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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Contents

Foreword

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

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

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1 Scope

The present document specifies the radio network layer signalling protocol called Radio Access Network Application Part (RANAP) for the Iu interface. RANAP supports the functions of Iu interface by signalling procedures defined in this document. RANAP is developed in accordance to the general principles stated in [1], [2] and [3].

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply".

- For a non-specific reference, the latest version applies".

[1]   UMTS 23.930: "3rd Generation Partnership Project (3GPP) Technical Specification Group Services and System Aspects; Iu Principles".

[2]   UMTS 25.410: "3rd Generation Partnership Project (3GPP) Technical Specification Group Radio Access Network; UTRAN Iu Interface: General Aspects and Principles".

[3]   UMTS 25.401: "3rd Generation Partnership Project (3GPP) Technical Specification Group Radio Access Network; UTRAN Overall Description".

[4]   UMTS 25.931: "3rd Generation Partnership Project (3GPP) Technical Specification Group Radio Access Network; UTRAN Functions, Examples on Signalling Procedures".

[5]   UMTS 25.412: "3rd Generation Partnership Project (3GPP) Technical Specification Group Radio Access Network; UTRAN Iu Interface Signalling Transport".

[6]   UMTS 25.415: "3rd Generation Partnership Project (3GPP) Technical Specification Group Radio Access Network; UTRAN Iu Interface User Plane Protocols".

[7]   UMTS 23.107: "3rd Generation Partnership Project (3GPP) Technical Specification Group Services and System Aspects; QoS Concept and Architecture".

[8]   UMTS 24.008: "3rd Generation Partnership Project (3GPP); Mobile radio interface layer 3 specification, Core Network Protocols – Stage 3".

[9]   UMTS 25.414: "3rd Generation Partnership Project (3GPP) Technical Specification Group Radio Access Network; Iu Interface Data Transport and Transport Signalling".

[10]   UMTS 25.331: "3rd Generation Partnership Project (3GPP) Technical Specification Group Radio Access Network; RRC Protocol Specification".

[11]   GSM 08.08: "Mobile services Switching Centre – Base Station System (MSC – BSS) interface".

[12]   GSM 12.08: "Subscriber and equipment trace".

[13]   X.691 (12/94): "Information Technology - ASN.1 encoding rules - Specification of Packed Encoding Rules (PER)".

[14]   X.680, (12/94): "Information Technology - Abstract Syntax Notation One (ASN.1):Specification of basic notation".

[15]   X.681 (12/94): "Information Technology - Abstract Syntax Notation One (ASN.1): Information object specification".

[16]   UMTS 23.110: "3rd Generation Partnership Project (3GPP) Technical Specification Group Services and System Aspects, UMTS Access Stratum, Services and Functions".

[17]   UMTS 25.323: "3rd Generation Partnership Project (3GPP) Technical Specification Group Radio Access Network; Packet Data Convergence Protocol (PDCP) Specification".

3   Definitions, symbols and abbreviations

3.1   Definitions

For the purposes of the present document, the following terms and definitions apply.

Relocation of SRNS: relocation of SRNS is a UMTS functionality used to relocate the serving RNS role from one RNS to another RNS. This UMTS functionality is realised by several elementary procedures executed in several interfaces and by several protocols and it may involve a change in the radio resources used between UTRAN and UE

It is also possible to relocate the serving RNS role from:

-    one RNS within UMTS to another relocation target external to UMTS;

-    functionality equivalent to the serving RNS role from another relocation source external to UMTS to another RNS.

Serving RNS (SRNS): role an RNS can take with respect to a specific connection between an UE and UTRAN. There is one Serving RNS for each UE that has a connection to UTRAN. The Serving RNS is in charge of the radio connection between a UE and the UTRAN. The Serving RNS terminates the Iu for this UE

Serving RNC (SRNC): SRNC is the RNC belonging to SRNS

SRNC-ID: see [3] for definition

S-RNTI: see [3] for definition

Source RNS: role, with respect to a specific connection between UTRAN and CN, that RNS takes when it decides to initiate a relocation of SRNS

Source RNC: source RNC is the RNC belonging to source RNS

Target RNS: role an RNS gets with respect to a specific connection between UTRAN and CN when it is being a subject of a relocation of SRNS which is being made towards that RNS

Target RNC: target RNC is the RNC belonging to target RNS

Elementary Procedure: RANAP protocol consists of Elementary Procedures (EPs). An Elementary Procedure is a unit of interaction between the RNS and the CN. These Elementary Procedures are defined separately and are intended to be used to build up complete sequences in a flexible manner. If the independence between some EPs is restricted, it is described under the relevant EP description. Unless otherwise stated by the restrictions, the EPs may be invoked independently of each other as stand alone procedures, which can be active in parallel

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

-    **Class 1:** Elementary Procedures with response (success and/or failure).

-    **Class 2:** Elementary Procedures without response.

-    **Class 3:** Elementary Procedures with possibility of multiple responses.

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.

Class 2 EPs are considered always successful.

Class 3 EPs have one or several response messages reporting both successful, unsuccessful outcome of the requests and temporary status information about the requests. This type of EP only terminates through response(s) or EP timer expiry.

3.2   Symbols

Void.

3.3   Abbreviations

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

AAL2	ATM Adaptation Layer type 2
AS	Access Stratum
ASN.1	Abstract Syntax Notation One
ATM	Asynchronous Transfer Mode
CC	Call Control
CN	Core Network
CRNC	Controlling RNC
CS	Circuit Switched
DRNC	Drift RNC
DRNS	Drift RNS
EP	Elementary Procedure
IMEI	International Mobile Equipment Identity
IMSI	Internation Mobile Subscriber Identity
IPv4	Internet Protocol (version 4)
IPv6	Internet Protocol (version 6)
MM	Mobility Management
MSC	Mobile services Switching Center
NAS	Non Access Stratum
N-PDU	Network – Protocol Data Unit
OSP:IHOSS	Octet Stream Protocol: Internet-Hosted Octet Stream Service
P-TMSI	Packet TMSI
PDCP	Packet Data Convergence Protocol
PDU	Protocol Data Unit
PPP	Point-to-Point ProtocolF
PS	Packet Switched
QoS	Quality of Service
RAB	Radio Access Bearer
RANAP	Radio Access Network Application Part
RNC	Radio Network Controller
RNS	Radio Network Subsystem
RRC	Radio Resource Control
SAI	Service Area Identifier
SCCP	Signalling Connection Control Part
SDU	Service Data Unit
SGSN	Serving GPRS Support Node
SRNC	Serving RNC
SRNS	Serving RNS

TEID	Tunnel Endpoint Identifier
TMSI	Temporary Mobile Subscriber Identity
UE	User Equipment
UTRAN	UMTS Terrestrial Radio Access Network

4 General

4.1 Procedure Specification Principles

The principle for specifying the procedure logic is to specify the functional behaviour of the RNC exactly and completely. The CN functional behaviour is left unspecified. The EPs Relocation Preparation, Reset and Overload Control are exceptions from this principle.

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. RAB Assignment 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. RAB ASSIGNMENT REQUEST message.
IE	When referring to an information element (IE) in the specification the *Information Element Name* is written with the first letters in each word in upper case characters and all letters in Italic font followed by the abbreviation "IE", e.g. *User Plane Mode* 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. "Abstract Syntax Error (Reject)" or "Geographical Coordinates ".

5 RANAP Services

RANAP provides the signalling service between UTRAN and CN that is required to fulfil the RANAP functions described in clause 7. RANAP services are divided into three groups based on Service Access Points (SAP) defined in UMTS TS 23.110 [16]:

1. General control services: They are related to the whole Iu interface instance between RNC and logical CN domain, and are accessed in CN through the General Control SAP. They utilise connection-less signalling transport provided by the Iu signalling bearer.

