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Foreword

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

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

Version x.y.z

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- x the first digit:
 - 1 presented to TSG for information;
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- Y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the radio network layer signalling 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".
- [28] 3GPP TS 25.413: "UTRAN Iu interface RANAP signalling".
- [29] 3GPP TS 36.304: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode".
- [30] 3GPP TS 29.531: "5G System; Network Slice Selection Services; Stage 3".

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
DL	Downlink
EPC	Evolved Packet Core
GUAMI	Globally Unique AMF Identifier
IMEISV	International Mobile station Equipment Identity and Software Version number
LMF	Location Management Function
N3IWF	Non 3GPP InterWorking Function
NGAP	NG Application Protocol
NRPPa	NR Positioning Protocol Annex
NSCI	New Security Context Indicator
NSSAI	Network Slice Selection Assistance Information
OTDOA	Observed Time Difference of Arrival
PSCell	Primary SCG Cell
SCG	Secondary Cell Group
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
TAC	Tracking Area Code
TAI	Tracking Area Identity
TNLA	Transport Network Layer Association
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 <i>Information Element Name</i> is written with the first letters in each word in upper case characters and all letters in Italic font followed by the abbreviation "IE", e.g., <i>Information Element</i> IE.
Value of an IE	When referring to the value of an information element (IE) in the specification the "Value" is written as it is specified in subclause 9.2 enclosed by quotation marks, e.g., "Value".

5 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 Radio Capability Info Indication	UE RADIO CAPABILITY INFO INDICATION
RRC Inactive Transition Report	RRC INACTIVE TRANSITION REPORT
Overload Start	OVERLOAD START
Overload Stop	OVERLOAD STOP
Secondary RAT Data Usage Report	SECONDARY RAT DATA USAGE REPORT

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 sessions and the corresponding QoS flows, and to setup corresponding DRBs for a given UE. The procedure uses UE-associated signalling.

8.2.1.2 Successful Operation

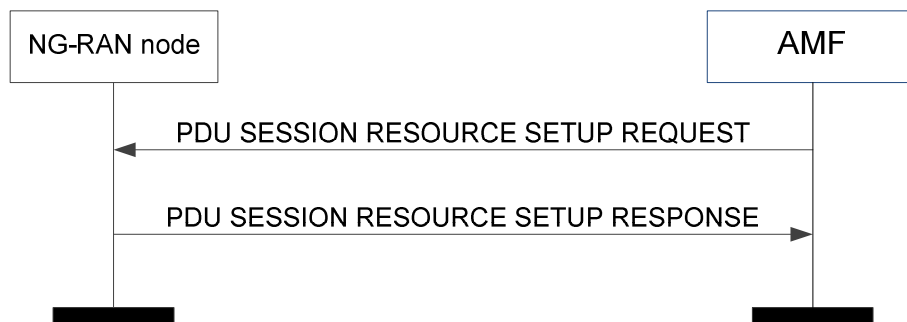


Figure 8.2.1.2-1: PDU session resource setup: successful operation

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 the PDU session related NG-RAN configuration consisting of at least one PDU session resource and include each PDU session resource to setup in the *PDU Session Resource Setup Request List IE*.

Upon reception of the PDU SESSION RESOURCE SETUP REQUEST message, 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 List 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 DRB and associate each accepted QoS flow of the PDU session to a DRB established.

For each PDU session successfully established the NG-RAN node shall pass to the UE the *PDU Session NAS-PDU IE*, if included, 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.

If the *NAS-PDU IE* is included in the PDU SESSION RESOURCE SETUP REQUEST message, the NG-RAN node shall pass it to the UE.

For each PDU session the NG-RAN node shall store the *UL NG-U UP TNL Information IE* 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 UL NG-U UP TNL 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 allocate for this split PDU session resources for an additional NG-U transport bearer for some or all of the QoS flows present in the *QoS Flow Setup Request List IE* and it shall indicate these QoS flows in the *Additional DL QoS Flow per TNL Information IE* in the *PDU Session Resource Setup Response Transfer IE*. In case the *Additional DL QoS Flow per TNL Information IE* is not included the SMF shall consider the proposed additional UL NG-U UP TNL information as available again.

For each PDU session, if the *Network Instance IE* is included in the *PDU Session Resource Setup Request Transfer IE* contained in the PDU SESSION RESOURCE SETUP REQUEST message and the *Common Network Instance IE* is not present, the NG-RAN node shall, if supported, use it when selecting transport network resource as specified in TS 23.501 [9].

For each PDU session, if the *Common Network Instance 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 shall, if supported, use it when selecting transport network resource as specified in TS 23.501 [9].

For each PDU session, if the *PDU Session Type IE* included in the *PDU Session Resource Setup Request Transfer IE* of the PDU SESSION RESOURCE SETUP REQUEST message 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 Transfer* IE of the PDU SESSION RESOURCE SETUP RESPONSE message.

For each PDU session for which the *Maximum Integrity Protected Data Rate Downlink* IE or the *Maximum Integrity Protected Data Rate Uplink* IE are included in the *Security Indication* IE in the *PDU Session Resource Setup Request Transfer* IE of the PDU SESSION RESOURCE SETUP REQUEST message, the NG-RAN node shall store the respective information and, if integrity protection is to be performed for the PDU session, it shall enforce the traffic limits corresponding to the received values, for the concerned PDU session and concerned UE, as specified in TS 23.501 [9].

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:

- if the *Integrity Protection Indication* IE is set to "not needed", then the NG-RAN node shall not perform user plane integrity protection for the concerned PDU session;
- if the *Confidentiality Protection Indication* IE is set to "not needed", then the NG-RAN node shall not perform user plane ciphering for the concerned PDU session.

For each PDU session for which the *PDU Session Aggregate Maximum Bit Rate* IE is included in the *PDU Session Resource Setup Request Transfer* IE of the PDU SESSION RESOURCE SETUP REQUEST message, the NG-RAN node shall store the received value in the UE context and use it when enforcing traffic policing for Non-GBR QoS flows for the concerned UE as specified in TS 23.501 [9].

For each PDU session in the PDU SESSION RESOURCE SETUP REQUEST message, if the *Additional QoS Flow Information* IE is included in the *QoS Flow Level QoS Parameters* IE in the *PDU Session Resource Setup Request Transfer* IE of the PDU SESSION RESOURCE 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.

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.
- 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.

For each QoS flow which has been successfully established, the NG-RAN node shall store 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 use 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 PDU session resource requested to be setup:

- For each PDU session resource successfully setup, the *PDU Session Resource Setup Response Transfer* IE shall be included containing:
 1. The NG-U UP transport layer information to be used for the PDU session and associated list of QoS flows which have been successfully established, in the *QoS Flow per TNL Information* IE.
 2. The list of QoS flows which failed to be established, if any, in the *QoS Flow Failed to Setup List* IE. 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 the unsuccessful establishment.
- For each PDU session resource which failed to be setup, the *PDU Session Resource Setup Unsuccessful Transfer* IE shall be included containing a cause value that should be precise enough to enable the SMF to know the reason for the unsuccessful establishment.

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 or *PDU Session Resource Setup Unsuccessful Transfer* IE to the SMF associated with the concerned PDU session.

The *UE Aggregate Maximum Bit Rate* IE should be sent to the NG-RAN node if the AMF has not sent it previously. If it is included in the PDU SESSION RESOURCE SETUP REQUEST 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].

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 which failed to be setup with an appropriate cause value, e.g. "NG intra-system handover triggered", "NG inter-system handover triggered" or "Xn handover triggered".
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

If the NG-RAN node receives a PDU SESSION RESOURCE SETUP REQUEST message containing several *PDU Session ID* IEs (in the *PDU Session Resource Setup Request List* IE) set to the same value, the NG-RAN node shall

report the establishment of the corresponding PDU sessions as failed in the PDU SESSION RESOURCE SETUP RESPONSE message with an appropriate cause value.

If the NG-RAN node receives a PDU SESSION RESOURCE SETUP REQUEST message containing a *PDU Session ID* IE (in the *PDU Session Resource Setup Request List* IE) set to a value that identifies an active PDU session (established before the PDU SESSION RESOURCE SETUP REQUEST message was received), the NG-RAN node shall report the establishment of the new PDU session as failed in the PDU SESSION RESOURCE SETUP REQUEST message with an appropriate cause value.

If the NG-RAN node receives a PDU SESSION RESOURCE SETUP REQUEST message containing a *QoS Flow Setup Request List* IE in the *PDU Session Resource Setup Request Transfer* IE including at least one Non-GBR QoS flow but the *PDU Session Aggregate Maximum Bit Rate* IE is not present, the NG-RAN node shall report the establishment of the corresponding PDU session as failed in the PDU SESSION RESOURCE SETUP REQUEST message with an appropriate cause value.

If the NG-RAN node receives a PDU SESSION RESOURCE SETUP REQUEST message containing a *QoS Flow Level QoS Parameters* IE in the *PDU Session Resource Setup Request Transfer* IE for a GBR QoS flow but the *GBR QoS Flow Information* IE is not present, the NG-RAN node shall report the establishment of the corresponding QoS flow as failed in the *PDU Session Resource Setup Response Transfer* IE of the PDU SESSION RESOURCE SETUP RESPONSE message with an appropriate cause value. If the NG-RAN node receives a PDU SESSION RESOURCE SETUP REQUEST message containing the *Delay Critical* IE in the *Dynamic 5QI Descriptor* IE of the *QoS Flow Level QoS Parameters* IE of the *PDU Session Resource Setup Request Transfer* IE set to the value “delay critical” but the *Maximum Data Burst Volume* IE is not present, the NG-RAN node shall report the establishment of the corresponding QoS flow as failed in the *PDU Session Resource Setup Response Transfer* IE of the PDU SESSION RESOURCE SETUP RESPONSE message with an appropriate cause value.

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

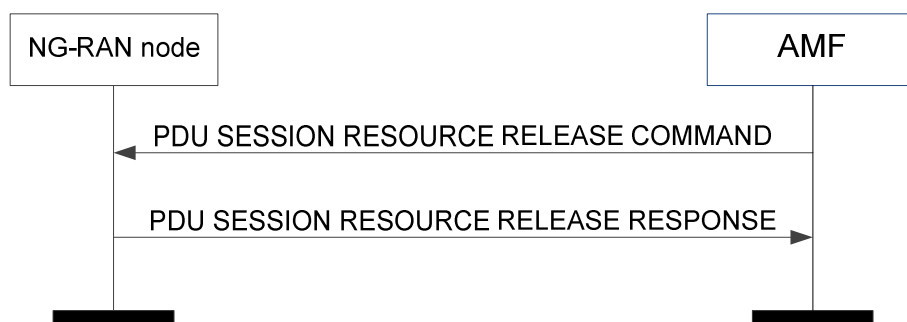


Figure 8.2.2.2-1: PDU session resource release: successful operation

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 resource, and include each PDU session resource to release in the *PDU Session Resource to Release List* IE.

If a *NAS-PDU* IE is contained in the PDU SESSION RESOURCE RELEASE COMMAND 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 any.

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 was 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].

For each PDU session for which the *Secondary RAT Usage Information* IE is included in the *PDU Session Resource Release Response Transfer* IE, the SMF shall handle this information as specified in TS 23.502 [10].

8.2.2.3 Unsuccessful Operation

The unsuccessful operation is specified in the successful operation section.

8.2.2.4 Abnormal Conditions

If the NG-RAN node receives a PDU SESSION RESOURCE RELEASE COMMAND message containing multiple *PDU Session ID* IEs (in the *PDU Session Resource to Release List* IE) set to the same value, the NG-RAN node shall initiate the release of one corresponding PDU session and ignore the duplication of the instances of the selected corresponding PDU sessions.

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

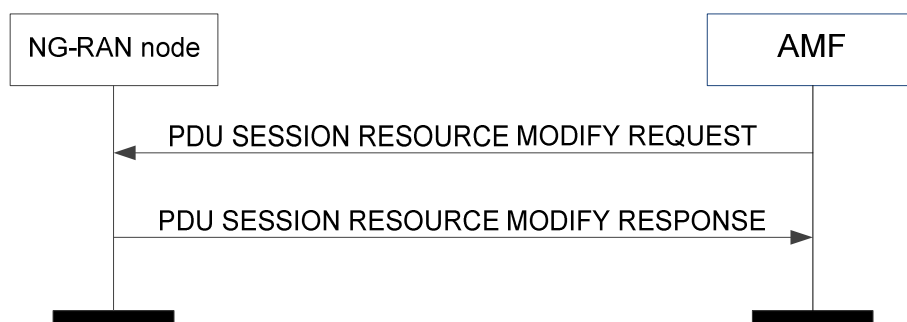


Figure 8.2.3.2-1: PDU session resource modify: successful operation

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 List* 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, if the *S-NSSAI* IE is included in the *PDU Session Resource Modify Request Item* IE contained in the PDU SESSION RESOURCE MODIFY REQUEST message, the NG-RAN node shall replace the previously provided S-NSSAI by the received S-NSSAI for the concerned PDU session and use it as specified in TS 23.502 [10].

For each PDU session, if the *Network Instance* IE is included in the *PDU Session Resource Modify Request Transfer* IE contained in the PDU SESSION RESOURCE MODIFY REQUEST message and the *Common Network Instance* IE is not present, the NG-RAN node shall, if supported, use it as specified in TS 23.501 [9].

For each PDU session, if the *Common Network Instance* IE is included in the *PDU Session Resource Modify Request Transfer* IE contained in the PDU SESSION RESOURCE MODIFY REQUEST message, the NG-RAN node shall, if supported, use it as specified in TS 23.501 [9].

For each PDU session included in the *PDU Session Resource Modify Request List* 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 DRB 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 DRB of the PDU session. The associated DRB for the QoS flow accepted to modify may not change.
- For each QoS flow included in the *QoS Flow Add or Modify Request List* IE, if the *QoS Flow Add or Modify Request Item* IE is included for an existing *QoS Flow Identifier* IE, the NG-RAN node shall overwrite the content of the full *QoS Flow Add or Modify Request Item* IE.
- 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 DRB.
- 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 store and use the received PDU Session Aggregate Maximum Bit Rate value when enforcing traffic policing for Non-GBR QoS flows for the concerned UE as specified in TS 23.501 [9].
- If the *UL NG-U UP TNL Modify List* 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 transport bearers identified by the *DL NG-U UP TNL Information* IE included in the *PDU Session Resource Modify Request Transfer* IE for the concerned PDU session.
- If the *Additional UL NG-U UP TNL Information* IE is included in the *PDU Session Resource Modify Request Transfer* IE, the NG-RAN node may allocate resources for an additional NG-U transport bearer for some or all of the QoS flows present in the *QoS Flow Add or Modify Request List* IE and it shall indicate these QoS flows in the *Additional DL QoS Flow per TNL Information* IE in the *PDU Session Resource Modify Response Transfer* IE. In case the *Additional DL QoS Flow per TNL Information* IE is not included the SMF shall consider the proposed additional UL NG-U UP TNL information as available again.
- In case more than one NG-U transport bearers have been set up for the PDU session, if all the QoS flows associated to one existing NG-U transport bearer are included in the *QoS Flow to Release List* IE in the *PDU Session Resource Modify Request Transfer* IE, the NG-RAN node and 5GC shall consider that the concerned NG-U transport bearer is removed for the PDU session, and both NG-RAN node and 5GC shall therefore consider the related NG-U UP TNL information as available again.

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 containing:

1. The list of QoS flows which have been successfully setup or modified, if any, 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, 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 *PDU Session Resource Modify Unsuccessful Transfer* IE shall be included containing the failure cause.
 - For each PDU session, if the *DL NG-U UP TNL Information* IE is included in the *PDU Session Resource Modify Response Transfer* IE in the PDU SESSION RESOURCE MODIFY RESPONSE message, it shall be considered by the SMF as the new DL transport layer address for the PDU session. The NG-RAN also may indicate the mapping between each new DL transport layer address and the corresponding UL transport layer address assigned by the 5GC.
 - For each PDU session, if the *Additional NG-U UP TNL Information* IE is included in the *PDU Session Resource Modify Response Transfer* IE in the PDU SESSION RESOURCE MODIFY RESPONSE message, it shall be considered by the SMF as the new DL transport layer address(es) for the PDU session. The NG-RAN also may indicate the mapping between each new DL transport layer address and the corresponding UL transport layer address assigned by the 5GC.

Upon reception of the PDU SESSION RESOURCE MODIFY RESPONSE message the AMF shall, for each PDU session indicated in the *PDU Session ID* IE, transfer transparently the *PDU Session Resource Modify Response Transfer* IE or *PDU Session Resource Modify Unsuccessful Transfer* IE to each SMF associated with the concerned PDU session.

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 the NG-RAN node is not able to support IMS voice, 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 Modify Response Transfer* IE or in the *PDU Session Resource Modify Unsuccessful 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, e.g. "NG intra-system handover triggered", "NG inter-system handover triggered" or "Xn handover triggered".
2. The NG-RAN node shall trigger the handover procedure.

8.2.3.3 Unsuccessful Operation

The unsuccessful operation is specified in the successful operation section.

8.2.3.4 Abnormal Conditions

If the NG-RAN node receives a PDU SESSION RESOURCE MODIFY REQUEST message containing several *PDU Session ID* IEs (in the *PDU Session Resource Modify Request List* IE) set to the same value, the NG-RAN node shall

report the modification of the corresponding PDU sessions as failed in the PDU SESSION RESOURCE MODIFY RESPONSE message with an appropriate cause value.

If the NG-RAN node receives a PDU SESSION RESOURCE MODIFY REQUEST message containing some *PDU Session ID* IEs (in the *PDU Session Resource Modify Request List* IE) that the NG-RAN node does not recognize, the NG-RAN node shall report the corresponding invalid PDU sessions as failed in the PDU SESSION RESOURCE MODIFY RESPONSE message with an appropriate cause value.

If the NG-RAN node receives a PDU SESSION RESOURCE MODIFY REQUEST message containing a *QoS Flow Level QoS Parameters* IE in the *PDU Session Resource Modify Request Transfer* IE for a GBR QoS flow but the *GBR QoS Flow Information* IE is not present, the NG-RAN node shall report the addition or modification of the corresponding QoS flow as failed in the *PDU Session Resource Modify Response Transfer* IE of the PDU SESSION RESOURCE MODIFY RESPONSE message with an appropriate cause value.

If the NG-RAN node receives a PDU SESSION RESOURCE MODIFY REQUEST message containing the *Delay Critical* IE in the *Dynamic 5QI Descriptor* IE of the *QoS Flow Level QoS Parameters* IE of the *PDU Session Resource Modify Request Transfer* IE set to the value “delay critical” but the *Maximum Data Burst Volume* IE is not present, the NG-RAN node shall report the addition or modification of the corresponding QoS flow as failed in the *PDU Session Resource Modify Response Transfer* IE of the PDU SESSION RESOURCE MODIFY RESPONSE message with an appropriate cause value.

If the NG-RAN node receives a PDU SESSION RESOURCE MODIFY REQUEST message containing a PDU session in the *PDU Session Resource Modify Request List* IE with the same QoS flow included in both the *QoS Flow Add or Modify Request List* IE and the *QoS Flow to Release List* IE, the NG-RAN node shall report the corresponding QoS flow as failed in the *QoS Flow Failed to Add or Modify List* IE of the *PDU Session Resource Modify Response Transfer* IE of the PDU SESSION RESOURCE MODIFY RESPONSE message with an appropriate cause value if the PDU session is modified successfully. The NG-RAN node shall not release the QoS flow when the corresponding QoS flow already exists.

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 notification control is requested. The procedure uses UE-associated signalling.

8.2.4.2 Successful Operation

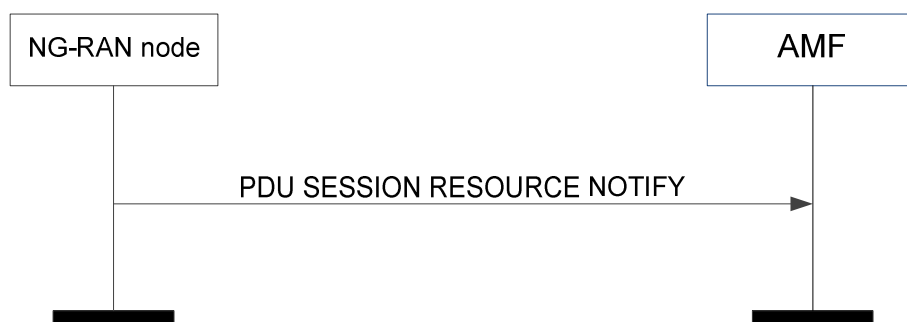


Figure 8.2.4.2-1: PDU session resource notify

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 session resources or QoS flows which are released or not fulfilled anymore or fulfilled again by the NG-RAN node.

- For each PDU session for 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 containing:
 1. The list of QoS flows which are released by the NG-RAN node, if any, 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, in the *QoS Flow Notify List IE* together with the *Notification Cause IE*.
 - For each PDU session resource which is released by the NG-RAN node, the *PDU Session Resource Notify Released Transfer IE* shall be included containing 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* or *PDU Session Resource Notify Released Transfer IE* to the SMF associated with the concerned PDU session. Upon reception of *PDU Session Resource Notify Transfer IE*, the 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.

For each PDU session for which the *Secondary RAT Usage Information IE* is included in the *PDU Session Resource Notify Transfer IE* or the *PDU Session Resource Notify Released Transfer IE*, the SMF shall handle this information as specified in TS 23.502 [10].

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

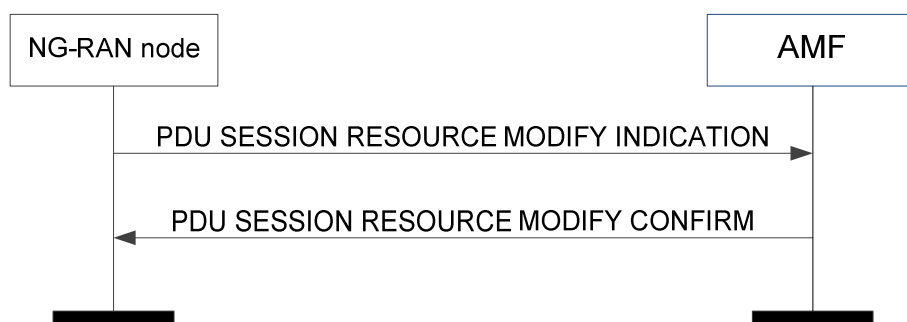


Figure 8.2.5.2-1: PDU session resource modify indication: successful operation

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 the SMF associated with the concerned PDU session.

For each PDU session for which the *DL QoS Flow per TNL Information IE* is included in the *PDU Session Resource Modify Indication Transfer IE* in the PDU SESSION RESOURCE MODIFY INDICATION message, the SMF shall consider the included DL transport layer address as the DL transport layer address for the included associated QoS flows and it may provide the associated UL transport layer address in the *UL NG-U UP TNL Information IE* in the *PDU Session Resource Modify Confirm Transfer IE* in the PDU SESSION RESOURCE MODIFY CONFIRM message.

For each PDU session for which the *Additional DL QoS Flow per TNL Information IE* is included in the *PDU Session Resource Modify Indication Transfer IE* in the PDU SESSION RESOURCE MODIFY INDICATION message, the

SMF shall, if supported, consider for this split PDU session each included DL transport layer address(es) as the DL transport layer address(s) for the included associated QoS flows and it may provide the associated UL transport layer address(s) in the *Additional NG-U UP TNL Information IE* in the *PDU Session Resource Modify Confirm Transfer IE* in the PDU SESSION RESOURCE MODIFY CONFIRM message.

In case more than one NG-U transport bearers have been set up for the PDU session, the *DL QoS Flow per TNL Information IE* and the *Additional DL QoS Flow per TNL Information IE* in the *PDU Session Resource Modify Indication Transfer IE* in the PDU SESSION RESOURCE MODIFY INDICATION message shall be included if at least one QoS flow is associated to their respective NG-U transport bearer; if no QoS flow is associated to one existing NG-U transport bearer after the modification, the NG-RAN node and 5GC shall consider that the concerned NG-U transport bearer is removed for the PDU session, and both NG-RAN node and 5GC shall therefore consider the related NG-U UP TNL information as available again.

If the *Security Result IE* is included in the *PDU Session Resource Modify Indication Transfer IE* in the PDU SESSION RESOURCE MODIFY INDICATION message, it may be considered by the SMF as the new security status of the PDU session.

For each PDU session for which the *Secondary RAT Usage Information IE* is included in the *PDU Session Resource Modify Indication Transfer IE*, the SMF shall handle this information as specified in TS 23.502 [10].

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 containing:
 1. The list of QoS flows which have been successfully modified in the *QoS Flow Modify Confirm List IE*.
 2. The list of QoS flows which have failed to be modified, if any, in the *QoS Flow Failed to Modify List IE*.
- For each PDU session which failed to be modified, the *PDU Session Resource Modify Indication Unsuccessful 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 DRB for the concerned QoS flow, or
 2. keep the previous transport layer information before sending the PDU SESSION RESOURCE MODIFY INDICATION unchanged for the concerned QoS flow.

Upon reception of the *PDU Session Resource Modify Indication Unsuccessful Transfer IE* for each PDU session listed in the PDU SESSION RESOURCE MODIFY CONFIRM message, 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 layer 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 or if the NG-RAN node has already initiated a UE-associated logical NG-connection by sending an INITIAL UE MESSAGE message via another NG interface instance. The procedure uses UE-associated signalling.

For signalling only connections and if the *UE Context Request IE* is not received in the Initial UE Message, the AMF may be configured to trigger the procedure for all NAS procedures or on a per NAS procedure basis depending on operator's configuration.

8.3.1.2 Successful Operation

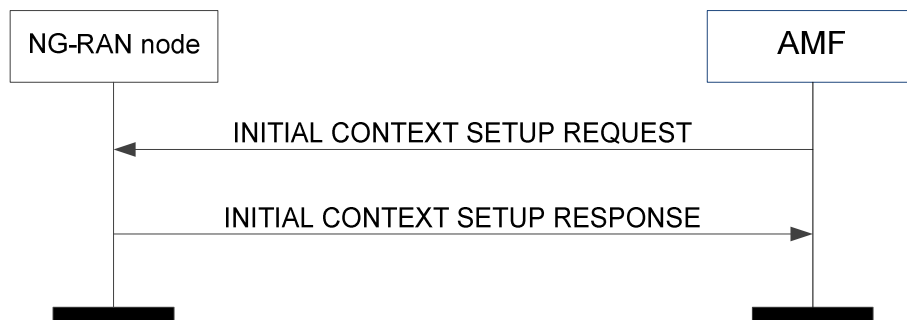


Figure 8.3.1.2-1: Initial context setup: successful operation

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 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 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 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 result for each PDU session resource requested to be setup as defined in the PDU Session Resource Setup procedure.

Upon reception of the INITIAL CONTEXT 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 or *PDU Session Resource Setup Unsuccessful Transfer* IE to the 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.

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 *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 *Core Network Assistance Information for RRC INACTIVE* 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 e.g. the RRC_INACTIVE state decision and RNA 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 *CN Assisted RAN Parameters Tuning* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the NG-RAN node may use it as described in TS 23.501 [9].

If the *RRC Inactive Transition Report Request* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the NG-RAN node shall, if supported, store this information in the UE context.

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.

If the *Redirection for Voice EPS Fallback* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the NG-RAN node shall, if supported, store it and use it in a subsequent decision of EPS fallback for voice as specified in TS 23.502 [10].

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

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.

Interactions with RRC Inactive Transition Report procedure:

If the *RRC Inactive Transition Report Request IE* is included in the INITIAL CONTEXT SETUP REQUEST message and set to "subsequent state transition report", the NG-RAN node shall, if supported, send the RRC INACTIVE TRANSITION REPORT message to the AMF to report the RRC state of the UE when the UE enters or leaves RRC_INACTIVE state.

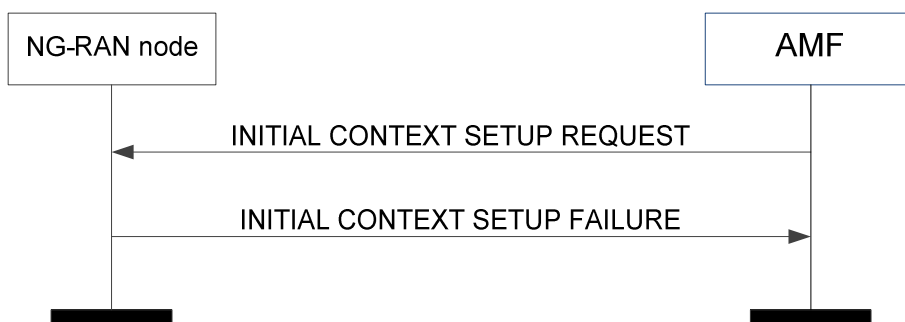
8.3.1.3 Unsuccessful Operation

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.

If the *PDU Session Resource Setup Request List IE* is contained in the INITIAL CONTEXT SETUP REQUEST message, the NG-RAN node shall report to the AMF, in the INITIAL CONTEXT SETUP FAILURE message, the unsuccessful establishment result for each PDU session resource requested to be setup as defined in the PDU Session Resource Setup procedure.

Upon reception of the INITIAL CONTEXT SETUP FAILURE message the AMF shall, for each PDU session indicated in the *PDU Session ID IE*, transfer transparently the *PDU Session Resource Setup Unsuccessful Transfer IE* to the SMF associated with the concerned PDU session.

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

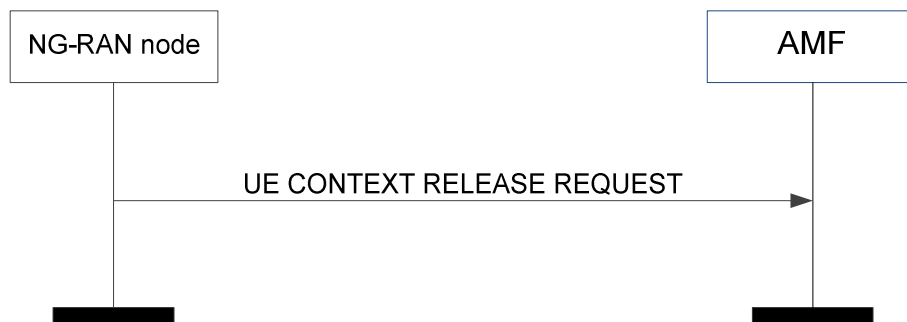


Figure 8.3.2.2-1: UE context release request

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., "TXnRELOCOverall Expiry", "Redirection", for the requested UE-associated logical NG-connection release.

If the *PDU Session Resource List* IE is included in the UE CONTEXT RELEASE REQUEST message, the AMF shall handle this information as specified in TS 23.502 [10].

Interactions with UE Context Release procedure:

The UE Context Release procedure should be initiated upon reception of a UE CONTEXT RELEASE REQUEST message. If the UE was configured with DC radio resources at the time UE Context Release Request procedure was triggered, and the PSCell information was available, the NG-RAN node shall store the PSCell information in the UE context.

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, or release of the old UE-associated logical NG-connection when the UE has initiated the establishment of a new UE-associated logical NG-connection, etc. The procedure uses UE-associated signalling.

8.3.3.2 Successful Operation

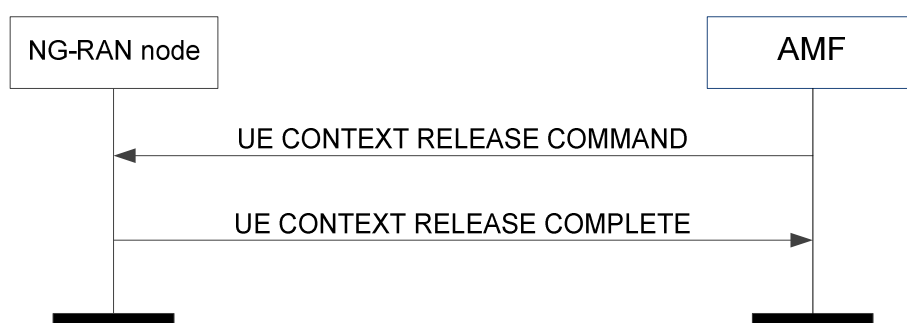


Figure 8.3.3.2-1: UE context release: successful operation

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 *PDU Session Resource List* 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 *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.

For each PDU session for which the *Secondary RAT Usage Information* IE is included in the *PDU Session Resource Release Response Transfer* IE, the SMF shall handle this information as specified in TS 23.502 [10].

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 $T_{NG_RELOC_Overall}$, 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 $T_{NG_RELOC_Overall}$, the NG-RAN node shall stop the timer $T_{NG_RELOC_Overall}$ 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.

8.3.4.2 Successful Operation

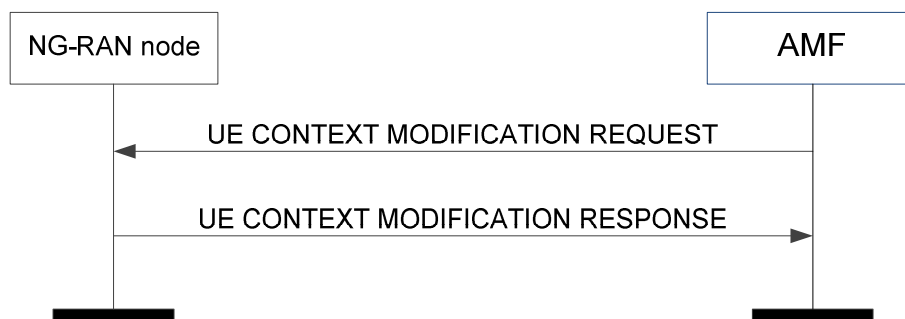


Figure 8.3.4.2-1: UE context modification: successful operation

If the *Security Key* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the NG-RAN node shall store it and perform AS key re-keying according to TS 33.501 [13].

If the *UE Security Capabilities* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the NG-RAN node shall store them and take them into use together with the received keys according to TS 33.501 [13].

If the *Index to RAT/Frequency Selection Priority* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the NG-RAN node shall, if supported, 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 *Core Network Assistance Information for RRC INACTIVE* 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 e.g. the RRC_INACTIVE state decision and RNA 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 *CN Assisted RAN Parameters Tuning* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the NG-RAN node may use it as described in TS 23.501 [9].

If the *RRC Inactive Transition Report Request* 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 report to the AMF the *User Location Information* IE and the *RRC State* IE in the UE CONTEXT MODIFICATION RESPONSE message.

If the *RRC Inactive Transition Report Request* IE is included in the UE CONTEXT MODIFICATION REQUEST message and set to "cancel report", the NG-RAN node shall, if supported, stop reporting to the AMF the RRC state of the UE.

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 taking into account the *Emergency Service Target CN* IE if provided.

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.

If the *New GUAMI* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the NG-RAN node shall replace the previously stored GUAMI as specified in TS 23.501 [9].

Interactions with RRC Inactive Transition Report procedure:

If the *RRC Inactive Transition Report Request* IE is included in the UE CONTEXT MODIFICATION REQUEST message and set to "single RRC connected state report", the NG-RAN node shall, if supported and if the UE is in RRC_INACTIVE state, send one subsequent RRC INACTIVE TRANSITION REPORT message to the AMF when the RRC state transitions to RRC_CONNECTED state.

If the *RRC Inactive Transition Report Request* IE is included in the UE CONTEXT MODIFICATION REQUEST message and set to "subsequent state transition report", the NG-RAN node shall, if supported, send the RRC INACTIVE TRANSITION REPORT message to the AMF to report the RRC state of the UE when the UE enters or leaves RRC_INACTIVE state.

8.3.4.3 Unsuccessful Operation

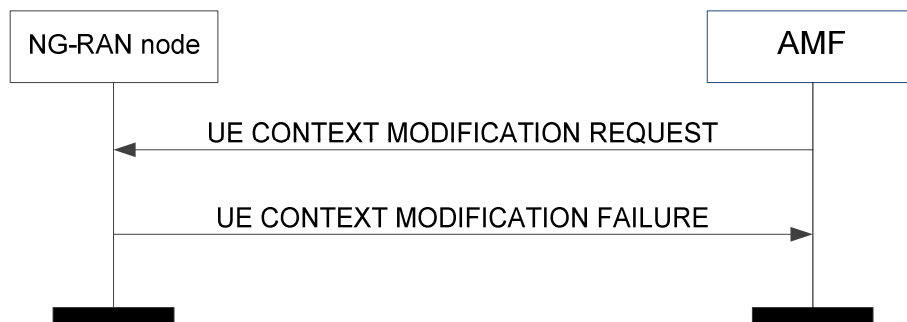


Figure 8.3.4.3-1: UE context modification: unsuccessful operation

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.

If the *New AMF UE NGAP ID* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the NG-RAN node may use the received *New AMF UE NGAP ID* IE or *Old AMF UE NGAP ID* IE in the UE CONTEXT MODIFICATION FAILURE message.

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.

NOTE: If the *Emergency Fallback Indicator* IE and the *Security Key* IE are both included in the UE CONTEXT MODIFICATION REQUEST message, the NG-RAN node may handle only the *Emergency Fallback Indicator* IE.

8.3.5 RRC Inactive Transition Report

8.3.5.1 General

The purpose of the RRC Inactive Transition Report procedure is to notify the AMF when the UE enters or leaves RRC_INACTIVE state. The procedure uses UE-associated signalling.

8.3.5.2 Successful Operation

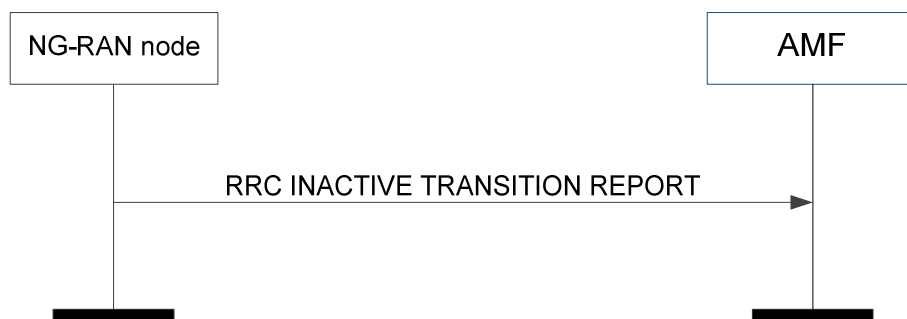


Figure 8.3.5.2-1: RRC Inactive transition report

The NG-RAN node initiates the procedure by sending an RRC INACTIVE TRANSITION REPORT message to the AMF. Upon reception of the RRC INACTIVE TRANSITION REPORT message, the AMF shall take appropriate actions based on the information indicated by the *RRC State* IE.

8.3.5.3 Abnormal Conditions

Void.

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 HANOVER REQUIRED message to the serving AMF. When the source NG-RAN node sends the HANOVER REQUIRED message, it shall start the timer $T_{NGRELOC_{prep}}$. The source NG-RAN node shall indicate the appropriate cause value for the handover in the *Cause* IE.

Upon reception of the HANOVER REQUIRED message the AMF shall, for each PDU session indicated in the *PDU Session ID* IE, transparently transfer the *Handover Required Transfer* IE to the SMF associated with the concerned PDU session.

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

If the *DRBs to QoS Flows Mapping List* IE is included in the *PDU Session Resource Information Item* IE within the *Source NG-RAN node to Target NG-RAN node Transparent Container* IE of the HANOVER REQUIRED message, it implicitly indicates that the source NG-RAN node proposes forwarding of downlink data for those DRBs.

If the *QoS Flow Mapping Indication* IE for a QoS flow is included in the *Associated QoS Flow List* IE within the *DRBs to QoS Flows Mapping List* IE within the *Source NG-RAN node to Target NG-RAN node Transparent Container* IE of the HANOVER REQUIRED message, it indicates that the source NG-RAN node has mapped only the uplink or downlink of the QoS flow to the DRB.

If the HANOVER COMMAND message contains the *DL Forwarding UP TNL 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 HANOVER COMMAND message contains the *UL Forwarding UP TNL Information IE* for a given DRB in the *Data Forwarding Response DRB List IE* within the *Handover Command Transfer IE*, it means the target NG-RAN node has requested the forwarding of uplink data for this DRB.

