procedure, the procedure shall be considered as unsuccessfully terminated and local error handling shall be initiated.

Class 2:

Where the logical error occurs in a message of a class 2 procedure, the procedure shall be terminated and the Error Indication procedure shall be initiated with an appropriate cause value. The *Procedure Code* IE and the *Triggering Message* IE within the *Criticality Diagnostics* IE shall then be included in order to identify the message containing the logical error.

10.5 Exceptions

The error handling for all the cases described hereafter shall take precedence over any other error handling described in the other subclauses of clause 10.

- If any type of error (Transfer Syntax Error, Abstract Syntax Error or Logical Error) is detected in the ERROR INDICATION message, it shall not trigger the Error Indication procedure in the receiving Node but local error handling.
- In case a response message or Error Indication message needs to be returned, but the information necessary to determine the receiver of that message is missing, the procedure shall be considered as unsuccessfully terminated and local error handling shall be initiated.
- If an error that terminates a procedure occurs, the returned cause value shall reflect the error that caused the termination of the procedure even if one or more abstract syntax errors with criticality "ignore and notify" have earlier occurred within the same procedure.
- If an AP ID error is detected, the error handling as described in subclause 10.6 shall be applied.

10.6 Handling of AP ID

NOTE: The "first message", the "first returned message" and the "last message" as used below correspond to messages for a UE-associated logical connection. The "first message" has a new AP ID from the sending node and the "first returned message" is the first response message, which has a new AP ID from the node sending the "first returned message". Thereafter the two AP IDs are included in all messages over the UE-associated logical connection unless otherwise allowed by the specification. The "last message" is a message sent by a node in order to complete the termination of a given UE-associated logical connection, such that no other messages for the same connection are expected in either direction. The nodes should ensure as far as possible that previously allocated AP ID are not immediately reused.

If a node receives a message (other than the first or first returned messages) including AP ID that is an unknown local AP ID, or an inconsistent remote AP ID (i.e. it is different to the remote AP ID stored previously for this UE-associated logical connection) for the same NG interface:

- if this message is not the last message for this UE-associated logical connection, the node shall initiate an Error Indication procedure with inclusion of the received AP ID(s) from the peer node and an appropriate cause value. Both nodes shall initiate a local release of any established UE-associated logical connection (for the same NG interface) having the erroneous AP ID(s) as local or remote identifier.

- if this message is the last message for this UE-associated logical connection, the receiving node shall initiate a local release of any established UE-associated logical connection (for the same NG interface) that have either the local or remote AP ID(s) as identifiers.

Annex A (informative): Change history

Change history							
Date	**Meeting**	**Tdoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2017-04	R3#95b	R3-171209	-	-	-	TS skeleton	0.0.0
2017-04	R3#95b	R3-171311	-	-	-	Incorporated agreed TPs from R3#95b	0.0.1
2017-05	R3#96	R3-171480	-	-	-	Update of title page and change history	0.0.2
2017-05	R3#96	R3-171975	-	-	-	Incorporated agreed TPs from R3#96	0.1.0
2017-07	R3 NR#2	R3-172604	-	-	-	Incorporated agreed TPs from R3 NR#2 Adhoc	0.2.0
2017-08	R3#97	R3-173447	-	-	-	Incorporated agreed TPs from R3#97	0.3.0
2017-10	R3#97b	R3-174239	-	-	-	Incorporated agreed TPs from R3#97b	0.4.0
2017-12	R3#98	R3-175056	-	-	-	Incorporated agreed TPs from R3#98	0.5.0
2018-01	R3 NR#1	R3-180651	-	-	-	Incorporated agreed TPs from R3 NR Adhoc 1801	0.6.0
2018-03	R3#99	R3-181588	-	-	-	Incorporated agreed TPs from R3#99	0.7.0
2018-04	R3#99b	R3-182524	-	-	-	Incorporated agreed TPs from R3#99b	0.8.0
2018-05	R3#100	R3-183592	-	-	-	Incorporated agreed TPs from R3#100	0.9.0
2018-06	RAN#80	RP-180737	-	-	-	For approval	1.0.0
2018-06	RAN#80	-	-	-	-	Specification approved at TSG-RAN and placed under change control	15.0.0

History

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