2. Notification services: They are related to specified UEs or all UEs in specified area, and are accessed in CN through the Notification SAP. They utilise connection-less signalling transport provided by the Iu signalling bearer.

3. Dedicated control services: They are related to one UE, and are accessed in CN through the Dedicated Control SAP. RANAP functions that provide these services are associated with Iu signalling connection that is maintained for the UE in question. The Iu signalling connection is realised with connection-oriented signalling transport provided by the Iu signalling bearer.

6   Services Expected from Signalling Transport

Signalling transport shall provide two different service modes for the RANAP.

1. Connection oriented data transfer service. This service is supported by a signalling connection between RNC and CN domain. It shall be possible to dynamically establish and release signalling connections based on the need. Each active UE shall have its own signalling connection. The signalling connection shall provide in sequence delivery of RANAP messages. RANAP shall be notified if the signalling connection breaks.

2. Connectionless data transfer service. RANAP shall be notified in case a RANAP message did not reach the intended peer RANAP entity.

7   Functions of RANAP

RANAP protocol has the following functions:

- Relocating serving RNC. This function enables to change the serving RNC functionality as well as the related Iu resources (RAB(s) and Signalling connection) from one RNC to another.

- Overall RAB management. This function is responsible for setting up, modifying and releasing RABs.

- Queuing the setup of RAB. The purpose of this function is to allow placing some requested RABs into a queue, and indicate the peer entity about the queuing.

- Requesting RAB release. While the overall RAB management is a function of the CN, the UTRAN has the capability to request the release of RAB.

- Release of all Iu connection resources. This function is used to explicitly release all resources related to one Iu connection.

- Requesting the release of all Iu connection resources. While the Iu release is managed from the CN, the UTRAN has the capability to request the release of all Iu connection resources from the corresponding Iu connection.

- SRNS context forwarding function. This function is responsible for transferring SRNS context from the RNC to the CN for intersystem forward handover in case of packet forwarding.

- Controlling overload in the Iu interface. This function allows adjusting the load in the Iu interface.

- Resetting the Iu. This function is used for resetting an Iu interface.

- Sending the UE Common ID (permanent NAS UE identity) to the RNC. This function makes the RNC aware of the UE's Common ID.

- Paging the user. This function provides the CN for capability to page the UE.

- Controlling the tracing of the UE activity. This function allows setting the trace mode for a given UE. This function also allows the deactivation of a previously established trace.

- Transport of NAS information between UE and CN (ref. [8]). This function has three sub-classes:

1. Transport of the initial NAS signalling message from the UE to CN. This function transfers transparently the NAS information. As a consequence also the Iu signalling connection is set up.

2. Transport of NAS signalling messages between UE and CN, This function transfers transparently the NAS signalling messages on the existing Iu signalling connection. It also includes a specific service to handle signalling messages differently.

3. Transport of NAS information to be broadcasted to UEs. This function allows setting the NAS information to be broadcasted to the UEs from the CN.

- Controlling the security mode in the UTRAN. This function is used to send the security keys (ciphering and integrity protection) to the UTRAN, and setting the operation mode for security functions.

- Controlling location reporting. This function allows the CN to operate the mode in which the UTRAN reports the location of the UE.

- Location reporting. This function is used for transferring the actual location information from RNC to the CN.

- Data volume reporting function. This function is responsible for reporting unsuccessfully transmitted DL data volume over UTRAN for specific RABs.

- Reporting general error situations. This function allows reporting of general error situations, for which function specific error messages have not been defined.

These functions are implemented by one or several RANAP elementary procedures described in the following clause.

8   RANAP Procedures

8.1   Elementary Procedures

In the following tables, all EPs are divided into Class 1, Class 2 and Class 3 EPs (see subclause 3.1 for explanation of the different classes):

Table 1: Class 1

Elementary Procedure	Initiating Message	Successful Outcome	Unsuccessful Outcome
		Response message	Response message
Iu Release	IU RELEASE COMMAND	IU RELEASE COMPLETE	
Relocation Preparation	RELOCATION REQUIRED	RELOCATION COMMAND	RELOCATION PREPARATION FAILURE
Relocation Resource Allocation	RELOCATION REQUEST	RELOCATION REQUEST ACKNOWLEDGE	RELOCATION FAILURE
Relocation Cancel	RELOCATION CANCEL	RELOCATION CANCEL ACKNOWLEDGE	
SRNS Context Transfer	SRNS CONTEXT REQUEST	SRNS CONTEXT RESPONSE	
Security Mode Control	SECURITY MODE COMMAND	SECURITY MODE COMPLETE	SECURITY MODE REJECT
Data Volume Report	DATA VOLUME REPORT REQUEST	DATA VOLUME REPORT	
Cn Information Broadcast	CN INFORMATION BROADCAST REQUEST	CN INFORMATION BROADCAST CONFIRM	CN INFORMATION BROADCAST REJECT
Reset	RESET	RESET ACKNOWLEDGE	
Reset resource	RESET RESOURCE	RESET RESOURCE ACKNOWLEDGE	

Table 2: Class 2

Elementary Procedure	Message
RAB Release Request	RAB RELEASE REQUEST
Iu Release Request	IU RELEASE REQUEST
Relocation Detect	RELOCATION DETECT
Relocation Complete	RELOCATION COMPLETE
SRNS Data Forwarding Initiation	SRNS DATA FORWARD COMMAND
SRNS Context Forwarding from Source RNC to CN	FORWARD SRNS CONTEXT
SRNS Data Forwarding to Target RNC from CN	FORWARD SRNS CONTEXT
Paging	PAGING
Common ID	COMMON ID
CN Invoke Trace	CN INVOKE TRACE
CN Deactivate Trace	CN DEACTIVATE TRACE
Location Reporting Control	LOCATION REPORTING CONTROL
Location Report	LOCATION REPORT
Initial UE Message	INITIAL UE MESSAGE
Direct Transfer	DIRECT TRANSFER
Overload Control	OVERLOAD
Error Indication	ERROR INDICATION

Table 3: Class 3

Elementary Procedure	Initiating Message	Respone Message
RAB Assignment	RAB ASSIGNMENT REQUEST	RAB ASSIGNMENT RESPONSE x N (N>=1)

The following applies concerning interference between Elementary Procedures:

- The Reset procedure takes precedence over all other EPs.

- The Iu Release procedure takes precedence over all other EPs except the Reset procedure.

8.2 RAB Assignment

8.2.1 General

The purpose of the RAB Assignment procedure is to enable modifications and/or releases of already established RABs and/or the establishment of new RABs for a given UE. The procedure uses connection oriented signalling.

8.2.2 Successful Operation

* it can be several responses
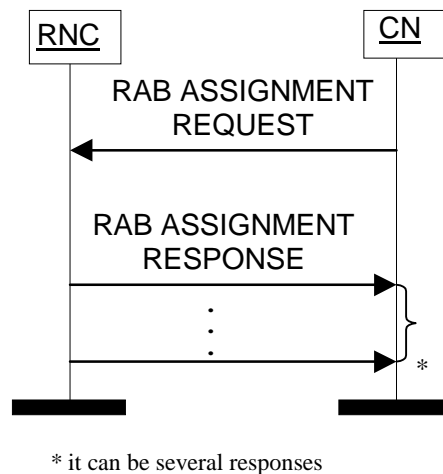
Figure 1: RAB Assignment procedure

The CN shall initiate the procedure by sending a RAB ASSIGNMENT REQUEST message. When sending the RAB ASSIGNMENT REQUEST, the CN shall start the T $_{RABAssgt}$ timer.

The CN may request UTRAN to:

- establish;

- modify;

- release.

One or several RABs with one RAB ASSIGNMENT REQUEST message.

The message shall contain the information required by the UTRAN to build the new RAB configuration, such as:

- list of RABs to establish or modify with their bearer characteristics;

- list of RABs to release.

For each RAB requested to establish or modify, the message shall contain:

- RAB ID.