If the HANOVER COMMAND message contains the *UL Forwarding UP TNL Information IE* for a given PDU session within the *Handover Command Transfer IE*, the source NG-RAN node shall consider that the forwarding of uplink data of the QoS flows is accepted by the target NG-RAN node.

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 *Direct Forwarding Path Availability IE* is included in the HANOVER REQUIRED message the AMF shall handle it as specified in TS 23.502 [10].

If the *Direct Forwarding Path Availability IE* is included within the *Handover Required Transfer IE* of the HANOVER REQUIRED message the SMF 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 HANOVER COMMAND message to the source NG-RAN node. In case of intra-system handover, the AMF shall include the *PDU Session Resource Handover List IE* in the HANOVER COMMAND message.

Upon reception of the HANOVER 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*.

NOTE: As an exception in case of inter-system handover to LTE, the AMF generates the *Handover Preparation Unsuccessful Transfer IE* in the *PDU Session Resources to Release List IE*.

If the HANOVER COMMAND message contains the *QoS Flow to be Forwarded List IE* within the *Handover Command Transfer IE* for a given PDU session, then the source NG-RAN node should initiate data forwarding for the listed QoS flows over the forwarding tunnel specified in the *DL Forwarding UP TNL Information IE* as specified in TS 38.300 [8].

If the HANOVER COMMAND message contains the *Additional DL Forwarding UP TNL Information IE* within the *Handover Command Transfer IE*, the source NG-RAN node should initiate data forwarding of the PDU session split in different tunnel and shall use the received UP transport layer information for the forwarding QoS flows associated to it.

If the HANOVER COMMAND message contains the *Additional UL Forwarding UP TNL Information IE* within the *Handover Command Transfer IE*, the source NG-RAN node should initiate data forwarding of the PDU session split in different tunnels using the received UP transport layer information.

If the *NAS Security Parameters from NG-RAN IE* is included in the HANOVER COMMAND message the NG-RAN node shall use it as specified in TS 33.501 [13].

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 HANOVER 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:

If, after a HANOVER REQUIRED message is sent and before the Handover Preparation procedure is terminated, the source NG-RAN node receives an AMF initiated PDU Session Management procedure on the same UE-associated signalling connection, the source NG-RAN node shall either:

1. Cancel the Handover Preparation procedure by executing the Handover Cancellation procedure with an appropriate cause value. After successful completion of the Handover Cancellation procedure, the source NG-RAN node shall continue the AMF initiated PDU Session Management procedure.

or

2. Terminate the AMF initiated PDU Session Management procedure by sending the appropriate response message with an appropriate cause value, e.g. "NG intra-system handover triggered" or "NG inter-system handover triggered" to the AMF and then the source NG-RAN node shall continue with the handover procedure.

8.4.1.3 Unsuccessful Operation

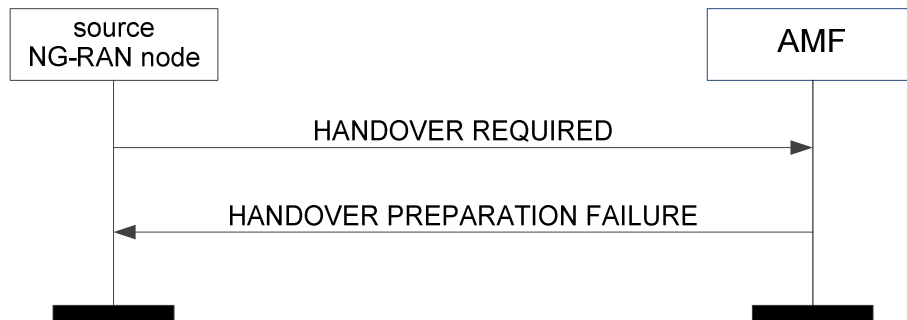


Figure 8.4.1.3-1: Handover preparation: unsuccessful operation

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 HANOVER 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 HANOVER REQUIRED message before timer $T_{NG_RELOC_{prep}}$ 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 HANOVER COMMAND message or HANOVER PREPARATION FAILURE message received after the initiation of the Handover Cancel procedure.

8.4.1.4 Abnormal Conditions

If the NG-RAN node receives at least one PDU Session ID included in the *PDU Session Resource Handover List* IE without at least one valid associated GTP tunnel address pair (in either UL or DL), then the NG-RAN node shall consider it as a logical error and act as described in subclause 10.4. A GTP tunnel address pair is considered valid if both the *GTP-TEID* IE and the *Endpoint IP Address* IE are present.

8.4.2 Handover Resource Allocation

8.4.2.1 General

The purpose of the Handover Resource Allocation procedure is to reserve resources at the target 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 HANOVER REQUEST message to the target NG-RAN node.

If the *Masked IMEISV* IE is contained in the HANOVER 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 HANOVER REQUEST message the target NG-RAN node shall

- attempt to execute the requested PDU session configuration and associated security;
- store the received 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 reception of the *UE History Information* IE, which is included within the *Source to Target Transparent Container* IE of the HANOVER REQUEST message, the target NG-RAN node shall collect the information defined as mandatory in the *UE History Information* IE and shall, if supported, collect the information defined as optional in the *UE History Information* IE, for as long as the UE stays in one of its cells, and store the collected information to be used for future handover preparations.

Upon receiving the *PDU Session Resource Setup List* IE contained in the HANOVER 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 report to the AMF in the HANOVER REQUEST ACKNOWLEDGE message the result for each PDU session resource requested to be setup. 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.

For each PDU session resource which failed to be setup, the *Handover Resource Allocation Unsuccessful Transfer* IE shall be included in the HANOVER REQUEST ACKNOWLEDGE message containing a cause value that should be precise enough to enable the SMF to know the reason for the unsuccessful establishment.

Upon reception of the HANOVER 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 or *Handover Resource Allocation Unsuccessful Transfer* IE to the SMF associated with the concerned PDU session.

If the HANOVER 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* as forwarding tunnel for the QoS flows listed in the *QoS Flow Setup Response List IE* of the HANDOVER REQUEST ACKNOWLEDGE message.

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

In case of intra-system handover, for each PDU session for which the *Additional DL UP TNL Information for HO List IE* is included in the *Handover Request Acknowledge Transfer IE* of the HANDOVER REQUEST ACKNOWLEDGE message, the SMF shall consider the included *Additional DL NG-U UP TNL Information IE* as the downlink termination point for the associated flows indicated in the *Additional QoS Flow Setup Response List IE* for this PDU session split in different tunnels and shall consider the *Additional DL Forwarding UP TNL Information IE*, if included, as the forwarding tunnel associated to these QoS flows.

In case of intra-system handover, for each PDU session for which the *Additional UL Forwarding UP TNL Information IE* is included in the *Handover Request Acknowledge Transfer IE* of the HANDOVER REQUEST ACKNOWLEDGE message, the SMF shall consider it as the termination points for the uplink forwarding tunnels for this PDU session split in different tunnels.

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* of 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 *Core Network Assistance Information for RRC INACTIVE* IE is included in the HANOVER REQUEST message, the target NG-RAN node shall, if supported, store this information in the UE context and use it for e.g. the RRC_INACTIVE state decision and RNA 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 *CN Assisted RAN Parameters Tuning* IE is included in the HANOVER REQUEST message, the NG-RAN node may use it as described in TS 23.501 [9].

If the *New Security Context Indicator* IE is included in the HANOVER REQUEST message, the target NG-RAN node shall use the information as specified in TS 33.501 [13].

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

If the *RRC Inactive Transition Report Request* IE is included in the HANOVER REQUEST message, the NG-RAN node shall, if supported, store this information in the UE context.

If the *Redirection for Voice EPS Fallback* IE is included in the HANOVER REQUEST message, the NG-RAN node shall, if supported, store it and use it in a subsequent decision of EPS fallback for voice as specified in TS 23.502 [10].

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

Interactions with RRC Inactive Transition Report procedure:

If the *RRC Inactive Transition Report Request* IE is included in the HANOVER REQUEST message and set to "subsequent state transition report", the NG-RAN node shall, if supported, send the RRC INACTIVE TRANSITION REPORT message to the AMF to report the RRC state of the UE when the UE enters or leaves RRC_INACTIVE state.

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 any of the PDU session resources, or a failure occurs during the Handover Preparation, it shall send the HANOVER 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 HANOVER 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 HANOVER FAILURE message.

If the target NG-RAN node receives a HANOVER REQUEST message which does not contain the *Mobility Restriction List* IE, and the serving PLMN cannot be determined otherwise by the NG-RAN node, the target NG-RAN node shall reject the procedure using the HANOVER FAILURE message.

If the target NG-RAN node receives a HANOVER REQUEST message containing the *Mobility Restriction List* IE, and the serving PLMN indicated is not supported by the target cell, the target NG-RAN node shall reject the procedure using the HANOVER 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 HANOVER 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 establish a UE associated signalling connection to the 5GC and, if applicable, to request the switch of the downlink termination point of the NG-U transport bearer towards a new termination point.

8.4.4.2 Successful Operation

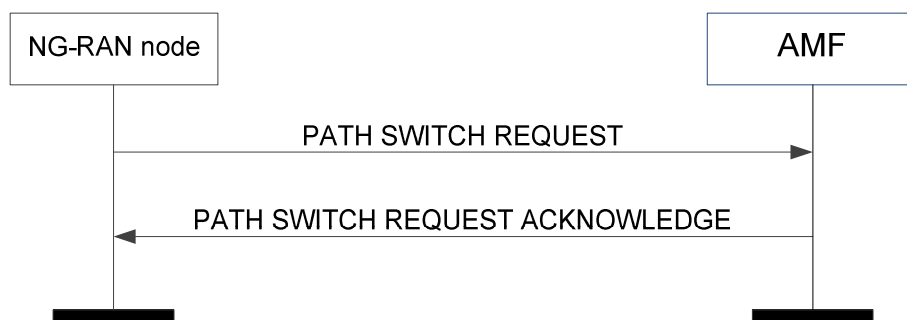


Figure 8.4.4.2-1: Path switch request: successful operation

The NG-RAN node initiates the procedure by sending the PATH SWITCH REQUEST message to the AMF. Upon reception of the PATH SWITCH REQUEST message the AMF shall, for each PDU session indicated in the *PDU*

Session ID IE, transparently transfer the *Path Switch Request Transfer IE* to the SMF associated with the concerned PDU session.

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].

For each PDU session for which the *Additional DL QoS Flow per TNL Information IE* is included in the *Path Switch Request Transfer IE* of the *PATH SWITCH REQUEST* message, the SMF may use each included UP transport layer information as the downlink termination point for the included associated QoS flows for this PDU session split in different tunnels.

The list of PDU sessions which failed to be setup, if any, shall be included in the *PATH SWITCH REQUEST* message within the *Path Switch Request Setup Failed Transfer IE*. 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.

For each PDU session for which the *DL NG-U TNL Information Reused IE* set to "true" is included in the *Path Switch Request Transfer IE* of the *PATH SWITCH REQUEST* message, the SMF shall, if supported, consider that the DL TNL information contained in the *DL NG-U UP TNL Information IE* has been reused.

If the *Security Indication IE* is included 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 *UL NG-U UP TNL Information IE* is included within the *Path Switch Request Acknowledge Transfer IE* of the *PATH SWITCH REQUEST ACKNOWLEDGE* message, the NG-RAN node shall store this information and use it as the uplink termination point for the user plane data for this PDU session.

If the *Additional NG-U UP TNL Information IE* is included within the *Path Switch Request Acknowledge Transfer IE* of the *PATH SWITCH REQUEST ACKNOWLEDGE* message, the NG-RAN node shall store this information and use the included *UL NG-U UP TNL Information IE(s)* as the uplink termination point(s) of the user plane data for this PDU session split in different tunnel.

If the *Core Network Assistance Information for RRC INACTIVE 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 e.g. the *RRC_INACTIVE* state decision and RNA 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 *CN Assisted RAN Parameters Tuning IE* is included in the *PATH SWITCH REQUEST ACKNOWLEDGE* message, the NG-RAN node may use it as described in TS 23.501 [9].

If the *RRC Inactive Transition Report Request IE* is included in the *PATH SWITCH REQUEST ACKNOWLEDGE* message, the NG-RAN node shall, if supported, store this information in the UE context.

If the *New Security Context Indicator IE* is included in the *PATH SWITCH REQUEST ACKNOWLEDGE* message, the NG-RAN node shall use the 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]).

If the *Redirection for Voice EPS Fallback IE* is included in the *PATH SWITCH REQUEST ACKNOWLEDGE* message, the NG-RAN node shall, if supported, store it and use it in a subsequent decision of EPS fallback for voice as specified in TS 23.502 [10].

If the *PDU Session Resource Released List* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message, the NG-RAN node shall release the corresponding QoS flows and regard the PDU session(s) indicated in the *PDU Session Resource Released List* IE as being released. The appropriate cause value for each PDU session released is included in the *Path Switch Request Unsuccessful Transfer* IE contained in the PATH SWITCH REQUEST ACKNOWLEDGE message.

Interactions with RRC Inactive Transition Report procedure:

If the *RRC Inactive Transition Report Request* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message and set to "single RRC connected state report" and the UE is in RRC_CONNECTED state, the NG-RAN node shall, if supported, send one RRC INACTIVE TRANSITION REPORT message to the AMF to report the RRC state of the UE.

If the *RRC Inactive Transition Report Request* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message and set to "single RRC connected state report" and the UE is in RRC_INACTIVE state, the NG-RAN node shall, if supported, send to the AMF one RRC INACTIVE TRANSITION REPORT message plus one subsequent RRC INACTIVE TRANSITION REPORT message when the RRC state transitions to RRC_CONNECTED state.

If the *RRC Inactive Transition Report Request* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message and set to "subsequent state transition report", the NG-RAN node shall, if supported, send one RRC INACTIVE TRANSITION REPORT message to the AMF to report the RRC state of the UE and subsequent RRC INACTIVE TRANSITION REPORT messages to report the RRC state of the UE when the UE enters or leaves RRC_INACTIVE state.

8.4.4.3 Unsuccessful Operation

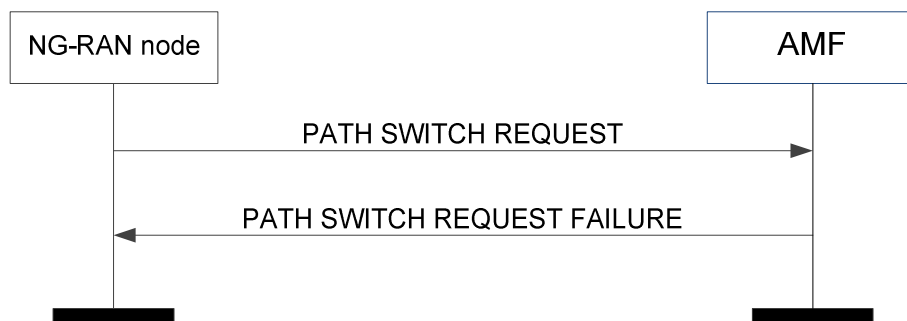


Figure 8.4.4.3-1: Path switch request: unsuccessful operation

If the 5GC fails to switch the downlink termination point of the NG-U transport bearer towards a new termination point for all PDU session resources, the AMF shall send the PATH SWITCH REQUEST FAILURE message to the NG-RAN node.

The NG-RAN node shall release the corresponding QoS flows and regard the PDU session(s) indicated in the *PDU Session Resource Released List* IE included in the PATH SWITCH REQUEST FAILURE message as being released.

The appropriate cause value for each PDU session released is included in the *Path Switch Request Unsuccessful Transfer* IE contained in the PATH SWITCH REQUEST FAILURE message.

8.4.4.4 Abnormal Conditions

If the AMF receives a PATH SWITCH REQUEST message containing several *PDU Session ID* IEs (in the *PDU Session Resource to be Switched in Downlink List* IE) set to the same value, the AMF shall send the PATH SWITCH REQUEST FAILURE message to the NG-RAN node.

NOTE: As an exception, the AMF generates the *Path Switch Request Unsuccessful Transfer* IE.

8.4.5 Handover Cancellation

8.4.5.1 General

The purpose of the Handover Cancellation 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

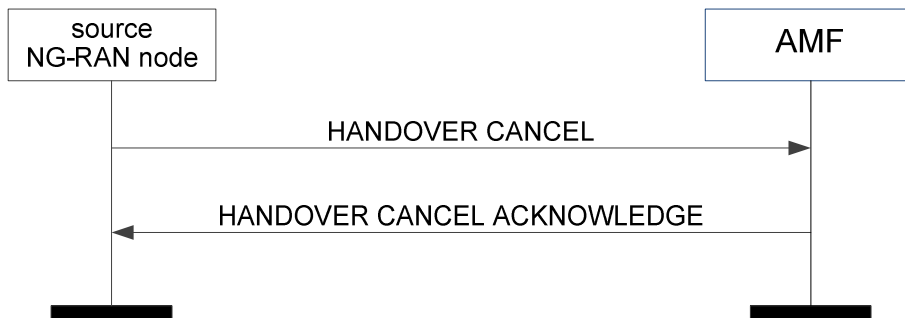


Figure 8.4.5.2-1: Handover cancel: successful operation

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

If the source NG-RAN node becomes aware of the fact that an expected HANDOVER CANCEL ACKNOWLEDGE message is missing, the source NG-RAN node shall consider the Handover Cancellation procedure as successfully terminated.

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 NG-based handover. The procedure uses UE-associated signalling.

8.4.6.2 Successful Operation

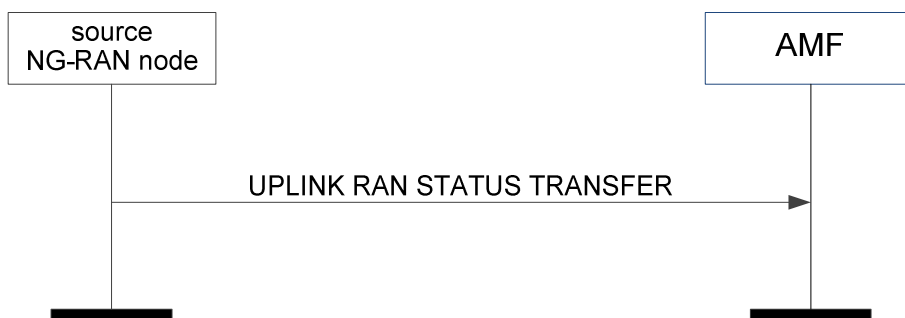


Figure 8.4.6.2-1: Uplink RAN status transfer

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

For each DRB for which PDCP-SN and HFN status preservation applies, the source NG-RAN node shall include the *DRB ID IE*, the *UL COUNT Value IE* and the *DL COUNT Value IE* within the *DRBs Subject to Status Transfer List IE* in the *RAN Status Transfer Transparent Container IE* of the UPLINK RAN STATUS TRANSFER message.

The source NG-RAN node may also include in the UPLINK RAN STATUS TRANSFER message the missing and the received uplink SDUs in the *Receive Status of UL PDCP SDUs IE* for each DRB for which the source NG-RAN node has accepted the request from the target NG-RAN node for uplink forwarding.

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 enable lossless NG-based handover. The procedure uses UE-associated signalling.

8.4.7.2 Successful Operation

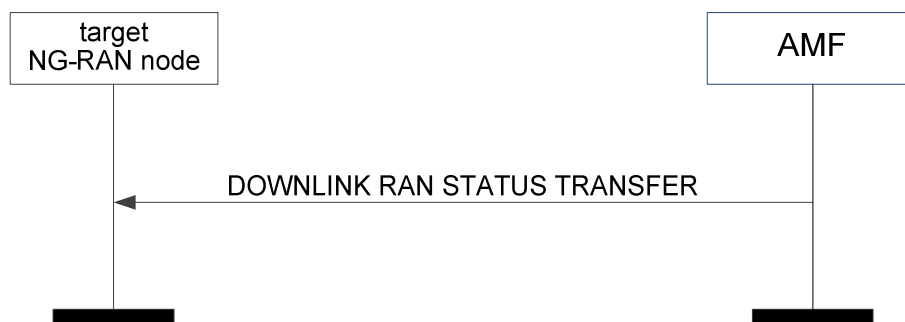


Figure 8.4.7.2-1: Downlink RAN status transfer

The AMF initiates the procedure by sending the DOWNLINK RAN STATUS TRANSFER message to the target NG-RAN node. The target NG-RAN node using Full Configuration for this handover as per TS 38.300 [8] shall ignore the information received in this message.

For each DRB in the *DRBs Subject to Status Transfer List IE* within the *RAN Status Transfer Transparent Container IE*, the target NG-RAN node shall not deliver any uplink packet which has a PDCP-SN lower than the value of the *UL Count Value IE*.

For each DRB in the *DRBs Subject to Status Transfer List IE* within the *RAN Status Transfer Transparent Container IE*, the target NG-RAN node shall use the value of the *DL COUNT Value IE* for the first downlink packet for which there is no PDCP-SN yet assigned.

If the *Receive Status of UL PDCP SDUs IE* is included for at least one DRB in the *RAN Status Transfer Transparent Container IE* of the DOWNLINK RAN STATUS TRANSFER message, the target NG-RAN node may use it in a Status Report message sent to the UE over the radio interface.

8.4.7.3 Abnormal Conditions

If the target NG-RAN node receives this message for a UE for which no prepared handover exists at the target NG-RAN node, the target NG-RAN node shall ignore the message.

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

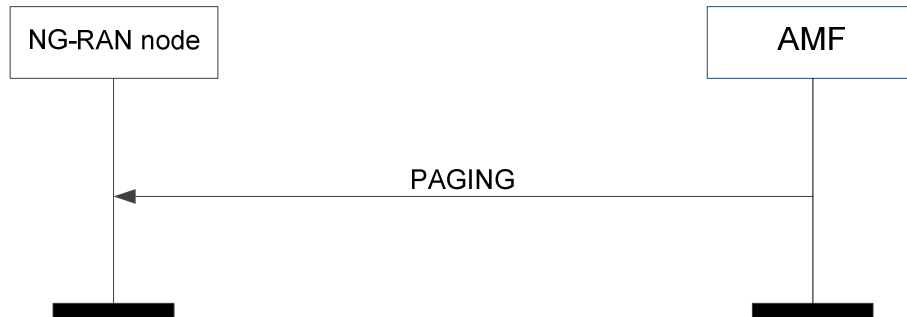


Figure 8.5.1.2-1: Paging

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 *TAI List for Paging* IE.

If the *Paging DRX* IE is included in the PAGING message, the NG-RAN node shall use it according to TS 38.304 [12] and TS 36.304 [29].

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

If the *Paging Priority* IE is included in the PAGING message, 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] and TS 36.331 [21].

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.

If the *Allowed NSSAI* IE is included in the INITIAL UE MESSAGE message the AMF shall use the IE as defined in TS 23.502 [10].

If the *Source to Target AMF Information Reroute* IE is included in the INITIAL UE MESSAGE message the AMF shall use the IE as defined in TS 23.502 [10].

8.6.1.3 Abnormal Conditions

If the *5G-S-TMSI* is not received by the AMF in the INITIAL UE MESSAGE message whereas expected, the AMF shall consider the procedure as failed.

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 or if the NG-RAN node has already initiated a UE-associated logical NG-connection by sending an INITIAL UE MESSAGE message via another NG interface instance.

8.6.2.2 Successful Operation

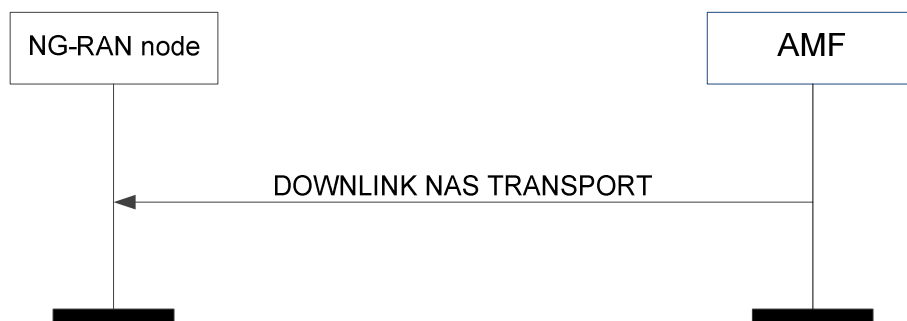


Figure 8.6.2.2-1: Downlink NAS transport

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 overwrite any previously stored mobility restriction 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].

The *UE Aggregate Maximum Bit Rate* IE should be sent to the NG-RAN node if the AMF has not sent it previously. If it 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

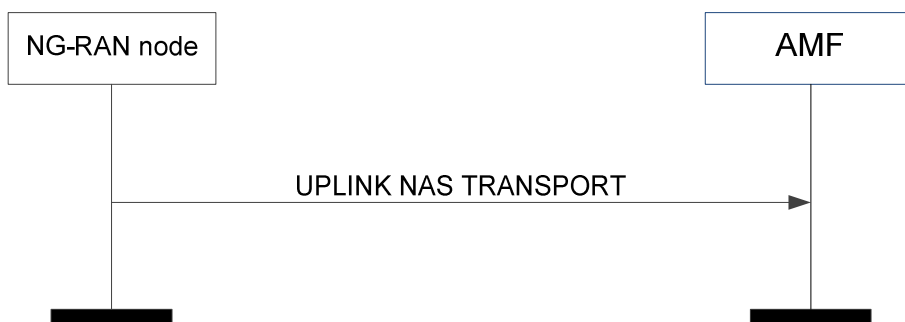


Figure 8.6.3.2-1: Uplink NAS transport

The NG-RAN node initiates the procedure by sending an UPLINK NAS TRANSPORT message to the AMF.

The *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

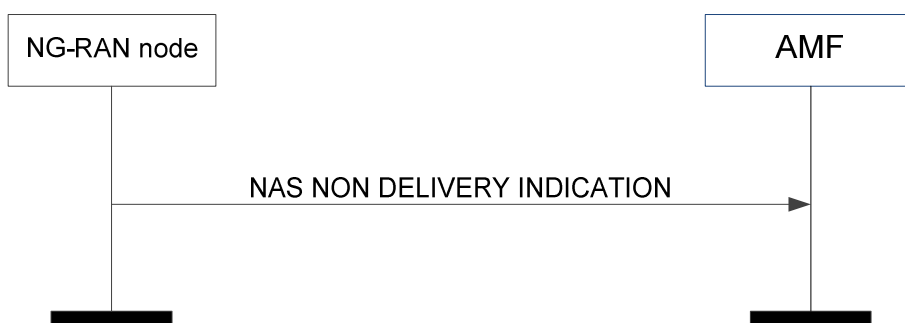


Figure 8.6.4.2-1: NAS non delivery indication

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

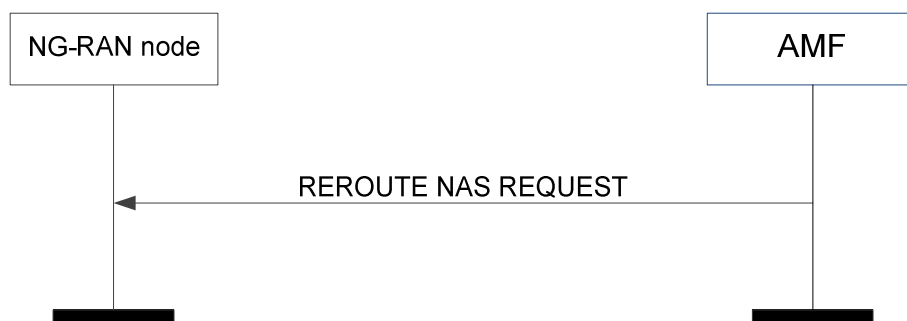


Figure 8.6.5.2-1: Reroute NAS request

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 propagate it in the rerouted INITIAL UE MESSAGE message as defined in TS 23.502 [10].

If the *Source to Target AMF Information Reroute* IE is included in the REROUTE NAS REQUEST message, then the NG-RAN node shall propagate it in the rerouted INITIAL UE MESSAGE message 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.

This procedure erases any existing application level configuration data in the two nodes, replaces it by the one received and clears AMF overload state information at the NG-RAN node. If the NG-RAN node and AMF do not agree on

retaining the UE contexts this procedure also re-initialises the NGAP UE-related contexts (if any) and erases all related signalling connections in the two nodes like an NG Reset procedure would do.

8.7.1.2 Successful Operation

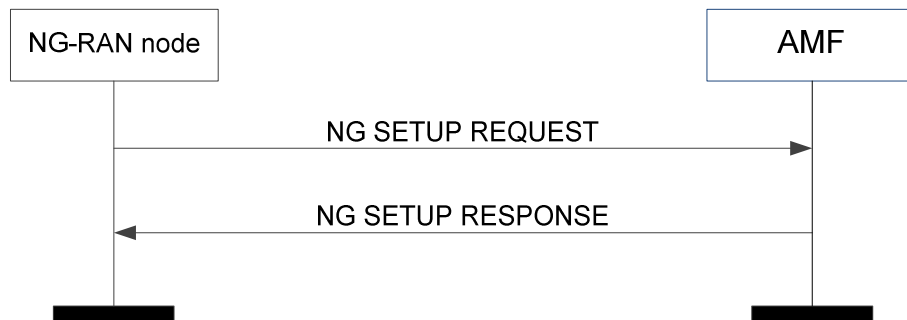


Figure 8.7.1.2-1: NG setup: successful operation

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 *UE Retention Information* IE set to “ues-retained“ is included in the NG SETUP REQUEST message, the AMF may accept the proposal to retain the existing UE related contexts and signalling connections by including the *UE Retention Information* IE set to “ues-retained“ in the NG SETUP RESPONSE message.

The AMF shall include the *Backup AMF Name* IE, if available, in the *Served GUAMI List* IE in the NG SETUP RESPONSE message. The NG-RAN node shall, if supported, consider the AMF as indicated by the *Backup AMF Name* IE when performing AMF reselection, as specified in TS 23.501 [9].

8.7.1.3 Unsuccessful Operation

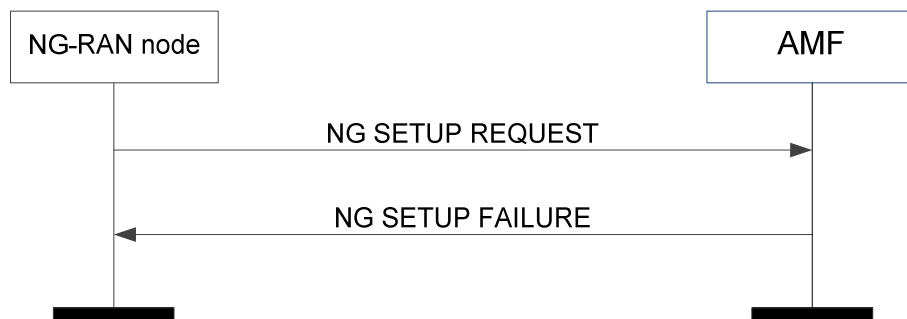


Figure 8.7.1.3-1: NG setup: unsuccessful operation

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

If the NG-RAN node initiates the procedure by sending an NG SETUP REQUEST message including the *PLMN Identity* IEs and none of the PLMNs provided by the NG-RAN node is identified by the AMF, then the AMF shall reject the NG Setup procedure with an appropriate cause value.

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

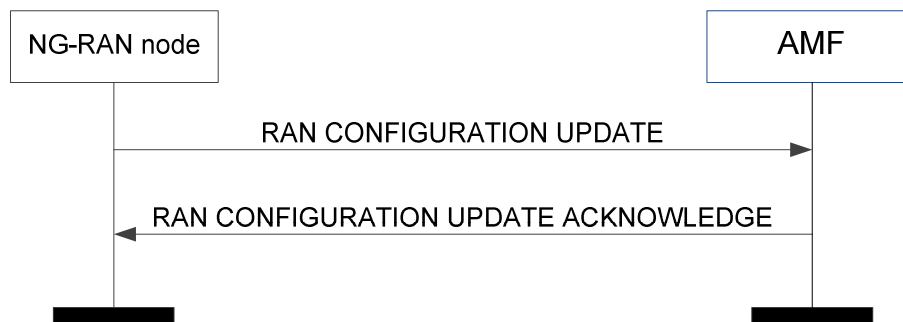


Figure 8.7.2.2-1: RAN configuration update: successful operation

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 an information element is not included in the RAN CONFIGURATION UPDATE message, the AMF shall interpret that the corresponding configuration data is not changed and shall continue to operate the NG-C interface with the existing related configuration data.

If the *Supported TA List* IE is included in the RAN CONFIGURATION UPDATE message, the AMF shall overwrite the whole list of supported TAs and the corresponding list of supported slices for each TA, and use them for subsequent registration area management of the UE.

If the *Global RAN Node ID* IE is included in the RAN CONFIGURATION UPDATE message, the AMF shall associate the TNLA to the NG-C interface instance using the Global RAN Node ID.

If the RAN CONFIGURATION UPDATE message includes *NG-RAN TNL Association to Remove List* IE, and the *Endpoint IP Address* IE and the *Port Number* IE for both TNL endpoints of the TNL association(s) are included in the *NG-RAN TNL Association to Remove List* IE, the AMF shall, if supported, consider that the TNL association(s) indicated by both received TNL endpoints will be removed by the NG-RAN node. If the *Endpoint IP Address* IE, or the *Endpoint IP Address* IE and the *Port Number* IE for one or both of the TNL endpoints is included in the *NG-RAN TNL Association to Remove List* IE in RAN CONFIGURATION UPDATE message, the AMF shall, if supported, consider that the TNL association(s) indicated by the received endpoint IP address(es) will be removed by the NG-RAN node.

8.7.2.3 Unsuccessful Operation

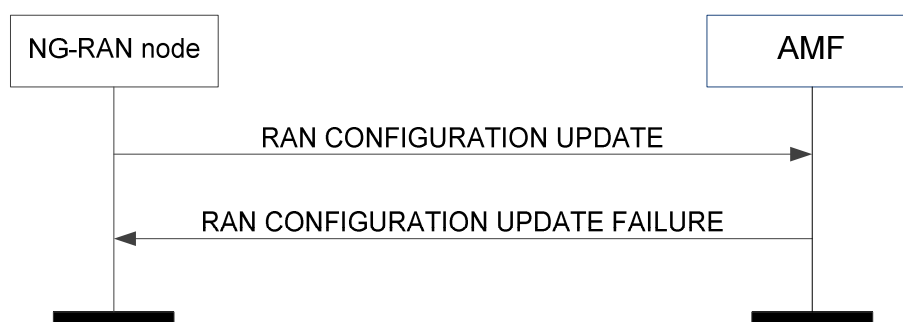


Figure 8.7.2.3-1: RAN configuration update: unsuccessful operation

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

If the *Time to Wait* IE is included in the RAN CONFIGURATION UPDATE FAILURE message, the NG-RAN node shall wait at least for the indicated time before reinitiating the RAN Configuration Update procedure towards the same AMF.

8.7.2.4 Abnormal Conditions

If the NG-RAN node, after initiating the RAN Configuration Update procedure, receives neither a RAN CONFIGURATION UPDATE ACKNOWLEDGE nor a RAN CONFIGURATION UPDATE FAILURE message, the NG-RAN node may reinitiate a further RAN Configuration Update procedure towards the same AMF, provided that the content of the new RAN CONFIGURATION UPDATE message is identical to the content of the previously unacknowledged RAN CONFIGURATION UPDATE message.

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

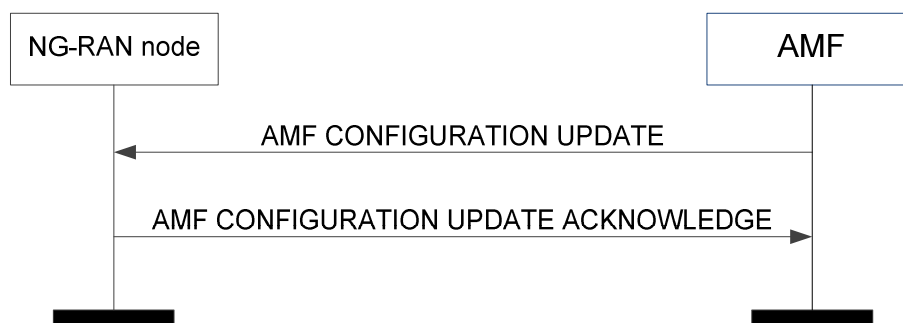


Figure 8.7.3.2-1: AMF configuration update: successful operation

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 an information element is not included in the AMF CONFIGURATION UPDATE message, the NG-RAN node shall interpret that the corresponding configuration data is not changed and shall continue to operate the NG-C interface with the existing related configuration data.

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

If the *AMF TNL Association to Add List* IE is included 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 CONFIGURATION UPDATE message includes *AMF TNL Association to Remove List* IE, and the *Endpoint IP Address* and the *Port Number* IE for both TNL endpoints of the TNL association(s) is included in the AMF

TNL Association to Remove List IE, the NG-RAN node shall, if supported, initiate removal of the TNL association(s) indicated by both received TNL endpoints towards the AMF. If the *Endpoint IP Address* IE, or the *Endpoint IP Address* IE and the *Port Number* IE for one or both of the TNL endpoints is included in the *AMF TNL Association to Remove List* IE, the NG-RAN node shall, if supported, initiate removal of the TNL association(s) indicated by the received endpoint IP address(es). If the *AMF Name* IE is included in the AMF CONFIGURATION UPDATE message, the NG-RAN node shall 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 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 included 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 Address 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

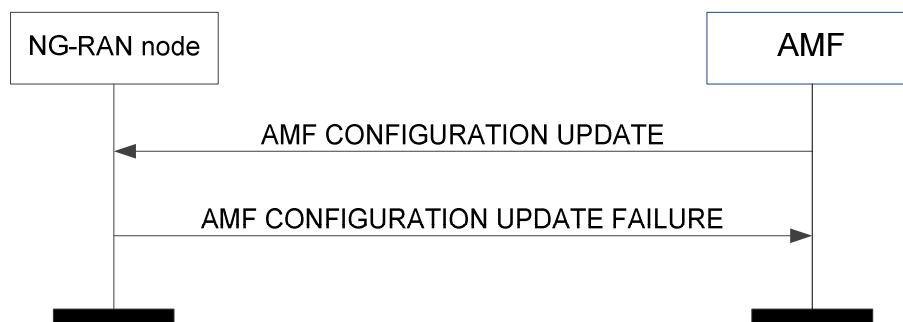


Figure 8.7.3.3-1: AMF configuration update: unsuccessful operation

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

If the *Time to Wait* IE is included in the AMF CONFIGURATION UPDATE FAILURE message, the AMF shall wait at least for the indicated time before reinitiating the AMF Configuration Update procedure towards the same NG-RAN node.

8.7.3.4 Abnormal Conditions

If the AMF receives neither an AMF CONFIGURATION UPDATE ACKNOWLEDGE nor an AMF CONFIGURATION UPDATE FAILURE message, the AMF may reinitiate the AMF Configuration Update procedure towards the same NG-RAN node provided that the content of the new AMF CONFIGURATION UPDATE message is identical to the content of the previously unacknowledged AMF CONFIGURATION UPDATE message.