- RAB parameters (including e.g. Allocation/Retention Priority).

- Data Volume Reporting Indication (only for PS).

- User Plane Mode.

- UP Mode Versions.

- PDP Type Information (only for PS)

- Transport Layer Address.

- Iu Transport Association.

- DL GTP-PDU sequence number (only in case of handover from GPRS to UMTS or when establishing a RAB for an existing PDP context).

- UL GTP-PDU sequence number (only in case of handover from GPRS to UMTS or when establishing a RAB for an existing PDP context).

- DL N-PDU sequence number (only in case of handover from GPRS to UMTS).

- UL N-PDU sequence number (only in case of handover from GPRS to UMTS).

For each RAB request to release, the message shall contain:

- RAB ID.

- Cause.

Upon reception of the RAB ASSIGNMENT REQUEST message UTRAN shall execute the requested RAB configuration.

The RAB ID shall identify uniquely the RAB for the specific CN domain for the particular UE, which makes the RAB ID unique over the Iu connection on which the RAB ASSIGNMENT REQUEST message is received. When a RAB ID already in use over that particular Iu instance is used, the procedure is considered as modification of that RAB.

The RNC shall be prepared to receive a RAB ASSIGNMENT REQUEST message containing a *RABs to be released* IE at any time and shall always reply to it. If there is an ongoing RAB Assignment procedure for a RAB indicated within the *RABs to be released* IE, the RNC shall discard the preceding RAB Assignment procedure for that specific RAB, release any related resources and report the released RAB within the RAB ASSIGNMENT RESPONSE message.

The RNC shall pass the contents of *RAB ID* IE to the radio interface protocol for each RAB requested to establish or modify.

The RNC shall establish or modify the resources according to the values of the *Allocation/Retention Priority* IE (priority level, pre-emption indicators, queuing) and the resource situation as follows:

- The RNC shall consider the priority level of the requested RAB, when deciding on the resource allocation.

- If the requested RAB is allowed for queuing and the resource situation so requires, RNC may place the RAB in the establishment queue.

- The priority levels and the pre-emption indicators may (singularly or in combination) be used to determine whether the RAB assignment has to be performed unconditionally and immediately. If the requested RAB is allowed to pre-empt and the resource situation so requires, RNC may trigger the pre-emption procedure which may then cause the forced release of a lower priority RAB vulnerable for pre-emption. Whilst the process and the extent of the pre-emption procedure is operator dependent, the pre-emption indicators, if given in the RAB ASSIGNMENT REQUEST, shall be treated as follows:

  1. The values of the last received *Pre-emption Vulnerability IE* and *Priority Level* IEshall prevail.

  2. If the *Pre-emption Capability* IE is set to "can trigger pre-emption", then this allocation request may trigger the pre-emption procedure.

  3. If the *Pre-emption Capability* IE is set to "cannot trigger pre-emption", then this allocation request may not trigger the pre-emption procedure.

  4. If the *Pre-emption Vulnerability* IE is set to "vulnerable to pre-emption", then this connection shall be included in the pre-emption process.

  5. If the *Pre-emption Vulnerability* IE is set to "not vulnerable to pre-emption", then this connection shall not be included in the pre-emption process.

  6. If the *Priority Level* IE is set to "no priority used" the given values for the *Pre-emption Capability*IE and *Pre-emption Vulnerability* IE shall not be considered. Instead the values "cannot trigger pre-emption" and "not vulnerable to pre-emption" shall prevail.

- If the *Allocation/Retention Priority* IE is not given in the RAB ASSIGNMENT REQUEST message, the allocation request shall not trigger the pre-emption process and the connection shall be vulnerable to pre-emption and considered to have the value "lowest" as priority level. Moreover, queuing shall not be allowed.

- The UTRAN pre-emption process shall keep the following rules:

  1. UTRAN shall only pre-empt RABs with lower priority, in ascending order of priority.

  2. The pre-emption can be done for RABs belonging to the same UE or to other UEs.

If the RAB ASSIGNMENT REQUEST message includes the *PDP Type Information* IE, the UTRAN may use this to configure any compression algorithms.

UTRAN shall report to CN, in the first RAB ASSIGNMENT RESPONSE message, the result for all the requested RABs, such as:

- List of RABs successfully established.

- List of RABs successfully modified RABs.

- List of RABs released.

- List of RABs failed to establish or modify or release.

- List of RABs queued.

If the RAB ID of a RAB requested to be released is unknown in the RNC, this shall be reported as a RAB failed to release with the cause value "Invalid RAB ID".

If the *NAS Synchronisation Indicator* IE is contained in the RAB ASSIGNMENT REQUEST message, the RNC shall pass it to the radio interface protocol for the transfer to the UE.

In case a request to modify or release a RAB contains the RAB ID of a RAB being queued, the RAB shall be taken out of the queue and treated according to the second request. The first request shall be responded to as a RAB failed to setup or modify with the cause value "Request superseded".

If none of the RABs have been queued, the CN shall stop timer $T_{RABAssgt.}$ And the RAB Assignment procedure terminates. In that case, the procedure shall also be terminated in UTRAN.

When the request to establish or modify one or several RABs is put in the queue, UTRAN shall start the timer $T_{QUEUING}$. This timer specifies the maximum time for queuing of the request of establishment or modification. The same timer $T_{QUEUING}$ is supervising all RABs being queued.

For each RAB that is queued the following outcomes shall be possible:

- successfully established or modified;

- failed to establish or modify;

- failed due to expiry of the timer $T_{QUEUING}$.

For the queued RABs, indicated in the first RAB ASSIGNMENT RESPONSE message, UTRAN shall report the outcome of the queuing for every RAB individually or for several RABs in subsequent RAB ASSIGNMENT RESPONSE message(s). This is left to implementation. UTRAN shall stop $T_{QUEUING}$ when all RABs have been either successfully established or modified or failed to establish or modify. The RAB Assignment procedure is then terminated both in CN and UTRAN when all RABs have been responded to.

When CN receives the response that one or several RABs are queued, CN shall expect UTRAN to provide the outcome of the queuing function for each RAB before expiry of the $T_{RABAssgt}$ timer. In case the timer $T_{RABAssgt}$ expires, the CN shall consider the RAB Assignment procedure terminated and the not reported RABs shall be considered as failed.

In the case the timer $T_{QUEUING}$ expires, the RAB Assignment procedure terminates in UTRAN for all queued RABs, and UTRAN shall respond for all of them in one RAB ASSIGNMENT RESPONSE message. The RAB Assignment procedure shall also be terminated in CN.

UTRAN shall report the outcome of a specific RAB to establish or modify only after the transport network control plane signalling, which is needed for RAB establishment or modification, has been executed. The transport network control plane signalling shall use the *Transport Layer Address* IE and *Iu Transport Association* IE.

After reporting the outcome of a specific RAB to establish or modify, the RNC shall initiate the user plane mode as requested by the CN in the *User Plane Mode* IE. This initialisation is described in ref.[6].

When UTRAN reports unsuccessful modification of RAB configuration the cause value should be precise enough to enable the core network to know the reason for unsuccessful modification. Typical cause values are: "Requested Traffic Class not Available", "Invalid RAB Parameters Value", "Requested Maximum Bit Rate not Available", "Requested Maximum Bit Rate for DL not Available", "Requested Maximum Bit Rate for UL not Available", "Requested

Guaranteed Bit Rate not Available", "Requested Guaranteed Bit Rate for DL not Available", "Requested Guaranteed Bit Rate for UL not Available", "Requested Transfer Delay not Achievable", "Invalid RAB Parameters Combination", "Condition Violation for SDU Parameters", "Condition Violation for Traffic Handling Priority", "Condition Violation for Guaranteed Bit Rate", "User Plane Versions not Supported", "Iu UP Failure".

8.2.3 Unsuccessful Operation

The unsuccessful operation for this Class 3 Elementary procedure is described under the Successful Operation chapter.

8.2.4 Abnormal Conditions

Interactions with Relocation Preparation:

If the relocation becomes absolutely necessary during the RAB Assignment in order to keep the communication with the UE, the RNC may interrupt the ongoing RAB Assignment procedure and initiate the Relocation Preparation procedure as follows:

1. The RNC shall terminate the RAB Assignment procedure indicating unsuccessful RAB configuration modification:

    - for all queued RABs;

    - for RABs not already established or modified, and

    - for RABs not already released;

    with the cause "Relocation triggered".

2. The RNC shall terminate the RAB Assignment procedure indicating successful RAB configuration modification:

    - for RABs already established or modified but not yet reported to the CN, and

    - for RABs already released but not yet reported to the CN.

3. The RNC shall report this outcome of the procedure in one RAB ASSIGNMENT RESPONSE message.

4. The RNC shall invoke relocation by sending the RELOCATION REQUIRED to the active CN node(s).

5. The CN shall terminate the RAB Assignment procedure at reception of the RAB ASSIGNMENT RESPONSE message.

8.3 RAB Release Request

8.3.1 General

The purpose of the RAB Release Request procedure is to enable UTRAN to request the release of one or several radio access bearers. The procedure uses connection oriented signalling.

8.3.2 Successful Operation
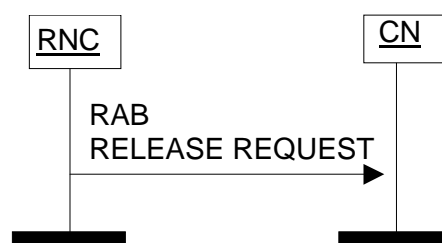
Figure 2: RAB Release Request procedure. Successful Operation

The RNC shall initiate the procedure by generating a RAB RELEASE REQUEST message towards the CN. The *RABs to be released* IE shall indicate the list of RABs requested to release and the *Cause* IE associated to each RAB shall indicate the reason for the release, e.g. "RAB pre-empted".

Upon reception of the RAB RELEASE REQUEST message, the CN should initiate the appropriate release procedure for the identified RABs in the RAB RELEASE REQUEST message. It is up to the CN to decide how to react to the request.

Interaction with Iu Release Command:

If no RABs will remain according to the RAB Release Request message, the CN may decide to initiate the Iu Release procedure if it does not want to keep the Iu signalling connection. The cause value to use is "No remaining RAB".

Interaction with RAB Assignment (release RAB):

If the CN decides to release some or all indicated RABs, the CN may decide to invoke the RAB Assignment procedure (release RAB) to this effect.

8.3.3   Abnormal Conditions

8.4   Iu Release Request

8.4.1   General

The purpose of the Iu Release Request procedure is to enable UTRAN to request the CN to release the Iu connection for a particular UE due to some UTRAN generated reason (e.g. "O&M Intervention", "Unspecified Failure", "User Inactivity", "Repeated Integrity Checking Failure" , "Release due to UE generated signalling connection release"). The procedure uses connection oriented signalling.

8.4.2   Successful Operation

Figure 3: Iu Release Request procedure. Successful Operation

The RNS controlling the Iu connection(s) of that particular UE shall initiate the procedure by generating an IU RELEASE REQUEST message towards the CN. If two Iu connections exist for that particular UE, RNC shall sent an IU RELEASE REQUEST message to both CN domains. The procedure may be initiated for instance when the contact with a particular UE is lost or due to user inactivity.

The IU RELEASE REQUEST message shall indicate the cause value for the requested Iu connection release. It is up to the CN to decide how to react to the request.

Interactions with Iu Release:

If the CN decides to release the Iu connection, the CN shall initiate the Iu Release procedure.

8.4.3 Abnormal Conditions

8.5 Iu Release

8.5.1 General

The purpose of the Iu Release procedure is to enable the CN to release the Iu connection and all UTRAN resources related only to that Iu connection to be released. The procedure uses connection oriented mode signalling.

The Iu Release procedure can be initiated for at least the following reasons:

- Completion of transaction between UE and CN.

- UTRAN generated reasons, e.g. reception of IU RELEASE REQUEST.

- Completion of successful relocation of SRNS.

- Cancellation of relocation after successful completion of the Relocation Resource Allocation procedure.

8.5.2 Successful Operation
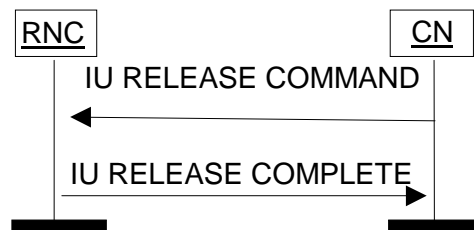
Figure 4: Iu Release procedure

The procedure is initiated by the CN by sending an IU RELEASE COMMAND message to the UTRAN.

After the IU RELEASE COMMAND has been sent, the CN shall not send further RANAP connection oriented messages on this particular connection.

The IU RELEASE COMMAND message shall include a *Cause* IE, indicating the reason for the release (e.g. "Successful Relocation", "Normal Release", "Release due to UTRAN Generated Reason", "Relocation Cancelled").

When the RNC receives the IU RELEASE COMMAND:

1. Clearing of the related UTRAN resources is initiated. However, the UTRAN shall not clear resources related to other Iu signalling connections the UE might have. The Iu transport bearers for RABs subject to data forwarding and other UTRAN resources used for the GTP-PDU forwarding process, are released by the RNC only when the timer $T_{DATAfwd}$ expires.

2. The RNC returns any assigned Iu user plane resources to idle. Then the RNC sends an IU RELEASE COMPLETE message to the CN. (The RNC does not need to wait for the release of UTRAN radio resources to be completed before returning the IU RELEASE COMPLETE message.) When an IU RELEASE COMPLETE message is sent, the procedure is terminated in the UTRAN.

Reception of an IU RELEASE COMPLETE message terminates the procedure in the CN.

8.5.3 Abnormal Conditions

If the Iu Release procedure is not initiated towards the source RNC from the CN before the expiry of timer $T_{RELOCoverall}$, the source RNC should initiate the Iu Release Request procedure towards the CN with a cause value "$T_{relocoverall}$ expiry".

8.6 Relocation Preparation

8.6.1 General

The purpose of the Relocation Preparation procedure is to prepare relocation of SRNS either with involving UE or without involving UE. The relocation procedure shall be co-ordinated in all Iu signalling connections existing for the UE in order to allow Relocation co-ordination in the target RNC. The procedure uses connection oriented signalling.

The source RNC shall not initiate the Relocation Preparation procedure for an Iu signalling connection if a Prepared Relocation exists in the RNC for that Iu signalling connection or if a Relocation Preparation procedure is ongoing for that Iu signalling connection.

8.6.2 Successful Operation
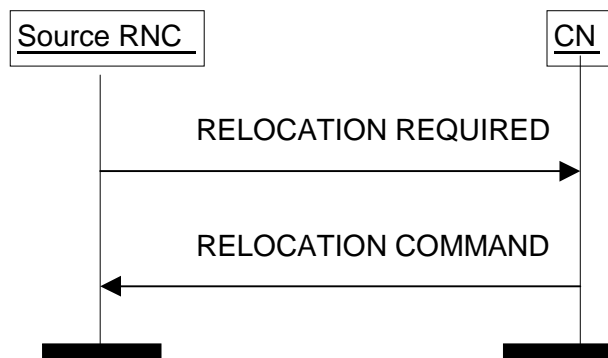
Figure 5: Relocation Preparation procedure. Successful operation

The source RNC shall initiate the procedure by generating RELOCATION REQUIRED message. The source RNC shall decide whether to initiate the intra-system Relocation or the inter-system Relocation. In case of intra-system Relocation the source RNC shall indicate in the *Source ID* IE the RNC-ID of the source RNC and in the *Target ID* IE the RNC-ID of the target RNC. In case of inter-system Relocation the source RNC shall indicate in the *Source ID* IE the Service Area Identifier and in the *Target ID* IE the cell global identity of the target system. The source RNC shall indicate the appropriate cause value for the Relocation in the *Cause* IE.