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

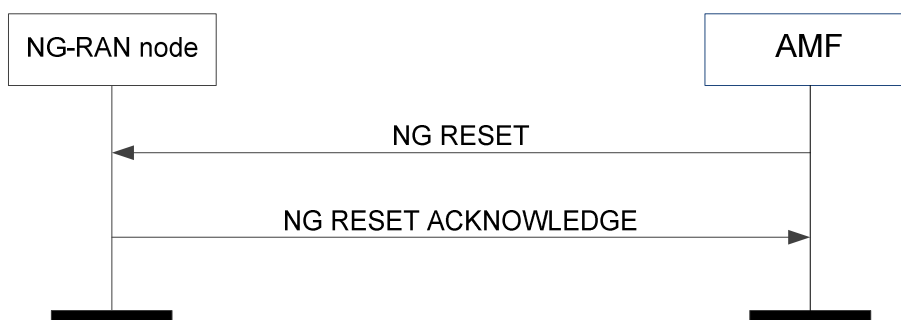


Figure 8.7.4.2.1-1: NG reset initiated by the AMF: successful operation

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 IE*s 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 IE*s, 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

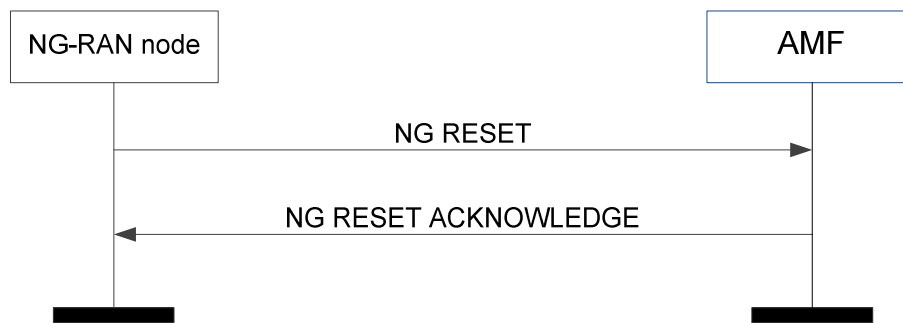


Figure 8.7.4.2.2-1: NG reset initiated by the NG-RAN node: successful operation

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 IE*s 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 IE*s, 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

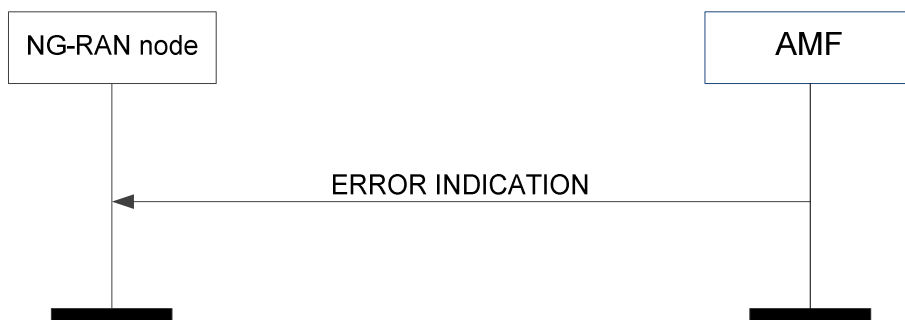


Figure 8.7.5.2-1: Error indication initiated by the AMF

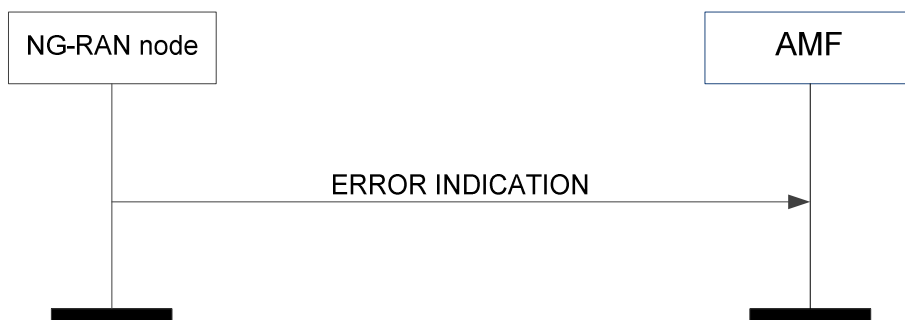


Figure 8.7.5.2-2: Error indication initiated by the NG-RAN node

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 local UE NGAP ID" or "Inconsistent remote 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

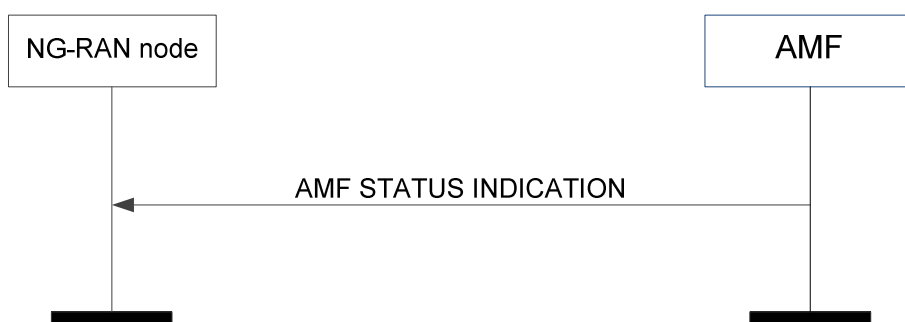


Figure 8.7.6.2-1: AMF status indication

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* as specified in TS 23.501 [9].

8.7.6.3 Abnormal Conditions

Void.

8.7.7 Overload Start

8.7.7.1 General

The purpose of the Overload Start procedure is to inform an NG-RAN node to reduce the signalling load towards the concerned AMF. The procedure uses non-UE associated signalling.

8.7.7.2 Successful Operation



Figure 8.7.7.2-1: Overload start

The NG-RAN node receiving the OVERLOAD START message shall assume the AMF from which it receives the message as being in an overloaded state.

If the *Overload Action IE* is included the *AMF Overload Response IE* within the OVERLOAD START message, the NG-RAN node shall use it to identify the related signalling traffic. When the *Overload Action IE* is set to

- "reject RRC connection establishments for non-emergency mobile originated data transfer" (i.e., reject traffic corresponding to RRC cause "mo-data", "mo-SMS", "mo-VideoCall" and "mo-VoiceCall" in TS 38.331 [18] or "mo-data" and "mo-VoiceCall" in TS 36.331 [21]), or
- "reject RRC connection establishments for signalling" (i.e., reject traffic corresponding to RRC cause "mo-data", "mo-SMS", "mo-signalling", "mo-VideoCall" and "mo-VoiceCall" in TS 38.331 [18] or "mo-data", "mo-signalling" and "mo-VoiceCall" in TS 36.331 [21]), or
- "only permit RRC connection establishments for emergency sessions and mobile terminated services" (i.e., only permit traffic corresponding to RRC cause "emergency" and "mt-Access" in TS 38.331 [18] or in TS 36.331 [21]), or
- "only permit RRC connection establishments for high priority sessions and mobile terminated services" (i.e., only permit traffic corresponding to RRC cause "highPriorityAccess", "mps-PriorityAccess", "mcs-PriorityAccess" and "mt-Access" in TS 38.331 [18] or "highPriorityAccess" and "mt-Access" in TS 36.331 [21]),

the NG-RAN node shall:

- if the *AMF Traffic Load Reduction Indication IE* is included in the OVERLOAD START message, reduce the signalling traffic by the indicated percentage,
- otherwise ensure that only the signalling traffic not indicated as to be rejected is sent to the AMF.

If the *Overload Start NSSAI List IE* is included in the OVERLOAD START message, the NG-RAN node shall:

- if the *Slice Traffic Load Reduction Indication IE* is present, reduce the signalling traffic by the indicated percentage for the UE(s) whose requested NSSAI only include S-NSSAI(s) contained in the *Overload Start NSSAI List IE*, and the signalling traffic indicated as to be reduced by the *Overload Action IE* in the *Slice Overload Response IE* if the IE is present,

- otherwise ensure that only the signalling traffic from UE(s) whose requested NSSAI includes S-NSSAI(s) other than the ones contained in the *Overload Start NSSAI List IE*, or the signalling traffic not indicated as to be reduced by the *Overload Action IE* in the *Slice Overload Response IE* for the UE(s) if the requested NSSAI matched, is sent to the AMF.

If an overload control is ongoing and the NG-RAN node receives a further OVERLOAD START message, the NG-RAN node shall replace the contents of the previously received information with the new one.

8.7.7.3 Abnormal Conditions

Void.

8.7.8 Overload Stop

8.7.8.1 General

The purpose of the Overload Stop procedure is to signal to an NG-RAN node the AMF is connected to that the overload situation at the AMF has ended and normal operation shall resume. The procedure uses non-UE associated signalling.

8.7.8.2 Successful Operation



Figure 8.7.8.2-1: Overload stop

The NG-RAN node receiving the OVERLOAD STOP message shall assume that the overload situation at the AMF from which it receives the message has ended and shall resume normal operation for the applicable traffic towards this AMF.

8.7.8.3 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

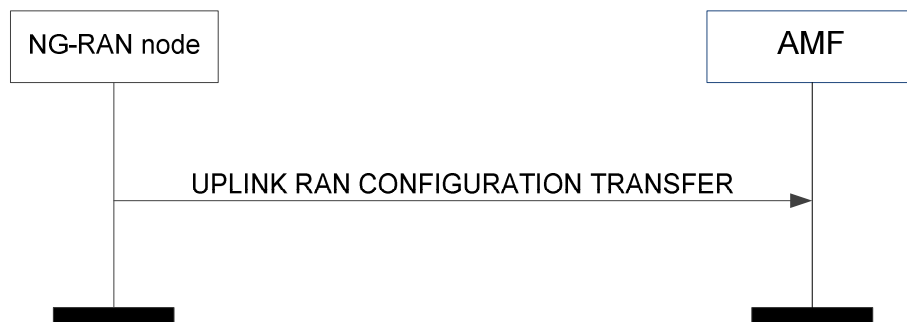


Figure 8.8.1.2-1: Uplink RAN configuration transfer

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*.

If the AMF receives the *EN-DC SON Configuration Transfer IE*, it shall transparently transfer the *EN-DC SON Configuration Transfer IE* towards an MME serving the eNB indicated in the *Target eNB-ID IE* which is included in the *EN-DC 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

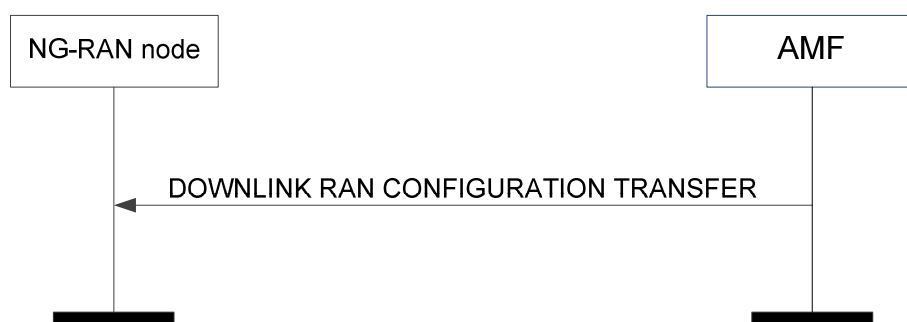


Figure 8.8.2.2-1: Downlink RAN configuration transfer

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* or in the *EN-DC SON Configuration Transfer IE*, the *SON Information IE* containing the *SON Information Request IE*, it may transfer back the requested information either towards the NG-RAN node indicated in the *Source RAN Node ID IE* of the *SON Configuration Transfer IE* or towards an eNB indicated in the *Source eNB-ID IE* of the *EN-DC 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.

In case the *Xn SCTP Transport Layer Addresses* IE is present and the *IP-Sec Transport Layer Address* IE is also present, the concerned SCTP traffic is conveyed within an IP-Sec tunnel terminated at the IP-Sec tunnel endpoint given in this *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

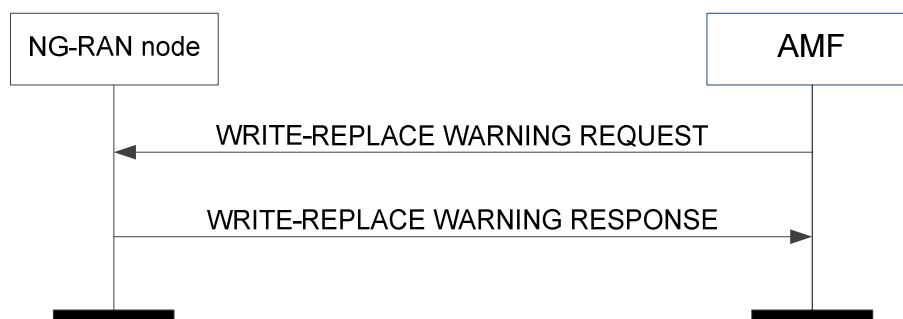


Figure 8.9.1.2-1: Write-Replace Warning procedure: successful operation

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 Indicator* 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 *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].

If the *Warning Area Coordinates* IE is included in the WRITE-REPLACE WARNING REQUEST message, the NG-RAN node shall include this information together with the warning message being broadcast 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

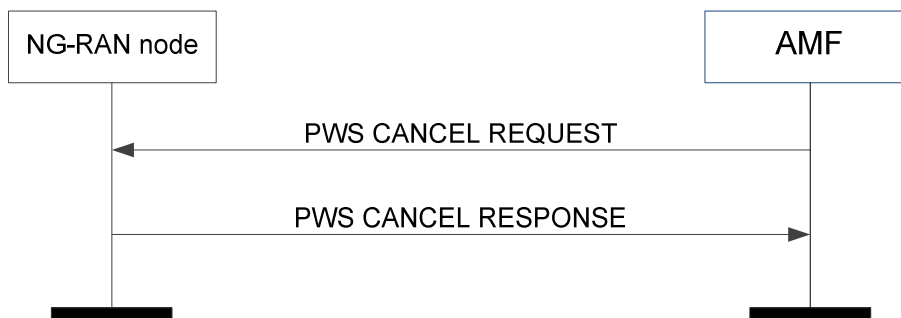


Figure 8.9.2.2-1: PWS Cancel procedure: successful operation

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 Restart Indication procedure is to inform the AMF that PWS information for some or all cells of the NG-RAN node may be reloaded from the CBC if needed. The procedure uses non UE-associated signalling.

8.9.3.2 Successful Operation

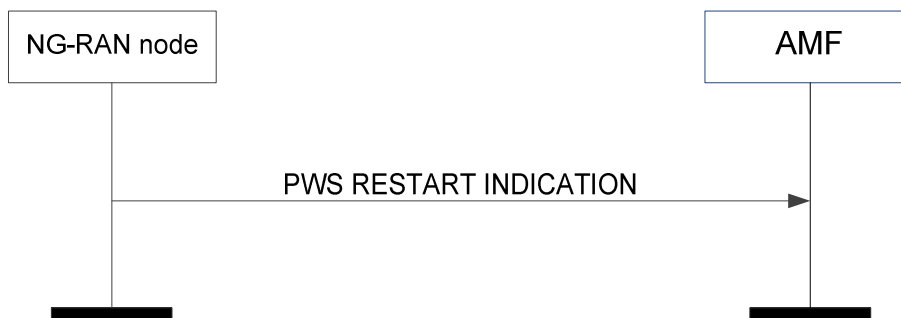


Figure 8.9.3.2-1: PWS restart indication

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

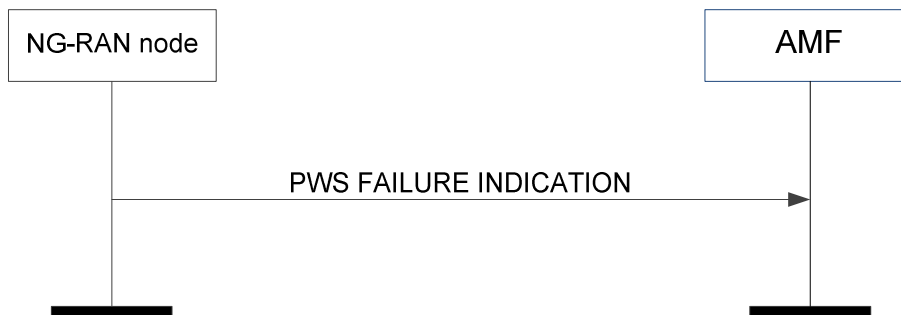


Figure 8.9.4.2-1: PWS failure indication

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

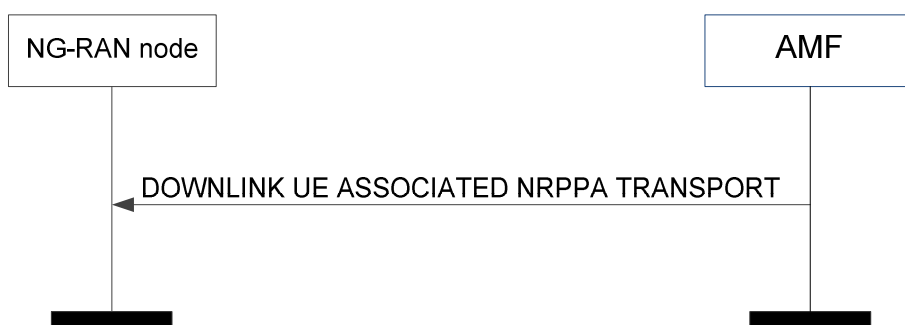


Figure 8.10.2.1-1: Downlink UE-associated NRPPa transport

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

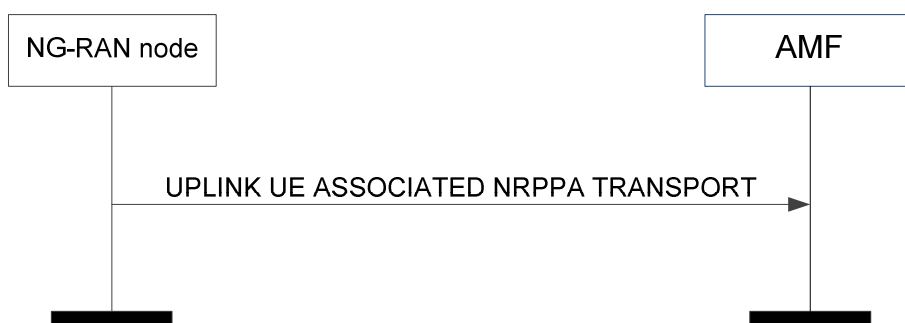


Figure 8.10.2.2-1: Uplink UE-associated NRPPa transport

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

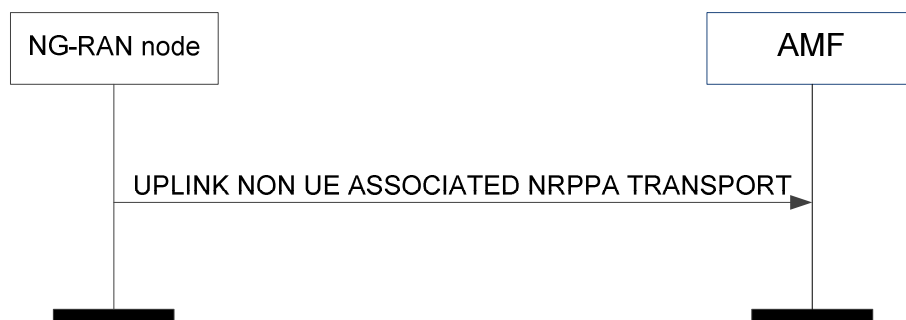


Figure 8.10.2.4-1: Uplink non UE-associated NRPPa transport

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

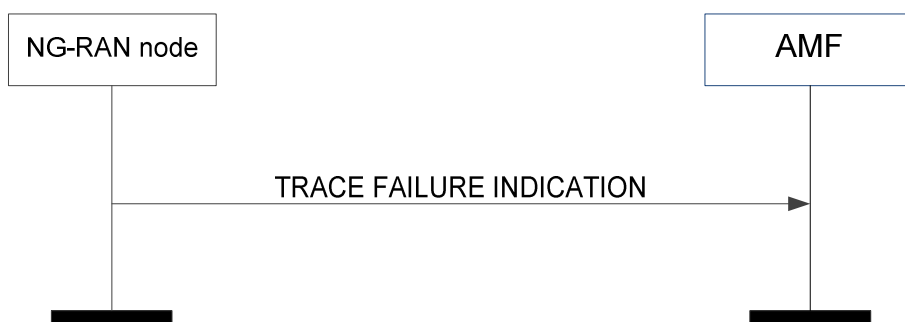


Figure 8.11.2.2-1: Trace failure indication

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. The procedure uses UE-associated signalling.

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

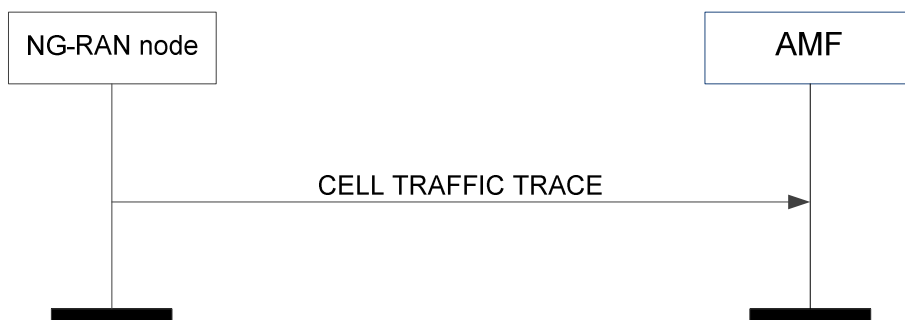


Figure 8.11.4.2-1: Cell traffic trace

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 CM-CONNECTED state as specified in TS 23.501 [9] and TS 23.502 [10]. The procedure uses UE-associated signalling.

8.12.1.2 Successful Operation

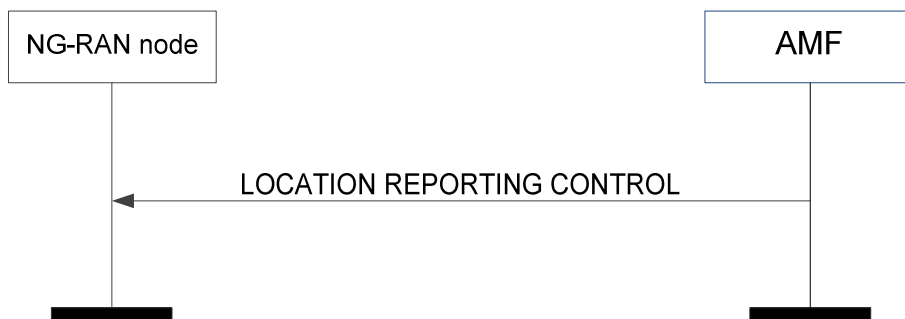


Figure 8.12.1.2-1: Location reporting control

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;
- to stop reporting UE presence in the area of interest;
- to cancel location reporting for the UE.

If the *Area Of Interest List* IE is included in the *Location Reporting Request Type* IE 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].

NOTE: The NG-RAN reports the UE presence for all set of Location Reporting Reference IDs for inter-NG-RAN node handover.

If the *Additional Location Information* IE is included in the LOCATION REPORTING CONTROL message and set to "Include PSCell" then, if Dual Connectivity is activated, the NG-RAN node shall include the current PSCell in the report. If a report upon change of serving cell is requested, the NG-RAN node shall provide the report also whenever the UE changes the PSCell, and when Dual Connectivity is activated.

If reporting upon change of serving cell is requested, the NG-RAN node shall send a report immediately and shall send a report whenever the UE's location changes.

8.12.1.3 Abnormal Conditions

Interactions with Location Reporting Failure Indication procedure:

If the NG-RAN node receives a LOCATION REPORTING CONTROL message containing several *Location Reporting Reference ID* IE set to the same value, the NG-RAN node shall send the LOCATION REPORTING FAILURE INDICATION message with an appropriate cause value.

8.12.2 Location Reporting Failure Indication

8.12.2.1 General

The purpose of the Location Reporting Failure Indication procedure is to allow the NG-RAN node to inform the AMF that the location reporting request contained in the Location Reporting Control procedure, the Handover Resource Allocation procedure or the Initial Context Setup procedure has failed. The procedure uses UE-associated signalling.

8.12.2.2 Successful Operation

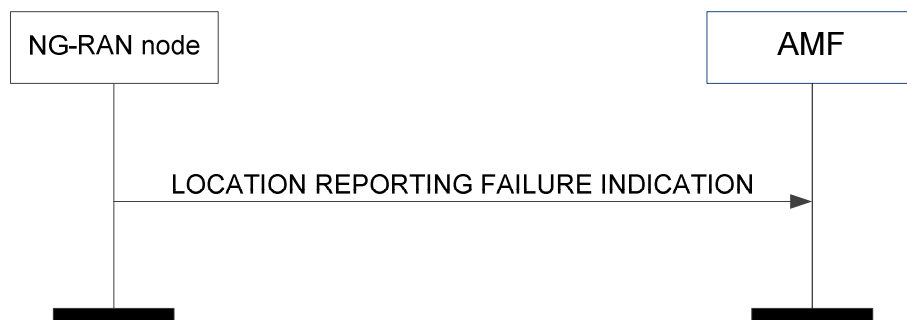


Figure 8.12.2.2-1: Location reporting failure indication

The NG-RAN node initiates the procedure by sending a LOCATION REPORTING FAILURE INDICATION message to the AMF. Upon reception of the LOCATION REPORTING 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 report

The NG-RAN node initiates the procedure by sending a LOCATION REPORT message to the AMF. 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

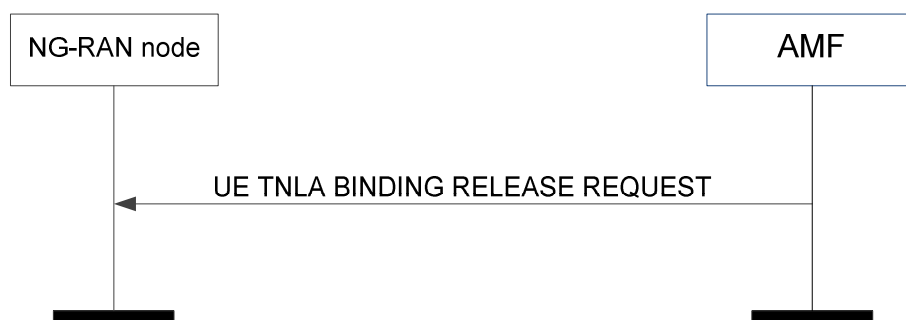


Figure 8.13.1.2-1: UE TNLA binding release request

At reception of the UE TNLA BINDING RELEASE REQUEST message, the NG-RAN node shall release the UE TNLA binding for the UE 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 the UE.

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 the UE indicated in the UE TNLA BINDING RELEASE REQUEST message shall be aborted.

8.13.1.3 Abnormal Conditions

Void.

8.14 UE Radio Capability Management Procedures

8.14.1 UE Radio Capability Info Indication

8.14.1.1 General

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

8.14.1.2 Successful Operation

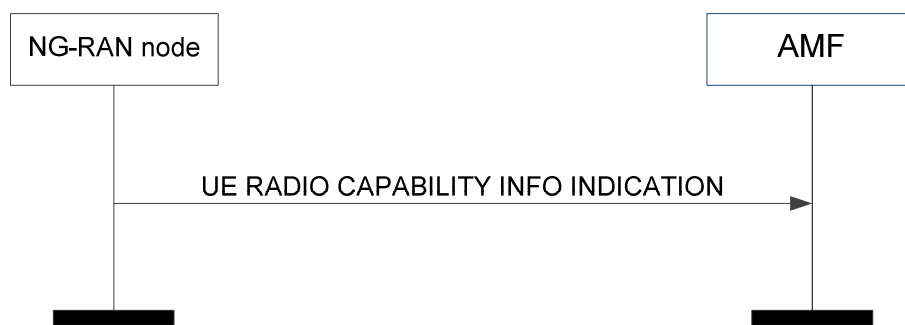


Figure 8.14.1.2-1: UE radio capability info indication

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

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

The UE radio capability information received by the AMF shall replace previously stored corresponding UE radio 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

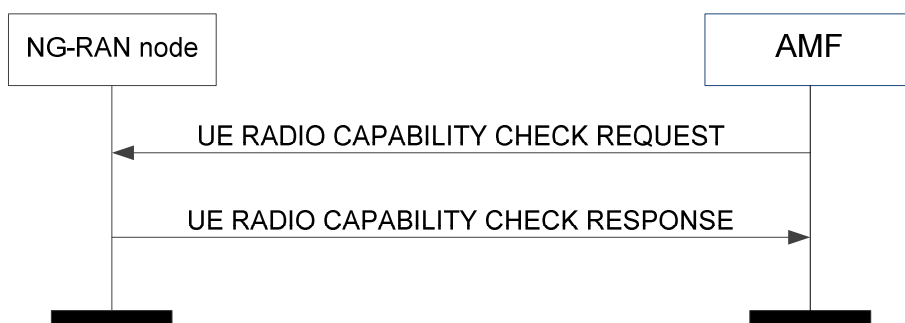


Figure 8.14.2.2-1: UE radio capability check procedure: successful operation

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.

8.15 Data Usage Reporting Procedures

8.15.1 Secondary RAT Data Usage Report

8.15.1.1 General

The purpose of the Secondary RAT Data Usage Report procedure is to provide information on the used resources of the secondary RAT (e.g. NR resources during MR-DC operation) as specified in TS 23.501 [9].

8.15.1.2 Successful Operation

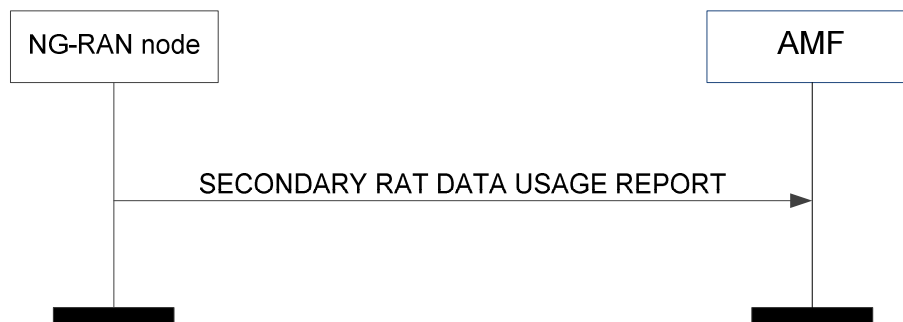


Figure 8.15.1.2-1: Secondary RAT data usage report

The NG-RAN node initiates the procedure by sending the *SECONDARY RAT DATA USAGE REPORT* message to the AMF.

If the *Handover Flag* IE is included in the *SECONDARY RAT DATA USAGE REPORT* message, it indicates that for each PDU session the AMF should buffer the *Secondary RAT Data Usage Report Transfer* IE since the secondary RAT data usage report is sent due to handover as defined in TS 23.502 [10].

For each PDU session for which the *Secondary RAT Usage Information List* IE is included in the the *Secondary RAT Data Usage Transfer* IE, the SMF shall handle this information as specified in TS 23.502 [10].

The NG-RAN node shall, if supported, report in the *SECONDARY RAT DATA USAGE REPORT* message location information of the UE in the *User Location Information* IE.

8.15.1.3 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 9.1.1-1.

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 (C) 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 9.1.2-1.

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		1..<maxno ofPDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session NAS-PDU	O		NAS-PDU 9.3.3.4		-	
>>S-NSSAI	M		9.3.1.24		-	
>>PDU Session Resource Setup Request Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Setup Request Transfer</i> IE specified in subclause 9.3.4.1.	-	
UE Aggregate Maximum Bit Rate	O		9.3.1.58		YES	ignore

Range bound	Explanation
maxnoofPDU Sessions	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		1..<maxno of PDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Setup Response Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Setup Response Transfer</i> IE specified in subclause 9.3.4.2.	-	
PDU Session Resource Failed to Setup List		0..1			YES	ignore
>PDU Session Resource Failed to Setup Item		1..<maxno of PDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Setup Unsuccessful Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Setup Unsuccessful Transfer</i> IE specified in subclause 9.3.4.16.	-	
Criticality Diagnostics	O		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofPDU Sessions	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		1			YES	reject
>PDU Session Resource to Release Item		1..<maxno ofPDUSessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Release Command Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Release Command Transfer</i> IE specified in subclause 9.3.4.12.	-	

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

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
PDU Session Resource Released List		1			YES	ignore
>PDU Session Resource Released Item		1..<maxno ofPDUSessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Release Response Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Release Response Transfer</i> IE specified in subclause 9.3.4.21.	-	
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		1..<maxno of PDUSessions>			-	
>>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 <i>PDU Session Resource Modify Request Transfer</i> IE specified in subclause 9.3.4.3.	-	
>>S-NSSAI	O		9.3.1.24		YES	reject

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		1..<maxno of PDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Modify Response Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Modify Response Transfer</i> IE specified in subclause 9.3.4.4.	-	
PDU Session Resource Failed to Modify List		0..1			YES	ignore
>PDU Session Resource Failed to Modify Item		1..<maxno of PDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Modify Unsuccessful Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Modify Unsuccessful Transfer</i> IE specified in subclause 9.3.4.17.	-	
User Location Information	O		9.3.1.16		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofPDU Sessions	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 QoS requirements of already established GBR QoS flow(s) for which notification control has been requested are either not fulfilled anymore or fulfilled again by the NG-RAN node. This message can also be sent by the NG-RAN node to notify that PDU session resource(s) for a given UE are released.

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		1..<maxno of PDU Sessions>			-	
>>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		0..1			YES	ignore
>PDU Session Resource Released Item		1..<maxno of PDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Notify Released Transfer	M		OCTET STRING	Containing the PDU Session Resource Notify Released Transfer IE specified in subclause 9.3.4.13.	-	
User Location Information	O		9.3.1.16		YES	ignore

Range bound	Explanation
maxnoofPDU Sessions	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		1..<maxno of PDU Sessions>			-	
>>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		0..1			YES	ignore
>PDU Session Resource Modify Confirm Item		1..<maxno ofPDUSes sions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Modify Confirm Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Modify Confirm Transfer</i> IE specified in subclause 9.3.4.7.	-	
PDU Session Resource Failed to Modify List		0..1			YES	ignore
>PDU Session Resource Failed to Modify Item		1..<maxno ofPDUSes sions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Modify Indication Unsuccessful Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Modify Indication Unsuccessful Transfer</i> IE specified in subclause 9.3.4.22.	-	
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 9.3.3.21		YES	reject
UE Aggregate Maximum Bit Rate	C- ifPDUsessionResourceSetup		9.3.1.58		YES	reject
Core Network Assistance Information for RRC INACTIVE	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		1..<maxno ofPDUsessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session NAS-PDU	O		NAS-PDU 9.3.3.4		-	
>>S-NSSAI	M		9.3.1.24		-	
>>PDU Session Resource Setup Request Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Setup Request Transfer</i> IE specified in subclause 9.3.4.1.	-	
Allowed NSSAI	M		9.3.1.31	Indicates the S-NSSAIs permitted by the network	YES	reject
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
RRC Inactive Transition Report Request	O		9.3.1.91		YES	ignore
UE Radio Capability for Paging	O		9.3.1.68		YES	ignore
Redirection for Voice EPS Fallback	O		9.3.1.116		YES	ignore
Location Reporting Request Type	O		9.3.1.65		YES	ignore
CN Assisted RAN Parameters Tuning	O		9.3.1.119		YES	ignore

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 <i>PDU Session Resource Setup List</i> 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		1..<maxno of PDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Setup Response Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Setup Response Transfer</i> IE specified in subclause 9.3.4.2.	-	
PDU Session Resource Failed to Setup List		0..1			YES	ignore
>PDU Session Resource Failed to Setup Item		1..<maxno of PDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Setup Unsuccessful Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Setup Unsuccessful Transfer</i> IE specified in subclause 9.3.4.16.	-	
Criticality Diagnostics	O		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofPDU Sessions	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
PDU Session Resource Failed to Setup List		0..1			YES	ignore
>PDU Session Resource Failed to Setup Item		1..<maxno ofPDUSessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Setup Unsuccessful Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Setup Unsuccessful Transfer</i> IE specified in subclause 9.3.4.16.	-	
Cause	M		9.3.1.2		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.

9.2.2.4 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
PDU Session Resource List		0..1			YES	reject
>PDU Session Resource Item		1..<maxno ofPDUSessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
Cause	M		9.3.1.2		YES	ignore

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

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		-	
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		9.3.1.100		YES	ignore
PDU Session Resource List		0..1			YES	reject
>PDU Session Resource Item		1..<maxno of PDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>PDU Session Resource Release Response Transfer	O		OCTET STRING	Containing the <i>PDU Session Resource Release Response Transfer</i> IE specified in subclause 9.3.4.21.	YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

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

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
Core Network Assistance Information for RRC INACTIVE	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	reject
RRC Inactive Transition Report Request	O		9.3.1.91		YES	ignore
New GUAMI	O		GUAMI 9.3.3.3		YES	reject
CN Assisted RAN Parameters Tuning	O		9.3.1.119		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
RRC State	O		9.3.1.92		YES	ignore
User Location Information	O		9.3.1.16		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

9.2.2.10 RRC INACTIVE TRANSITION REPORT

This message is sent by the NG-RAN node to notify the 5GC the UE enters or leaves RRC_INACTIVE state.

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
RRC State	M		9.3.1.92		YES	ignore
User Location Information	M		9.3.1.16		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		1..<maxno of PDUSessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>Handover Required Transfer	M		OCTET STRING	Containing the <i>Handover Required Transfer</i> IE specified in subclause 9.3.4.14.	-	
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
NAS Security Parameters from NG-RAN	C-iftoEPS		9.3.3.26		YES	reject
PDU Session Resource Handover List		0..1			YES	ignore
>PDU Session Resource Handover Item		1..<maxno of PDUSessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>Handover Command Transfer	M		OCTET STRING	Containing the <i>Handover Command Transfer</i> IE specified in subclause 9.3.4.10.	-	
PDU Session Resource to Release List		0..1			YES	ignore
>PDU Session Resource to Release Item		1..<maxno of PDUSessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>Handover Preparation Unsuccessful Transfer	M		OCTET STRING	Containing the <i>Handover Preparation Unsuccessful Transfer</i> IE specified in subclause 9.3.4.18.	-	
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.

Condition	Explanation
iftoEPS	This IE shall be present if the <i>Handover Type</i> IE is set to the value "5GStoEPS".

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
Core Network Assistance Information for RRC INACTIVE	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
New Security Context Indicator	O		9.3.1.55		YES	reject
NASC	O		NAS-PDU 9.3.3.4	Refers to either the "Intra N1 mode NAS transparent container" or the "S1 mode to N1 mode NAS transparent container", the details of the IE definition and the encoding are specified in TS 24.501 [26].	YES	reject
PDU Session Resource Setup List		1			YES	reject
>PDU Session Resource Setup Item		1..<maxno of PDUsessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>S-NSSAI	M		9.3.1.24		-	
>>Handover Request Transfer	M		OCTET STRING	Containing the <i>PDU Session Resource Setup Request Transfer</i> IE specified in subclause 9.3.4.1.	-	
Allowed NSSAI	M		9.3.1.31	Indicates the S-NSSAIs permitted by the network.	YES	reject
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
RRC Inactive Transition Report Request	O		9.3.1.91		YES	ignore
GUAMI	M		9.3.3.3		YES	reject
Redirection for Voice EPS Fallback	O		9.3.1.116		YES	ignore
CN Assisted RAN Parameters Tuning	O		9.3.1.119		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		1..<maxno ofPDUSes sions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>Handover Request Acknowledge Transfer	M		OCTET STRING	Containing the <i>Handover Request Acknowledge Transfer</i> IE specified in subclause 9.3.4.11.	-	
PDU Session Resource Failed to Setup List		0..1			YES	ignore
>PDU Session Resource Failed to Setup Item		1..<maxno ofPDUSes sions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>Handover Resource Allocation Unsuccessful Transfer	M		OCTET STRING	Containing the <i>Handover Resource Allocation Unsuccessful Transfer</i> IE specified in subclause 9.3.4.19.	-	
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		1..<maxno of PDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>Path Switch Request Transfer	M		OCTET STRING	Containing the <i>Path Switch Request Transfer</i> IE specified in subclause 9.3.4.8.	-	
PDU Session Resource Failed to Setup List		0..1			YES	ignore
>PDU Session Resource Failed to Setup Item		1..<maxno of PDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>Path Switch Request Setup Failed Transfer	M		OCTET STRING	Containing the <i>Path Switch Request Setup Failed Transfer</i> IE specified in subclause 9.3.4.15.	-	

Range bound	Explanation
maxnoofPDU Sessions	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
New Security Context Indicator	O		9.3.1.55		YES	reject
PDU Session Resource Switched List		1			YES	ignore
>PDU Session Resource Switched Item		1..<maxno of PDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>Path Switch Request Acknowledge Transfer	M		OCTET STRING	Containing the <i>Path Switch Request Acknowledge Transfer</i> IE specified in subclause 9.3.4.9.	-	
PDU Session Resource Released List		0..1			YES	ignore
>PDU Session Resource Released Item		1..<maxno of PDU Sessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>Path Switch Request Unsuccessful Transfer	M		OCTET STRING	Containing the <i>Path Switch Request Unsuccessful Transfer</i> IE specified in subclause 9.3.4.20.	-	
Allowed NSSAI	M		9.3.1.31	Indicates the S-NSSAIs permitted by the network.	YES	reject
Core Network Assistance Information for RRC INACTIVE	O		9.3.1.15		YES	ignore
RRC Inactive Transition Report Request	O		9.3.1.91		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore
Redirection for Voice EPS Fallback	O		9.3.1.116		YES	ignore
CN Assisted RAN Parameters Tuning	O		9.3.1.119		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
PDU Session Resource Released List		1			YES	ignore
>PDU Session Resource Released Item		1..<maxno of PDUSessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>Path Switch Request Unsuccessful Transfer	M		OCTET STRING	Containing the PDU session <i>Path Switch Request Unsuccessful Transfer</i> IE specified in subclause 9.3.4.20.	-	
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.