The source RNC shall determine whether the relocation of SRNS shall be executed with or without involvement of UE. The source RNC shall set the *Relocation Type* IE accordingly to "UE involved " or "UE not involved".

The source RNC shall indicate in the RELOCATION REQUIRED message the amount of Iu signalling connections existing for the UE by setting correctly the *Number of Iu Instances* IE included in the *Source to Target RNC Transparent Containe*r IE. This container may also include the necessary information for Relocation co-ordination, security procedures and the handling of UE Capabilities. The container may include the RRC context to be relocated within the *RRC Container* IE. When the *Relocation Type* IE is set to "UE not involved in relocation of SRNS" and the UE is using dedicated or shared channels, the container shall include the mapping between each RAB subflow and transport channel identifier(s). When the RAB is carried on a dedicated channel, the DCH ID shall be included, and when it is carried on a downlink or uplink shared channel, the DSCH ID or USCH Id respectively shall be included.

The source RNC shall send the RELOCATION REQUIRED message to the CN and the source RNC shall start the timer $T_{RELOCprep.}$

When the preparation including resource allocation in the target system is ready and the CN has decided to continue the relocation of SRNS, the CN shall send RELOCATION COMMAND message to the source RNC and the CN shall start the timer $T_{RELOCcompl}$.

For each RAB originating from the PS domain, the RELOCATION COMMAND message may contain Iu transport address and Iu transport association to be used for the forwarding of the DL N-PDU duplicates towards the relocation target. Upon reception of the RELOCATION COMMAND message from the PS domain, the source RNC shall start the timer $T_{DATAfwd.}$

The Relocation Preparation procedure is terminated in the CN by transmission of RELOCATION COMMAND message.

If *Relocation Type* IE was set to "UE involved " by the source RNC and if the target system does not support all existing RABs, the RELOCATION COMMAND message shall contain a list of RABs indicating all the RABs that are not supported by the target system. The source RNC shall pass this information to the radio protocols. The resources associated with these not supported RABs shall not be released until the relocation is completed. This is in order to make a return to the old configuration possible in case of a failed or cancelled relocation.

Upon reception of RELOCATION COMMAND the source RNC shall stop the timer $T_{RELOCprep}$, RNC shall start the timer $T_{RELOCOverall}$ and RNC shall terminate the Relocation Preparation procedure. The source RNC is then defined to have a Prepared Relocation for that Iu signalling connection.

When Relocation Preparation procedure is terminated successfully and when the source RNC is ready, the source RNC should trigger the execution of relocation of SRNS.

In case of intersystem handover to GSM the RNC shall include *MS Classmark 2* and *MS Classmark 3* IEs received from the UE in the RELOCATION REQUIRED message to the CN.

Interactions with other procedures:

If, after RELOCATION REQUIRED message is sent and before the Relocation Preparation procedure is terminated, the source RNC receives a RANAP message initiating an other connection oriented RANAP class 1 or class 3 procedure (except Iu RELEASE COMMAND, which shall be handled normally) via the same Iu signalling connection, the source RNC shall either:

1. cancel the Relocation Preparation procedure i.e. execute Relocation Cancel procedure with an appropriate value for the *Cause* IE, e.g. 'Interaction with other procedure', and after successful completion of Relocation Cancel procedure, the source RNC shall continue the initiated RANAP procedure;

   or

2. terminate the initiated RANAP procedure without any changes in UTRAN by sending appropriate response message with the cause value "Relocation Triggered" to the CN. The source RNC shall then continue the relocation of SRNS.

If during the Relocation Preparation procedure the source RNC receives a DIRECT TRANSFER message it shall be handled normally.

If during the Relocation Preparation procedure the source RNC receives connection oriented RANAP class 2 messages (with the exception of DIRECT TRANSFER) it shall decide to either execute the procedure immediately or suspend it. In the case the relocation is cancelled the RNC shall resume any suspended procedures (if any)

After Relocation Preparation procedure is terminated successfully, all RANAP messages (except Iu RELEASE COMMAND message, which shall be handled normally) received via the same Iu signalling bearer shall be ignored by the source RNC.

8.6.3   Unsuccessful Operation
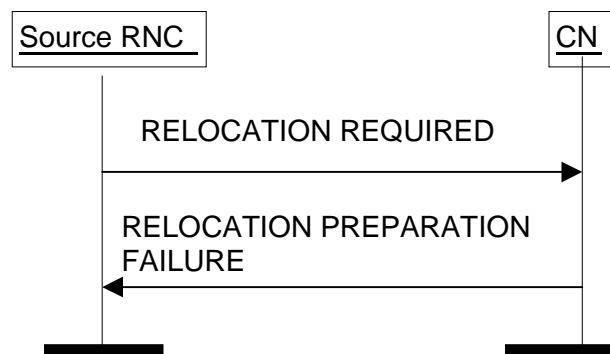
Figure 6: Relocation Preparation procedure. Unsuccessful operation

If the CN or target system is not able to even partially accept the relocation of SRNS or a failure occurs during the Relocation Preparation procedure in the CN or the CN decides not to continue the relocation of SRNS, the CN shall send RELOCATION PREPARATION FAILURE message to the source RNC.

RELOCATION PREPARATION FAILURE shall contain appropriate value for the *Cause* IE e.g. "$T_{RELOCalloc}$ expiry", "Relocation Failure in Target CN/RNC or Target System".

Transmission of RELOCATION PREPARATION FAILURE terminates the procedure in the CN. Reception of RELOCATION PREPARATION FAILURE terminates the procedure in UTRAN.

When Relocation preparation is unsuccessfully terminated, the existing Iu signalling connection can be used normally.

If the Relocation Preparation procedure is terminated unsuccessfully, the CN shall release the possibly existing Iu signalling connection for the same UE and related to the same relocation of SRNS towards the target RNC by initiating Iu Release procedure towards the target RNC with an appropriate value for the *Cause* IE, e.g. "Relocation Cancelled".

Interactions with Relocation Cancel procedure:

If there is no response from the CN to the RELOCATION REQUIRED message before timer $T_{RELOCprep}$ expires in the source RNC, the source RNC shall cancel the Relocation Preparation procedure by initiating the Relocation Cancel procedure with appropriate value for the *Cause* IE, e.g. "$T_{RELOCprep}$ expiry".

8.6.4 Abnormal Conditions

If the target RNC, which was indicated in the RELOCATION REQUIRED message, is not known to the CN:

1. The CN shall reject the relocation of SRNS by sending a RELOCATION PREPARATION FAILURE message to the source RNC with *Cause* IE set to "Unknown target RNC".

2. The CN shall continue to use the existing Iu connection towards the source RNC.

8.6.5 Co-ordination of Two Iu Signalling Connections

If the RNC has decided to initiate Relocation Preparation procedure, the RNC shall initiate simultaneously Relocation Preparation procedure on all Iu signalling connections existing for the UE.

The source RNC shall not trigger the execution of relocation of SRNS unless it has received RELOCATION COMMAND message from all Iu signalling connections existing for the UE.

If the source RNC receives RELOCATION PREPARATION FAILURE message from the CN, the RNC shall initiate Relocation Cancel procedure on the other Iu signalling connection for the UE if the other Iu signalling connection exists and if the Relocation Preparation procedure is still ongoing or the procedure has terminated successfully in that Iu signalling connection.

8.7 Relocation Resource Allocation

8.7.1 General

The purpose of the Relocation Resource Allocation procedure is to allocate resources from target RNS for a relocation of SRNS. Procedure shall be co-ordinated in all Iu signalling connections existing for the UE. The procedure uses connection oriented signalling.