9.2.3.11 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

This message is sent by the source NG-RAN node to transfer the uplink PDCP-SN and HFN receiver status and the downlink PDCP SN and HFN transmitter status during intra 5GC NG-based 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	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		9.3.1.108		YES	reject

9.2.3.14 DOWNLINK RAN STATUS TRANSFER

This message is sent by the AMF to the target NG-RAN node to transfer the uplink PDCP-SN and HFN receiver status and the downlink PDCP SN and HFN transmitter status during intra 5GC NG-based handover.

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		9.3.1.108		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 Paging Identity	M		9.3.3.18		YES	ignore
Paging DRX	O		9.3.1.90		YES	ignore
TAI List for Paging		1			YES	ignore
>TAI List for Paging Item		1..<maxno ofTAIforPaging>			-	
>>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
Paging Origin	O		9.3.3.22		YES	ignore
Assistance Data for Paging	O		9.3.1.69		YES	ignore

Range bound	Explanation
maxnoofTAIforPaging	Maximum no. of TAIs for paging. 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	M		9.3.1.111		YES	ignore
5G-S-TMSI	O		9.3.3.20		YES	reject
AMF Set ID	O		9.3.3.12		YES	ignore
UE Context Request	O		ENUMERATED (requested, ...)		YES	ignore
Allowed NSSAI	O		9.3.1.31		YES	reject
Source to Target AMF Information Reroute	O		9.3.3.27		YES	ignore
Selected PLMN Identity	O		PLMN Identity 9.3.3.5	Indicates the selected PLMN id for the non-3GPP access.	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 9.3.3.21		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
Allowed NSSAI	O		9.3.1.31	Indicates the S-NSSAIs permitted by the network.	YES	reject

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	reject
Source to Target AMF Information Reroute	O		9.3.3.27		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.	YES	reject
>Supported TA Item		1..<maxno ofTACs>			-	
>>TAC	M		9.3.3.10	Broadcast TAC	-	
>>Broadcast PLMN List		1			-	
>>>Broadcast PLMN Item		1..<maxno ofBPLMNs >			-	
>>>>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		Paging DRX 9.3.1.90		YES	ignore
UE Retention Information	O		9.3.1.117		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		9.3.3.21		YES	reject
Served GUAMI List		1			YES	reject
>Served GUAMI Item		1..<maxno ofServedG UAMIs>			-	
>>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			YES	reject
>PLMN Support Item		1..<maxno ofPLMNs>			-	
>>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
UE Retention Information	O		9.3.1.117		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		9.3.1.3		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.	YES	reject
>Supported TA Item		1..<maxno ofTACs>			-	
>>TAC	M		9.3.3.10	Broadcast TAC	-	
>>Broadcast PLMN List		1			-	
>>>Broadcast PLMN Item		1..<maxno ofBPLMNs >			-	
>>>>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	O		Paging DRX 9.3.1.90		YES	ignore
Global RAN Node ID	O		9.3.1.5		YES	ignore
NG-RAN TNL Association to Remove List		0..1			YES	reject
>NG-RAN TNL Association to Remove Item		1..<maxno ofTNLAAssociations>			-	
>>TNL Association Transport Layer Address	M		CP Transport Layer Information 9.3.2.6	Transport layer address of the NG-RAN node.	-	
>>TNL Association Transport Layer Address at AMF	O		CP Transport Layer Information 9.3.2.6	Transport layer address of the AMF.	-	

Range bound	Explanation
maxnoofTACs	Maximum no. of TACs. Value is 256.
maxnoofBPLMNs	Maximum no. of Broadcast PLMNs. Value is 12.
maxnoofTNLAAssociations	Maximum no. of TNL Associations between the NG-RAN node and the AMF. Value is 32.

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		9.3.1.3		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		9.3.1.3		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			YES	reject
>Served GUAMI Item		1..<maxno ofServedGUAMIs>			-	
>>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			YES	reject
>PLMN Support Item		1..<maxno ofPLMNs>			-	
>>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		1..<maxno ofTNLAAssociations>			-	
>>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		9.3.2.9		-	
>>TNL Address Weight Factor	M		9.3.2.10		-	
AMF TNL Association to Remove List		0..1			YES	ignore
>AMF TNL Association to Remove Item		1..<maxno ofTNLAAssociations>			-	
>>AMF TNL Association Address	M		CP Transport Layer Information 9.3.2.6	Transport Layer Address of the AMF.	-	
>>TNL Association Transport Layer Address NG-RAN	O		CP Transport Layer Address 9.3.2.6	Transport Layer Address of the NG-RAN node.	YES	reject
AMF TNL Association to Update List		0..1			YES	ignore
>AMF TNL Association to Update Item		1..<maxno ofTNLAAssociations>			-	
>>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		9.3.2.9		-	
>>TNL Address Weight Factor	O		9.3.2.10		-	

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.
maxnoofTNLAAssociations	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		1..<maxno ofTNLAassociations>			-	
>>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		9.3.1.3		YES	ignore

Range bound	Explanation
maxnoofTNLAassociations	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		9.3.1.3		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	YES	reject
>Unavailable GUAMI Item		1..<maxno ofServedGUAMIs>			-	
>>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 <i>Reset Type</i>	M				YES	reject
>NG interface						
>>Reset All	M		ENUMERATED (Reset all, ...)		-	
>Part of NG interface						
>>UE-associated Logical NG-connection List	M		9.3.3.25		-	

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	O		9.3.3.25		YES	ignore
Criticality Diagnostics	O		9.3.1.3		YES	ignore

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

9.2.6.14 OVERLOAD START

This message is sent by the AMF and is used to indicate to the NG-RAN node that the AMF is overloaded.

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 Overload Response	O		Overload Response 9.3.1.104		YES	reject
AMF Traffic Load Reduction Indication	O		Traffic Load Reduction Indication 9.3.1.106		YES	ignore
Overload Start NSSAI List		0..1			YES	ignore
>Overload Start NSSAI Item		1..<maxno ofSliceltems>			-	
>>Slice Overload List	M		9.3.1.107		-	
>>Slice Overload Response	O		Overload Response 9.3.1.104		-	
>>Slice Traffic Load Reduction Indication	O		Traffic Load Reduction Indication 9.3.1.106		-	

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

9.2.6.15 OVERLOAD STOP

This message is sent by the AMF and is used to indicate that the AMF is no longer overloaded.

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

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
EN-DC SON Configuration Transfer	O		OCTET STRING	Contains the <i>EN-DC SON Configuration Transfer</i> IE as defined in TS 36.413 [16].	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
EN-DC SON Configuration Transfer	O		OCTET STRING	Contains the <i>EN-DC SON Configuration Transfer</i> IE as defined in TS 36.413 [16].	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		OCTET STRING (SIZE(50))	This IE is not used in the specification. If received, the IE is ignored.	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
Warning Area Coordinates	O		9.3.1.112		YES	ignore

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..<maxno ofCellsinngeNB>			-	
>>>E-UTRA CGI	M		9.3.1.9		-	
>NR						
>>NR Cell List for Restart		1..<maxno ofCellsingNB>			-	
>>>NR CGI	M		9.3.1.7		-	
Global RAN Node ID	M		9.3.1.5		YES	reject
TAI List for Restart		1..<maxno ofTAIforRestart>			YES	reject
>TAI	M		9.3.3.11		-	
Emergency Area ID List for Restart		0..<maxno ofEAIforRestart>			YES	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..<maxno ofCellsinngeNB>			-	
>>>E-UTRA CGI	M		9.3.1.9		-	
>NR						
>>PWS Failed NR Cell List		1..<maxno ofCellsingNB>			-	
>>>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 <i>Trace Activation</i> 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 <i>Trace Activation</i> 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
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 Radio Capability Management Messages

9.2.13.1 UE RADIO CAPABILITY INFO INDICATION

This message is sent by the NG-RAN node to provide UE radio 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

9.2.14 Data Usage Reporting Messages

9.2.14.1 SECONDARY RAT DATA USAGE REPORT

This message is sent by the NG-RAN node to report Secondary RAT data usage.

Direction: NG-RAN → AMF

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
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 Secondary RAT Usage List		1			YES	ignore
>PDU Session Resource Secondary RAT Usage Item		1..<maxno of PDUSessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>Secondary RAT Data Usage Report Transfer	M		OCTET STRING	Containing the <i>Secondary RAT Data Usage Report Transfer</i> IE specified in subclause 9.3.4.23	-	
Handover Flag	O		ENUMERATED (handover_preparation, ...)		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.

9.3 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, 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(s) not supported, UE in RRC_INACTIVE state not reachable, Redirection, Resources not available for the slice(s), UE maximum integrity protected data rate reason, Release due to CN-detected mobility, ..., N26 interface not available, Release due to pre-emption, Multiple Location Reporting Reference ID Instances)	

>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 <i>PDU Session Resource to Release List</i> IE or <i>QoS flow to Release List</i> 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.
TNGRELOCoverall expiry	The reason for the action is expiry of timer TNGRELOCoverall.
TNGRELOCprep expiry	Handover Preparation procedure is cancelled when timer TNGRELOCprep 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.
Radio connection with UE lost	The action is requested due to losing the radio connection to the UE.
Radio resources not available	No requested radio resources are available.
Invalid QoS combination	The action was failed because of invalid QoS combination.
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/from 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(s) not supported	Slice(s) not supported.

UE in RRC_INACTIVE state not reachable	The action is requested due to RAN paging failure.
Redirection	The release is requested due to inter-system redirection or intra-system redirection.
Resources not available for the slice(s)	The requested resources are not available for the slice(s).
UE maximum integrity protected data rate reason	The request is not accepted in order to comply with the maximum data rate for integrity protection supported by the UE.
Release due to CN-detected mobility	The context release is requested by the AMF because the UE is already served by another CN node (same or different system), or another NG interface of the same CN node.
N26 interface not available	The action failed due to a temporary failure of the N26 interface.
Release due to pre-emption	Release is initiated due to pre-emption.
Multiple Location Reporting Reference ID Instances	The action failed because multiple areas of interest are set with the same Location Reporting Reference ID.

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		<i>0..<maxnoofErrors></i>		
>IE Criticality	M		ENUMERATED (reject, ignore, notify)	Used for reporting the criticality of the triggering IE. The value 'ignore' is not applicable.
>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 <i>NG-RAN node</i>	M			
> <i>gNB</i>				
>>Global <i>gNB</i> ID	M		9.3.1.6	
> <i>ng-eNB</i>				
>>Global <i>ng-eNB</i> ID	M		9.3.1.8	
> <i>N3IWF</i>				
>>Global <i>N3IWF</i> 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 <i>gNB ID</i>	M			
> <i>gNB ID</i>				
>>gNB ID	M		BIT STRING (SIZE(22..32))	Equal to the leftmost bits of the <i>NR Cell Identity</i> IE contained in the <i>NR CGI</i> IE of each cell served by the gNB.

9.3.1.7 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 <i>NR Cell Identity</i> 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 <i>ng-eNB ID</i>	M			
> <i>Macro ng-eNB ID</i>				
>>Macro ng-eNB ID	M		BIT STRING (SIZE(20))	Equal to the 20 leftmost bits of the <i>E-UTRA Cell Identity</i> IE contained in the <i>E-UTRA CGI</i> IE of each cell served by the ng-eNB.
> <i>Short Macro ng-eNB ID</i>				
>>Short Macro ng-eNB ID	M		BIT STRING (SIZE(18))	Equal to the 18 leftmost bits of the <i>E-UTRA Cell Identity</i> IE contained in the <i>E-UTRA CGI</i> IE of each cell served by the ng-eNB.
> <i>Long Macro ng-eNB ID</i>				
>>Long Macro ng-eNB ID	M		BIT STRING (SIZE(21))	Equal to the 21 leftmost bits of the <i>E-UTRA Cell Identity</i> IE contained in the <i>E-UTRA CGI</i> 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 <i>E-UTRA Cell Identity</i> 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 requested, ...)	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 Void

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 and is ignored otherwise.
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 is 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 is ignored otherwise.

9.3.1.13 QoS Flow List with Cause

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		<i>1..<maxnoofQoSFlows></i>		
>QoS Flow Identifier	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 Core Network Assistance Information for RRC INACTIVE

This IE provides assistance information for e.g. RRC_INACTIVE configuration.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Identity Index Value	M		9.3.3.23	
UE Specific DRX	O		Paging DRX 9.3.1.90	
Periodic Registration Update Timer	M		9.3.3.24	
MICO Mode Indication	O		9.3.1.23	
TAI List for RRC Inactive		1		
>TAI List for RRC Inactive Item		1..<maxnoofTAIforInactive>		
>>TAI	M		9.3.3.11	
Expected UE Behaviour	O		9.3.1.93	

Range bound	Explanation
maxnoofTAIforInactive	Maximum no. of TAIs for RRC Inactive. 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	Criticality	Assigned Criticality
CHOICE <i>User Location Information</i>	M				-	
> <i>E-UTRA user location information</i>						
>> <i>E-UTRA CGI</i>	M		9.3.1.9		-	
>> <i>TAI</i>	M		9.3.3.11		-	
>> <i>Age of Location</i>	O		Time Stamp 9.3.1.75	Indicates the UTC time when the location information was generated.	-	
>> <i>PSCell Information</i>	O		NG-RAN CGI 9.3.1.73		YES	ignore
> <i>NR user location information</i>						
>> <i>NR CGI</i>	M		9.3.1.7		-	
>> <i>TAI</i>	M		9.3.3.11		-	
>> <i>Age of Location</i>	O		Time Stamp 9.3.1.75	Indicates the UTC time when the location information was generated.	-	
>> <i>PSCell Information</i>	O		NG-RAN CGI 9.3.1.73		YES	ignore
> <i>N3IWF user location information</i>						
>> <i>IP Address</i>	M		Transport Layer Address 9.3.2.4	UE's local IP address used to reach the N3IWF	-	
>> <i>Port Number</i>	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		<i>1..<maxnoofSliceltems></i>		
> <i>S-NSSAI</i>	M		9.3.1.24	

Range bound	Explanation
maxnoofSliceltems	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].
5QI	O		INTEGER (0..255, ...)	Indicates the dynamically assigned 5QI as 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]. This IE shall be included if the <i>Delay Critical</i> IE is set to "delay critical" and is ignored otherwise.

Condition	Explanation
ifGBRflow	This IE shall be present if the <i>GBR QoS Flow Information</i> IE is present in the <i>QoS Flow Level QoS Parameters</i> 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.
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 (see TS 23.501 [9]). Usage: The QoS flow shall not pre-empt other QoS flows or, the QoS flow may pre-empt other QoS flows. Note: 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 (see TS 23.501 [9]). 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. Note: 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 <i>Source NG-RAN Node to Target NG-RAN Node Transparent Container</i> IE or the <i>Source eNB to Target eNB Transparent Container</i> 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 <i>Target NG-RAN Node to Source NG-RAN Node Transparent Container</i> IE or the <i>Target eNB to Source eNB Transparent Container</i> 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 as defined in TS 23.003 [23].

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 <i>Target ID</i>	M			
> <i>NG-RAN</i>				
>>Global RAN Node ID	M		9.3.1.5	
>>Selected TAI	M		TAI 9.3.3.11	
> <i>E-UTRAN</i>				
>>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 Request Indicator	M		ENUMERATED (emergency fallback requested, ...)	
Emergency Service Target CN	O		ENUMERATED (5GC, EPC, ...)	

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. Additionally, this IE contains the maximum integrity protected data rate per UE for integrity protection for DRBs.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
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.	-	
Maximum Integrity Protected Data Rate Uplink	C- ifIntegrityP rotectionR equiredor Preferred		Maximum Integrity Protected Data Rate 9.3.1.103	Indicates the maximum aggregate rate for integrity protected DRBs supported by the UE in UL. If the <i>Maximum Integrity Protected Data Rate Downlink</i> IE is absent, this IE applies to both UL and DL.	-	
Maximum Integrity Protected Data Rate Downlink	O		Maximum Integrity Protected Data Rate 9.3.1.103	Indicates the maximum aggregate rate for integrity protected DRBs supported by the UE in the DL.	YES	ignore

Condition	Explanation
ifIntegrityProtectionRequiredorPreferred	This IE shall be present if the <i>Integrity Protection Indication</i> IE within the <i>Security Indication</i> IE is present and set to "required" or "preferred".

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, ...)	Indicates the standardized or pre-configured 5QI as 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	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	Criticality	Assigned Criticality
RRC Container	M		OCTET STRING	Includes the RRC <i>HandoverPreparationInformation</i> message as defined in TS 38.331 [18] if the target is a gNB. Includes the RRC <i>HandoverPreparationInformation</i> 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		1..<maxnofPDUSessions>			-	
>>PDU Session ID	M		9.3.1.50		-	
>>QoS Flow Information List		1			-	
>>>QoS Flow Information Item		1..<maxnofQoSFlows>			-	
>>>>QoS Flow Identifier	M		9.3.1.51		-	
>>>>DL Forwarding	O		9.3.1.33		-	
>>>>UL Forwarding	O		9.3.1.118		YES	reject
>>DRBs to QoS Flows Mapping List	O		9.3.1.34		-	
E-RAB Information List		0..1		For inter-system handovers to 5G.	-	
>E-RAB Information Item		1..<maxnofE-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		-	
UE History Information	M		9.3.1.95		-	

Range bound	Explanation
maxnofPDUSessions	Maximum no. of PDU sessions allowed towards one UE. Value is 256.
maxnofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.
maxnofE-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 <i>HandoverCommand</i> message as defined in TS 38.331 [18] if the target is a gNB. Includes the RRC <i>HandoverCommand</i> 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		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		<i>1..<maxnoofDRBs></i>		
>DRB ID	M		9.3.1.53	
>Associated QoS Flow List	M		9.3.1.99	Contains information of the QoS flows mapped to the DRB

Range bound	Explanation
maxnoofDRBs	Maximum no. of DRBs allowed towards one UE. Value is 32.

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.

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 <i>Warning Area</i>	M			
> <i>E-UTRA Cell IDs</i>				
>> <i>EUTRA CGI List for Warning</i>		<i>1..<maxnoofCellIDforWarning></i>		
>>> <i>E-UTRA CGI</i>	M		9.3.1.9	
> <i>NR Cell IDs</i>				
>> <i>NR CGI List for Warning</i>		<i>1..<maxnoofCellIDforWarning></i>		
>>> <i>NR CGI</i>	M		9.3.1.7	
> <i>TAIs for Warning</i>				
>> <i>TAI List for Warning</i>		<i>1..<maxnoofTAIforWarning></i>		
>>> <i>TAI</i>	M		9.3.3.11	
> <i>Emergency Area IDs</i>				
>> <i>Emergency Area ID List</i>		<i>1..<maxnoofEmergencyAreaID></i>		
>>> <i>Emergency Area ID</i>	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 Void

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 <i>Broadcast Completed Area</i>	M			
> <i>Cell ID Broadcast E-UTRA</i>				
>> Completed Cell List		1..<maxnoofCellIDforWarning>		
>>>E-UTRA CGI	M		9.3.1.9	
> <i>TAI Broadcast E-UTRA</i>				
>> 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	
> <i>Emergency Area ID Broadcast E-UTRA</i>				
>> 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	
> <i>Cell ID Broadcast NR</i>				
>> Completed Cell List		1..<maxnoofCellIDforWarning>		
>>>NR-CGI	M		9.3.1.7	
> <i>TAI Broadcast NR</i>				
>> TAI Broadcast		1..<maxnoofTAIforWarning>		
>>>TAI	M		9.3.3.11	
>>> Completed Cell in TAI List		1..<maxnoofCellinTAI>		
>>>>NR-CGI	M		9.3.1.7	
> <i>Emergency Area ID Broadcast NR</i>				
>> 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 <i>Broadcast Cancelled Area</i>	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 Identifier

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
QoS Flow Identifier	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 New Security Context Indicator

This IE indicates that the AMF has activated a new 5G NAS security context as described in TS 33.501 [13].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
New Security Context Indicator	M		ENUMERATED (true, ...)	The NSCI as defined in TS 33.501 [13].

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 <i>N3IWF ID</i>	M			
> <i>N3IWF ID</i>				
>> <i>N3IWF ID</i>	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		1		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	Criticality	Assigned Criticality
Event Type	M		ENUMERATED (direct, change of serving cell, UE presence in the area of interest, stop change of serving cell, stop UE presence in the area of interest, cancel location reporting for the UE, ...)			
Report Area	M		ENUMERATED (cell, ...)			
Area of Interest List		<i>0..1</i>				
>Area of Interest Item		<i>1..<maxno ofAol></i>				
>>Area of Interest	M		9.3.1.66			
>>Location Reporting Reference ID	M		9.3.1.76			
Location Reporting Reference ID to be Cancelled	C- ifEventTypesStopUEPresinAol		Location Reporting Reference ID 9.3.1.76			
Additional Location Information	O		ENUMERATED (Include PSCell, ...)		YES	ignore

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

Condition	Explanation
ifEventTypesStopUEPresinAol	This IE shall be present if the <i>Event Type</i> 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		0..1		
>Area of Interest TAI Item		1..<maxnoofTAlinAol>		
>>TAI	M		9.3.3.11	
Area of Interest Cell List		0..1		
>Area of Interest Cell Item		1..<maxnoofCellinAol>		
>>NG-RAN CGI	M		9.3.3.73	
Area of Interest RAN Node List		0..1		
>Area of Interest RAN Node Item		1..<maxnoofRANNodeinAol>		
>>Global RAN Node ID	M		9.3.1.5	

Range bound	Explanation
maxnoofTAlinAol	Maximum no. of tracking areas in an area of interest. Value is 16.
maxnoofCellinAol	Maximum no. of cells in an area of interest. Value is 256.
maxnoofRANNodeinAol	Maximum no. of NG-RAN nodes in an area 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		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 of NR	O		OCTET STRING	Includes the RRC <i>UERadioPagingInformation</i> message as defined in TS 38.331 [18].
UE Radio Capability for Paging of E-UTRA	O		OCTET STRING	Includes the RRC <i>UERadioPagingInformation</i> message as defined in TS 36.331 [21].

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		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, ...)	Paging attempt count (see 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 <i>NG-RAN CGI</i>	M			
> <i>NR</i>				
>> <i>NR CGI</i>	M		9.3.1.7	
> <i>E-UTRA</i>				
>> <i>E-UTRA CGI</i>	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	Includes the RRC <i>UERadioAccessCapabilityInformation</i> message 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].

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		<i>1..<maxnoofDRBs></i>		
>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 for a QoS flow.

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 for a QoS flow.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Packet Delay Budget	M		INTEGER (0..1023, ...)	Upper bound value for the delay that a packet may experience expressed in unit of 0.5ms.

9.3.1.81 Packet Error Rate

This IE indicates the Packet Error Rate for a QoS flow.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Scalar	M		INTEGER (0..9, ...)	The packet error rate is expressed as <i>Scalar</i> x 10-k where k is the <i>Exponent</i> .
Exponent	M		INTEGER (0..9, ...)	

9.3.1.82 Averaging Window

This IE indicates the Averaging Window for a QoS flow, and applies to GBR QoS flows only.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Averaging Window	M		INTEGER (0..4095, ...)	Unit: ms. The default value of the IE is 2000ms.

9.3.1.83 Maximum Data Burst Volume

This IE indicates the Maximum Data Burst Volume for a QoS flow, and applies to delay critical GBR QoS flows only.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Maximum Data Burst Volume	M		INTEGER (0..4095, ...)	Unit: byte.

9.3.1.84 Priority Level

This IE indicates the Priority Level for a QoS flow.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Priority Level	M		INTEGER (1..127, ...)	Values ordered in decreasing order of priority, i.e. with 1 as the highest priority and 127 as the lowest priority.

9.3.1.85 Mobility Restriction List

This IE defines roaming or access restrictions for subsequent mobility action for which the NG-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. 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	Criticality	Assigned Criticality
Serving PLMN	M		PLMN Identity 9.3.3.5		-	
Equivalent PLMNs		<i>0..<maxno ofEPLMNs ></i>		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		<i>0..<maxno ofEPLMNs PlusOne></i>		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. Bits 2-7 reserved for future use.	-	
Forbidden Area Information		<i>0..<maxno ofEPLMNs PlusOne></i>		This IE contains Forbidden Area information as specified in TS 23.501 [9].	-	
>PLMN Identity	M		9.3.3.5		-	
> Forbidden TACs		<i>1..<maxno ofForbTACs></i>			-	
>>TAC	M		9.3.3.10	The TAC of the forbidden TAI.	-	
Service Area Information		<i>0..<maxno ofEPLMNs PlusOne></i>		This IE contains Service Area Restriction information as specified in TS 23.501 [9].	-	
>PLMN Identity	M		9.3.3.5		-	
> Allowed TACs		<i>0..<maxno ofAllowed Areas></i>			-	
>>TAC	M		9.3.3.10	The TAC of the allowed TAI.	-	

>Not Allowed TACs		<i>0..<maxno ofAllowed Areas></i>			-	
>>TAC	M		9.3.3.10	The TAC of the not-allowed TAI.	-	
Last E-UTRAN PLMN Identity	O		PLMN Identity 9.3.3.5	Indicates the E-UTRAN PLMN ID from where the UE formerly handed over to 5GS and which is preferred in case of subsequent mobility to EPS.	YES	ignore
Core Network Type Restriction for Serving PLMN	O		ENUMERATED (EPCForbidden, ...)	Indicates whether the UE is restricted to connect to EPC for the Serving PLMN as specified in TS 23.501 [9].	YES	ignore
Core Network Type Restriction for Equivalent PLMNs		<i>0..<maxno ofEPLMNs ></i>			YES	ignore
>PLMN Identity	M		9.3.3.5	Includes any of the Equivalent PLMNs listed in the <i>Mobility Restriction List</i> IE for which CN Type restriction applies as specified in TS 23.501 [9].	-	
>Core Network Type Restriction	M		ENUMERATED (EPCForbidden, 5GCForbidden, ...)	Indicates whether the UE is restricted to connect to EPC or to 5GC for this PLMN.		

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, ...)	

9.3.1.90 Paging DRX

This IE indicates the Paging DRX as defined in TS 38.304 [12] and TS 36.304 [29].

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

9.3.1.91 RRC Inactive Transition Report Request

This IE is used to request the NG-RAN node to report or stop reporting to the 5GC when the UE enters or leaves RRC_INACTIVE state.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RRC Inactive Transition Report Request	M		ENUMERATED (Subsequent state transition report, Single RRC connected state report, Cancel report, ...)	

9.3.1.92 RRC State

This IE indicates the RRC state of the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RRC State	M		ENUMERATED (Inactive, Connected, ...)	Indicates the current RRC state of the UE.

9.3.1.93 Expected UE Behaviour

This IE indicates the behaviour of a UE with predictable activity and/or mobility behaviour, to assist the NG-RAN node in e.g. determining the optimum RRC connection time or helping with the RRC_INACTIVE state transition and RNA configuration (e.g. size and shape of the RNA).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Expected UE Activity Behaviour	O		9.3.1.94	
Expected HO Interval	O		ENUMERATED (sec15, sec30, sec60, sec90, sec120, sec180, long-time, ...)	Indicates the expected time interval between inter NG-RAN node handovers. If "long-time" is included, the interval between inter NG-RAN node handovers is expected to be longer than 180 seconds.
Expected UE Mobility	O		ENUMERATED (stationary, mobile, ...)	Indicates whether the UE is expected to be stationary or mobile.
Expected UE Moving Trajectory		0..1		Indicates the UE's expected geographical movement.
>Expected UE Moving Trajectory Item		1..<maxnoofCellsUEMovingTrajectory>		Includes list of 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)	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
maxnoofCellsUEMovingTrajectory	Maximum no. of cells of UE moving trajectory. Value is 16.

9.3.1.94 Expected UE Activity Behaviour

This IE indicates information about the expected "UE activity behaviour" as defined in TS 23.501 [9].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Expected Activity Period	O		INTEGER (1..30 40 50 60 80 100 120 150 180 181, ...)	If set to "181" the expected activity time is longer than 180 seconds. The remaining values indicate the expected activity time in [seconds].
Expected Idle Period	O		INTEGER (1..30 40 50 60 80 100 120 150 180 181, ...)	If set to "181" the expected idle time is longer than 180 seconds. The remaining values indicate the expected idle time in [seconds].
Source of UE Activity Behaviour Information	O		ENUMERATED (subscription information, statistics, ...)	If "subscription information" is indicated, the information contained in the <i>Expected Activity Period</i> IE and the <i>Expected Idle Period</i> IE, if present, is derived from subscription information. If "statistics" is indicated, the information contained in the <i>Expected Activity Period</i> IE and the <i>Expected Idle Period</i> IE, if present, is derived from statistical information.

9.3.1.95 UE History Information

This IE contains information about cells that a UE has been served by in active state prior to the target cell.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Last Visited Cell Item		<i>1..<maxnoofCellsinUEHistoryInfo></i>		Most recent information is added to the top of this list.
>Last Visited Cell Information	M		9.3.1.96	

Range bound	Explanation
maxnoofCellsinUEHistoryInfo	Maximum no. of cells in the UE history information. Value is 16.

9.3.1.96 Last Visited Cell Information

This IE may contain cell specific information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE <i>Last Visited Cell Information</i>	M			
>NG-RAN Cell				
>>Last Visited NG-RAN Cell Information	M		9.3.1.97	
>E-UTRAN Cell				
>>Last Visited E-UTRAN Cell Information	M		OCTET STRING	Defined in TS 36.413 [16].
>UTRAN Cell				
>>Last Visited UTRAN Cell Information	M		OCTET STRING	Defined in TS 25.413 [28].
>GERAN Cell				
>>Last Visited GERAN Cell Information	M		OCTET STRING	Defined in TS 36.413 [16].

9.3.1.97 Last Visited NG-RAN Cell Information

This IE contains information about a cell. In case of NR cell, this IE contains information about a set of NR cells with the same NR ARFCN for reference point A, and the *Global Cell ID* IE identifies one of the NR cells in the set. The information is to be used for RRM purposes.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Global Cell ID	M		NG-RAN CGI 9.3.1.73	
Cell Type	M		9.3.1.98	
Time UE Stayed in Cell	M		INTEGER (0..4095)	The duration of time the UE stayed in the cell, or set of NR cells with the same NR ARFCN for reference point A, in seconds. If the duration is more than 4095s, this IE is set to 4095.
Time UE Stayed in Cell Enhanced Granularity	O		INTEGER (0..40950)	The duration of time the UE stayed in the cell, or set of NR cells with the same NR ARFCN for reference point A, in 1/10 seconds. If the duration is more than 4095s, this IE is set to 40950.
HO Cause Value	O		Cause 9.3.1.2	The cause for the handover.

9.3.1.98 Cell Type

This IE provides the cell coverage area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cell Size	M		ENUMERATED (verysmall, small, medium, large, ...)	

9.3.1.99 Associated QoS Flow List

This IE indicates the list of QoS flows associated with e.g. a DRB or UP TNL endpoint.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Associated QoS Flow Item		<i>1..<maxnoofQoSFlows></i>		
>QoS Flow Identifier	M		9.3.1.51	
>QoS Flow Mapping Indication	O		ENUMERATED (ul, dl, ...)	

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

9.3.1.100 Information on Recommended Cells and RAN Nodes for Paging

This IE provides information on recommended cells and NG-RAN nodes for paging.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Recommended Cells for Paging	M		9.3.1.71	
Recommended RAN Nodes for Paging	M		9.3.1.101	

9.3.1.101 Recommended RAN Nodes for Paging

This IE contains recommended NG-RAN nodes for paging.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Recommended RAN Node List		1		
>Recommended RAN Node Item		1..<maxnoofRecommendedRANNodes>		Includes visited and non-visited NG-RAN nodes, where visited NG-RAN nodes are listed in the order the UE visited them with the most recent NG-RAN node being the first in the list. Non-visited NG-RAN nodes are included after the visited NG-RAN node they are associated with.
>>CHOICE AMF Paging Target				The AMF paging target is either an NG-RAN node identity or a TAI as specified in TS 38.300 [8].
>>>RAN Node				
>>>>Global RAN Node ID	M		9.3.1.5	
>>>TAI				
>>>>TAI	M		9.3.3.11	

Range bound	Explanation
maxnoofRedommendedRANNodes	Maximum no. of recommended NG-RAN nodes. Value is 16.

9.3.1.102 PDU Session Aggregate Maximum Bit Rate

This IE is applicable for all Non-GBR QoS flows per PDU session which is defined for the downlink and the uplink direction and is provided by the SMF to the NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PDU Session Aggregate Maximum Bit Rate		1		Applicable for Non-GBR QoS flows.
>PDU Session Aggregate Maximum Bit Rate Downlink	M		Bit Rate 9.3.1.4	Indicates the PDU session Aggregate Maximum Bit Rate as specified in TS 23.501 [9] in the downlink direction.
>PDU Session Aggregate Maximum Bit Rate Uplink	M		Bit Rate 9.3.1.4	Indicates the PDU session Aggregate Maximum Bit Rate as specified in TS 23.501 [9] in the uplink direction.

9.3.1.103 Maximum Integrity Protected Data Rate

This IE indicates the maximum aggregate data rate for integrity protected DRBs for a UE as defined in TS 38.300 [8].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Maximum Integrity Protected Data Rate	M		ENUMERATED (64kbps, max UE rate, ...)	Defines the upper bound of the aggregate data rate of user plane integrity protected data for either UL or DL.

9.3.1.104 Overload Response

This IE indicates the required behaviour of the NG-RAN node in an overload situation.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE <i>Overload Response</i>	M			
> <i>Overload Action</i>				
>>Overload Action	M		9.3.1.105	

9.3.1.105 Overload Action

This IE indicates which signalling traffic is subject to rejection by the NG-RAN node in an AMF overload situation as defined in TS 23.501 [9].

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

9.3.1.106 Traffic Load Reduction Indication

This IE indicates the percentage of the type of traffic relative to the instantaneous incoming rate at the NG-RAN node, as indicated in the *Overload Action* IE, to be rejected.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Traffic Load Reduction Indication	M		INTEGER (1..99)	

9.3.1.107 Slice Overload List

This IE indicates the list of overloaded slices.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Slice Overload Item		<i>1..<maxnoofSlicItems></i>		
>S-NSSAI	M		9.3.1.24	

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

9.3.1.108 RAN Status Transfer Transparent Container

This IE is produced by the source NG-RAN node and is transmitted to the target NG-RAN node. It is used for intra 5GC NG handover.

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
DRBs Subject to Status Transfer List		1			-	
>DRBs Subject to Status Transfer Item		1..<maximum of DRBs>			-	
>>DRB ID	M		9.3.1.53		-	
>>CHOICE UL DRB Status	M				-	
>>>12 bits						
>>>>UL COUNT Value	M		COUNT Value for PDCP SN Length 12 9.3.1.109	PDCP-SN and HFN of the first missing UL PDCP SDU in case of 12 bit long PDCP-SN.	-	
>>>>Receive Status of UL PDCP SDUs	O		BIT STRING (SIZE(1..2048))	The IE is used in case of 12 bit long PDCP-SN. The first bit indicates the status of the SDU after the First Missing UL PDCP SDU. The N th bit indicates the status of the UL PDCP SDU in position (N + First Missing SDU Number) modulo (1 + the maximum value of the PDCP-SN). 0: PDCP SDU has not been received. 1: PDCP SDU has been received correctly.	-	
>>>>18 bits						
>>>>UL COUNT Value	M		COUNT Value for PDCP SN Length 18 9.3.1.110	PDCP-SN and HFN of the first missing UL PDCP SDU in case of 18 bit long PDCP-SN.	-	

>>>>Receive Status of UL PDCP SDUs	O		BIT STRING (SIZE(1..131072))	The IE is used in case of 18 bit long PDCP-SN. The first bit indicates the status of the SDU after the First Missing UL PDCP SDU. The N^{th} bit indicates the status of the UL PDCP SDU in position ($N + \text{First Missing SDU Number}$) modulo ($1 + \text{the maximum value of the PDCP-SN}$). 0: PDCP SDU has not been received. 1: PDCP SDU has been received correctly.	-	
>>CHOICE DL DRB Status	M				-	
>>> 12 bits						
>>>>DL COUNT Value	M		COUNT Value for PDCP SN Length 12 9.3.1.109	PDCP-SN and HFN that the target NG-RAN node should assign for the next DL PDCP SDU not having an SN yet in case of 12 bit long PDCP-SN.	-	
>>> 18 bits						
>>>>DL COUNT Value	M		COUNT Value for PDCP SN Length 18 9.3.1.110	PDCP-SN and HFN that the target NG-RAN node should assign for the next DL PDCP SDU not having an SN yet in case of 18 bit long PDCP-SN.	-	
>>Old Associated QoS Flow List - UL End Marker Expected	O		Associated QoS Flow List 9.3.1.99	Indicates that the source NG-RAN node has initiated QoS flow re-mapping and has not yet received SDAP end markers, as described in TS 38.300 [8].	YES	reject

Range bound	Explanation
maxnoofDRBs	Maximum no. of DRBs allowed towards one UE. Value is 32.

9.3.1.109 COUNT Value for PDCP SN Length 12

This IE contains a PDCP sequence number and a hyper frame number in case of 12 bit long PDCP-SN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PDCP SN Length 12	M		INTEGER (0..4095)	
HFN for PDCP SN Length 12	M		INTEGER (0..1048575)	

9.3.1.110 COUNT Value for PDCP SN Length 18

This IE contains a PDCP sequence number and a hyper frame number in case of 18 bit long PDCP-SN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PDCP SN Length 18	M		INTEGER (0..262143)	
HFN for PDCP SN Length 18	M		INTEGER (0..16383)	

9.3.1.111 RRC Establishment Cause

This IE indicates the reason for RRC Connection Establishment as received from the UE in the *EstablishmentCause* defined in TS 38.331 [18] and TS 36.331 [21], or the reason for RRC Connection Resume as received from the UE in the *ResumeCause* defined in TS 38.331 [18].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RRC Establishment Cause	M		ENUMERATED (emergency, highPriorityAccess, mt-Access, mo-Signalling, mo-Data, mo-VoiceCall, mo-VideoCall, mo-SMS, mps-PriorityAccess, mcs-PriorityAccess, ..., notAvailable)	The <i>notAvailable</i> value is used in case the UE is re-establishing an RRC connection but there is fallback to RRC connection establishment as described in [18], or the <i>ResumeCause</i> received from the UE does not map to any other value of the <i>RRC Establishment Cause</i> IE.

9.3.1.112 Warning Area Coordinates

This IE contains the affected alert area coordinates of a warning message, and will be broadcast over the radio interface.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Warning Area Coordinates	M		OCTET STRING (SIZE(1..1024))	

9.3.1.113 Network Instance

This IE provides the network instance to be used by the NG-RAN node when selecting a particular transport network resource as described in TS 23.501 [9].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Network Instance	M		INTEGER (1..256, ...)	

9.3.1.114 Secondary RAT Usage Information

This IE provides information on the secondary resources used with MR-DC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PDU Session Usage Report		0..1		
>RAT Type	M		ENUMERATED (nR, e-UTRA, ...)	
>PDU Session Timed Report List	M		Volume Timed Report List 9.3.1.115	
QoS Flows Usage Report List		0..1		
>QoS Flow Usage Report Item		1..<maxnoofQoSFlows>		
>>QoS Flow Indicator	M		9.3.1.51	
>>RAT Type	M		ENUMERATED (nR, e-UTRA, ...)	
>>QoS Flows Timed Report List	M		Volume Timed Report List 9.3.1.115	

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

9.3.1.115 Volume Timed Report List

This IE provides information on the data usage.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Volume Timed Report Item		1..<maxnoofTimePeriods>		
>Start Timestamp	M		OCTET STRING (SIZE(4))	UTC time encoded in the same format as the first four octets of the 64-bit timestamp format as defined in section 6 of IETF RFC 5905 [14]. It indicates the start time of the collecting period of the included Usage Count UL IE and Usage Count DL IE.
>End Timestamp	M		OCTET STRING (SIZE(4))	UTC time encoded in the same format as the first four octets of the 64-bit timestamp format as defined in section 6 of IETF RFC 5905 [14]. It indicates the end time of the collecting period of the included Usage Count UL IE and Usage Count DL IE.
>Usage Count UL	M		INTEGER (0..2 ⁶⁴ -1)	The unit is: octets.
>Usage Count DL	M		INTEGER (0..2 ⁶⁴ -1)	The unit is: octets.

Range bound	Explanation
maxnoofTimePeriods	Maximum no. of time reporting periods. Value is 2.

9.3.1.116 Redirection for Voice EPS Fallback

This IE is used to indicate that the AMF and the UE support the redirection for voice for EPS Fallback.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Redirection for Voice EPS Fallback	M		ENUMERATED (possible, not-possible, ...)	

9.3.1.117 UE Retention Information

This IE allows the NG-RAN node and the AMF to indicate whether prior UE related contexts and related UE-associated logical NG-connections and RRC connections are intended to be retained.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Retention Information	M		ENUMERATED (ues-retained, ...)	

9.3.1.118 UL Forwarding

This IE indicates that the QoS flow is proposed for forwarding of uplink packets.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UL Forwarding	M		ENUMERATED (UL forwarding proposed, ...)	

9.3.1.119 CN Assisted RAN Parameters Tuning

This IE provides information for assisting in parameters tuning of the NG-RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Expected UE Behaviour	O		9.3.1.93	This IE may be present in case the <i>Core Network Assistance Information for RRC INACTIVE</i> IE is not included and is ignored otherwise.

9.3.1.120 Common Network Instance

This IE provides the common network instance to be used by the NG-RAN node when selecting a particular transport network resource as described in TS 23.501 [9] in a format common with 5GC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Common Network Instance	M		OCTET STRING	

9.3.2 Transport Network Layer Related IEs

9.3.2.1 QoS Flow per TNL Information List

This IE is used to provide a list of additional UP transport layer information for a split PDU session, along with the associated QoS flows.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
QoS Flow per TNL Information Item		1..<maxnoofMultiConnectivityMinusOne>		
>QoS Flow per TNL Information	M		9.3.2.8	

Range bound	Explanation
maxnoofMultiConnectivityMinusOne	Maximum no. of connectivity allowed for a UE minus one. Value is 3. The current version of the specification supports 1.

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	Criticality	Assigned Criticality
CHOICE <i>CP Transport Layer Information</i>						
> <i>Endpoint-IP-address</i>					-	
>>Endpoint IP Address	M		Transport Layer Address 9.3.2.4		-	
> <i>Endpoint-IP-address-and-port</i>					YES	reject
>>Endpoint IP Address	M		Transport Layer Address 9.3.2.4		-	
>>Port Number	M		OCTET STRING (SIZE(2))		-	

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		<i>1..<maxnoofTNLAssociations></i>		
>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.

9.3.2.8 QoS Flow per TNL Information

This IE indicates the NG-U transport layer information and associated list of QoS flows.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UP Transport Layer Information	M		9.3.2.2	
Associated QoS Flow List	M		9.3.1.99	

9.3.2.9 TNL Association Usage

This IE indicates the usage of the TNL association.

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

9.3.2.10 TNL Address Weight Factor

This IE indicates the weight factor of the TNL address.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
TNL Address Weight Factor	M		INTEGER (0..255)	Value 0 indicates the TNL address is not permitted for the initial NGAP message. If the value for each TNL address is the same, it indicates the deployments that rely solely on 5GC-based load balancing.

9.3.2.11 UP Transport Layer Information Pair List

This IE is used to provide a list of uplink UP transport layer information and associated downlink UP transport layer information for a split PDU session.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UP Transport Layer Information Pair Item		<i>1..<maxnoofMultiConnectivityMinusOne></i>		
>UL NG-U UP TNL Information	M		UP Transport Layer Information 9.3.2.2	
>DL NG-U UP TNL Information	M		UP Transport Layer Information 9.3.2.2	

Range bound	Explanation
maxnoofMultiConnectivityMinusOne	Maximum no. of connectivity allowed for a UE minus one. Value is 3. The current version of the specification supports 1.

9.3.2.12 UP Transport Layer Information List

This IE is used to provide a list of additional UP transport layer information for a split PDU session.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UP Transport Layer Information Item		<i>1..<maxnoofMultiConnectivityMinusOne></i>		
>NG-U UP TNL Information	M		UP Transport Layer Information 9.3.2.2	

Range bound	Explanation
maxnoofMultiConnectivityMinusOne	Maximum no. of connectivity allowed for a UE minus one. Value is 3. The current version of the specification supports 1.

9.3.2.13 QoS Flow List with Data Forwarding

This IE is used to provide a list of QoS flows with indication if forwarding is accepted.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
QoS Flow Item with Data Forwarding		$1..<maxnoofQoSFlows>$		
>QoS Flow Identifier	M		9.3.1.51	
>Data Forwarding Accepted	O		9.3.1.62	

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

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, as described in TS 38.401 [2].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
AMF UE NGAP ID	M		INTEGER (0..2 ⁴⁰ -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		BIT STRING (SIZE(8))	
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	The content is defined in TS 24.501 [26].

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- ifSONInfor mationRe quest		9.3.3.9	Source NG-RAN node Xn TNL Configuration Info.

Condition	Explanation
ifSONInformationRequest	This IE shall be present if the <i>SON Information</i> IE contains the <i>SON Information Request</i> IE set to "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 <i>SON Information</i>	M			
> <i>SON Information Request</i>				
>>SON Information Request	M		ENUMERATED (Xn TNL Configuration Info, ...)	
> <i>SON Information Reply</i>				
>>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	Criticality	Assigned Criticality
Xn Transport Layer Addresses		<i>1..<maxnoo fXnTLAs></i>			-	
>Transport Layer Address	M		9.3.2.4	Transport Layer Addresses for Xn Sctp endpoint.	-	
Xn Extended Transport Layer Addresses		<i>0..<maxnoo fXnExtTLAs ></i>			-	
>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		<i>0..<maxnoo fXnGTP-TLAs></i>			-	
>>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).	-	
>Xn Sctp Transport Layer Addresses		<i>0..<maxnoo fXnTLAs></i>			YES	ignore
>>Transport Layer Address Sctp	<u>M</u>		Transport Layer Address 9.3.2.4	Transport Layer Addresses for Xn Sctp endpoint.	-	

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(10))	

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)	Values ordered in decreasing order of priority, i.e. with 1 as the highest priority and 256 as the lowest priority

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 <i>UE Paging Identity</i>	M			
>5G-S-TMSI				
>>5G-S-TMSI	M		9.3.3.20	

9.3.3.19 AMF Pointer

This IE is used to identify one or more AMF(s) within the AMF Set.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
AMF Pointer	M		BIT STRING (SIZE(6))	

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, ...)	

9.3.3.23 UE Identity Index Value

This IE is used by the NG-RAN node to calculate the Paging Frame as specified in TS 38.304 [12] and TS 36.304 [29].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE <i>UE Identity Index Value</i>				
> <i>Index Length 10</i>				
>> <i>Index Length 10</i>	M		BIT STRING (SIZE(10))	Coded as specified in TS 38.304 [12] and TS 36.304 [29].

9.3.3.24 Periodic Registration Update Timer

This IE is used to assist NG-RAN to generate corresponding timer for periodic RNA update for RRC_INACTIVE UEs.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Periodic Registration Update Timer	M		BIT STRING (SIZE(8))	<p>Bits 5 to 1 represent the binary coded timer value.</p> <p>Bits 6 to 8 define the timer value unit for the Periodic Registration Update Timer as follows:</p> <p>Bits</p> <p>8 7 6</p> <p>0 0 0 value is incremented in multiples of 10 minutes 0 0 1 value is incremented in multiples of 1 hour 0 1 0 value is incremented in multiples of 10 hours 0 1 1 value is incremented in multiples of 2 seconds 1 0 0 value is incremented in multiples of 30 seconds 1 0 1 value is incremented in multiples of 1 minute 1 1 1 value indicates that the timer is deactivated.</p> <p>1 1 0 value is incremented in multiples of 1 hour in this version of the protocol.</p>

9.3.3.25 UE-associated Logical NG-connection List

This IE contains a list of UE-associated logical NG-connections.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE-associated Logical NG-connection Item		<i>1..<maxnoofNGConnectionsToReset></i>		
>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 65536.

9.3.3.26 NAS Security Parameters from NG-RAN

This IE provides security related parameters for inter-system handover from NG-RAN to E-UTRAN via the eNB to the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
NAS Security Parameters from NG-RAN	M		OCTET STRING	Refers to the <i>N1 mode to S1 mode NAS transparent container</i> IE, the details of the IE definition and the encoding are specified in TS 24.501 [26].

9.3.3.27 Source to Target AMF Information Reroute

This IE is used to transparently pass information provided by NSSF from the source AMF to the target AMF through the NG-RAN node; it is produced by the source core network node and is transmitted to the target core network node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Configured NSSAI	O		OCTET STRING (SIZE(128))	The maximum number of S-NSSAI in Configured NSSAI is 16. This IE contains optional mapping S-NSSAI. When present, this IE shall be transmitted transparent from the source Core network node to the target Core network node. The octets of the OCTET STRING are encoded according to description in TS 29.531 [30].
Rejected NSSAI in PLMN	O		OCTET STRING (SIZE(32))	This IE contain the rejected NSSAI(s) in the PLMN. When present, this IE shall be transmitted transparent from the source Core network node to the target Core network node. The octets of the OCTET STRING are encoded according to description in TS 29.531 [30].
Rejected NSSAI in TA	O		OCTET STRING (SIZE(32))	This IE contain the rejected NSSAI(s) in the TA. When present, this IE shall be transmitted transparent from the source Core network node to the target Core network node. The octets of the OCTET STRING are encoded according to description in TS 29.531 [30].

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	Criticality	Assigned Criticality
PDU Session Aggregate Maximum Bit Rate	O		9.3.1.102	This IE shall be present when at least one Non-GBR QoS flow is being setup and is ignored otherwise.	YES	reject
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.	YES	reject
Additional UL NG-U UP TNL Information	O		UP Transport Layer Information List 9.3.2.12	UPF endpoint of the additional NG-U transport bearer(s), for delivery of UL PDUs for split PDU session.	YES	reject
Data Forwarding Not Possible	O		9.3.1.63	This IE may be present in case of HANDOVER REQUEST message and is ignored otherwise.	YES	reject
PDU Session Type	M		9.3.1.52		YES	reject
Security Indication	O		9.3.1.27		YES	reject
Network Instance	O		9.3.1.113	This IE is ignored if the <i>Common Network Instance</i> IE is included.	YES	reject
QoS Flow Setup Request List		1			YES	reject
>QoS Flow Setup Request Item		1..<maxno of QoSFlows>			-	
>>QoS Flow Identifier	M		9.3.1.51		-	
>>QoS Flow Level QoS Parameters	M		9.3.1.12		-	
>>E-RAB ID	O		9.3.2.3		-	
Common Network Instance	O		9.3.1.120		YES	ignore

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 QoS Flow per TNL Information	M		QoS Flow per TNL Information 9.3.2.8	NG-RAN node endpoint of the NG-U transport bearer for delivery of DL PDUs, together with associated QoS flows.
Additional DL QoS Flow per TNL Information	O		QoS Flow per TNL Information List 9.3.2.1	NG-RAN node endpoint of the additional NG-U transport bearer(s) for delivery of DL PDUs for split PDU session, together with associated QoS flows.
Security Result	O		9.3.1.59	
QoS Flow Failed to Setup List	O		QoS Flow List with Cause 9.3.1.13	

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	Criticality	Assigned Criticality
PDU Session Aggregate Maximum Bit Rate	O		9.3.1.102		YES	reject
UL NG-U UP TNL Modify List		<i>0..1</i>			YES	reject
>UL NG-U UP TNL Modify Item		<i>1..<maxno ofMultiConnectivity></i>			-	
>>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.	-	
>>DL NG-U UP TNL Information	M		UP Transport Layer Information 9.3.2.2	Identifies the NG-U transport bearer at the NG-RAN node.	-	
Network Instance	O		9.3.1.113	This IE is ignored if the <i>Common Network Instance</i> IE is included.	YES	reject
QoS Flow Add or Modify Request List		<i>0..1</i>			YES	reject
>QoS Flow Add or Modify Request Item		<i>1..<maxno ofQoSFlows></i>			-	
>>QoS Flow Identifier	M		9.3.1.51		-	
>>QoS Flow Level QoS Parameters	O		9.3.1.12		-	
>>E-RAB ID	O		9.3.2.3		-	
QoS Flow to Release List	O		QoS Flow List with Cause 9.3.1.13		YES	reject
Additional UL NG-U UP TNL Information	O		UP Transport Layer Information List 9.3.2.12	UPF endpoint of the additional NG-U transport bearer(s) proposed for delivery of UL PDUs for split PDU session.	YES	reject
Common Network Instance	O		9.3.1.120		YES	ignore

Range bound	Explanation
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.
maxnoofMultiConnectivity	Maximum no. of connectivity allowed for a UE. Value is 4. The current version of the specification supports up to 2 connectivity.

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	Criticality	Assigned Criticality
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.	-	
UL NG-U UP TNL Information	O		UP Transport Layer Information 9.3.2.2	Identifies the NG-U transport bearer at the 5GC node.	-	
QoS Flow Add or Modify Response List		0..1			-	
>QoS Flow Add or Modify Response Item		1..<maxno ofQoSFlows>			-	
>>QoS Flow Identifier	M		9.3.1.51		-	
Additional DL QoS Flow per TNL Information	O		QoS Flow per TNL Information List 9.3.2.1	NG-RAN node endpoint of the additional NG-U transport bearer(s) for delivery of DL PDUs for split PDU session, together with associated QoS flows.	-	
QoS Flow Failed to Add or Modify List	O		QoS Flow List with Cause 9.3.1.13		-	
Additional NG-U UP TNL Information	O		UP Transport Layer Information Pair List 9.3.2.11	NG-RAN node endpoint of the NG-U transport bearer corresponding to the modified UPF endpoint received in the PDU Session Resource Modify Request Transfer IE in case of PDU session split.	YES	ignore

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	Criticality	Assigned Criticality
QoS Flow Notify List		0..1			-	
>QoS Flow Notify Item		1..<maxno of QoSFlows>			-	
>>QoS Flow Identifier	M		9.3.1.51		-	
>>Notification Cause	M		ENUMERATED (fulfilled, not fulfilled, ...)		-	
QoS Flow Released List	O		QoS Flow List with Cause 9.3.1.13		-	
Secondary RAT Usage Information	O		9.3.1.114		YES	ignore

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	Criticality	Assigned Criticality
DL QoS Flow per TNL Information	M		QoS Flow per TNL Information 9.3.2.8	NG-RAN node endpoint of the NG-U transport bearer for delivery of DL PDUs, together with associated QoS flows.	-	
Additional DL QoS Flow per TNL Information	O		QoS Flow per TNL Information List 9.3.2.1	NG-RAN node endpoint of the additional NG-U transport bearer(s) for delivery of DL PDUs for split PDU session, together with associated QoS flows	-	
Secondary RAT Usage Information	O		9.3.1.114		YES	ignore
Security Result	O		9.3.1.59	Current UP security status	YES	ignore

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		1..<maxnoofQoSFlows>		
>>QoS Flow Identifier	M		9.3.1.51	
UL NG-U UP TNL Information	M		UP Transport Layer Information 9.3.2.2	UPF endpoint of the NG-U transport bearer corresponding to the <i>DL NG-U UP TNL Information</i> IE received in the <i>PDU Session Resource Modify Indication Transfer</i> IE.
Additional NG-U UP TNL Information	O		UP Transport Layer Information Pair List 9.3.2.11	NG-RAN node endpoint of the NG-U transport bearer indicated in the <i>PDU Session Resource Modify Indication Transfer</i> IE and the corresponding UPF endpoint for split PDU session.
QoS Flow Failed to Modify List	O		QoS Flow List with Cause 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	Criticality	Assigned Criticality
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 NG-U TNL Information Reused	O		ENUMERATED (true, ...)	Indicates that DL NG-U TNL Information has been reused.	-	
User Plane Security Information	O		9.3.1.60		-	
QoS Flow Accepted List		1		QoS flows associated with the <i>DL NG-U UP TNL Information</i> IE.	-	
>QoS Flow Accepted Item		1..<maxnoofQoSFlows>			-	
>>QoS Flow Identifier	M		9.3.1.51		-	
Additional DL QoS Flow per TNL Information	O		QoS Flow per TNL Information List 9.3.2.1	NG-RAN node endpoint of the additional NG-U transport bearer(s) for delivery of DL PDUs for split PDU session, together with associated QoS flows.	YES	ignore

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	Criticality	Assigned Criticality
UL NG-U UP TNL Information	O		UP Transport Layer Information 9.3.2.2	UPF endpoint of the NG-U transport bearer corresponding to the <i>DL NG-U UP TNL Information</i> IE received in the <i>Path Switch Request Transfer</i> IE.	-	
Security Indication	O		9.3.1.27		-	
Additional NG-U UP TNL Information	O		UP Transport Layer Information Pair List 9.3.2.11	NG-RAN node endpoint of the NG-U transport bearer indicated in the <i>Path Switch Request Transfer</i> IE and the corresponding UPF endpoint for split PDU session.	YES	ignore

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	Criticality	Assigned Criticality
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		0..1		QoS flows associated with the <i>DL Forwarding UP TNL Information</i> IE.	-	
>QoS Flow to be Forwarded Item		1..<maxno ofQoSFlows>			-	
>>QoS Flow Identifier	M		9.3.1.51		-	
Data Forwarding Response DRB List	O		9.3.1.77		-	
Additional DL Forwarding UP TNL Information	O		QoS Flow per TNL Information List 9.3.2.1	NG-RAN node endpoint to deliver forwarded DL PDUs for split PDU session, together with associated QoS flows to be forwarded.	YES	ignore
UL Forwarding UP TNL Information	O		UP Transport Layer Information 9.3.2.2	To deliver forwarded UL PDUs	YES	reject
Additional UL Forwarding UP TNL Information	O		UP Transport Layer Information List 9.3.2.12	NG-RAN node endpoint to deliver forwarded UL PDUs for split PDU session.	YES	reject

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	Criticality	Assigned Criticality
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	M		QoS Flow List with Data Forwarding 9.3.2.13	QoS flows associated with the <i>DL NG-U UP TNL Information</i> IE.	-	
QoS Flow Failed to Setup List	O		QoS Flow List with Cause 9.3.1.13		-	
Data Forwarding Response DRB List	O		9.3.1.77		-	
Additional DL UP TNL Information for HO List		0..1			YES	ignore
>Additional DL UP TNL Information for HO Item		1..<maxno ofMultiConnectivityMinusOne>		Additional DL UP TNL Information for split PDU session, in the same order as the UPF endpoint of the additional NG-U transport bearer(s) received in the <i>PDU Session Request Setup Transfer</i> IE of the Handover Request message.	-	
>>Additional DL NG-U UP TNL Information	M		UP Transport Layer Information 9.3.2.2	NG-RAN node endpoint of the additional NG-U transport bearer for delivery of DL PDUs.	-	
>>Additional QoS Flow Setup Response List	M		QoS Flow List with Data Forwarding 9.3.2.13	QoS flows associated with the <i>Additional DL NG-U UP TNL Information</i> IE.	-	
>>Additional DL Forwarding UP TNL Information	O		UP Transport Layer Information 9.3.2.2	NG-RAN node endpoint to deliver forwarded DL PDUs.	-	
UL Forwarding UP TNL Information	O		UP Transport Layer Information 9.3.2.2	To deliver forwarded UL PDUs	YES	reject
Additional UL Forwarding UP TNL Information	O		UP Transport Layer Information List 9.3.2.12	NG-RAN node endpoint to deliver forwarded UL PDUs for split PDU session.	YES	reject

Range bound	Explanation
maxnoofQoSFlows	Maximum no. of QoS flows allowed within one PDU session. Value is 64.
maxnoofMultiConnectivityMinusOne	Maximum no. of connectivity allowed for a UE minus one. Value is 3. The current version of the specification supports 1.

9.3.4.12 PDU Session Resource Release Command Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cause	M		9.3.1.2	

9.3.4.13 PDU Session Resource Notify Released Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Cause	M		9.3.1.2		-	
Secondary RAT Usage Information	O		9.3.1.114		YES	ignore

9.3.4.14 Handover Required Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Direct Forwarding Path Availability	O		9.3.1.64	

9.3.4.15 Path Switch Request Setup Failed Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cause	M		9.3.1.2	

9.3.4.16 PDU Session Resource Setup Unsuccessful Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cause	M		9.3.1.2	
Criticality Diagnostics	O		9.3.1.3	

9.3.4.17 PDU Session Resource Modify Unsuccessful Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cause	M		9.3.1.2	
Criticality Diagnostics	O		9.3.1.3	

9.3.4.18 Handover Preparation Unsuccessful Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cause	M		9.3.1.2	

9.3.4.19 Handover Resource Allocation Unsuccessful Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cause	M		9.3.1.2	
Criticality Diagnostics	O		9.3.1.3	

9.3.4.20 Path Switch Request Unsuccessful Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cause	M		9.3.1.2	

9.3.4.21 PDU Session Resource Release Response Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Secondary RAT Usage Information	O		9.3.1.114		YES	ignore

9.3.4.22 PDU Session Resource Modify Indication Unsuccessful Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cause	M		9.3.1.2	

9.3.4.23 Secondary RAT Data Usage Report Transfer

This IE is transparent to the AMF.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Secondary RAT Usage Information	O		9.3.1.114	

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

```
-- ASN1START
-- *****
--
-- 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,
OverloadStart,
OverloadStop,
Paging,
PathSwitchRequest,
PathSwitchRequestAcknowledge,
PathSwitchRequestFailure,
PDUSessionResourceModifyConfirm,
PDUSessionResourceModifyIndication,
PDUSessionResourceModifyRequest,
PDUSessionResourceModifyResponse,
PDUSessionResourceNotify,
PDUSessionResourceReleaseCommand,
PDUSessionResourceReleaseResponse,
PDUSessionResourceSetupRequest,
PDUSessionResourceSetupResponse,
PrivateMessage,
PWSCancelRequest,
PWSCancelResponse,
PWSFailureIndication,
PWSRestartIndication,
RANConfigurationUpdate,
RANConfigurationUpdateAcknowledge,
RANConfigurationUpdateFailure,
RerouteNASRequest,
RRCInactiveTransitionReport,
SecondaryRATDataUsageReport,
TraceFailureIndication,
TraceStart,
UEContextModificationFailure,
UEContextModificationRequest,
UEContextModificationResponse,
UEContextReleaseCommand,
UEContextReleaseComplete,
UEContextReleaseRequest,
UERadioCapabilityCheckRequest,
UERadioCapabilityCheckResponse,
UERadioCapabilityInfoIndication,
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-OverloadStart,
id-OverloadStop,
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-RRCInactiveTransitionReport,
id-SecondaryRATDataUsageReport,
id-TraceFailureIndication,
id-TraceStart,
id-UEContextModification,
id-UEContextRelease,
id-UEContextReleaseRequest,
id-UERadioCapabilityCheck,
id-UERadioCapabilityInfoIndication,
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
  overloadStart
  overloadStop
}

```

```

    paging
    pduSessionResourceNotify
    privateMessage
    pwsFailureIndication
    pwsRestartIndication
    rerouteNASRequest
    rrcInactiveTransitionReport
    secondaryRATDataUsageReport
    traceFailureIndication
    traceStart
    ueContextReleaseRequest
    ueRadioCapabilityInfoIndication
    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
}

overloadStart NGAP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      OverloadStart
  PROCEDURE CODE          id-OverloadStart
  CRITICALITY             ignore
}

overloadStop NGAP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      OverloadStop
  PROCEDURE CODE          id-OverloadStop
  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
}

rRCInactiveTransitionReport NGAP-ELEMENTARY-PROCEDURE ::= {
```

```
INITIATING MESSAGE      RRCInactiveTransitionReport
PROCEDURE CODE          id-RRCInactiveTransitionReport
CRITICALITY             ignore
}

secondaryRATDataUsageReport NGAP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      SecondaryRATDataUsageReport
  PROCEDURE CODE          id-SecondaryRATDataUsageReport
  CRITICALITY             ignore
}

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
}

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
}

ueRadioCapabilityInfoIndication NGAP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      UERadioCapabilityInfoIndication
  PROCEDURE CODE          id-UERadioCapabilityInfoIndication
}
```

```

    CRITICALITY          ignore
  }

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
-- ASN1STOP

```

9.4.4 PDU Definitions

```

-- ASN1START
-- *****

```

```
--
-- 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-TNLAssociationSetupList,
    AMF-TNLAssociationToAddList,
    AMF-TNLAssociationToRemoveList,
    AMF-TNLAssociationToUpdateList,
    AMF-UE-NGAP-ID,
    AssistanceDataForPaging,
    BroadcastCancelledAreaList,
    BroadcastCompletedAreaList,
    CancelAllWarningMessages,
    Cause,
    CellIDListForRestart,
    CNAssistedRANTuning,
    ConcurrentWarningMessageInd,
    CoreNetworkAssistanceInformationForInactive,
    CPTransportLayerInformation,
    CriticalityDiagnostics,
    DataCodingScheme,
    DirectForwardingPathAvailability,
    EmergencyAreaIDListForRestart,
    EmergencyFallbackIndicator,
    EN-DCSONConfigurationTransfer,
    EUTRA-CGI,
    FiveG-S-TMSI,
    GlobalRANNodeID,
    GUAMI,
    HandoverFlag,
    HandoverType,
    IMSVoiceSupportIndicator,
    IndexToRFSP,
    InfoOnRecommendedCellsAndRANNodesForPaging,
```

LocationReportingRequestType,
MaskedIMEISV,
MessageIdentifier,
MobilityRestrictionList,
NAS-PDU,
NASSecurityParametersFromNGRAN,
NewSecurityContextInd,
NGRAN-CGI,
NGRAN-TNLAssociationToRemoveList,
NGRANTraceID,
NR-CGI,
NRPPa-PDU,
NumberOfBroadcastsRequested,
OverloadResponse,
OverloadStartNSSAIIList,
PagingDRX,
PagingOrigin,
PagingPriority,
PDUSessionAggregateMaximumBitRate,
PDUSessionResourceAdmittedList,
PDUSessionResourceFailedToModifyListModCfm,
PDUSessionResourceFailedToModifyListModRes,
PDUSessionResourceFailedToSetupListCxtFail,
PDUSessionResourceFailedToSetupListCxtRes,
PDUSessionResourceFailedToSetupListHOAck,
PDUSessionResourceFailedToSetupListPSReq,
PDUSessionResourceFailedToSetupListSURES,
PDUSessionResourceHandoverList,
PDUSessionResourceListCxtRelCpl,
PDUSessionResourceListCxtRelReq,
PDUSessionResourceListHORqd,
PDUSessionResourceModifyListModCfm,
PDUSessionResourceModifyListModInd,
PDUSessionResourceModifyListModReq,
PDUSessionResourceModifyListModRes,
PDUSessionResourceNotifyList,
PDUSessionResourceReleasedListNot,
PDUSessionResourceReleasedListPSAck,
PDUSessionResourceReleasedListPSFail,
PDUSessionResourceReleasedListRelRes,
PDUSessionResourceSecondaryRATUsageList,
PDUSessionResourceSetupListCxtReq,
PDUSessionResourceSetupListCxtRes,
PDUSessionResourceSetupListHOREq,
PDUSessionResourceSetupListSUREq,
PDUSessionResourceSetupListSURES,
PDUSessionResourceSwitchedList,
PDUSessionResourceToBeSwitchedDLLList,
PDUSessionResourceToReleaseListHOCmd,
PDUSessionResourceToReleaseListRelCmd,
PLMNIdentity,
PLMNSupportList,
PWSFailedCellIDList,
RANNodeName,

RANPagingPriority,
RANStatusTransfer-TransparentContainer,
RAN-UE-NGAP-ID,
RedirectionVoiceFallback,
RelativeAMFCapacity,
RepetitionPeriod,
ResetType,
RoutingID,
RRCEstablishmentCause,
RRCInactiveTransitionReportRequest,
RRCState,
SecurityContext,
SecurityKey,
SerialNumber,
ServedGUAMIList,
SliceSupportList,
S-NSSAI,
SONConfigurationTransfer,
SourceToTarget-TransparentContainer,
SourceToTarget-AMFInformationReroute,
SupportedTAList,
TAIListForPaging,
TAIListForRestart,
TargetID,
TargetToSource-TransparentContainer,
TimeToWait,
TNLAssociationList,
TraceActivation,
TrafficLoadReductionIndication,
TransportLayerAddress,
UEAggregateMaximumBitRate,
UE-associatedLogicalNG-connectionList,
UEContextRequest,
UE-NGAP-IDs,
UEPagingIdentity,
UEPresenceInAreaOfInterestList,
UERadioCapability,
UERadioCapabilityForPaging,
UERetentionInformation,
UESecurityCapabilities,
UnavailableGUAMIList,
UserLocationInformation,
WarningAreaCoordinates,
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-AMFOverloadResponse ,
id-AMFSetID ,
id-AMF-TNLAssociationFailedToSetupList ,
id-AMF-TNLAssociationSetupList ,
id-AMF-TNLAssociationToAddList ,
id-AMF-TNLAssociationToRemoveList ,
id-AMF-TNLAssociationToUpdateList ,
id-AMFTrafficLoadReductionIndication ,
id-AMF-UE-NGAP-ID ,
id-AssistanceDataForPaging ,
id-BroadcastCancelledAreaList ,
id-BroadcastCompletedAreaList ,
id-CancelAllWarningMessages ,
id-Cause ,
id-CellIDListForRestart ,
id-CNAssistedRANTuning ,
id-ConcurrentWarningMessageInd ,
id-CoreNetworkAssistanceInformationForInactive ,
id-CriticalityDiagnostics ,
id-DataCodingScheme ,
id-DefaultPagingDRX ,
id-DirectForwardingPathAvailability ,
id-EmergencyAreaIDListForRestart ,
id-EmergencyFallbackIndicator ,
id-ENDC-SONConfigurationTransferDL ,
id-ENDC-SONConfigurationTransferUL ,
id-EUTRA-CGI ,
id-FiveG-S-TMSI ,
id-GlobalRANNodeID ,
id-GUAMI ,
id-HandoverFlag ,
id-HandoverType ,
id-IMSVoiceSupportIndicator ,
id-IndexToRFSP ,
id-InfoOnRecommendedCellsAndRANNodesForPaging ,
id-LocationReportingRequestType ,
id-MaskedIMEISV ,
id-MessageIdentifier ,
id-MobilityRestrictionList ,
id-NAS-PDU ,
id-NASC ,
id-NASSecurityParametersFromNGRAN ,
id-NewAMF-UE-NGAP-ID ,
id-NewGUAMI ,
```

id-NewSecurityContextInd,
id-NGAP-Message,
id-NGRAN-CGI,
id-NGRAN-TNLAssociationToRemoveList,
id-NGRANTraceID,
id-NR-CGI,
id-NRPPa-PDU,
id-NumberOfBroadcastsRequested,
id-OldAMF,
id-OverloadStartNSSAList,
id-PagingDRX,
id-PagingOrigin,
id-PagingPriority,
id-PDUSessionResourceAdmittedList,
id-PDUSessionResourceFailedToModifyListModCfm,
id-PDUSessionResourceFailedToModifyListModRes,
id-PDUSessionResourceFailedToSetupListCxtFail,
id-PDUSessionResourceFailedToSetupListCxtRes,
id-PDUSessionResourceFailedToSetupListHOAck,
id-PDUSessionResourceFailedToSetupListPSReq,
id-PDUSessionResourceFailedToSetupListSURES,
id-PDUSessionResourceHandoverList,
id-PDUSessionResourceListCxtRelCpl,
id-PDUSessionResourceListCxtRelReq,
id-PDUSessionResourceListHORqd,
id-PDUSessionResourceModifyListModCfm,
id-PDUSessionResourceModifyListModInd,
id-PDUSessionResourceModifyListModReq,
id-PDUSessionResourceModifyListModRes,
id-PDUSessionResourceNotifyList,
id-PDUSessionResourceReleasedListNot,
id-PDUSessionResourceReleasedListPSAck,
id-PDUSessionResourceReleasedListPSFail,
id-PDUSessionResourceReleasedListRelRes,
id-PDUSessionResourceSecondaryRATUsageList,
id-PDUSessionResourceSetupListCxtReq,
id-PDUSessionResourceSetupListCxtRes,
id-PDUSessionResourceSetupListHOReq,
id-PDUSessionResourceSetupListSURREQ,
id-PDUSessionResourceSetupListSURES,
id-PDUSessionResourceSwitchedList,
id-PDUSessionResourceToBeSwitchedDLList,
id-PDUSessionResourceToReleaseListHOCmd,
id-PDUSessionResourceToReleaseListRelCmd,
id-PLMNSupportList,
id-PWSFailedCellIDList,
id-RANNodeName,
id-RANPagingPriority,
id-RANStatusTransfer-TransparentContainer,
id-RAN-UE-NGAP-ID,
id-RedirectionVoiceFallback,
id-RelativeAMFCapacity,
id-RepetitionPeriod,
id-ResetType,

```
id-RoutingID,  
id-RRCEstablishmentCause,  
id-RRCInactiveTransitionReportRequest,  
id-RRCState,  
id-SecurityContext,  
id-SecurityKey,  
id-SelectedPLMNIdentity,  
id-SerialNumber,  
id-ServedGUAMIList,  
id-SliceSupportList,  
id-SONConfigurationTransferDL,  
id-SONConfigurationTransferUL,  
id-SourceAMF-UE-NGAP-ID,  
id-SourceToTarget-TransparentContainer,  
id-SourceToTarget-AMFInformationReroute,  
id-SupportedTAList,  
id-TAIListForPaging,  
id-TAIListForRestart,  
id-TargetID,  
id-TargetToSource-TransparentContainer,  
id-TimeToWait,  
id-TraceActivation,  
id-TraceCollectionEntityIPAddress,  
id-UEAggregateMaximumBitRate,  
id-UE-associatedLogicalNG-connectionList,  
id-UEContextRequest,  
id-UE-NGAP-IDs,  
id-UEPagingIdentity,  
id-UEPresenceInAreaOfInterestList,  
id-UERadioCapability,  
id-UERadioCapabilityForPaging,  
id-UERetentionInformation,  
id-UESecurityCapabilities,  
id-UnavailableGUAMIList,  
id-UserLocationInformation,  
id-WarningAreaCoordinates,  
id-WarningAreaList,  
id-WarningMessageContents,  
id-WarningSecurityInfo,  
id-WarningType
```

```
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 }|
    { ID id-UEAggregateMaximumBitRate CRITICALITY ignore TYPE UEAggregateMaximumBitRate PRESENCE optional   },
    ...
}

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

-- *****
--
-- 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-PDUSessionResourceToReleaseListRelCmd CRITICALITY reject  TYPE PDUSessionResourceToReleaseListRelCmd 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-PDUSessionResourceReleasedListRelRes CRITICALITY ignore  TYPE PDUSessionResourceReleasedListRelRes 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 },
  ...
}

-- *****
--
-- 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 PDUSessionResourceFailedToModifyListModRes PRESENCE optional }|
  { ID id-UserLocationInformation CRITICALITY ignore TYPE UserLocationInformation PRESENCE optional }|
  { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional },
  ...
}

-- *****
--
-- 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-PDUSessionResourceReleasedListNot CRITICALITY ignore TYPE PDUSessionResourceReleasedListNot PRESENCE optional  }|
    { ID id-UserLocationInformation        CRITICALITY ignore TYPE UserLocationInformation   PRESENCE optional  },
    ...
}

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

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

-- *****

```



```

--
-- 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-CoreNetworkAssistanceInformationForInactive CRITICALITY ignore TYPE CoreNetworkAssistanceInformationForInactive PRESENCE optional } |
    { ID id-GUAMI                    CRITICALITY reject TYPE GUAMI                    PRESENCE mandatory } |
    { ID id-PDUSessionResourceSetupListCxtReq CRITICALITY reject TYPE PDUSessionResourceSetupListCxtReq PRESENCE optional } |
    { ID id-AllowedNSSAI              CRITICALITY reject 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  } |
    { ID id-RRCInactiveTransitionReportRequest CRITICALITY ignore TYPE RRCInactiveTransitionReportRequest PRESENCE optional } |
    { ID id-UERadioCapabilityForPaging CRITICALITY ignore TYPE UERadioCapabilityForPaging PRESENCE optional  } |
    { ID id-RedirectionVoiceFallback   CRITICALITY ignore TYPE RedirectionVoiceFallback   PRESENCE optional  } |
    { ID id-LocationReportingRequestType CRITICALITY ignore TYPE LocationReportingRequestType PRESENCE optional  } |
    { ID id-CNAssistedRANTuning        CRITICALITY ignore TYPE CNAssistedRANTuning        PRESENCE optional  },
    ...
}

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

```

```

-- *****
--
-- 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-PDUSessionResourceFailedToSetupListCxtFail CRITICALITY ignore TYPE PDUSessionResourceFailedToSetupListCxtFail PRESENCE optional
    } |
    { 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-PDUSessionResourceListCxtRelReq  CRITICALITY reject  TYPE PDUSessionResourceListCxtRelReq  PRESENCE optional   }|
    { 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-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-PDU SessionResourceListCxtRelCpl CRITICALITY reject TYPE PDU SessionResourceListCxtRelCpl 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-CoreNetworkAssistanceInformationForInactive CRITICALITY ignore TYPE CoreNetworkAssistanceInformationForInactive PRESENCE optional }|
}

{ ID id-EmergencyFallbackIndicator CRITICALITY reject TYPE EmergencyFallbackIndicator PRESENCE optional }|
{ ID id-NewAMF-UE-NGAP-ID          CRITICALITY reject TYPE AMF-UE-NGAP-ID          PRESENCE optional }|
{ ID id-RRCInactiveTransitionReportRequest CRITICALITY ignore TYPE RRCInactiveTransitionReportRequest PRESENCE optional }|
{ ID id-NewGUAMI                    CRITICALITY reject TYPE GUAMI                    PRESENCE optional }|
{ ID id-CNAssistedRANTuning          CRITICALITY ignore TYPE CNAssistedRANTuning          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-RRCState                 CRITICALITY ignore TYPE RRCState                 PRESENCE optional  }|
    { ID id-UserLocationInformation  CRITICALITY ignore TYPE UserLocationInformation  PRESENCE optional  }|
    { 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  },
    ...
}