8.7.2 Successful Operation
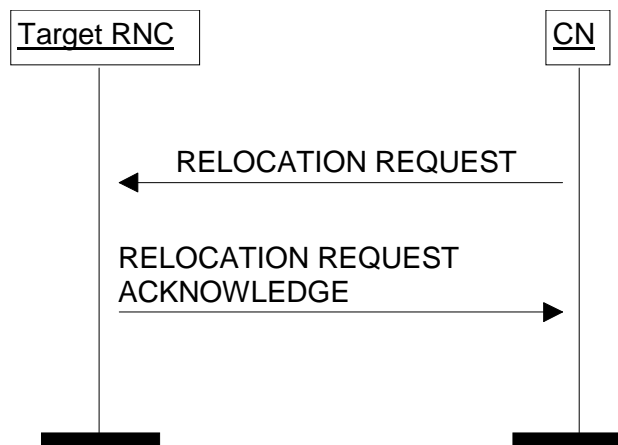
Figure 7: Relocation Resource Allocation procedure. Successful operation.

The CN shall initiate the procedure by generating RELOCATION REQUEST message. This message shall contain the information (if any)required by the UTRAN to build the RAB configuration existing for the UE before relocation.

The CN shall transmit the RELOCATION REQUEST message to target RNC and the CN shall start the timer $T_{RELOCalloc.}$

Upon reception of the RELOCATION REQUEST message, the target RNC shall initiate allocation of requested resources. The following information elements received in RELOCATION REQUEST message:

- RAB-ID.

- User plane mode.

- Priority level, queuing and pre-emption indication.

- Iu signalling connection identifier.

Require special actions in the RNC. The actions are the same as specified for the same IEs in the RAB Assignment procedure.

If the RELOCATION REQUEST message includes the *PDP Type Information* IE, the UTRAN may use this to configure any compression algorithms.

The Iu signalling connection identifier contains an Iu signalling connection identifier which is allocated by the CN, and which the RNC is required to store and remember for the duration of the Iu connection.

Following additional actions shall be executed in the target RNC during Relocation Resource Allocation procedure:

If *Relocation Type* IE is set to " UE involved in relocation of SRNS":

- The target RNC may accept a requested RAB only if:

   1. the RAB can be supported by the target RNC, and

   2. the radio bearer(s) for the RAB exist(s) or the target RNC will establish necessary radio resources for the RAB by radio interface information to be generated by the target RNC and to be included in RELOCATION REQUEST ACKNOWLEDGE message.

- Other RABs shall be rejected by the target RNC in the RELOCATION REQUEST ACKNOWLEDGE message with an appropriate value for *Cause* IE, e.g. "Unable to Establish During Relocation".

- If existing radio bearer(s) are not related to any RAB that is accepted by target RNC, the radio bearers shall be ignored by target RNC. No actions to release the radio bearer(s) shall be taken by target RNC.

If *RelocationType* IE is set to "UE not involved in relocation of SRNS":

- The target RNC may accept a RAB only if the radio bearer(s) for the RAB exist(s) and can be used for the RAB by the target RNC.

- If existing radio bearers are not related to any RAB that is accepted by target RNC, the radio bearers shall be ignored during the relocation of SRNS and the radio bearers shall be released by radio interface protocols after completion of relocation of SRNS.

After all necessary resources for accepted RABs including the Iu user plane, are successfully allocated, the target RNC shall send RELOCATION REQUEST ACKNOWLEDGE message to the CN. The resources associated with the RABs indicated as failed to set up shall not be released in the CN until the relocation is completed. This is in order to make a return to the old configuration possible in case of a failed or cancelled relocation.

The RELOCATION REQUEST ACKNOWLEDGE message received by the CN may optionally contain a transparent container, which shall be transferred by CN to the source RNC or the external relocation source while completing the Relocation Preparation procedure.

The target RNC shall include the target to source RNC transparent container in the RELOCATION REQUEST ACKNOWLEDGE message if the relocation type indicates "UE involved in relocation of SRNS". If the target RNC supports triggering of the Relocation Detect procedure via the Iur interface, the RNC shall assign a d-RNTI for the context of the relocation and include it in the container. If two CNs are involved in the relocation of SRNS, the target RNC may, however, decide to send the container to only one CN.

Transmission and reception of RELOCATION REQUEST ACKNOWLEDGE message terminates the procedure in the UTRAN and the CN respectively.

8.7.3 Unsuccessful Operation
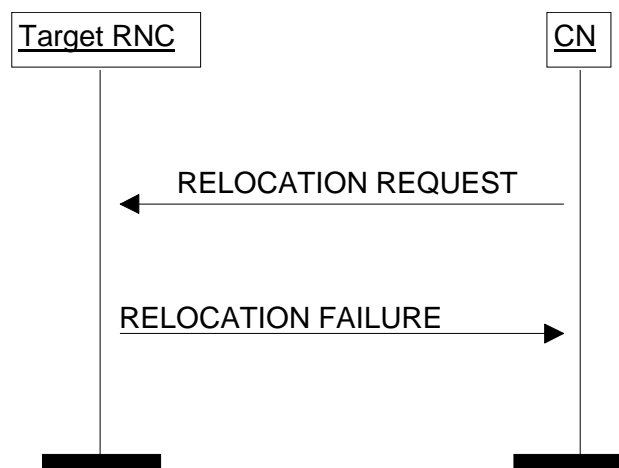
Figure 8: Relocation Resource Allocation procedure: Unsuccessful operation

If the target RNC can not even partially accept the relocation of SRNS or a failure occurs during the Relocation Resource Allocation procedure in the target RNC, the target RNC shall send RELOCATION FAILURE message to the CN.

Transmission and reception of RELOCATION FAILURE message terminates the procedure in the UTRAN and the CN respectively.

When CN has received RELOCATION FAILURE message from target RNC, CN shall stop timer $T_{RELOCalloc}$ and shall assume possibly allocated resources within target RNC completely released.

8.7.4 Abnormal Conditions

If after reception of the RELOCATION REQUEST message, the target RNC receives another RELOCATION REQUEST message on the same Iu connection, then the target RNC shall discard the latter message and the original Relocation Resource Allocation procedure shall continue normally.

Interactions with Iu Release:

If the CN decides to not continue the Relocation Resource Allocation procedure before the Relocation Resource Allocation procedure is completed, the CN shall stop timer $T_{RELOCalloc}$ and the CN shall, if the Iu signalling connection has been established or later becomes established, initiate the Iu Release procedure towards the target RNC with an appropriate value for the *Cause* IE, e.g. "Relocation Cancelled".

8.7.5 Co-ordination of Two Iu Signalling Connections

Co-ordination of two Iu signalling connections during Relocation Resource Allocation procedure shall be executed by the target RNC when the *Number of Iu Instancies* IE received in the *Source RNC to Target RNC Transparent Container* IE in the RELOCATION REQUEST message indicates that two CN domains are involved in relocation of SRNS.

If two CN domains are involved, the following actions shall be taken by the target RNC:

- The target RNC shall utilise the *Permanent NAS UE Identity* IE, received explicitly by each CN domain within RELOCATION REQUEST message, to co-ordinate both Iu signalling connections.

- The target RNC shall generate and send RELOCATION REQUEST ACKNOWLEDGE only after all expected RELOCATION REQUEST messages are received and analysed.

- The target RNC shall ensure that there is no conflicting information in *Target RNC to Source RNC Transparent Container* IE in RELOCATION REQUEST ACKNOWLEDGE messages transmitted via different Iu signalling connections and related to the same relocation of SRNS.

- The selection of signalling connection utilised for the *Target RNC to Source RNC Transparent Container* IE in RELOCATION REQUEST ACKNOWLEDGE message need not to be dependent on the signalling connection via which the *Source RNC to Target RNC Transparent Container* IE in RELOCATION REQUEST message was received.