-- *****
--
-- RRC INACTIVE TRANSITION REPORT
--
-- *****

RRCInactiveTransitionReport ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container      { {RRCInactiveTransitionReportIEs} },
    ...
}

RRCInactiveTransitionReportIEs 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-RRCState                 CRITICALITY ignore TYPE RRCState                 PRESENCE mandatory }|
    { ID id-UserLocationInformation  CRITICALITY ignore TYPE UserLocationInformation  PRESENCE mandatory },
    ...
}

-- *****
--
-- 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 }|
    ...
}

-- *****
--
-- 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-NASSecurityParametersFromNGRAN CRITICALITY reject TYPE NASSecurityParametersFromNGRAN PRESENCE conditional }|
    -- This IE shall be present if HandoverType IE is set to value "5GStoEPPS" --
    { ID id-PDUSessionResourceHandoverList CRITICALITY ignore TYPE PDUSessionResourceHandoverList PRESENCE optional }|
    { ID id-PDUSessionResourceToReleaseListHOCmd CRITICALITY ignore TYPE PDUSessionResourceToReleaseListHOCmd PRESENCE optional }|
    { ID id-TargetToSource-TransparentContainer CRITICALITY reject TYPE TargetToSource-TransparentContainer PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics    CRITICALITY ignore TYPE CriticalityDiagnostics    PRESENCE optional }|
    ...
}

-- *****
--

```

```

-- 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-CoreNetworkAssistanceInformationForInactive CRITICALITY ignore TYPE CoreNetworkAssistanceInformationForInactive PRESENCE optional }|
    { ID id-UESecurityCapabilities   CRITICALITY reject TYPE UESecurityCapabilities   PRESENCE mandatory }|
    { ID id-SecurityContext         CRITICALITY reject TYPE SecurityContext         PRESENCE mandatory }|
    { ID id-NewSecurityContextInd    CRITICALITY reject TYPE NewSecurityContextInd    PRESENCE optional  }|
    { ID id-NASC                    CRITICALITY reject TYPE NAS-PDU                    PRESENCE optional  }|
    { ID id-PDUSessionResourceSetupListHOREq CRITICALITY reject TYPE PDUSessionResourceSetupListHOREq PRESENCE mandatory }|
    { ID id-AllowedNSSAI            CRITICALITY reject TYPE AllowedNSSAI            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 CRITICALITY ignore TYPE LocationReportingRequestType PRESENCE optional }|
    { ID id-LocationReportingRequestType CRITICALITY ignore TYPE LocationReportingRequestType PRESENCE optional }|
    { ID id-RRCInactiveTransitionReportRequest CRITICALITY ignore TYPE RRCInactiveTransitionReportRequest PRESENCE optional }|
    { ID id-GUAMI                   CRITICALITY reject TYPE GUAMI                   PRESENCE mandatory }|
}

```

```

    { ID id-RedirectionVoiceFallback          CRITICALITY ignore TYPE RedirectionVoiceFallback PRESENCE optional }|
    { ID id-CNAssistedRANTuning              CRITICALITY ignore TYPE CNAssistedRANTuning      PRESENCE optional },
    ...
}

-- *****
--
-- 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-PDUSessionResourceFailedToSetupListHOack CRITICALITY ignore TYPE PDUSessionResourceFailedToSetupListHOack PRESENCE optional }|
    { ID id-TargetToSource-TransparentContainer CRITICALITY reject TYPE TargetToSource-TransparentContainer PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional },
    ...
}

-- *****
--
-- 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 mandatory } },
    ...
}

-- *****
--
-- 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-PDUSessionResourceFailedToSetupListPSReq CRITICALITY ignore  TYPE PDUSessionResourceFailedToSetupListPSReq PRESENCE optional } },
    ...
}

-- *****
--
-- 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-NewSecurityContextInd    CRITICALITY reject TYPE NewSecurityContextInd    PRESENCE optional   }|
  { ID id-PDUSessionResourceSwitchedList CRITICALITY ignore  TYPE PDUSessionResourceSwitchedList PRESENCE mandatory }|
  { ID id-PDUSessionResourceReleasedListPSAck CRITICALITY ignore  TYPE PDUSessionResourceReleasedListPSAck PRESENCE optional }|
  { ID id-AllowedNSSAI            CRITICALITY reject TYPE AllowedNSSAI            PRESENCE mandatory }|
  { ID id-CoreNetworkAssistanceInformationForInactive CRITICALITY ignore  TYPE CoreNetworkAssistanceInformationForInactive PRESENCE optional }|
optional }|
  { ID id-RRCInactiveTransitionReportRequest CRITICALITY ignore  TYPE RRCInactiveTransitionReportRequest PRESENCE optional }|
  { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional }|
  { ID id-RedirectionVoiceFallback CRITICALITY ignore  TYPE RedirectionVoiceFallback PRESENCE optional }|
  { ID id-CNAssistedRANTuning CRITICALITY ignore  TYPE CNAssistedRANTuning PRESENCE optional }|
  ...
}

```

```

-- *****
--
-- 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-PDUSessionResourceReleasedListPSFail CRITICALITY ignore  TYPE PDUSessionResourceReleasedListPSFail 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 },
  ...
}

-- *****
--
-- HANOVER 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-UEPagingIdentity          CRITICALITY ignore  TYPE UEPagingIdentity          PRESENCE mandatory }|
    { ID id-PagingDRX                 CRITICALITY ignore  TYPE PagingDRX                 PRESENCE optional }|
    { ID id-TAILListForPaging          CRITICALITY ignore  TYPE TAILListForPaging          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 },
    ...
}

-- *****
--
-- 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 mandatory } |
    { ID id-FiveG-S-TMSI            CRITICALITY reject TYPE FiveG-S-TMSI            PRESENCE optional   } |
    { ID id-AMFSetID                CRITICALITY ignore TYPE AMFSetID                PRESENCE optional   } |
    { ID id-UEContextRequest        CRITICALITY ignore TYPE UEContextRequest        PRESENCE optional   } |
    { ID id-AllowedNSSAI            CRITICALITY reject TYPE AllowedNSSAI            PRESENCE optional   } |
    { ID id-SourceToTarget-AMFInformationReroute CRITICALITY ignore TYPE SourceToTarget-AMFInformationReroute PRESENCE optional } |
    { ID id-SelectedPLMNIdentity    CRITICALITY ignore TYPE PLMNIdentity          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   } |
    { ID id-AllowedNSSAI            CRITICALITY reject TYPE AllowedNSSAI            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 reject  TYPE AllowedNSSAI            PRESENCE optional }|
  { ID id-SourceToTarget-AMFInformationReroute  CRITICALITY ignore  TYPE SourceToTarget-AMFInformationReroute  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 }|
    { ID id-UERetentionInformation    CRITICALITY ignore  TYPE UERetentionInformation    PRESENCE optional },
    ...
}

-- *****
--
-- 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 }|
    { ID id-UERetentionInformation    CRITICALITY ignore  TYPE UERetentionInformation    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 }|
    { ID id-GlobalRANNodeID CRITICALITY ignore  TYPE GlobalRANNodeID  PRESENCE optional }|
    { ID id-NGRAN-TNLAssociationToRemoveList CRITICALITY reject  TYPE NGRAN-TNLAssociationToRemoveList 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 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 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 },
    ...
}

-- *****
--
-- NG RESET ACKNOWLEDGE
--
-- *****

NGResetAcknowledge ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container      { {NGResetAcknowledgeIEs} },
    ...
}

NGResetAcknowledgeIEs NGAP-PROTOCOL-IES ::= {
    { ID id-UE-associatedLogicalNG-connectionList          CRITICALITY ignore TYPE UE-associatedLogicalNG-connectionList          PRESENCE optional
    }|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore TYPE CriticalityDiagnostics          PRESENCE optional
    },
    ...
}

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

-- *****
--
-- OVERLOAD START
--
-- *****

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

OverloadStartIEs NGAP-PROTOCOL-IES ::= {
    { ID id-AMFOverloadResponse      CRITICALITY reject  TYPE OverloadResponse      PRESENCE optional  }|
    { ID id-AMFTrafficLoadReductionIndication  CRITICALITY ignore  TYPE TrafficLoadReductionIndication  PRESENCE optional  }|
    { ID id-OverloadStartNSSAList      CRITICALITY ignore  TYPE OverloadStartNSSAList      PRESENCE optional  },
    ...
}

-- *****
--
-- OVERLOAD STOP
--
-- *****

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

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

-- *****
--
-- 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 }|
  { ID id-ENDC-SONConfigurationTransferUL     CRITICALITY ignore  TYPE EN-DCSONConfigurationTransfer  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 }|
  { ID id-ENDC-SONConfigurationTransferDL     CRITICALITY ignore  TYPE EN-DCSONConfigurationTransfer  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  }|
  { ID id-WarningAreaCoordinates     CRITICALITY ignore TYPE WarningAreaCoordinates     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-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 RADIO CAPABILITY MANAGEMENT ELEMENTARY PROCEDURES
--
-- *****

```

```

-- *****
--
-- UE RADIO CAPABILITY INFO INDICATION
--
-- *****

UERadioCapabilityInfoIndication ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container          { {UERadioCapabilityInfoIndicationIEs} },
    ...
}

UERadioCapabilityInfoIndicationIEs 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 ::= {
  ...
}

-- *****
--
-- DATA USAGE REPORTING ELEMENTARY PROCEDURES
--
-- *****
--
-- *****
--
-- SECONDARY RAT DATA USAGE REPORT
--
-- *****

SecondaryRATDataUsageReport ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container   { {SecondaryRATDataUsageReportIEs} },
  ...
}

SecondaryRATDataUsageReportIEs 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-PDUSessionResourceSecondaryRATUsageList CRITICALITY ignore  TYPE PDUSessionResourceSecondaryRATUsageList PRESENCE mandatory  } |
  }

```

```

    { ID id-HandoverFlag                               CRITICALITY ignore TYPE HandoverFlag           PRESENCE optional
    }|
    { ID id-UserLocationInformation                     CRITICALITY ignore TYPE UserLocationInformation     PRESENCE optional },
    ...
}

END
-- ASN1STOP

```

9.4.5 Information Element Definitions

```

-- ASN1START
-- *****
--
-- 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

    id-AdditionalDLForwardingUPTNLInformation,
    id-AdditionalULForwardingUPTNLInformation,
    id-AdditionalDLQosFlowPerTNLInformation,
    id-AdditionalDLUPTNLInformationForHOList,
    id-AdditionalNGU-UP-TNLInformation,
    id-AdditionalUL-NGU-UP-TNLInformation,
    id-Cause,
    id-CNTypeRestrictionsForEquivalent,
    id-CNTypeRestrictionsForServing,
    id-CommonNetworkInstance,
    id-DataForwardingNotPossible,
    id-DL-NGU-UP-TNLInformation,
    id-EndpointIPAddressAndPort,
    id-LastEUTRAN-PLMNIdentity,
    id-LocationReportingAdditionalInfo,
    id-MaximumIntegrityProtectedDataRate-DL,
    id-NetworkInstance,
    id-OldAssociatedQosFlowList-ULendmarkerexpected,
    id-PDUSessionAggregateMaximumBitRate,
    id-PDUSessionResourceFailedToSetupListCxtFail,
    id-PDUSessionResourceReleaseResponseTransfer,
    id-PDUSessionType,
    id-PSCellInformation,

```

id-QosFlowAddOrModifyRequestList,
id-QosFlowSetupRequestList,
id-QosFlowToReleaseList,
id-SCTP-TLAs,
id-SecondaryRATUsageInformation,
id-SecurityIndication,
id-SecurityResult,
id-S-NSSAI,
id-TNLAssociationTransportLayerAddressNGRAN,
id-UL-NGU-UP-TNLInformation,
id-UL-NGU-UP-TNLModifyList,
id-ULForwarding,
id-ULForwardingUP-TNLInformation,
maxnoofAllowedAreas,
maxnoofAllowedS-NSSAIs,
maxnoofBPLMNs,
maxnoofCellIDforWarning,
maxnoofCellinAoI,
maxnoofCellinEAI,
maxnoofCellsingNB,
maxnoofCellsinngeNB,
maxnoofCellinTAI,
maxnoofCellsinUEHistoryInfo,
maxnoofCellsUEMovingTrajectory,
maxnoofDRBs,
maxnoofEmergencyAreaID,
maxnoofEAIforRestart,
maxnoofEPLMNs,
maxnoofEPLMNsPlusOne,
maxnoofE-RABs,
maxnoofErrors,
maxnoofForbTACs,
maxnoofMultiConnectivity,
maxnoofMultiConnectivityMinusOne,
maxnoofNGConnectionsToReset,
maxnoofPDUSessions,
maxnoofPLMNs,
maxnoofQosFlows,
maxnoofRANNodeinAoI,
maxnoofRecommendedCells,
maxnoofRecommendedRANNodes,
maxnoofAoI,
maxnoofServedGUAMIs,
maxnoofSliceItems,
maxnoofTACs,
maxnoofTAIforInactive,
maxnoofTAIforPaging,
maxnoofTAIforRestart,
maxnoofTAIforWarning,
maxnoofTAIinAoI,
maxnoofTimePeriods,
maxnoofTNLAssociations,
maxnoofXnExtTLAs,
maxnoofXnGTP-TLAs,


```

maxnoofXnTLAs
FROM NGAP-Constants

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

ProtocolExtensionContainer{},
ProtocolIE-Container{},
NGAP-PROTOCOL-EXTENSION,
ProtocolIE-SingleContainer{},
NGAP-PROTOCOL-IES
FROM NGAP-Containers;

-- A

AdditionalDLUPTNLInformationForHOList ::= SEQUENCE (SIZE(1..maxnoofMultiConnectivityMinusOne)) OF AdditionalDLUPTNLInformationForHOItem

AdditionalDLUPTNLInformationForHOItem ::= SEQUENCE {
    additionalDL-NGU-UP-TNLInformation          UPTransportLayerInformation,
    additionalQosFlowSetupResponseList         QosFlowListWithDataForwarding,
    additionalDLForwardingUPTNLInformation     UPTransportLayerInformation OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { { AdditionalDLUPTNLInformationForHOItem-ExtIEs} } OPTIONAL,
    ...
}

AdditionalDLUPTNLInformationForHOItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

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, ...))

AMFPagingTarget ::= CHOICE {
    globalRANNodeID      GlobalRANNodeID,
    tAI                  TAI,
    choice-Extensions    ProtocolIE-SingleContainer { {AMFPagingTarget-ExtIEs} }
}

AMFPagingTarget-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

AMFPointer ::= BIT STRING (SIZE(6))

AMFRegionID ::= BIT STRING (SIZE(8))

AMFSetID ::= BIT STRING (SIZE(10))

AMF-TNLAssociationSetupList ::= SEQUENCE (SIZE(1..maxnoofTNLAssociations)) OF AMF-TNLAssociationSetupItem

AMF-TNLAssociationSetupItem ::= SEQUENCE {
    aMF-TNLAssociationAddress      CPTransportLayerInformation,
    iE-Extensions      ProtocolExtensionContainer { {AMF-TNLAssociationSetupItem-ExtIEs} } OPTIONAL,
    ...
}

AMF-TNLAssociationSetupItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AMF-TNLAssociationToAddList ::= SEQUENCE (SIZE(1..maxnoofTNLAssociations)) OF AMF-TNLAssociationToAddItem

AMF-TNLAssociationToAddItem ::= SEQUENCE {
    aMF-TNLAssociationAddress      CPTransportLayerInformation,
    tNLAssociationUsage            TNLAssociationUsage                                OPTIONAL,
    tNLAddressWeightFactor        TNLAddressWeightFactor,
    iE-Extensions      ProtocolExtensionContainer { {AMF-TNLAssociationToAddItem-ExtIEs} } OPTIONAL,
    ...
}

AMF-TNLAssociationToAddItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```

AMF-TNLAssociationToRemoveList ::= SEQUENCE (SIZE(1..maxnoofTNLAAssociations)) OF AMF-TNLAssociationToRemoveItem

AMF-TNLAssociationToRemoveItem ::= SEQUENCE {
    aMF-TNLAssociationAddress      CPTransportLayerInformation,
    iE-Extensions                  ProtocolExtensionContainer { {AMF-TNLAssociationToRemoveItem-ExtIEs} } OPTIONAL,
    ...
}

AMF-TNLAssociationToRemoveItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    {ID id-TNLAssociationTransportLayerAddressNGRAN CRITICALITY reject EXTENSION CPTransportLayerInformation PRESENCE optional},
    ...
}

AMF-TNLAssociationToUpdateList ::= SEQUENCE (SIZE(1..maxnoofTNLAAssociations)) OF AMF-TNLAssociationToUpdateItem

AMF-TNLAssociationToUpdateItem ::= SEQUENCE {
    aMF-TNLAssociationAddress      CPTransportLayerInformation,
    tNLAssociationUsage            TNLAAssociationUsage                                OPTIONAL,
    tNLAddressWeightFactor         TNLAAddressWeightFactor                          OPTIONAL,
    iE-Extensions                  ProtocolExtensionContainer { {AMF-TNLAssociationToUpdateItem-ExtIEs} } OPTIONAL,
    ...
}

AMF-TNLAssociationToUpdateItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AMF-UE-NGAP-ID ::= INTEGER (0..1099511627775)

AreaOfInterest ::= SEQUENCE {
    areaOfInterestTAIList          AreaOfInterestTAIList                    OPTIONAL,
    areaOfInterestCellList         AreaOfInterestCellList                  OPTIONAL,
    areaOfInterestRANNodeList      AreaOfInterestRANNodeList                OPTIONAL,
    iE-Extensions                  ProtocolExtensionContainer { {AreaOfInterest-ExtIEs} } OPTIONAL,
    ...
}

AreaOfInterest-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AreaOfInterestCellList ::= SEQUENCE (SIZE(1..maxnoofCellinAoI)) OF AreaOfInterestCellItem

AreaOfInterestCellItem ::= SEQUENCE {
    nGRAN-CGI                      NGRAN-CGI,
    iE-Extensions                  ProtocolExtensionContainer { {AreaOfInterestCellItem-ExtIEs} } OPTIONAL,
    ...
}

AreaOfInterestCellItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AreaOfInterestList ::= SEQUENCE (SIZE(1..maxnoofAoI)) OF AreaOfInterestItem

```

```

AreaOfInterestItem ::= SEQUENCE {
    areaOfInterest          AreaOfInterest,
    locationReportingReferenceID  LocationReportingReferenceID,
    iE-Extensions          ProtocolExtensionContainer { {AreaOfInterestItem-ExtIEs} } OPTIONAL,
    ...
}

AreaOfInterestItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AreaOfInterestRANNodeList ::= SEQUENCE (SIZE(1..maxnoofRANNodeinAoI)) OF AreaOfInterestRANNodeItem

AreaOfInterestRANNodeItem ::= SEQUENCE {
    globalRANNodeID        GlobalRANNodeID,
    iE-Extensions          ProtocolExtensionContainer { {AreaOfInterestRANNodeItem-ExtIEs} } OPTIONAL,
    ...
}

AreaOfInterestRANNodeItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AreaOfInterestTAIList ::= SEQUENCE (SIZE(1..maxnoofTAIinAoI)) 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 {
    qosFlowIdentifier          QosFlowIdentifier,
    qosFlowMappingIndication   ENUMERATED {ul, dl, ...}           OPTIONAL,
    iE-Extensions              ProtocolExtensionContainer { {AssociatedQosFlowItem-ExtIEs} }  OPTIONAL,
    ...
}

AssociatedQosFlowItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

AveragingWindow ::= INTEGER (0..4095, ...)

-- B

BitRate ::= INTEGER (0..4000000000000, ...)

BroadcastCancelledAreaList ::= CHOICE {
    cellIDCancelledEUTRA          CellIDCancelledEUTRA,
    tAICancelledEUTRA             TAICancelledEUTRA,
    emergencyAreaIDCancelledEUTRA EmergencyAreaIDCancelledEUTRA,
    cellIDCancelledNR             CellIDCancelledNR,
    tAICancelledNR                TAICancelledNR,
    emergencyAreaIDCancelledNR    EmergencyAreaIDCancelledNR,
    choice-Extensions             ProtocolIE-SingleContainer { {BroadcastCancelledAreaList-ExtIEs} }
}

BroadcastCancelledAreaList-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

BroadcastCompletedAreaList ::= CHOICE {
    cellIDBroadcastEUTRA          CellIDBroadcastEUTRA,
    tAIBroadcastEUTRA             TAIBroadcastEUTRA,
    emergencyAreaIDBroadcastEUTRA EmergencyAreaIDBroadcastEUTRA,
    cellIDBroadcastNR             CellIDBroadcastNR,
    tAIBroadcastNR                TAIBroadcastNR,
    emergencyAreaIDBroadcastNR    EmergencyAreaIDBroadcastNR,
    choice-Extensions             ProtocolIE-SingleContainer { {BroadcastCompletedAreaList-ExtIEs} }
}

BroadcastCompletedAreaList-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

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,
  choice-Extensions    ProtocolIE-SingleContainer { {Cause-ExtIEs} }
}

Cause-ExtIEs NGAP-PROTOCOL-IES ::= {
  ...
}

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,  
    radio-resources-not-available,  
    invalid-qos-combination,  
    failure-in-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,  
    redirection,  
    resources-not-available-for-the-slice,  
    ue-max-integrity-protected-data-rate-reason,  
    release-due-to-cn-detected-mobility,  
    ...,  
    n26-interface-not-available,  
    release-due-to-pre-emption,  
    multiple-location-reporting-reference-ID-instances  
}
```



```
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,
    choice-Extensions          ProtocolIE-SingleContainer { {CellIDListForRestart-ExtIEs} }
}

CellIDListForRestart-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

CellSize ::= ENUMERATED {verysmall, small, medium, large, ...}

CellType ::= SEQUENCE {
    cellSize          CellSize,
    iE-Extensions     ProtocolExtensionContainer { {CellType-ExtIEs} }    OPTIONAL,
    ...
}

CellType-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CNAssistedRANTuning ::= SEQUENCE {
    expectedUEBehaviour          ExpectedUEBehaviour          OPTIONAL,
    iE-Extensions                ProtocolExtensionContainer { {CNAssistedRANTuning-ExtIEs} } OPTIONAL,
    ...
}

CNAssistedRANTuning-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CNTypeRestrictionsForEquivalent ::= SEQUENCE (SIZE(1..maxnoofEPLMNs)) OF CNTypeRestrictionsForEquivalentItem

CNTypeRestrictionsForEquivalentItem ::= SEQUENCE {
    plmnIdentity          PLMNIdentity,
    cn-Type              ENUMERATED {epc-forbidden, fiveGC-forbidden, ...},
    iE-Extensions        ProtocolExtensionContainer { {CNTypeRestrictionsForEquivalentItem-ExtIEs} }    OPTIONAL,
    ...
}

CNTypeRestrictionsForEquivalentItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CNTypeRestrictionsForServing ::= ENUMERATED {
    epc-forbidden,
    ...
}

CommonNetworkInstance ::= OCTET STRING

```

```

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,
    ...
}

CoreNetworkAssistanceInformationForInactive ::= SEQUENCE {
    ueIdentityIndexValue          UEIdentityIndexValue,
    ueSpecificDRX                 PagingDRX                                OPTIONAL,
    periodicRegistrationUpdateTimer PeriodicRegistrationUpdateTimer,
    mICOModeIndication            MICOModeIndication                OPTIONAL,
    tAIListForInactive            TAIListForInactive,
    expectedUEBehaviour           ExpectedUEBehaviour                OPTIONAL,
    iE-Extensions                 ProtocolExtensionContainer { {CoreNetworkAssistanceInformationForInactive-ExtIEs} } OPTIONAL,
    ...
}

CoreNetworkAssistanceInformationForInactive-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

COUNTValueForPDCP-SN12 ::= SEQUENCE {
    pDCP-SN12                     INTEGER (0..4095),
    hFN-PDCP-SN12                 INTEGER (0..1048575),
    iE-Extensions                 ProtocolExtensionContainer { {COUNTValueForPDCP-SN12-ExtIEs} } OPTIONAL,
    ...
}

COUNTValueForPDCP-SN12-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

COUNTValueForPDCP-SN18 ::= SEQUENCE {
    pDCP-SN18                     INTEGER (0..262143),
    hFN-PDCP-SN18                 INTEGER (0..16383),
    iE-Extensions                 ProtocolExtensionContainer { {COUNTValueForPDCP-SN18-ExtIEs} } OPTIONAL,
    ...
}

COUNTValueForPDCP-SN18-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

CPTransportLayerInformation ::= CHOICE {
    endpointIPAddress             TransportLayerAddress,
    choice-Extensions            ProtocolIE-SingleContainer { {CPTransportLayerInformation-ExtIEs} }
}

```

```

CPTransportLayerInformation-ExtIEs NGAP-PROTOCOL-IES ::= {
  { ID id-EndpointIPAddressAndPort          CRITICALITY reject  TYPE EndpointIPAddressAndPort  PRESENCE mandatory},
  ...
}

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,
  ...
}
DL-NGU-TNLInformationReused ::= ENUMERATED {
  true,
  ...
}
DirectForwardingPathAvailability ::= ENUMERATED {
  direct-path-available,
  ...
}
DRB-ID ::= INTEGER (1..32, ...)
DRBsSubjectToStatusTransferList ::= SEQUENCE (SIZE(1..maxnoofDRBs)) OF DRBsSubjectToStatusTransferItem
DRBsSubjectToStatusTransferItem ::= SEQUENCE {
  dRB-ID DRB-ID,
  dRBStatusUL DRBStatusUL,
  dRBStatusDL DRBStatusDL,
  iE-Extension ProtocolExtensionContainer { {DRBsSubjectToStatusTransferItem-ExtIEs} } OPTIONAL,
  ...
}
DRBsSubjectToStatusTransferItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  { ID id-OldAssociatedQosFlowList-ULendmarkerexpected CRITICALITY reject EXTENSION AssociatedQosFlowList PRESENCE optional },
  ...
}
DRBStatusDL ::= CHOICE {
  dRBStatusDL12 DRBStatusDL12,
  dRBStatusDL18 DRBStatusDL18,
  choice-Extensions ProtocolIE-SingleContainer { {DRBStatusDL-ExtIEs} }
}
DRBStatusDL-ExtIEs NGAP-PROTOCOL-IES ::= {
  ...
}

```

```

DRBStatusDL12 ::= SEQUENCE {
    dL-COUNTValue          COUNTValueForPDCP-SN12,
    iE-Extension          ProtocolExtensionContainer { {DRBStatusDL12-ExtIEs} }    OPTIONAL,
    ...
}

DRBStatusDL12-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

DRBStatusDL18 ::= SEQUENCE {
    dL-COUNTValue          COUNTValueForPDCP-SN18,
    iE-Extension          ProtocolExtensionContainer { {DRBStatusDL18-ExtIEs} }    OPTIONAL,
    ...
}

DRBStatusDL18-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

DRBStatusUL ::= CHOICE {
    dRBStatusUL12          DRBStatusUL12,
    dRBStatusUL18          DRBStatusUL18,
    choice-Extensions     ProtocolIE-SingleContainer { {DRBStatusUL-ExtIEs} }
}

DRBStatusUL-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

DRBStatusUL12 ::= SEQUENCE {
    uL-COUNTValue          COUNTValueForPDCP-SN12,
    receiveStatusOfUL-PDCP-SDUs BIT STRING (SIZE(1..2048))    OPTIONAL,
    iE-Extension          ProtocolExtensionContainer { {DRBStatusUL12-ExtIEs} }    OPTIONAL,
    ...
}

DRBStatusUL12-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

DRBStatusUL18 ::= SEQUENCE {
    uL-COUNTValue          COUNTValueForPDCP-SN18,
    receiveStatusOfUL-PDCP-SDUs BIT STRING (SIZE(1..131072))    OPTIONAL,
    iE-Extension          ProtocolExtensionContainer { {DRBStatusUL18-ExtIEs} }    OPTIONAL,
    ...
}

DRBStatusUL18-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

DRBsToQosFlowsMappingList ::= SEQUENCE (SIZE(1..maxnoofDRBs)) OF DRBsToQosFlowsMappingItem

```

```

DRBsToQosFlowsMappingItem ::= SEQUENCE {
    drb-ID                DRB-ID,
    associatedQosFlowList AssociatedQosFlowList,
    iE-Extensions        ProtocolExtensionContainer { {DRBsToQosFlowsMappingItem-ExtIEs} } OPTIONAL,
    ...
}

DRBsToQosFlowsMappingItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

Dynamic5QIDescriptor ::= SEQUENCE {
    priorityLevelQos        PriorityLevelQos,
    packetDelayBudget       PacketDelayBudget,
    packetErrorRate         PacketErrorRate,
    fiveQI                  FiveQI OPTIONAL,
    delayCritical           DelayCritical OPTIONAL,
    -- The above IE shall be present in case of GBR QoS flow
    averagingWindow         AveragingWindow OPTIONAL,
    -- The above IE shall be present in case of GBR QoS flow
    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 ::= SEQUENCE {
    emergencyFallbackRequestIndicator  EmergencyFallbackRequestIndicator,
    emergencyServiceTargetCN           EmergencyServiceTargetCN           OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { {EmergencyFallbackIndicator-ExtIEs} } OPTIONAL,
    ...
}

EmergencyFallbackIndicator-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

EmergencyFallbackRequestIndicator ::= ENUMERATED {
    emergency-fallback-requested,
    ...
}

EmergencyServiceTargetCN ::= ENUMERATED {
    fiveGC,

```

```

    epc,
    ...
}

EN-DCSONConfigurationTransfer ::= OCTET STRING

EndpointIPAddressAndPort ::= SEQUENCE {
    endpointIPAddress TransportLayerAddress,
    portNumber PortNumber,
    iE-Extensions ProtocolExtensionContainer { { EndpointIPAddressAndPort-ExtIEs } } OPTIONAL
}

EndpointIPAddressAndPort-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

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,
    ...
}

ExpectedActivityPeriod ::= INTEGER (1..30|40|50|60|80|100|120|150|180|181, ...)

ExpectedHOInterval ::= ENUMERATED {
    sec15, sec30, sec60, sec90, sec120, sec180, long-time,
    ...
}

ExpectedIdlePeriod ::= INTEGER (1..30|40|50|60|80|100|120|150|180|181, ...)

ExpectedUEActivityBehaviour ::= SEQUENCE {
    expectedActivityPeriod           ExpectedActivityPeriod           OPTIONAL,
    expectedIdlePeriod               ExpectedIdlePeriod             OPTIONAL,
    sourceOfUEActivityBehaviourInformation SourceOfUEActivityBehaviourInformation OPTIONAL,
    iE-Extensions                    ProtocolExtensionContainer { {ExpectedUEActivityBehaviour-ExtIEs} } OPTIONAL,
    ...
}

ExpectedUEActivityBehaviour-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

ExpectedUEBehaviour ::= SEQUENCE {
    expectedUEActivityBehaviour     ExpectedUEActivityBehaviour     OPTIONAL,
    expectedHOInterval              ExpectedHOInterval             OPTIONAL,
    expectedUEMobility              ExpectedUEMobility             OPTIONAL,
    expectedUEMovingTrajectory      ExpectedUEMovingTrajectory     OPTIONAL,
    iE-Extensions                    ProtocolExtensionContainer { {ExpectedUEBehaviour-ExtIEs} } OPTIONAL,
    ...
}

ExpectedUEBehaviour-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {

```

```

}
...
}
ExpectedUEMobility ::= ENUMERATED {
    stationary,
    mobile,
    ...
}
ExpectedUEMovingTrajectory ::= SEQUENCE (SIZE(1..maxnoofCellsUEMovingTrajectory)) OF ExpectedUEMovingTrajectoryItem
ExpectedUEMovingTrajectoryItem ::= SEQUENCE {
    nGRAN-CGI          NGRAN-CGI,
    timeStayedInCell  INTEGER (0..4095) OPTIONAL,
    iE-Extensions     ProtocolExtensionContainer { {ExpectedUEMovingTrajectoryItem-ExtIEs} } OPTIONAL,
    ...
}
ExpectedUEMovingTrajectoryItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
-- 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,
    choice-Extensions   ProtocolIE-SingleContainer { {GlobalRANNodeID-ExtIEs} }
}

GlobalRANNodeID-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

GNB-ID ::= CHOICE {
    gNB-ID      BIT STRING (SIZE(22..32)),
    choice-Extensions   ProtocolIE-SingleContainer { {GNB-ID-ExtIEs} }
}

GNB-ID-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

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        OPTIONAL,
    dataForwardingResponseDRBList     DataForwardingResponseDRBList  OPTIONAL,
    iE-Extensions                     ProtocolExtensionContainer { {HandoverCommandTransfer-ExtIEs} } OPTIONAL,
    ...
}
```

```

HandoverCommandTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  { ID id-AdditionalDLForwardingUPTNLInformation  CRITICALITY ignore  EXTENSION QosFlowPerTNLInformationList  PRESENCE optional } |
  { ID id-ULForwardingUP-TNLInformation          CRITICALITY reject  EXTENSION UPTransportLayerInformation  PRESENCE optional } |
  { ID id-AdditionalULForwardingUPTNLInformation  CRITICALITY reject  EXTENSION UPTransportLayerInformationList  PRESENCE optional },
  ...
}

HandoverFlag ::= ENUMERATED {
  handover-preparation,
  ...
}

HandoverPreparationUnsuccessfulTransfer ::= SEQUENCE {
  cause          Cause,
  iE-Extensions  ProtocolExtensionContainer { {HandoverPreparationUnsuccessfulTransfer-ExtIEs} } OPTIONAL,
  ...
}

HandoverPreparationUnsuccessfulTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

HandoverRequestAcknowledgeTransfer ::= SEQUENCE {
  dL-NGU-UP-TNLInformation      UPTransportLayerInformation,
  dLForwardingUP-TNLInformation  UPTransportLayerInformation          OPTIONAL,
  securityResult                SecurityResult                    OPTIONAL,
  qosFlowSetupResponseList      QosFlowListWithDataForwarding,
  qosFlowFailedToSetupList      QosFlowListWithCause          OPTIONAL,
  dataForwardingResponseDRBList  DataForwardingResponseDRBList  OPTIONAL,
  iE-Extensions                 ProtocolExtensionContainer { {HandoverRequestAcknowledgeTransfer-ExtIEs} } OPTIONAL,
  ...
}

HandoverRequestAcknowledgeTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  { ID id-AdditionalDLUPTNLInformationForHOList  CRITICALITY ignore  EXTENSION AdditionalDLUPTNLInformationForHOList  PRESENCE optional } |
  { ID id-ULForwardingUP-TNLInformation          CRITICALITY reject  EXTENSION UPTransportLayerInformation  PRESENCE optional } |
  { ID id-AdditionalULForwardingUPTNLInformation  CRITICALITY reject  EXTENSION UPTransportLayerInformationList  PRESENCE optional },
  ...
}

HandoverRequiredTransfer ::= SEQUENCE {
  directForwardingPathAvailability  DirectForwardingPathAvailability  OPTIONAL,
  iE-Extensions                    ProtocolExtensionContainer { {HandoverRequiredTransfer-ExtIEs} } OPTIONAL,
  ...
}

HandoverRequiredTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

HandoverResourceAllocationUnsuccessfulTransfer ::= SEQUENCE {
  cause          Cause,
  criticalityDiagnostics  CriticalityDiagnostics          OPTIONAL,
  iE-Extensions  ProtocolExtensionContainer { {HandoverResourceAllocationUnsuccessfulTransfer-ExtIEs} } OPTIONAL,
}

```

```
    ...
}

HandoverResourceAllocationUnsuccessfulTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

HandoverType ::= ENUMERATED {
    intra5gs,
    fivegs-to-eps,
    eps-to-5gs,
    ...
}

-- I

IMSVoiceSupportIndicator ::= ENUMERATED {
    supported,
    not-supported,
    ...
}

IndexToRFSP ::= INTEGER (1..256, ...)

InfoOnRecommendedCellsAndRANNodesForPaging ::= SEQUENCE {
    recommendedCellsForPaging      RecommendedCellsForPaging,
    recommendRANNodesForPaging     RecommendedRANNodesForPaging,
    iE-Extensions                  ProtocolExtensionContainer { {InfoOnRecommendedCellsAndRANNodesForPaging-ExtIEs} } OPTIONAL,
    ...
}

InfoOnRecommendedCellsAndRANNodesForPaging-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

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

IntendedNumberOfPagingAttempts ::= INTEGER (1..16, ...)

InterfacesToTrace ::= BIT STRING (SIZE(8))

-- J
```



```

-- K
-- L

LastVisitedCellInformation ::= CHOICE {
    nGRANCell      LastVisitedNGRANCellInformation,
    eUTRANCell     LastVisitedEUTRANCellInformation,
    uTRANCell      LastVisitedUTRANCellInformation,
    gERANCell      LastVisitedGERANCellInformation,
    choice-Extensions  ProtocolIE-SingleContainer { {LastVisitedCellInformation-ExtIEs} }
}

LastVisitedCellInformation-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

LastVisitedCellItem ::= SEQUENCE {
    lastVisitedCellInformation      LastVisitedCellInformation,
    iE-Extensions      ProtocolExtensionContainer { {LastVisitedCellItem-ExtIEs} } OPTIONAL,
    ...
}

LastVisitedCellItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

LastVisitedEUTRANCellInformation ::= OCTET STRING

LastVisitedGERANCellInformation ::= OCTET STRING

LastVisitedNGRANCellInformation ::= SEQUENCE {
    globalCellID          NGRAN-CGI,
    cellType              CellType,
    timeUEStayedInCell    TimeUEStayedInCell,
    timeUEStayedInCellEnhancedGranularity  TimeUEStayedInCellEnhancedGranularity      OPTIONAL,
    hOCauseValue          Cause          OPTIONAL,
    iE-Extensions      ProtocolExtensionContainer { {LastVisitedNGRANCellInformation-ExtIEs} } OPTIONAL,
    ...
}

LastVisitedNGRANCellInformation-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

LastVisitedUTRANCellInformation ::= OCTET STRING

LocationReportingAdditionalInfo ::= ENUMERATED {
    includePSCell,
    ...
}

LocationReportingReferenceID ::= INTEGER (1..64, ...)

LocationReportingRequestType ::= SEQUENCE {
    eventType              EventType,

```

```

    reportArea                                ReportArea,
    areaOfInterestList                        AreaOfInterestList                OPTIONAL,
    locationReportingReferenceIDToBeCancelled LocationReportingReferenceID        OPTIONAL,
-- The above IE shall be present if the event type is set to "stop reporting UE presence in the area of interest"
    iE-Extensions      ProtocolExtensionContainer { {LocationReportingRequestType-ExtIEs} }  OPTIONAL,
    ...
}

LocationReportingRequestType-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    { ID id-LocationReportingAdditionalInfo CRITICALITY ignore EXTENSION LocationReportingAdditionalInfo PRESENCE optional },
    ...
}

-- M

MaskedIMEISV ::= BIT STRING (SIZE(64))

MaximumDataBurstVolume ::= INTEGER (0..4095, ...)

MessageIdentifier ::= BIT STRING (SIZE(16))

MaximumIntegrityProtectedDataRate ::= ENUMERATED {
    bitrate64kbs,
    maximum-UE-rate,
    ...
}

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

MobilityRestrictionList ::= SEQUENCE {
    servingPLMN          PLMNIdentity,
    equivalentPLMNs      EquivalentPLMNs                OPTIONAL,
    rATRestrictions      RATRestrictions                OPTIONAL,
    forbiddenAreaInformation ForbiddnAreaInformation    OPTIONAL,
    serviceAreaInformation ServiceAreaInformation        OPTIONAL,
    iE-Extensions      ProtocolExtensionContainer { {MobilityRestrictionList-ExtIEs} }  OPTIONAL,
    ...
}

MobilityRestrictionList-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    { ID id-LastEUTRAN-PLMNIdentity CRITICALITY ignore EXTENSION PLMNIdentity PRESENCE optional }|
    { ID id-CNTTypeRestrictionsForServing CRITICALITY ignore EXTENSION CNTTypeRestrictionsForServing PRESENCE optional}|
    { ID id-CNTTypeRestrictionsForEquivalent CRITICALITY ignore EXTENSION CNTTypeRestrictionsForEquivalent PRESENCE optional},
    ...
}

-- N

N3IWF-ID ::= CHOICE {
    n3IWF-ID          BIT STRING (SIZE(16)),

```

```

    choice-Extensions      ProtocolIE-SingleContainer { {N3IWF-ID-ExtIEs} }
  }
N3IWF-ID-ExtIEs NGAP-PROTOCOL-IES ::= {
  ...
}
NAS-PDU ::= OCTET STRING
NASSecurityParametersFromNGRAN ::= OCTET STRING
NetworkInstance ::= INTEGER (1..256, ...)
NewSecurityContextInd ::= ENUMERATED {
  true,
  ...
}
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)),
  choice-Extensions     ProtocolIE-SingleContainer { {NgENB-ID-ExtIEs} }
}
NgENB-ID-ExtIEs NGAP-PROTOCOL-IES ::= {
  ...
}
NGRAN-CGI ::= CHOICE {
  nR-CGI          NR-CGI,
  eUTRA-CGI      EUTRA-CGI,
  choice-Extensions ProtocolIE-SingleContainer { {NGRAN-CGI-ExtIEs} }
}
NGRAN-CGI-ExtIEs NGAP-PROTOCOL-IES ::= {
  ...
}
NGRAN-TNLAssociationToRemoveList ::= SEQUENCE (SIZE(1..maxnoofTNLAssociations)) OF NGRAN-TNLAssociationToRemoveItem
NGRAN-TNLAssociationToRemoveItem ::= SEQUENCE {
  tNLAssociationTransportLayerAddress      CPTransportLayerInformation,
  tNLAssociationTransportLayerAddressAMF   CPTransportLayerInformation OPTIONAL,
  iE-Extensions                           ProtocolExtensionContainer { { NGRAN-TNLAssociationToRemoveItem-ExtIEs } } OPTIONAL
}

```

```

NGRAN-TNLAssociationToRemoveItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

NonDynamic5QIDescriptor ::= SEQUENCE {
    fiveQI                    FiveQI,
    priorityLevelQos          PriorityLevelQos
    averagingWindow           AveragingWindow
    maximumDataBurstVolume    MaximumDataBurstVolume
    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-requested,
    ...
}

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

OverloadAction ::= ENUMERATED {
    reject-non-emergency-mo-dt,
    reject-rrc-cr-signalling,
    permit-emergency-sessions-and-mobile-terminated-services-only,
    permit-high-priority-sessions-and-mobile-terminated-services-only,
    ...
}

OverloadResponse ::= CHOICE {
    overloadAction      OverloadAction,
    choice-Extensions   ProtocolIE-SingleContainer { {OverloadResponse-ExtIEs} }
}

OverloadResponse-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

OverloadStartNSSAIIList ::= SEQUENCE (SIZE (1..maxnoofSliceItems)) OF OverloadStartNSSAIItem

OverloadStartNSSAIItem ::= SEQUENCE {
    sliceOverloadList          SliceOverloadList,
    sliceOverloadResponse      OverloadResponse OPTIONAL,
    sliceTrafficLoadReductionIndication TrafficLoadReductionIndication OPTIONAL,
    iE-Extensions              ProtocolExtensionContainer { {OverloadStartNSSAIItem-ExtIEs} } OPTIONAL,
    ...
}

OverloadStartNSSAIItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- P

PacketDelayBudget ::= INTEGER (0..1023, ...)

PacketErrorRate ::= SEQUENCE {
    pERScalar      INTEGER (0..9, ...),
    pERExponent    INTEGER (0..9, ...),
    iE-Extensions  ProtocolExtensionContainer { {PacketErrorRate-ExtIEs} } OPTIONAL,
    ...
}

PacketErrorRate-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```

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 ::= ENUMERATED {
    v32,
    v64,
    v128,
    v256,
    ...
}

PagingOrigin ::= ENUMERATED {
    non-3gpp,
    ...
}

PagingPriority ::= ENUMERATED {
    priolevel1,
    priolevel2,
    priolevel3,
    priolevel4,
    priolevel5,
    priolevel6,
    priolevel7,
    priolevel8,
    ...
}

PathSwitchRequestAcknowledgeTransfer ::= SEQUENCE {
    uL-NGU-UP-TNLInformation  UPTransportLayerInformation          OPTIONAL,
    securityIndication        SecurityIndication                  OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { {PathSwitchRequestAcknowledgeTransfer-ExtIEs} } OPTIONAL,
    ...
}

PathSwitchRequestAcknowledgeTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    { ID id-AdditionalNGU-UP-TNLInformation CRITICALITY ignore EXTENSION UPTransportLayerInformationPairList PRESENCE optional },
    ...
}

PathSwitchRequestSetupFailedTransfer ::= SEQUENCE {

```

```

    cause          Cause,
    iE-Extensions  ProtocolExtensionContainer { {PathSwitchRequestSetupFailedTransfer-ExtIEs} } OPTIONAL,
    ...
}

PathSwitchRequestSetupFailedTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PathSwitchRequestTransfer ::= SEQUENCE {
    dL-NGU-UP-TNLInformation      UPTransportLayerInformation,
    dL-NGU-TNLInformationReused   DL-NGU-TNLInformationReused           OPTIONAL,
    userPlaneSecurityInformation  UserPlaneSecurityInformation     OPTIONAL,
    qosFlowAcceptedList          QosFlowAcceptedList,
    iE-Extensions                ProtocolExtensionContainer { {PathSwitchRequestTransfer-ExtIEs} } OPTIONAL,
    ...
}

PathSwitchRequestTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    { ID id-AdditionalDLQosFlowPerTNLInformation    CRITICALITY ignore  EXTENSION QosFlowPerTNLInformationList  PRESENCE optional },
    ...
}

PathSwitchRequestUnsuccessfulTransfer ::= SEQUENCE {
    cause          Cause,
    iE-Extensions  ProtocolExtensionContainer { {PathSwitchRequestUnsuccessfulTransfer-ExtIEs} } OPTIONAL,
    ...
}

PathSwitchRequestUnsuccessfulTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionAggregateMaximumBitRate ::= SEQUENCE {
    pDUSessionAggregateMaximumBitRateDL  BitRate,
    pDUSessionAggregateMaximumBitRateUL  BitRate,
    iE-Extensions                        ProtocolExtensionContainer { {PDUSessionAggregateMaximumBitRate-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionAggregateMaximumBitRate-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionID ::= INTEGER (0..255)

PDUSessionResourceAdmittedList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceAdmittedItem

PDUSessionResourceAdmittedItem ::= SEQUENCE {
    pDUSessionID          PDUSessionID,
    handoverRequestAcknowledgeTransfer  OCTET STRING (CONTAINING HandoverRequestAcknowledgeTransfer),
    iE-Extensions        ProtocolExtensionContainer { {PDUSessionResourceAdmittedItem-ExtIEs} } OPTIONAL,
    ...
}

```

```

PDUSessionResourceAdmittedItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

PDUSessionResourceFailedToModifyListModCfm ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceFailedToModifyItemModCfm

PDUSessionResourceFailedToModifyItemModCfm ::= SEQUENCE {
  pduSessionID                PDUSessionID,
  pduSessionResourceModifyIndicationUnsuccessfulTransfer  OCTET STRING (CONTAINING PDUSessionResourceModifyIndicationUnsuccessfulTransfer),
  iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceFailedToModifyItemModCfm-ExtIEs} } OPTIONAL,
  ...
}

PDUSessionResourceFailedToModifyItemModCfm-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

PDUSessionResourceFailedToModifyListModRes ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceFailedToModifyItemModRes

PDUSessionResourceFailedToModifyItemModRes ::= SEQUENCE {
  pduSessionID                PDUSessionID,
  pduSessionResourceModifyUnsuccessfulTransfer  OCTET STRING (CONTAINING PDUSessionResourceModifyUnsuccessfulTransfer),
  iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceFailedToModifyItemModRes-ExtIEs} } OPTIONAL,
  ...
}

PDUSessionResourceFailedToModifyItemModRes-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

PDUSessionResourceFailedToSetupListCxtFail ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceFailedToSetupItemCxtFail

PDUSessionResourceFailedToSetupItemCxtFail ::= SEQUENCE {
  pduSessionID                PDUSessionID,
  pduSessionResourceSetupUnsuccessfulTransfer  OCTET STRING (CONTAINING PDUSessionResourceSetupUnsuccessfulTransfer),
  iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceFailedToSetupItemCxtFail-ExtIEs} } OPTIONAL,
  ...
}

PDUSessionResourceFailedToSetupItemCxtFail-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

PDUSessionResourceFailedToSetupListCxtRes ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceFailedToSetupItemCxtRes

PDUSessionResourceFailedToSetupItemCxtRes ::= SEQUENCE {
  pduSessionID                PDUSessionID,
  pduSessionResourceSetupUnsuccessfulTransfer  OCTET STRING (CONTAINING PDUSessionResourceSetupUnsuccessfulTransfer),
  iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceFailedToSetupItemCxtRes-ExtIEs} } OPTIONAL,
  ...
}

PDUSessionResourceFailedToSetupItemCxtRes-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {

```



```

}
...
}
PDUSessionResourceFailedToSetupListHOAck ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceFailedToSetupItemHOAck
PDUSessionResourceFailedToSetupItemHOAck ::= SEQUENCE {
    pDUSessionID                PDUSessionID,
    handoverResourceAllocationUnsuccessfulTransfer OCTET STRING (CONTAINING HandoverResourceAllocationUnsuccessfulTransfer),
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceFailedToSetupItemHOAck-ExtIEs} } OPTIONAL,
    ...
}
PDUSessionResourceFailedToSetupItemHOAck-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
PDUSessionResourceFailedToSetupListPSReq ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceFailedToSetupItemPSReq
PDUSessionResourceFailedToSetupItemPSReq ::= SEQUENCE {
    pDUSessionID                PDUSessionID,
    pathSwitchRequestSetupFailedTransfer OCTET STRING (CONTAINING PathSwitchRequestSetupFailedTransfer),
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceFailedToSetupItemPSReq-ExtIEs} } OPTIONAL,
    ...
}
PDUSessionResourceFailedToSetupItemPSReq-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
PDUSessionResourceFailedToSetupListSRes ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceFailedToSetupItemSRes
PDUSessionResourceFailedToSetupItemSRes ::= SEQUENCE {
    pDUSessionID                PDUSessionID,
    pDUSessionResourceSetupUnsuccessfulTransfer OCTET STRING (CONTAINING PDUSessionResourceSetupUnsuccessfulTransfer),
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceFailedToSetupItemSRes-ExtIEs} } OPTIONAL,
    ...
}
PDUSessionResourceFailedToSetupItemSRes-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
PDUSessionResourceHandoverList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceHandoverItem
PDUSessionResourceHandoverItem ::= SEQUENCE {
    pDUSessionID                PDUSessionID,
    handoverCommandTransfer OCTET STRING (CONTAINING HandoverCommandTransfer),
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceHandoverItem-ExtIEs} } OPTIONAL,
    ...
}
PDUSessionResourceHandoverItem-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 ::= {
    ...
}
```

```
PDUSessionResourceListCxtRelCpl ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceItemCxtRelCpl
```

```
PDUSessionResourceItemCxtRelCpl ::= SEQUENCE {
    pduSessionID          PDUSessionID,
    iE-Extensions         ProtocolExtensionContainer { {PDUSessionResourceItemCxtRelCpl-ExtIEs} } OPTIONAL,
    ...
}
```

```
PDUSessionResourceItemCxtRelCpl-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    { ID id-PDUSessionResourceReleaseResponseTransfer CRITICALITY ignore EXTENSION OCTET STRING (CONTAINING
    PDUSessionResourceReleaseResponseTransfer) PRESENCE optional },
    ...
}
```

```
PDUSessionResourceListCxtRelReq ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceItemCxtRelReq
```

```
PDUSessionResourceItemCxtRelReq ::= SEQUENCE {
    pduSessionID          PDUSessionID,
    iE-Extensions         ProtocolExtensionContainer { {PDUSessionResourceItemCxtRelReq-ExtIEs} } OPTIONAL,
    ...
}
```

```
PDUSessionResourceItemCxtRelReq-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
PDUSessionResourceListHORqd ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceItemHORqd
```

```
PDUSessionResourceItemHORqd ::= SEQUENCE {
    pduSessionID          PDUSessionID,
    handoverRequiredTransfer OCTET STRING (CONTAINING HandoverRequiredTransfer),
    iE-Extensions         ProtocolExtensionContainer { {PDUSessionResourceItemHORqd-ExtIEs} } OPTIONAL,
    ...
}
```

```
PDUSessionResourceItemHORqd-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```

PDUSessionResourceModifyConfirmTransfer ::= SEQUENCE {
    qosFlowModifyConfirmList      QosFlowModifyConfirmList,
    uLNGU-UP-TNLInformation        UPTransportLayerInformation,
    additionalNG-UUPTNLInformation UPTransportLayerInformationPairList OPTIONAL,
    qosFlowFailedToModifyList      QosFlowListWithCause          OPTIONAL,
    iE-Extensions                  ProtocolExtensionContainer { {PDUSessionResourceModifyConfirmTransfer-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceModifyConfirmTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceModifyIndicationUnsuccessfulTransfer ::= SEQUENCE {
    cause                          Cause,
    iE-Extensions                  ProtocolExtensionContainer { {PDUSessionResourceModifyIndicationUnsuccessfulTransfer-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceModifyIndicationUnsuccessfulTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceModifyRequestTransfer ::= SEQUENCE {
    protocolIEs                    ProtocolIE-Container          { {PDUSessionResourceModifyRequestTransferIEs} },
    ...
}

PDUSessionResourceModifyRequestTransferIEs NGAP-PROTOCOL-IES ::= {
    { ID id-PDUSessionAggregateMaximumBitRate CRITICALITY reject TYPE PDUSessionAggregateMaximumBitRate PRESENCE optional } |
    { ID id-UL-NGU-UP-TNLModifyList          CRITICALITY reject TYPE UL-NGU-UP-TNLModifyList          PRESENCE optional } |
    { ID id-NetworkInstance                   CRITICALITY reject TYPE NetworkInstance                   PRESENCE optional } |
    { ID id-QosFlowAddOrModifyRequestList     CRITICALITY reject TYPE QosFlowAddOrModifyRequestList     PRESENCE optional } |
    { ID id-QosFlowToReleaseList              CRITICALITY reject TYPE QosFlowListWithCause              PRESENCE optional } |
    { ID id-AdditionalUL-NGU-UP-TNLInformation CRITICALITY reject TYPE UPTransportLayerInformationList PRESENCE optional } |
    { ID id-CommonNetworkInstance            CRITICALITY ignore  TYPE CommonNetworkInstance            PRESENCE optional } |
    ...
}

PDUSessionResourceModifyResponseTransfer ::= SEQUENCE {
    dL-NGU-UP-TNLInformation        UPTransportLayerInformation        OPTIONAL,
    uL-NGU-UP-TNLInformation        UPTransportLayerInformation        OPTIONAL,
    qosFlowAddOrModifyResponseList   QosFlowAddOrModifyResponseList    OPTIONAL,
    additionalDLQosFlowPerTNLInformation QosFlowPerTNLInformationList      OPTIONAL,
    qosFlowFailedToAddOrModifyList   QosFlowListWithCause              OPTIONAL,
    iE-Extensions                  ProtocolExtensionContainer { {PDUSessionResourceModifyResponseTransfer-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceModifyResponseTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    { ID id-AdditionalNGU-UP-TNLInformation CRITICALITY ignore EXTENSION UPTransportLayerInformationPairList PRESENCE optional },
    ...
}

```

```

PDUSessionResourceModifyIndicationTransfer ::= SEQUENCE {
    dLQosFlowPerTNLInformation      QosFlowPerTNLInformation,
    additionalDLQosFlowPerTNLInformation  QosFlowPerTNLInformationList OPTIONAL,
    iE-Extensions      ProtocolExtensionContainer { {PDUSessionResourceModifyIndicationTransfer-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceModifyIndicationTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    { ID id-SecondaryRATUsageInformation      CRITICALITY ignore  EXTENSION SecondaryRATUsageInformation  PRESENCE optional } |
    { ID id-SecurityResult                    CRITICALITY ignore  EXTENSION SecurityResult          PRESENCE optional } ,
    ...
}

PDUSessionResourceModifyListModCfm ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceModifyItemModCfm

PDUSessionResourceModifyItemModCfm ::= SEQUENCE {
    pDUSessionID      PDUSessionID,
    pDUSessionResourceModifyConfirmTransfer  OCTET STRING (CONTAINING PDUSessionResourceModifyConfirmTransfer),
    iE-Extensions      ProtocolExtensionContainer { {PDUSessionResourceModifyItemModCfm-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceModifyItemModCfm-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceModifyListModInd ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceModifyItemModInd

PDUSessionResourceModifyItemModInd ::= SEQUENCE {
    pDUSessionID      PDUSessionID,
    pDUSessionResourceModifyIndicationTransfer  OCTET STRING (CONTAINING PDUSessionResourceModifyIndicationTransfer),
    iE-Extensions      ProtocolExtensionContainer { {PDUSessionResourceModifyItemModInd-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceModifyItemModInd-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceModifyListModReq ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceModifyItemModReq

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 ::= {
    {ID id-S-NSSAI      CRITICALITY reject  EXTENSION S-NSSAI      PRESENCE optional  },
    ...
}

```

```

PDUSessionResourceModifyListModRes ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceModifyItemModRes

PDUSessionResourceModifyItemModRes ::= SEQUENCE {
    pduSessionID                PDUSESSIONID,
    pduSessionResourceModifyResponseTransfer  OCTET STRING (CONTAINING PDUSessionResourceModifyResponseTransfer),
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceModifyItemModRes-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceModifyItemModRes-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceModifyUnsuccessfulTransfer ::= SEQUENCE {
    cause                        Cause,
    criticalityDiagnostics        CriticalityDiagnostics                                OPTIONAL,
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceModifyUnsuccessfulTransfer-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceModifyUnsuccessfulTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceNotifyList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceNotifyItem

PDUSessionResourceNotifyItem ::= SEQUENCE {
    pduSessionID                PDUSESSIONID,
    pduSessionResourceNotifyTransfer  OCTET STRING (CONTAINING PDUSessionResourceNotifyTransfer),
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceNotifyItem-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceNotifyItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceNotifyReleasedTransfer ::= SEQUENCE {
    cause                        Cause,
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceNotifyReleasedTransfer-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceNotifyReleasedTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    { ID id-SecondaryRATUsageInformation        CRITICALITY ignore EXTENSION SecondaryRATUsageInformation        PRESENCE optional },
    ...
}

PDUSessionResourceNotifyTransfer ::= SEQUENCE {
    qosFlowNotifyList            QosFlowNotifyList                                OPTIONAL,
    qosFlowReleasedList          QosFlowListWithCause                            OPTIONAL,
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceNotifyTransfer-ExtIEs} } OPTIONAL,
    ...
}

```

```
PDUSessionResourceNotifyTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  { ID id-SecondaryRATUsageInformation          CRITICALITY ignore  EXTENSION SecondaryRATUsageInformation  PRESENCE optional },
  ...
}

PDUSessionResourceReleaseCommandTransfer ::= SEQUENCE {
  cause          Cause,
  iE-Extensions  ProtocolExtensionContainer { {PDUSessionResourceReleaseCommandTransfer-ExtIEs} } OPTIONAL,
  ...
}

PDUSessionResourceReleaseCommandTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

PDUSessionResourceReleasedListNot ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceReleasedItemNot

PDUSessionResourceReleasedItemNot ::= SEQUENCE {
  pDUSessionID          PDUSessionID,
  pDUSessionResourceNotifyReleasedTransfer  OCTET STRING (CONTAINING PDUSessionResourceNotifyReleasedTransfer),
  iE-Extensions        ProtocolExtensionContainer { {PDUSessionResourceReleasedItemNot-ExtIEs} } OPTIONAL,
  ...
}

PDUSessionResourceReleasedItemNot-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

PDUSessionResourceReleasedListPSAck ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceReleasedItemPSAck

PDUSessionResourceReleasedItemPSAck ::= SEQUENCE {
  pDUSessionID          PDUSessionID,
  pathSwitchRequestUnsuccessfulTransfer  OCTET STRING (CONTAINING PathSwitchRequestUnsuccessfulTransfer),
  iE-Extensions        ProtocolExtensionContainer { {PDUSessionResourceReleasedItemPSAck-ExtIEs} } OPTIONAL,
  ...
}

PDUSessionResourceReleasedItemPSAck-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

PDUSessionResourceReleasedListPSFail ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceReleasedItemPSFail

PDUSessionResourceReleasedItemPSFail ::= SEQUENCE {
  pDUSessionID          PDUSessionID,
  pathSwitchRequestUnsuccessfulTransfer  OCTET STRING (CONTAINING PathSwitchRequestUnsuccessfulTransfer),
  iE-Extensions        ProtocolExtensionContainer { {PDUSessionResourceReleasedItemPSFail-ExtIEs} } OPTIONAL,
  ...
}

PDUSessionResourceReleasedItemPSFail-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}
}
```

```

PDUSessionResourceReleasedListRelRes ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceReleasedItemRelRes

PDUSessionResourceReleasedItemRelRes ::= SEQUENCE {
    pDUSessionID                PDUSessionID,
    pDUSessionResourceReleaseResponseTransfer  OCTET STRING (CONTAINING PDUSessionResourceReleaseResponseTransfer),
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceReleasedItemRelRes-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceReleasedItemRelRes-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceReleaseResponseTransfer ::= SEQUENCE {
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceReleaseResponseTransfer-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceReleaseResponseTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    { ID id-SecondaryRATUsageInformation          CRITICALITY ignore  EXTENSION SecondaryRATUsageInformation  PRESENCE optional },
    ...
}

PDUSessionResourceSecondaryRATUsageList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceSecondaryRATUsageItem

PDUSessionResourceSecondaryRATUsageItem ::= SEQUENCE {
    pDUSessionID                PDUSessionID,
    secondaryRATDataUsageReportTransfer  OCTET STRING (CONTAINING SecondaryRATDataUsageReportTransfer),
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceSecondaryRATUsageItem-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceSecondaryRATUsageItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceSetupListCxtReq ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceSetupItemCxtReq

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 ::= {
    ...
}

PDUSessionResourceSetupListCxtRes ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceSetupItemCxtRes

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```

PDUSessionResourceSetupItemCxtRes ::= SEQUENCE {
    pduSessionID                PDUSessionID,
    pduSessionResourceSetupResponseTransfer  OCTET STRING (CONTAINING PDUSessionResourceSetupResponseTransfer),
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceSetupItemCxtRes-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceSetupItemCxtRes-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceSetupListHOReq ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceSetupItemHOReq

PDUSessionResourceSetupItemHOReq ::= SEQUENCE {
    pduSessionID                PDUSessionID,
    s-NSSAI                      S-NSSAI,
    handoverRequestTransfer      OCTET STRING (CONTAINING PDUSessionResourceSetupRequestTransfer),
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceSetupItemHOReq-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceSetupItemHOReq-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceSetupListSUReq ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceSetupItemSUReq

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 ::= {
    ...
}

PDUSessionResourceSetupListSURes ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceSetupItemSURes

PDUSessionResourceSetupItemSURes ::= SEQUENCE {
    pduSessionID                PDUSessionID,
    pduSessionResourceSetupResponseTransfer  OCTET STRING (CONTAINING PDUSessionResourceSetupResponseTransfer),
    iE-Extensions                ProtocolExtensionContainer { {PDUSessionResourceSetupItemSURes-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceSetupItemSURes-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceSetupRequestTransfer ::= SEQUENCE {

```



```

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

PDUSessionResourceSetupRequestTransferIEs NGAP-PROTOCOL-IES ::= {
  { ID id-PDUSessionAggregateMaximumBitRate      CRITICALITY reject TYPE PDUSessionAggregateMaximumBitRate PRESENCE optional } |
  { ID id-UL-NGU-UP-TNLInformation                CRITICALITY reject TYPE UPTransportLayerInformation PRESENCE mandatory } |
  { ID id-AdditionalUL-NGU-UP-TNLInformation      CRITICALITY reject TYPE UPTransportLayerInformationList PRESENCE optional } |
  { ID id-DataForwardingNotPossible              CRITICALITY reject TYPE DataForwardingNotPossible PRESENCE optional } |
  { ID id-PDUSessionType                          CRITICALITY reject TYPE PDUSessionType PRESENCE mandatory } |
  { ID id-SecurityIndication                     CRITICALITY reject TYPE SecurityIndication PRESENCE optional } |
  { ID id-NetworkInstance                        CRITICALITY reject TYPE NetworkInstance PRESENCE optional } |
  { ID id-QosFlowSetupRequestList                CRITICALITY reject TYPE QosFlowSetupRequestList PRESENCE mandatory } |
  { ID id-CommonNetworkInstance                 CRITICALITY ignore TYPE CommonNetworkInstance PRESENCE optional },
  ...
}

PDUSessionResourceSetupResponseTransfer ::= SEQUENCE {
  dlQosFlowPerTNLInformation      QosFlowPerTNLInformation,
  additionalDLQosFlowPerTNLInformation QosFlowPerTNLInformationList OPTIONAL,
  securityResult                  SecurityResult OPTIONAL,
  qosFlowFailedToSetupList       QosFlowListWithCause OPTIONAL,
  iE-Extensions                  ProtocolExtensionContainer { {PDUSessionResourceSetupResponseTransfer-ExtIEs} } OPTIONAL,
  ...
}

PDUSessionResourceSetupResponseTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

PDUSessionResourceSetupUnsuccessfulTransfer ::= SEQUENCE {
  cause          Cause,
  criticalityDiagnostics CriticalityDiagnostics OPTIONAL,
  iE-Extensions ProtocolExtensionContainer { {PDUSessionResourceSetupUnsuccessfulTransfer-ExtIEs} } OPTIONAL,
  ...
}

PDUSessionResourceSetupUnsuccessfulTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

PDUSessionResourceSwitchedList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceSwitchedItem

PDUSessionResourceSwitchedItem ::= SEQUENCE {
  pduSessionID          PDUSessionID,
  pathSwitchRequestAcknowledgeTransfer OCTET STRING (CONTAINING PathSwitchRequestAcknowledgeTransfer),
  iE-Extensions        ProtocolExtensionContainer { { PDUSessionResourceSwitchedItem-ExtIEs} } OPTIONAL,
  ...
}

PDUSessionResourceSwitchedItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

```

```

PDUSessionResourceToBeSwitchedDLList ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceToBeSwitchedDLItem

PDUSessionResourceToBeSwitchedDLItem ::= SEQUENCE {
    pduSessionID          PDUSessionID,
    pathSwitchRequestTransfer  OCTET STRING (CONTAINING PathSwitchRequestTransfer),
    iE-Extensions        ProtocolExtensionContainer { { PDUSessionResourceToBeSwitchedDLItem-ExtIEs } } OPTIONAL,
    ...
}

PDUSessionResourceToBeSwitchedDLItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceToReleaseListHOCmd ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceToReleaseItemHOCmd

PDUSessionResourceToReleaseItemHOCmd ::= SEQUENCE {
    pduSessionID          PDUSessionID,
    handoverPreparationUnsuccessfulTransfer  OCTET STRING (CONTAINING HandoverPreparationUnsuccessfulTransfer),
    iE-Extensions        ProtocolExtensionContainer { {PDUSessionResourceToReleaseItemHOCmd-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceToReleaseItemHOCmd-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionResourceToReleaseListRelCmd ::= SEQUENCE (SIZE(1..maxnoofPDUSessions)) OF PDUSessionResourceToReleaseItemRelCmd

PDUSessionResourceToReleaseItemRelCmd ::= SEQUENCE {
    pduSessionID          PDUSessionID,
    pduSessionResourceReleaseCommandTransfer  OCTET STRING (CONTAINING PDUSessionResourceReleaseCommandTransfer),
    iE-Extensions        ProtocolExtensionContainer { {PDUSessionResourceToReleaseItemRelCmd-ExtIEs} } OPTIONAL,
    ...
}

PDUSessionResourceToReleaseItemRelCmd-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PDUSessionType ::= ENUMERATED {
    ipv4,
    ipv6,
    ipv4v6,
    ethernet,
    unstructured,
    ...
}

PDUSessionUsageReport ::= SEQUENCE {
    rATType          ENUMERATED {nr, eutra, ...},
    pduSessionTimedReportList  VolumeTimedReportList,
    iE-Extensions    ProtocolExtensionContainer { {PDUSessionUsageReport-ExtIEs} } OPTIONAL,
    ...
}

```

```

PDUSessionUsageReport-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

PeriodicRegistrationUpdateTimer ::= BIT STRING (SIZE(8))

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))

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, ...)

PWSFailedCellIDList ::= CHOICE {
    eUTRA-CGI-PWSFailedList    EUTRA-CGIList,
    nR-CGI-PWSFailedList       NR-CGIList,
    choice-Extensions          ProtocolIE-SingleContainer { {PWSFailedCellIDList-ExtIEs} }
}

PWSFailedCellIDList-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

-- Q

QoSCharacteristics ::= CHOICE {
    nonDynamic5QI          NonDynamic5QIDescriptor,
    dynamic5QI             Dynamic5QIDescriptor,
}

```

```

    choice-Extensions      ProtocolIE-SingleContainer { {QosCharacteristics-ExtIEs} }
  }
QosCharacteristics-ExtIEs NGAP-PROTOCOL-IES ::= {
  ...
}
QosFlowAcceptedList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowAcceptedItem
QosFlowAcceptedItem ::= SEQUENCE {
  qosFlowIdentifier      QosFlowIdentifier,
  iE-Extensions          ProtocolExtensionContainer { {QosFlowAcceptedItem-ExtIEs} } OPTIONAL,
  ...
}
QosFlowAcceptedItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}
QosFlowAddOrModifyRequestList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowAddOrModifyRequestItem
QosFlowAddOrModifyRequestItem ::= SEQUENCE {
  qosFlowIdentifier      QosFlowIdentifier,
  qosFlowLevelQosParameters      QosFlowLevelQosParameters          OPTIONAL,
  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 {
  qosFlowIdentifier      QosFlowIdentifier,
  iE-Extensions          ProtocolExtensionContainer { {QosFlowAddOrModifyResponseItem-ExtIEs} } OPTIONAL,
  ...
}
QosFlowAddOrModifyResponseItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}
QosFlowIdentifier ::= INTEGER (0..63, ...)
QosFlowInformationList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowInformationItem
QosFlowInformationItem ::= SEQUENCE {
  qosFlowIdentifier      QosFlowIdentifier,
  dlForwarding           DLForwarding                                OPTIONAL,
  iE-Extensions          ProtocolExtensionContainer { {QosFlowInformationItem-ExtIEs} } OPTIONAL,
  ...
}

```

```

}

QosFlowInformationItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  {ID id-ULForwarding CRITICALITY reject EXTENSION ULForwarding PRESENCE optional},
  ...
}

QosFlowLevelQosParameters ::= SEQUENCE {
  qosCharacteristics          QosCharacteristics,
  allocationAndRetentionPriority AllocationAndRetentionPriority,
  gBR-QosInformation          GBR-QosInformation           OPTIONAL,
  reflectiveQosAttribute      ReflectiveQosAttribute       OPTIONAL,
  additionalQosFlowInformation AdditionalQosFlowInformation OPTIONAL,
  iE-Extensions              ProtocolExtensionContainer { {QosFlowLevelQosParameters-ExtIEs} } OPTIONAL,
  ...
}

QosFlowLevelQosParameters-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

QosFlowListWithCause ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowWithCauseItem

QosFlowWithCauseItem ::= SEQUENCE {
  qosFlowIdentifier          QosFlowIdentifier,
  cause                     Cause,
  iE-Extensions            ProtocolExtensionContainer { {QosFlowWithCauseItem-ExtIEs} } OPTIONAL,
  ...
}

QosFlowWithCauseItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

QosFlowModifyConfirmList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowModifyConfirmItem

QosFlowModifyConfirmItem ::= SEQUENCE {
  qosFlowIdentifier          QosFlowIdentifier,
  iE-Extensions            ProtocolExtensionContainer { {QosFlowModifyConfirmItem-ExtIEs} } OPTIONAL,
  ...
}

QosFlowModifyConfirmItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

QosFlowNotifyList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowNotifyItem

QosFlowNotifyItem ::= SEQUENCE {
  qosFlowIdentifier          QosFlowIdentifier,
  notificationCause         NotificationCause,
  iE-Extensions            ProtocolExtensionContainer { {QosFlowNotifyItem-ExtIEs} } OPTIONAL,
  ...
}

```

```

QosFlowNotifyItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowPerTNLInformation ::= SEQUENCE {
    upTransportLayerInformation    UPTransportLayerInformation,
    associatedQosFlowList          AssociatedQosFlowList,
    iE-Extensions                  ProtocolExtensionContainer { { QosFlowPerTNLInformation-ExtIEs} } OPTIONAL,
    ...
}

QosFlowPerTNLInformation-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowPerTNLInformationList ::= SEQUENCE (SIZE(1..maxnoofMultiConnectivityMinusOne)) OF QosFlowPerTNLInformationItem

QosFlowPerTNLInformationItem ::= SEQUENCE {
    qosFlowPerTNLInformation      QosFlowPerTNLInformation,
    iE-Extensions                  ProtocolExtensionContainer { { QosFlowPerTNLInformationItem-ExtIEs} } OPTIONAL,
    ...
}

QosFlowPerTNLInformationItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowSetupRequestList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowSetupRequestItem

QosFlowSetupRequestItem ::= SEQUENCE {
    qosFlowIdentifier              QosFlowIdentifier,
    qosFlowLevelQosParameters      QosFlowLevelQosParameters,
    e-RAB-ID                       E-RAB-ID OPTIONAL,
    iE-Extensions                  ProtocolExtensionContainer { {QosFlowSetupRequestItem-ExtIEs} } OPTIONAL,
    ...
}

QosFlowSetupRequestItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

QosFlowListWithDataForwarding ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowItemWithDataForwarding

QosFlowItemWithDataForwarding ::= SEQUENCE {
    qosFlowIdentifier              QosFlowIdentifier,
    dataForwardingAccepted         DataForwardingAccepted OPTIONAL,
    iE-Extensions                  ProtocolExtensionContainer { {QosFlowItemWithDataForwarding-ExtIEs} } OPTIONAL,
    ...
}

QosFlowItemWithDataForwarding-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```

QosFlowSetupResponseListSURES ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowSetupResponseItemSURES
QosFlowSetupResponseItemSURES ::= SEQUENCE {
    qosFlowIdentifier      QosFlowIdentifier,
    iE-Extensions         ProtocolExtensionContainer { {QosFlowSetupResponseItemSURES-ExtIEs} } OPTIONAL,
    ...
}
QosFlowSetupResponseItemSURES-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
QosFlowToBeForwardedList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowToBeForwardedItem
QosFlowToBeForwardedItem ::= SEQUENCE {
    qosFlowIdentifier      QosFlowIdentifier,
    iE-Extensions         ProtocolExtensionContainer { {QosFlowToBeForwardedItem-ExtIEs} } OPTIONAL,
    ...
}
QosFlowToBeForwardedItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
QoSFlowsUsageReportList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QoSFlowsUsageReport-Item
QoSFlowsUsageReport-Item ::= SEQUENCE {
    qosFlowIdentifier      QosFlowIdentifier,
    rATType                ENUMERATED {nr, eutra, ...},
    qosFlowsTimedReportList VolumeTimedReportList,
    iE-Extensions         ProtocolExtensionContainer { {QoSFlowsUsageReport-Item-ExtIEs} } OPTIONAL,
    ...
}
QoSFlowsUsageReport-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
-- R
RANNodeName ::= PrintableString (SIZE(1..150, ...))
RANPagingPriority ::= INTEGER (1..256)
RANStatusTransfer-TransparentContainer ::= SEQUENCE {
    drBsSubjectToStatusTransferList DRBsSubjectToStatusTransferList,
    iE-Extensions         ProtocolExtensionContainer { {RANStatusTransfer-TransparentContainer-ExtIEs} } OPTIONAL,
    ...
}
RANStatusTransfer-TransparentContainer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```
RAN-UE-NGAP-ID ::= INTEGER (0..4294967295)

RATRestrictions ::= SEQUENCE (SIZE(1..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 ::= {
    ...
}

RecommendedRANNodesForPaging ::= SEQUENCE {
    recommendedRANNodeList    RecommendedRANNodeList,
    iE-Extensions            ProtocolExtensionContainer { {RecommendedRANNodesForPaging-ExtIEs} } OPTIONAL,
    ...
}

RecommendedRANNodesForPaging-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

RecommendedRANNodeList ::= SEQUENCE (SIZE(1..maxnoofRecommendedRANNodes)) OF RecommendedRANNodeItem

RecommendedRANNodeItem ::= SEQUENCE {
```



```
    aMFPagingTarget      AMFPagingTarget,
    iE-Extensions        ProtocolExtensionContainer { {RecommendedRANNodeItem-ExtIEs} } OPTIONAL,
    ...
}

RecommendedRANNodeItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

RedirectionVoiceFallback ::= ENUMERATED {
    possible,
    not-possible,
    ...
}

ReflectiveQosAttribute ::= ENUMERATED {
    subject-to,
    ...
}

ReferenceID ::= INTEGER (1..64, ...)