8.8 Relocation Detect

8.8.1 General

The purpose of Relocation Detect procedure is to indicate by the RNC the detection of SRNS relocation execution to the CN. Procedure shall be co-ordinated in all Iu signalling connections existing for the UE. The procedure uses connection oriented signalling.

8.8.2 Successful Operation
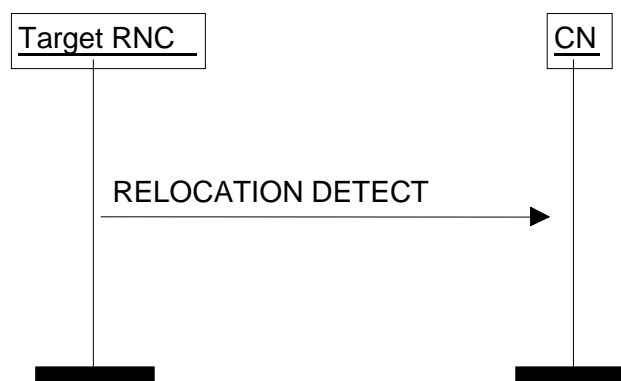
Figure 9: Relocation Detect procedure: Successful operation

The target RNC shall send RELOCATION DETECT message to the CN when relocation execution trigger is received.

If the type of relocation of SRNS is "UE involved in relocation of SRNS", the relocation execution trigger may be received either from the Uu interface or as an implementation option from the Iur interface If the type of relocation of SRNS is "UE not involved in relocation of SRNS", the relocation execution trigger is received from the Iur interface.

When RELOCATION DETECT message is sent, the target RNC shall start SRNC operation.

Upon reception of RELOCATION DETECT message, the CN may switch the user plane from the source RNC to the target RNC.

8.8.3 Abnormal Conditions

Interactions with Relocation Complete

If the RELOCATION COMPLETE message is received by CN before the reception of RELOCATION DETECT message, the CN shall handle the RELOCATION COMPLETE message normally.

8.8.4 Co-ordination of Multiple Iu Signalling Connections

When Relocation Detect procedure is to be intiated by the target RNC, the target RNC shall initiate the Relocation Detect procedure on all Iu signalling connections existing for the UE between the target RNC and the CN.

8.9 Relocation Complete

8.9.1 General

The purpose of Relocation Complete procedure is to indicate by the Target RNC the completion of relocation of SRNS to the CN. Procedure shall be co-ordinated in all Iu signalling connections existing for the UE. The procedure uses connection oriented signalling.

8.9.2 Successful Operation

Figure 10: Relocation Complete procedure. Successful Operation

When the new *SRNC-ID + S-RNTI* are successfully exchanged with the UE by the radio protocols, target RNC shall initiate Relocation Complete by sending RELOCATION COMPLETE message to CN.

8.9.3 Abnormal Conditions

If the timer $T_{RELOCcomplete}$ expires:

- The CN should initiate release of Iu connections towards the source and the target RNC by initiating the Iu Release procedure with an appropriate value for the *Cause* IE, e.g. " $T_{RELOCcomplete}$ expiry".

Interactions with the Relocation Detect procedure:

If the RELOCATION DETECT message is not received by CN before reception of RELOCATION COMPLETE message, CN shall handle the RELOCATION COMPLETE message normally.

8.9.4 Co-ordination of Multiple Iu Signalling Connections

When Relocation Complete procedure is to be intiated by target RNC, target RNC shall initiate the Relocation Complete procedure on all Iu signalling connections existing for the UE between target RNC and CN.

8.10 Relocation Cancel

8.10.1 General

The purpose of the Relocation Cancel procedure is to enable source RNC to cancel an ongoing relocation of SRNS. The Relocation Cancel procedure can be sent by the source RNC during and after the Relocation Preparation procedure as long as the relocation of SRNS is ongoing. The procedure shall be co-ordinated in all Iu signalling connections existing for the UE. The procedure uses connection oriented signalling.

8.10.2 Successful Operation
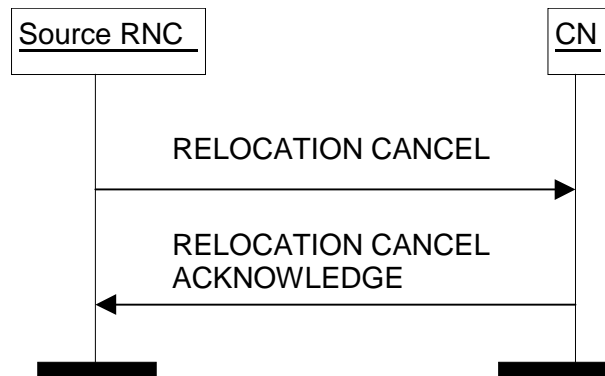
Figure 11: Relocation Cancel procedure. Successful Operation

RNC shall initiate the procedure by sending RELOCATION CANCEL message to CN. This message shall indicate the reason for canceling the relocation of SRNS by appropriate value of the *Cause* IE. Upon reception of RELOCATION CANCEL message, CN shall send RELOCATION CANCEL ACKNOWLEDGE message to source RNC.

Transmission and reception of RELOCATION CANCEL ACKNOWLEDGE terminates the procedure in CN and source RNC respectively. After this, the source RNC does not have a Prepared Relocation for that Iu signalling connection.

Interactions with Relocation Preparation:

Upon reception of RELOCATION CANCEL message from source RNC, CN shall locally terminate the possibly ongoing Relocation Preparation procedure towards that RNC and abandon the relocation of SRNS.

If source RNC receives RELOCATION COMMAND message from CN after Relocation Cancel procedure is initiated, source RNC shall ignore the received RELOCATION COMMAND message.

8.10.3 Unsuccessful Operation

8.10.4 Abnormal Conditions

8.10.5 Co-ordination of Two Iu Signalling Connections

If Relocation Cancel procedure is to be initiated due to other reasons than reception of RELOCATION PREPARATION FAILURE message, Relocation Cancel procedure shall be initiated on all Iu signalling connections existing for the UE in which the Relocation Preparation procedure has not terminated unsuccessfully.

8.11 SRNS Context Transfer

8.11.1 General

The purpose of the SRNS Context Transfer procedure is to trigger the transfer of SRNS contexts from the source RNC to the CN (PS domain) in case of inter system forward handover. The procedure uses connection oriented signalling.

8.11.2 Successful Operation
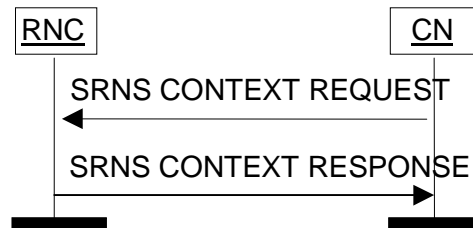
Figure 12: SRNS Context Transfer procedure

The CN shall initiate the procedure by sending a SRNS CONTEXT REQUEST message to the source RNC. The SRNS CONTEXT REQUEST message shall include the list of RABs whose contexts should be transferred.

The source RNC shall respond to the CN with a SRNS CONTEXT RESPONSE message containing the RAB Context information for the referenced RABs. For each RAB, the following information elements shall be included:

- RAB ID;

- the sequence number for the next downlink GTP-PDU to be sent to the UE i.e. DL GTP-PDU Sequence Number;

- the sequence number for the next uplink GTP-PDU to be tunnelled to the GGSN i.e. UL GTP-PDU Sequence Number;

- the radio interface sequence number (PDCP) of the next downlink N-PDU (PDCP SDU) that would have been sent to the UE by a source system i.e. DL N-PDU Sequence Number IE;

- the radio interface sequence number (PDCP) of the next uplink N-PDU (PDCP SDU) that would have been expected from the UE by a source system i.e. UL N-PDU Sequence Number IE.

Transmission and reception of the SRNS CONTEXT RESPONSE message shall terminate the procedure in the UTRAN and the CN respectively.

8.11.3 Unsuccessful Operation

The RAB ID for each RAB for which UTRAN is not able to transfer the RAB context is included in the SRNS Context Response message together with a *Cause* IE, e.g. Invalid RAB ID.