RelativeAMFCapacity ::= INTEGER (0..255)

ReportArea ::= ENUMERATED {
    cell,
    ...
}

RepetitionPeriod ::= INTEGER (0..131071)

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

ResetType ::= CHOICE {
    nG-Interface          ResetAll,
    partOfNG-Interface    UE-associatedLogicalNG-connectionList,
    choice-Extensions     ProtocolIE-SingleContainer { {ResetType-ExtIEs} }
}

ResetType-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

RoutingID ::= OCTET STRING

RRCContainer ::= OCTET STRING

RRCEstablishmentCause ::= ENUMERATED {
    emergency,
    highPriorityAccess,
    mt-Access,
}
```

```

    mo-Signalling,
    mo-Data,
    mo-VoiceCall,
    mo-VideoCall,
    mo-SMS,
    mps-PriorityAccess,
    mcs-PriorityAccess,
    ...,
    notAvailable
}

RRCInactiveTransitionReportRequest ::= ENUMERATED {
    subsequent-state-transition-report,
    single-rrc-connected-state-report,
    cancel-report,
    ...
}

RRCState ::= ENUMERATED {
    inactive,
    connected,
    ...
}

-- S

SCTP-TLAs ::= SEQUENCE (SIZE(1..maxnoofXnTLAs)) OF TransportLayerAddress

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

SecondaryRATUsageInformation ::= SEQUENCE {
    pduSessionUsageReport      PDUUsageReport          OPTIONAL,
    qosFlowsUsageReportList    QoSFlowsUsageReportList OPTIONAL,
    iE-Extension               ProtocolExtensionContainer { {SecondaryRATUsageInformation-ExtIEs} } OPTIONAL,
    ...
}

SecondaryRATUsageInformation-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

SecondaryRATDataUsageReportTransfer ::= SEQUENCE {
    secondaryRATUsageInformation      SecondaryRATUsageInformation          OPTIONAL,
    iE-Extensions                     ProtocolExtensionContainer { {SecondaryRATDataUsageReportTransfer-ExtIEs} } OPTIONAL,
    ...
}

SecondaryRATDataUsageReportTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

SecurityContext ::= SEQUENCE {
    nextHopChainingCount      NextHopChainingCount,
    nextHopNH                 SecurityKey,

```

```

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

SecurityContext-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

SecurityIndication ::= SEQUENCE {
    integrityProtectionIndication      IntegrityProtectionIndication,
    confidentialityProtectionIndication ConfidentialityProtectionIndication,
    maximumIntegrityProtectedDataRate-UL MaximumIntegrityProtectedDataRate      OPTIONAL,
-- The above IE shall be present if integrity protection is required or preferred
    iE-Extensions      ProtocolExtensionContainer { {SecurityIndication-ExtIEs} } OPTIONAL,
    ...
}

SecurityIndication-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    { ID id-MaximumIntegrityProtectedDataRate-DL      CRITICALITY ignore      EXTENSION MaximumIntegrityProtectedDataRate PRESENCE optional },
    ...
}

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 ::= {
    ...
}

SliceOverloadList ::= SEQUENCE (SIZE(1..maxnoofSliceItems)) OF SliceOverloadItem

SliceOverloadItem ::= SEQUENCE {
    s-NSSAI               S-NSSAI,
    iE-Extensions        ProtocolExtensionContainer { {SliceOverloadItem-ExtIEs} } OPTIONAL,
    ...
}

SliceOverloadItem-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 OPTIONAL,
    iE-Extensions        ProtocolExtensionContainer { { S-NSSAI-ExtIEs} } OPTIONAL,
    ...
}

S-NSSAI-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

SONConfigurationTransfer ::= SEQUENCE {
    targetRANNodeID       TargetRANNodeID,
    sourceRANNodeID       SourceRANNodeID,
    SONInformation        SONInformation,
    xnTNLConfigurationInfo XnTNLConfigurationInfo OPTIONAL,
    -- The above IE shall be present if the SON Information Request IE set to "Xn TNL Configuration Info"
    iE-Extensions        ProtocolExtensionContainer { {SONConfigurationTransfer-ExtIEs} } OPTIONAL,
    ...
}

```

```

}

SONConfigurationTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

SONInformation ::= CHOICE {
  sonInformationRequest      SONInformationRequest,
  sonInformationReply        SONInformationReply,
  choice-Extensions         ProtocolIE-SingleContainer { {SONInformation-ExtIEs} }
}

SONInformation-ExtIEs NGAP-PROTOCOL-IES ::= {
  ...
}

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,
  ueHistoryInformation        UEHistoryInformation,
  iE-Extensions               ProtocolExtensionContainer { {SourceNGRANNode-ToTargetNGRANNode-TransparentContainer-ExtIEs} }  OPTIONAL,
  ...
}

SourceNGRANNode-ToTargetNGRANNode-TransparentContainer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}

SourceOfUEActivityBehaviourInformation ::= ENUMERATED {
  subscription-information,
  statistics,
  ...
}

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.

SourceToTarget-AMFInformationReroute ::= SEQUENCE {
    configuredNSSAI          ConfiguredNSSAI          OPTIONAL,
    rejectedNSSAIinPLMN      RejectedNSSAIinPLMN       OPTIONAL,
    rejectedNSSAIinTA        RejectedNSSAIinTA         OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { {SourceToTarget-AMFInformationReroute-ExtIEs} } OPTIONAL,
    ...
}

SourceToTarget-AMFInformationReroute-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- This IE includes information from the source Core node to the target Core node for reroute information provide by NSSF.
-- The octets of the OCTET STRING are encoded according to the specifications of the Core network.

ConfiguredNSSAI ::= OCTET STRING (SIZE(128))

RejectedNSSAIinPLMN ::= OCTET STRING (SIZE(32))

RejectedNSSAIinTA ::= OCTET STRING (SIZE(32))

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 ::= {
    ...
}

TAILlistForInactive ::= SEQUENCE (SIZE(1..maxnoofTAIforInactive)) OF TAILlistForInactiveItem

TAILlistForInactiveItem ::= SEQUENCE {
    tAI      TAI,
    iE-Extensions      ProtocolExtensionContainer { {TAILlistForInactiveItem-ExtIEs} } OPTIONAL,
    ...
}

TAILlistForInactiveItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

TAILlistForPaging ::= SEQUENCE (SIZE(1..maxnoofTAIforPaging)) OF TAILlistForPagingItem

TAILlistForPagingItem ::= SEQUENCE {
    tAI      TAI,
    iE-Extensions      ProtocolExtensionContainer { {TAILlistForPagingItem-ExtIEs} } OPTIONAL,
    ...
}

TAILlistForPagingItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

TAILlistForRestart ::= SEQUENCE (SIZE(1..maxnoofTAIforRestart)) OF TAI

TAILlistForWarning ::= 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,
    choice-Extensions      ProtocolIE-SingleContainer { {TargetID-ExtIEs} }
}

```



```
TargetID-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

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, ...}

TimeUEStayedInCell ::= INTEGER (0..4095)

TimeUEStayedInCellEnhancedGranularity ::= INTEGER (0..40950)

TNLAddressWeightFactor ::= INTEGER (0..255)

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,
    ...
}

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,
    ...
}

TrafficLoadReductionIndication ::= INTEGER (1..99)

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-connectionList ::= SEQUENCE (SIZE(1..maxnoofNGConnectionsToReset)) OF UE-associatedLogicalNG-connectionItem

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, ...}

UEHistoryInformation ::= SEQUENCE (SIZE(1..maxnoofCellsinUEHistoryInfo)) OF LastVisitedCellItem

UEIdentityIndexValue ::= CHOICE {
    indexLength10      BIT STRING (SIZE(10)),
    choice-Extensions  ProtocolIE-SingleContainer { {UEIdentityIndexValue-ExtIEs} }
}

UEIdentityIndexValue-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

UE-NGAP-IDs ::= CHOICE {
    uE-NGAP-ID-pair    UE-NGAP-ID-pair,
    aMF-UE-NGAP-ID     AMF-UE-NGAP-ID,
    choice-Extensions  ProtocolIE-SingleContainer { {UE-NGAP-IDs-ExtIEs} }
}

UE-NGAP-IDs-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

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,
    choice-Extensions  ProtocolIE-SingleContainer { {UEPagingIdentity-ExtIEs} }
}

UEPagingIdentity-ExtIEs NGAP-PROTOCOL-IES ::= {

```

```

    ...
}

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 ::= SEQUENCE {
    uERadioCapabilityForPagingOfNR      UERadioCapabilityForPagingOfNR      OPTIONAL,
    uERadioCapabilityForPagingOfEUTRA   UERadioCapabilityForPagingOfEUTRA   OPTIONAL,
    iE-Extensions                      ProtocolExtensionContainer { {UERadioCapabilityForPaging-ExtIEs} } OPTIONAL,
    ...
}

UERadioCapabilityForPaging-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

UERadioCapabilityForPagingOfNR ::= OCTET STRING

UERadioCapabilityForPagingOfEUTRA ::= OCTET STRING

UERetentionInformation ::= ENUMERATED {
    ues-retained,
    ...
}

UESecurityCapabilities ::= SEQUENCE {
    nREncryptionAlgorithms              NREncryptionAlgorithms,
    nRintegrityProtectionAlgorithms     NRintegrityProtectionAlgorithms,
    eUTRAEncryptionAlgorithms          EUTRAEncryptionAlgorithms,
    eUTRAIntegrityProtectionAlgorithms  EUTRAIntegrityProtectionAlgorithms,

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

UESecurityCapabilities-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

```

```

UL-NGU-UP-TNLModifyList ::= SEQUENCE (SIZE(1..maxnoofMultiConnectivity)) OF UL-NGU-UP-TNLModifyItem

UL-NGU-UP-TNLModifyItem ::= SEQUENCE {
    uL-NGU-UP-TNLInformation      UPTransportLayerInformation,
    dL-NGU-UP-TNLInformation      UPTransportLayerInformation,
    iE-Extensions                 ProtocolExtensionContainer { {UL-NGU-UP-TNLModifyItem-ExtIEs} } OPTIONAL,
    ...
}

UL-NGU-UP-TNLModifyItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

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 ::= {
    ...
}

ULForwarding ::= ENUMERATED {
    ul-forwarding-proposed,
    ...
}

UPTransportLayerInformation ::= CHOICE {
    gTPTunnel      GTPtunnel,
    choice-Extensions ProtocolIE-SingleContainer { {UPTransportLayerInformation-ExtIEs} }
}

UPTransportLayerInformation-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}

UPTransportLayerInformationList ::= SEQUENCE (SIZE(1..maxnoofMultiConnectivityMinusOne)) OF UPTransportLayerInformationItem

UPTransportLayerInformationItem ::= SEQUENCE {
    nGU-UP-TNLInformation      UPTransportLayerInformation,
    iE-Extensions                 ProtocolExtensionContainer { {UPTransportLayerInformationItem-ExtIEs} } OPTIONAL,
    ...
}

UPTransportLayerInformationItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}

```

UPTransportLayerInformationPairList ::= SEQUENCE (SIZE(1..maxnoofMultiConnectivityMinusOne)) OF UPTransportLayerInformationPairItem

```
UPTransportLayerInformationPairItem ::= SEQUENCE {
    uL-NGU-UP-TNLInformation      UPTransportLayerInformation,
    dL-NGU-UP-TNLInformation      UPTransportLayerInformation,
    iE-Extensions                 ProtocolExtensionContainer { {UPTransportLayerInformationPairItem-ExtIEs} } OPTIONAL,
    ...
}
```

```
UPTransportLayerInformationPairItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
UserLocationInformation ::= CHOICE {
    userLocationInformationEUTRA      UserLocationInformationEUTRA,
    userLocationInformationNR         UserLocationInformationNR,
    userLocationInformationN3IWF      UserLocationInformationN3IWF,
    choice-Extensions                ProtocolIE-SingleContainer { {UserLocationInformation-ExtIEs} }
}
```

```
UserLocationInformation-ExtIEs NGAP-PROTOCOL-IES ::= {
    ...
}
```

```
UserLocationInformationEUTRA ::= SEQUENCE {
    eUTRA-CGI          EUTRA-CGI,
    tAI                TAI,
    timeStamp          TimeStamp
    iE-Extensions      ProtocolExtensionContainer { {UserLocationInformationEUTRA-ExtIEs} } OPTIONAL,
    ...
}
```

```
UserLocationInformationEUTRA-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
    { ID id-PSCellInformation CRITICALITY ignore EXTENSION NGRAN-CGI PRESENCE optional},
    ...
}
```

```
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,
    timeStamp      TimeStamp
    iE-Extensions  ProtocolExtensionContainer { {UserLocationInformationNR-ExtIEs} } OPTIONAL,
    ...
}
```

```
}
UserLocationInformationNR-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  { ID id-PSCellInformation CRITICALITY ignore EXTENSION NGRAN-CGI PRESENCE optional},
  ...
}
UserPlaneSecurityInformation ::= SEQUENCE {
  securityResult SecurityResult,
  securityIndication SecurityIndication,
  IE-Extensions ProtocolExtensionContainer { {UserPlaneSecurityInformation-ExtIEs} } OPTIONAL,
  ...
}
UserPlaneSecurityInformation-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}
-- V
VolumeTimedReportList ::= SEQUENCE (SIZE(1..maxnoofTimePeriods)) OF VolumeTimedReport-Item
VolumeTimedReport-Item ::= SEQUENCE {
  startTimeStamp OCTET STRING (SIZE(4)),
  endTimeStamp OCTET STRING (SIZE(4)),
  usageCountUL INTEGER (0..18446744073709551615),
  usageCountDL INTEGER (0..18446744073709551615),
  IE-Extensions ProtocolExtensionContainer { {VolumeTimedReport-Item-ExtIEs} } OPTIONAL,
  ...
}
VolumeTimedReport-Item-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {
  ...
}
-- W
WarningAreaCoordinates ::= OCTET STRING (SIZE(1..1024))
WarningAreaList ::= CHOICE {
  eUTRA-CGIListForWarning EUTRA-CGIListForWarning,
  nR-CGIListForWarning NR-CGIListForWarning,
  tAIListForWarning TAIListForWarning,
  emergencyAreaIDList EmergencyAreaIDList,
  choice-Extensions ProtocolIE-SingleContainer { {WarningAreaList-ExtIEs} }
}
WarningAreaList-ExtIEs NGAP-PROTOCOL-IES ::= {
  ...
}
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 ::= {
    { ID id-SCTP-TLAs        CRITICALITY ignore     EXTENSION SCTP-TLAs        PRESENCE optional },
    ...
}

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
-- ASN1STOP

```

9.4.6 Common Definitions

```

-- ASN1START
-- *****
--
-- 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, unsuccessful-outcome }

END
-- ASN1STOP
```

9.4.7 Constant Definitions

```
-- ASN1START
-- *****
--
-- 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-OverloadStart                    ProcedureCode ::= 22
id-OverloadStop                     ProcedureCode ::= 23
id-Paging                           ProcedureCode ::= 24
id-PathSwitchRequest               ProcedureCode ::= 25
id-PDUSessionResourceModify         ProcedureCode ::= 26
id-PDUSessionResourceModifyIndication ProcedureCode ::= 27
id-PDUSessionResourceRelease        ProcedureCode ::= 28
id-PDUSessionResourceSetup          ProcedureCode ::= 29
id-PDUSessionResourceNotify         ProcedureCode ::= 30
id-PrivateMessage                   ProcedureCode ::= 31
id-PWSCancel                        ProcedureCode ::= 32
id-PWSFailureIndication             ProcedureCode ::= 33
id-PWSRestartIndication             ProcedureCode ::= 34
id-RANConfigurationUpdate           ProcedureCode ::= 35
id-RerouteNASRequest               ProcedureCode ::= 36
id-RRCInactiveTransitionReport      ProcedureCode ::= 37
id-TraceFailureIndication           ProcedureCode ::= 38
id-TraceStart                       ProcedureCode ::= 39
id-UEContextModification            ProcedureCode ::= 40
id-UEContextRelease                 ProcedureCode ::= 41
id-UEContextReleaseRequest          ProcedureCode ::= 42
id-UERadioCapabilityCheck           ProcedureCode ::= 43
id-UERadioCapabilityInfoIndication ProcedureCode ::= 44
id-UETNLABindingRelease             ProcedureCode ::= 45
```

```

id-UplinkNASTransport                ProcedureCode ::= 46
id-UplinkNonUEAssociatedNRPPaTransport ProcedureCode ::= 47
id-UplinkRANConfigurationTransfer     ProcedureCode ::= 48
id-UplinkRANStatusTransfer           ProcedureCode ::= 49
id-UplinkUEAssociatedNRPPaTransport   ProcedureCode ::= 50
id-WriteReplaceWarning                ProcedureCode ::= 51
id-SecondaryRATDataUsageReport        ProcedureCode ::= 52

-- *****
--
-- 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
maxnoofCellinAoI                     INTEGER ::= 256
maxnoofCellinEAI                     INTEGER ::= 65535
maxnoofCellinTAI                     INTEGER ::= 65535
maxnoofCellsingNB                    INTEGER ::= 16384
maxnoofCellsinngeNB                  INTEGER ::= 256
maxnoofCellsinUEHistoryInfo          INTEGER ::= 16
maxnoofCellsUEMovingTrajectory       INTEGER ::= 16
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
maxnoofMultiConnectivity              INTEGER ::= 4
maxnoofMultiConnectivityMinusOne     INTEGER ::= 3
maxnoofNGConnectionsToReset          INTEGER ::= 65536
maxnoofPDUSessions                   INTEGER ::= 256
maxnoofPLMNs                         INTEGER ::= 12
maxnoofQosFlows                      INTEGER ::= 64
maxnoofRANNodeinAoI                  INTEGER ::= 64
maxnoofRecommendedCells              INTEGER ::= 16
maxnoofRecommendedRANNodes           INTEGER ::= 16
maxnoofAoI                           INTEGER ::= 64
maxnoofServedGUAMIs                  INTEGER ::= 256

```

maxnoofSliceItems	INTEGER ::= 1024
maxnoofTACs	INTEGER ::= 256
maxnoofTAIforInactive	INTEGER ::= 16
maxnoofTAIforPaging	INTEGER ::= 16
maxnoofTAIforRestart	INTEGER ::= 2048
maxnoofTAIforWarning	INTEGER ::= 65535
maxnoofTAIinAoI	INTEGER ::= 16
maxnoofTimePeriods	INTEGER ::= 2
maxnoofTNLAssociations	INTEGER ::= 32
maxnoofXnExtTLAs	INTEGER ::= 16
maxnoofXnGTP-TLAs	INTEGER ::= 16
maxnoofXnTLAs	INTEGER ::= 2

```
-- *****
--
-- IEs
--
-- *****
```

id-AllowedNSSAI	ProtocolIE-ID ::= 0
id-AMFName	ProtocolIE-ID ::= 1
id-AMFOverloadResponse	ProtocolIE-ID ::= 2
id-AMFSetID	ProtocolIE-ID ::= 3
id-AMF-TNLAssociationFailedToSetupList	ProtocolIE-ID ::= 4
id-AMF-TNLAssociationSetupList	ProtocolIE-ID ::= 5
id-AMF-TNLAssociationToAddList	ProtocolIE-ID ::= 6
id-AMF-TNLAssociationToRemoveList	ProtocolIE-ID ::= 7
id-AMF-TNLAssociationToUpdateList	ProtocolIE-ID ::= 8
id-AMFTrafficLoadReductionIndication	ProtocolIE-ID ::= 9
id-AMF-UE-NGAP-ID	ProtocolIE-ID ::= 10
id-AssistanceDataForPaging	ProtocolIE-ID ::= 11
id-BroadcastCancelledAreaList	ProtocolIE-ID ::= 12
id-BroadcastCompletedAreaList	ProtocolIE-ID ::= 13
id-CancelAllWarningMessages	ProtocolIE-ID ::= 14
id-Cause	ProtocolIE-ID ::= 15
id-CellIDListForRestart	ProtocolIE-ID ::= 16
id-ConcurrentWarningMessageInd	ProtocolIE-ID ::= 17
id-CoreNetworkAssistanceInformationForInactive	ProtocolIE-ID ::= 18
id-CriticalityDiagnostics	ProtocolIE-ID ::= 19
id-DataCodingScheme	ProtocolIE-ID ::= 20
id-DefaultPagingDRX	ProtocolIE-ID ::= 21
id-DirectForwardingPathAvailability	ProtocolIE-ID ::= 22
id-EmergencyAreaIDListForRestart	ProtocolIE-ID ::= 23
id-EmergencyFallbackIndicator	ProtocolIE-ID ::= 24
id-EUTRA-CGI	ProtocolIE-ID ::= 25
id-FiveG-S-TMSI	ProtocolIE-ID ::= 26
id-GlobalRANNodeID	ProtocolIE-ID ::= 27
id-GUAMI	ProtocolIE-ID ::= 28
id-HandoverType	ProtocolIE-ID ::= 29
id-IMSVoiceSupportIndicator	ProtocolIE-ID ::= 30
id-IndexToRFSP	ProtocolIE-ID ::= 31
id-InfoOnRecommendedCellsAndRANNodesForPaging	ProtocolIE-ID ::= 32
id-LocationReportingRequestType	ProtocolIE-ID ::= 33
id-MaskedIMEISV	ProtocolIE-ID ::= 34

id-MessageIdentifier	ProtocolIE-ID ::= 35
id-MobilityRestrictionList	ProtocolIE-ID ::= 36
id-NASC	ProtocolIE-ID ::= 37
id-NAS-PDU	ProtocolIE-ID ::= 38
id-NASSecurityParametersFromNGRAN	ProtocolIE-ID ::= 39
id-NewAMF-UE-NGAP-ID	ProtocolIE-ID ::= 40
id-NewSecurityContextInd	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-OverloadStartNSSAList	ProtocolIE-ID ::= 49
id-PagingDRX	ProtocolIE-ID ::= 50
id-PagingOrigin	ProtocolIE-ID ::= 51
id-PagingPriority	ProtocolIE-ID ::= 52
id-PDUSessionResourceAdmittedList	ProtocolIE-ID ::= 53
id-PDUSessionResourceFailedToModifyListModRes	ProtocolIE-ID ::= 54
id-PDUSessionResourceFailedToSetupListCxtRes	ProtocolIE-ID ::= 55
id-PDUSessionResourceFailedToSetupListHOAck	ProtocolIE-ID ::= 56
id-PDUSessionResourceFailedToSetupListPSReq	ProtocolIE-ID ::= 57
id-PDUSessionResourceFailedToSetupListSUSRes	ProtocolIE-ID ::= 58
id-PDUSessionResourceHandoverList	ProtocolIE-ID ::= 59
id-PDUSessionResourceListCxtRelCpl	ProtocolIE-ID ::= 60
id-PDUSessionResourceListHORqd	ProtocolIE-ID ::= 61
id-PDUSessionResourceModifyListModCfm	ProtocolIE-ID ::= 62
id-PDUSessionResourceModifyListModInd	ProtocolIE-ID ::= 63
id-PDUSessionResourceModifyListModReq	ProtocolIE-ID ::= 64
id-PDUSessionResourceModifyListModRes	ProtocolIE-ID ::= 65
id-PDUSessionResourceNotifyList	ProtocolIE-ID ::= 66
id-PDUSessionResourceReleasedListNot	ProtocolIE-ID ::= 67
id-PDUSessionResourceReleasedListPSAck	ProtocolIE-ID ::= 68
id-PDUSessionResourceReleasedListPSFail	ProtocolIE-ID ::= 69
id-PDUSessionResourceReleasedListRelRes	ProtocolIE-ID ::= 70
id-PDUSessionResourceSetupListCxtReq	ProtocolIE-ID ::= 71
id-PDUSessionResourceSetupListCxtRes	ProtocolIE-ID ::= 72
id-PDUSessionResourceSetupListHOReq	ProtocolIE-ID ::= 73
id-PDUSessionResourceSetupListSUSReq	ProtocolIE-ID ::= 74
id-PDUSessionResourceSetupListSUSRes	ProtocolIE-ID ::= 75
id-PDUSessionResourceToBeSwitchedDLList	ProtocolIE-ID ::= 76
id-PDUSessionResourceSwitchedList	ProtocolIE-ID ::= 77
id-PDUSessionResourceToReleaseListHOCmd	ProtocolIE-ID ::= 78
id-PDUSessionResourceToReleaseListRelCmd	ProtocolIE-ID ::= 79
id-PLMNSupportList	ProtocolIE-ID ::= 80
id-PWSFailedCellIDList	ProtocolIE-ID ::= 81
id-RANNodeName	ProtocolIE-ID ::= 82
id-RANPagingPriority	ProtocolIE-ID ::= 83
id-RANStatusTransfer-TransparentContainer	ProtocolIE-ID ::= 84
id-RAN-UE-NGAP-ID	ProtocolIE-ID ::= 85
id-RelativeAMFCapacity	ProtocolIE-ID ::= 86
id-RepetitionPeriod	ProtocolIE-ID ::= 87
id-ResetType	ProtocolIE-ID ::= 88

id-RoutingID	ProtocolIE-ID ::= 89
id-RRCEstablishmentCause	ProtocolIE-ID ::= 90
id-RRCInactiveTransitionReportRequest	ProtocolIE-ID ::= 91
id-RRCState	ProtocolIE-ID ::= 92
id-SecurityContext	ProtocolIE-ID ::= 93
id-SecurityKey	ProtocolIE-ID ::= 94
id-SerialNumber	ProtocolIE-ID ::= 95
id-ServedGUAMIList	ProtocolIE-ID ::= 96
id-SliceSupportList	ProtocolIE-ID ::= 97
id-SONConfigurationTransferDL	ProtocolIE-ID ::= 98
id-SONConfigurationTransferUL	ProtocolIE-ID ::= 99
id-SourceAMF-UE-NGAP-ID	ProtocolIE-ID ::= 100
id-SourceToTarget-TransparentContainer	ProtocolIE-ID ::= 101
id-SupportedTAList	ProtocolIE-ID ::= 102
id-TAIListForPaging	ProtocolIE-ID ::= 103
id-TAIListForRestart	ProtocolIE-ID ::= 104
id-TargetID	ProtocolIE-ID ::= 105
id-TargetToSource-TransparentContainer	ProtocolIE-ID ::= 106
id-TimeToWait	ProtocolIE-ID ::= 107
id-TraceActivation	ProtocolIE-ID ::= 108
id-TraceCollectionEntityIPAddress	ProtocolIE-ID ::= 109
id-UEAggregateMaximumBitRate	ProtocolIE-ID ::= 110
id-UE-associatedLogicalNG-connectionList	ProtocolIE-ID ::= 111
id-UEContextRequest	ProtocolIE-ID ::= 112
id-UE-NGAP-IDs	ProtocolIE-ID ::= 114
id-UEPagingIdentity	ProtocolIE-ID ::= 115
id-UEPresenceInAreaOfInterestList	ProtocolIE-ID ::= 116
id-UERadioCapability	ProtocolIE-ID ::= 117
id-UERadioCapabilityForPaging	ProtocolIE-ID ::= 118
id-UESecurityCapabilities	ProtocolIE-ID ::= 119
id-UnavailableGUAMIList	ProtocolIE-ID ::= 120
id-UserLocationInformation	ProtocolIE-ID ::= 121
id-WarningAreaList	ProtocolIE-ID ::= 122
id-WarningMessageContents	ProtocolIE-ID ::= 123
id-WarningSecurityInfo	ProtocolIE-ID ::= 124
id-WarningType	ProtocolIE-ID ::= 125
id-AdditionalUL-NGU-UP-TNLInformation	ProtocolIE-ID ::= 126
id-DataForwardingNotPossible	ProtocolIE-ID ::= 127
id-DL-NGU-UP-TNLInformation	ProtocolIE-ID ::= 128
id-NetworkInstance	ProtocolIE-ID ::= 129
id-PDUSessionAggregateMaximumBitRate	ProtocolIE-ID ::= 130
id-PDUSessionResourceFailedToModifyListModCfm	ProtocolIE-ID ::= 131
id-PDUSessionResourceFailedToSetupListCxtFail	ProtocolIE-ID ::= 132
id-PDUSessionResourceListCxtRelReq	ProtocolIE-ID ::= 133
id-PDUSessionType	ProtocolIE-ID ::= 134
id-QosFlowAddOrModifyRequestList	ProtocolIE-ID ::= 135
id-QosFlowSetupRequestList	ProtocolIE-ID ::= 136
id-QosFlowToReleaseList	ProtocolIE-ID ::= 137
id-SecurityIndication	ProtocolIE-ID ::= 138
id-UL-NGU-UP-TNLInformation	ProtocolIE-ID ::= 139
id-UL-NGU-UP-TNLModifyList	ProtocolIE-ID ::= 140
id-WarningAreaCoordinates	ProtocolIE-ID ::= 141
id-PDUSessionResourceSecondaryRATUsageList	ProtocolIE-ID ::= 142
id-HandoverFlag	ProtocolIE-ID ::= 143

id-SecondaryRATUsageInformation	ProtocolIE-ID ::= 144
id-PDUSessionResourceReleaseResponseTransfer	ProtocolIE-ID ::= 145
id-RedirectionVoiceFallback	ProtocolIE-ID ::= 146
id-UERetentionInformation	ProtocolIE-ID ::= 147
id-S-NSSAI	ProtocolIE-ID ::= 148
id-PSCellInformation	ProtocolIE-ID ::= 149
id-LastEUTRAN-PLMNIdentity	ProtocolIE-ID ::= 150
id-MaximumIntegrityProtectedDataRate-DL	ProtocolIE-ID ::= 151
id-AdditionalDLForwardingUPTNLInformation	ProtocolIE-ID ::= 152
id-AdditionalDLUPTNLInformationForHOList	ProtocolIE-ID ::= 153
id-AdditionalNGU-UP-TNLInformation	ProtocolIE-ID ::= 154
id-AdditionalDLQoSFlowPerTNLInformation	ProtocolIE-ID ::= 155
id-SecurityResult	ProtocolIE-ID ::= 156
id-ENDC-SONConfigurationTransferDL	ProtocolIE-ID ::= 157
id-ENDC-SONConfigurationTransferUL	ProtocolIE-ID ::= 158
id-OldAssociatedQoSFlowList-ULendmarkerexpected	ProtocolIE-ID ::= 159
id-CNTypeRestrictionsForEquivalent	ProtocolIE-ID ::= 160
id-CNTypeRestrictionsForServing	ProtocolIE-ID ::= 161
id-NewGUAMI	ProtocolIE-ID ::= 162
id-ULForwarding	ProtocolIE-ID ::= 163
id-ULForwardingUP-TNLInformation	ProtocolIE-ID ::= 164
id-CNAssistedRANTuning	ProtocolIE-ID ::= 165
id-CommonNetworkInstance	ProtocolIE-ID ::= 166
id-NGRAN-TNLAssociationToRemoveList	ProtocolIE-ID ::= 167
id-TNLAssociationTransportLayerAddressNGRAN	ProtocolIE-ID ::= 168
id-EndpointIPAddressAndPort	ProtocolIE-ID ::= 169
id-LocationReportingAdditionalInfo	ProtocolIE-ID ::= 170
id-SourceToTarget-AMFInformationReroute	ProtocolIE-ID ::= 171
id-AdditionalULForwardingUPTNLInformation	ProtocolIE-ID ::= 172
id-SCTP-TLAs	ProtocolIE-ID ::= 173
id-SelectedPLMNIdentity	ProtocolIE-ID ::= 174

END
-- ASN1STOP

9.4.8 Container Definitions

```
-- ASN1START
-- *****
--
-- 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
-- ASN1STOP
```

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

$T_{NG_{RELOCprep}}$

- Specifies the maximum time for the Handover Preparation procedure in the source NG-RAN node.

$T_{NG_{RELOCoverall}}$

- Specifies the maximum time for the protection of the overall handover procedure in the source NG-RAN node.

$T_{Xn_{RELOCoverall}}$

- 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:

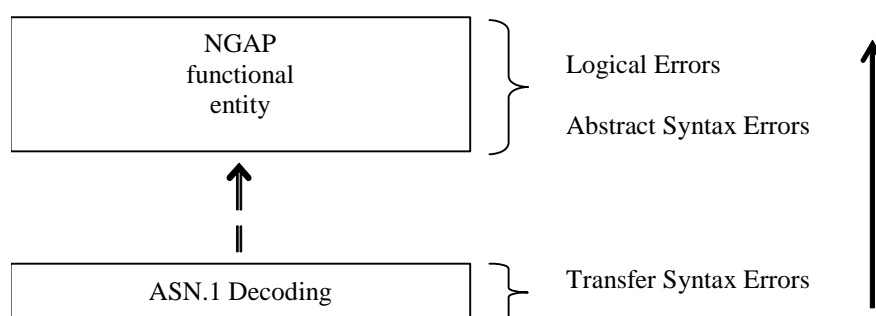


Figure 10.1-1: Protocol Errors in NGAP.

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 first returned message that includes an unknown local AP ID, the receiving node shall initiate an Error Indication procedure with inclusion of the received AP IDs from the peer node and an appropriate cause value. Both nodes shall initiate a local release of any established UE-associated logical connection (for the same NG interface) having these AP IDs as local or remote identifier.

If a node receives a message (other than the first or first returned messages) including an erroneous AP ID that is either 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 as either the 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) having the erroneous AP ID as either the local or remote identifier.

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
2018-09	RAN#81	RP-181922	0001	2	F	NR Corrections (38.413 Baseline CR covering RAN3-101 agreements)	15.1.0
2018-12	RAN#82	RP-182448	0003	2	F	Baseline CR for TS 38.413	15.2.0
2019-03	RAN#83	RP-190556	0005	3	F	NGAP Corrections for UP Security Handling in DC during PDU Session Lifetime	15.3.0
2019-03	RAN#83	RP-190555	0008	2	F	Separate UL/DL limits for UE's maximum IP rate	15.3.0
2019-03	RAN#83	RP-190554	0009	1	F	Data volume reporting for MR-DC with 5GC	15.3.0
2019-03	RAN#83	RP-190554	0010	3	F	Correction of PDU Session split at handover	15.3.0
2019-03	RAN#83	RP-190556	0011	1	F	Correction of EPS Voice Fallback	15.3.0
2019-03	RAN#83	RP-190556	0012	-	F	Correction of slice support over NG	15.3.0
2019-03	RAN#83	RP-190556	0014	1	F	Rapporteur updates for TS 38.413	15.3.0
2019-03	RAN#83	RP-190556	0015	-	F	Correction of User Location Information IE presence in HANDOVER NOTIFY	15.3.0
2019-03	RAN#83	RP-190556	0019	1	F	Correction to RRC state report	15.3.0
2019-03	RAN#83	RP-190555	0021	-	F	Support of RAN initiated multiple SCTP associations	15.3.0
2019-03	RAN#83	RP-190556	0023	-	F	Corrections on RAN/AMF Configuration Update	15.3.0
2019-03	RAN#83	RP-190556	0024	2	F	Correction of EPC interworking	15.3.0
2019-03	RAN#83	RP-190556	0025	1	F	Correction of Emergency Fallback	15.3.0
2019-03	RAN#83	RP-190202	0027	3	F	Transfer of the PSCell information to Core Network	15.3.0
2019-03	RAN#83	RP-190558	0028	1	F	Release due to pre-emption	15.3.0
2019-03	RAN#83	RP-190558	0029	-	F	Handling of APID for the first returned message	15.3.0
2019-03	RAN#83	RP-190556	0037	-	F	Clarification on the usage of TNL information	15.3.0
2019-03	RAN#83	RP-190556	0044	1	F	NG Setup Correction and UE context retention	15.3.0
2019-03	RAN#83	RP-190556	0045	1	F	UE AMBR handling in PDU Session Resource Setup procedure	15.3.0
2019-03	RAN#83	RP-190556	0046	1	F	Remove the second tunnel in the PDU session split, 5GC initiated	15.3.0
2019-03	RAN#83	RP-190556	0048	1	F	When NG-RAN node fails to set up a QoS flow for IMS voice	15.3.0
2019-03	RAN#83	RP-190556	0052	-	F	Correction of ASN.1 for PDU Session Resource Modify Response	15.3.0
2019-03	RAN#83	RP-190556	0053	1	F	Cause value in RRC fallback case	15.3.0
2019-03	RAN#83	RP-190556	0058	2	F	S-NSSAI update during EPS to 5GS handover	15.3.0
2019-03	RAN#83	RP-190561	0064	1	F	Introduction of TNL Address discovery for EN-DC (using new container)	15.3.0
2019-03	RAN#83	RP-190200	0066	-	F	Correction of ASN.1 for SON Configuration Transfer and PDU Session Resource Modify Request Transfer	15.3.0
2019-07	RAN#84	RP-191394	0099	1	F	Rapporteur updates for TS 38.413	15.4.0
2019-07	RP-84	RP-191397	0041	2	F	Support of ongoing re-mapping on source side during SDAP mobility	15.4.0
2019-07	RP-84	RP-191397	0067	1	F	NGAP Further Clarification of S-NSSAI Update for EPS to 5GS HO	15.4.0
2019-07	RP-84	RP-191394	0071	-	F	CR38413 for Clarification on PDU Session resource modify	15.4.0
2019-07	RP-84	RP-191397	0075	1	F	Correction of Core Network Type Restrictions	15.4.0
2019-07	RP-84	RP-191394	0077	1	F	Correction of PDU Session Release	15.4.0
2019-07	RP-84	RP-191395	0084	2	F	Removal of multiple SCTP associations PS: This CR was not implemented as it was not based on the latest version of the spec.	15.4.0
2019-07	RP-84	RP-191394	0095		F	Correction on Error Indication procedure	15.4.0
2019-07	RP-84	RP-191394	0096		F	Location Report Request Type	15.4.0
2019-07	RP-84	RP-191394	0101	2	F	GUAMI update in case of AMF change	15.4.0
2019-07	RP-84	RP-191397	0102	2	F	Data forwarding and QoS flow remapping	15.4.0
2019-07	RP-84	RP-191397	0111	1	F	Correction of CN Assistance Information	15.4.0
2019-07	RP-84	RP-191397	0112		F	Correction of Network Instance	15.4.0
2019-07	RP-84	RP-191394	0117	1	F	Correction of AMF UE NGAP ID	15.4.0
2019-07	RP-84	RP-191394	0130	1	F	Adding PSCell to the User Location Information	15.4.0
2019-07	RP-84	RP-191394	0135		F	Correction on Handover Command message	15.4.0
2019-07	RP-84	RP-191394	0148		F	Correction of duplicated descriptions on additional UL tunnel information	15.4.0
2019-09	RP-85	RP-192167	0084	4	F	Removal of multiple SCTP associations	15.5.0

2019-09	RP-85	RP-192166	0161	2	F	Correction of secured signalling connection	15.5.0
2019-09	RP-85	RP-192167	0178	1	F	PDU Session fail in Path Switch Request procedure	15.5.0
2019-09	RP-85	RP-192167	0195	2	F	Reroute NSSF provided information	15.5.0
2019-09	RP-85	RP-192166	0199		F	Correction of Handover Command message	15.5.0
2019-09	RP-85	RP-192167	0220	1	F	NGAP correction of Initial Context Setup procedure text	15.5.0
2019-09	RP-85	RP-192167	0226	1	F	Rapporteur cleanup of IE semantics descriptions	15.5.0
2019-12	RP-86	RP-192915	0256	1	F	Correction of NAS transparent container	15.6.0
2019-12	RP-86	RP-192915	0258	1	F	Missing procedural texts for NG interface	15.6.0
2019-12	RP-86	RP-192915	0261		F	Correction of Handover Command	15.6.0
2019-12	RP-86	RP-192915	0262	1	F	Correction of S-NSSAI coding	15.6.0
2019-12	RP-86	RP-192916	0269	1	F	Correction of Port Number IE in tabular	15.6.0
2019-12	RP-86	RP-192915	0276	2	F	Enable inclusion of the Backup AMF Name IE	15.6.0
2019-12	RP-86	RP-192916	0281		F	Correction of NG Handover	15.6.0
2019-12	RP-86	RP-192896	0286	3	F	Addition of abnormal cases for location report procedure	15.6.0
2019-12	RP-86	RP-192916	0300	2	F	CR to 38.413 on clarifications to Xn TNL Configuration Info	15.6.0
2019-12	RP-86	RP-192916	0303		F	CR for Clarification on purpose of path switch request	15.6.0
2019-12	RP-86	RP-193055	0304	-	F	Correction of Xn TNL Configuration Info	15.6.0
2020-03	RP-87-e	RP-200428	0316		F	Correction of Warning Security Information in ETWS primary notification	15.7.0
2020-03	RP-87-e	RP-200429	0318		F	Correction of tabular for Xn TNL Configuration Info	15.7.0
2020-03	RP-87-e	RP-200428	0334		F	Correction of RAN paging priority	15.7.0
2020-03	RP-87-e	RP-200428	0336	1	F	PDU session resource in UE context release	15.7.0
2020-07	RP-88-e	RP-201091	0356	2	F	Clarification the usage of the New AMF UE NGAP ID included in the UE CONTEXT MODIFICATION REQUEST message	15.8.0
2020-07	RP-88-e	RP-201091	0370	1	F	Correction of Revoke E-RAB ID	15.8.0
2020-07	RP-88-e	RP-201334	0378	2	F	Correction on AS rekeying handling	15.8.0
2020-07	RP-88-e	RP-201090	0388	3	F	Correction to PDU SESSION RESOURCE MODIFY CONFIRM	15.8.0
2020-07	RP-88-e	RP-201092	0391	1	F	Selected PLMN ID for untrusted non-3GPP access	15.8.0
2020-07	RP-88-e	RP-201090	0394	2	F	Correction on PDU Session Resource Modification Procedures	15.8.0
2020-09	RP-89-e	RP-201955	0442	1	F	Failure case of user location report	15.9.0
2020-09	RP-89-e	RP-201955	0444	1	F	Multiple location reporting requests and report	15.9.0
2020-12	RP-90-e	RP-202315	0504	1	F	Clarification on an abnormal condition in PDU Session Resource Modify Procedure	15.10.0
2021-03	RP-91-e	RP-210239	0354	5	F	Clarification of AS re-keying in the UE Context Modification procedure	15.11.0

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