8.11.4 Abnormal Conditions

8.12 SRNS Data Forwarding Initiation

8.12.1 General

The purpose of the SRNS Data Forwarding procedure is to trigger the transfer of N-PDUs from the RNC to the CN (PS domain) in case of inter system forward handover. The procedure uses connection oriented signalling.

8.12.2   Successful Operation

Figure 13: SRNS Data Forwarding Initiation procedure

CN initiates the procedure by sending SRNS DATA FORWARD COMMAND message to UTRAN. SRNS DATA FORWARD COMMAND message includes the list of RABs whose data should be forwarded and the necessary information for establishing a GTP tunnel to be used for data forwarding.

Upon reception of SRNS DATA FORWARD COMMAND RNC starts the timer $T_{DATAfwd}$.

8.12.3   Abnormal Conditions

8.13   SRNS Context Forwarding from Source RNC to CN

8.13.1   General

The purpose of this procedure is to transfer SRNS contexts from the source RNC to the CN (PS domain) in case of handover via the CN. The procedure uses connection oriented signalling. SRNS contexts are sent for each concerned RAB and contain the sequence numbers of the GTP-PDUs next to be transmitted in the uplink and downlink directions and the next PDCP sequence numbers that would have been used to send and receive data from the UE.

8.13.2   Successful Operation
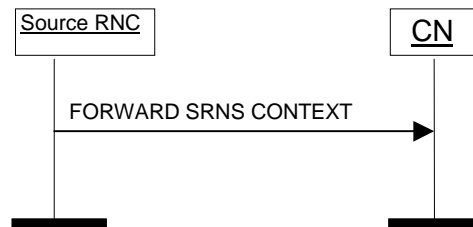
Figure 14: SRNS Context forwarding from source RNC to CN

The source RNC initialises the procedure by sending FORWARD SRNS CONTEXT message to the CN. The FORWARD SRNS CONTEXT message contains the RAB Context information for each referenced RAB. For each RAB the following information is included:

-    the sequence number for the next downlink GTP-PDU to be sent to the UE, and

-    the sequence number for the next uplink GTP-PDU to be tunnelled to the GGSN;

-    the radio interface sequence number (PDCP) of the next uplink N-PDU (PDCP SDU) that would have been expected from the UE by a source system i.e. *UL N-PDU Sequence Number* IE;

-    the radio interface sequence number (PDCP) of the next downlink N-PDU (PDCP SDU) that would have been sent to the UE by a source system i.e. *DL N-PDU Sequence Number* IE.

8.13.3 Abnormal Conditions

8.14 SRNS Context Forwarding to Target RNC from CN

8.14.1 General

The purpose of this procedure is to transfer SRNS contexts from the CN (PS domain) to the target RNC in case of handover via the CN. The procedure uses connection oriented signalling. SRNS contexts are sent for each referenced RAB and contain the sequence numbers of the GTP-PDUs next to be transmitted in the uplink and downlink directions and the next PDCP sequence numbers that would have been used to send and receive data from the UE.

8.14.2 Successful Operation
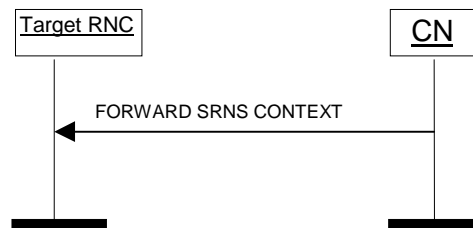
Figure 15: SRNS Context forwarding to target RNC from CN

The CN initialises the procedure by sending FORWARD SRNS CONTEXT message to the target RNC. The FORWARD SRNS CONTEXT message contains the RAB Context information for each referenced RAB. For each RAB the following information is included:

- the sequence number for the next downlink GTP-PDU to be sent to the UE, and

- the sequence number for the next uplink GTP-PDU to be tunnelled to the GGSN;

- the radio interface sequence number (PDCP) of the next uplink N-PDU (PDCP SDU) that would have been expected from the UE by a source system i.e.*UL N-PDU Sequence Number* IE;

- the radio interface sequence number (PDCP) of the next downlink N-PDU (PDCP SDU) that would have been sent to the UE by a source system i.e. DL *N-PDU Sequence Number* IE.

8.14.3 Abnormal Conditions

8.15 Paging

8.15.1 General

The purpose of the Paging procedure is to enable the CN to page a UE for a UE terminating service request. The procedure uses connectionless signalling.

8.15.2   Successful Operation
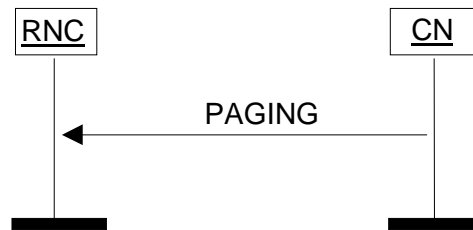
Figure 16: Paging procedure. Successful Operation

The CN shall initiate the procedure by sending a PAGING message. This message shall contain information necessary for RNC to be able to page the UE, like:

- CN Domain Indicator.

- Permanent NAS UE Identity.

- Temporary UE Identity.

- Paging Area.

- Paging Cause.

- Non Searching Indicator.

The *CN Domain Indicator* IE shall be used by the RNC to identify from which CN domain the PAGING message originates.

The *Permanent NAS UE Identity* IE (i.e. IMSI) shall be used by the UTRAN paging co-ordination function to check if a signalling connection towards the other CN domain already exists for this UE. In that case, the radio interface paging message can be sent via that connection instead of using the paging broadcast channel.

The *Temporary UE Identity* IE (e.g. TMSI) is the identity of the user that shall be used over the paging channel. If the *Temporary UE Identity* IE is not included in the PAGING message, the RNC shall use the Permanent UE Identity instead.

The *Paging Area* IE shall be used by the RNC to identify the area in which the radio interface paging message shall be broadcast in case no signalling connection, as described above, already exists for the UE. If the *Paging Area* IE is not included in the PAGING message, the whole RNC area shall be used as Paging Area.

The *Paging Cause* IE shall indicate to the RNC the reason for sending the PAGING message. The paging cause is transferred transparently to the UE.

The *Non Searching Indication* IE shall be used by the RNC to decide whether the UTRAN paging co-ordination function needs to be activated or not. In the absence of this IE, UTRAN paging co-ordination shall be performed.

It should be noted that each PAGING message on the Iu interface relates to only one UE and therefore the RNC has to pack the pages into the relevant radio interface paging message.

The core network is responsible for the paging repetition over the Iu interface.

8.15.3   Abnormal Conditions

8.16   Common ID

8.16.1   General

The purpose of the Common ID procedure is to inform the RNC about the permanent NAS UE Identity (i.e. IMSI) of a user. This is used by the RNC e.g. to create a reference between the permanent NAS UE identity of the user and the RRC connection of that user for UTRAN paging co-ordination. The procedure uses connection oriented signalling.

8.16.2   Successful Operation

Figure 17: Common ID procedure

After having established an Iu signalling connection, and if the Permanent NAS UE identity (i.e. IMSI) is available, the CN shall send a COMMON ID message , containing the *Permanent NAS UE Identity* IE to the RNC. The RNC associates the permanent identity to the RRC Connection of that user and shall save it for the duration of the RRC connection.

8.16.3   Abnormal Conditions

8.17   CN Invoke Trace

8.17.1   General

The purpose of the CN Invoke Trace procedure is to inform the RNC that it should begin producing a trace record of a type indicated by the CN and related to the UE. The procedure uses connection oriented signalling.

8.17.2   Successful Operation

Figure 18: CN Invoke Trace procedure

The trace is invoked by the CN by sending a CN INVOKE TRACE message to the RNC.

The events and parameters to be recorded are indicated in the *Trace Type* IE.

The *OMC ID* IE, if present, indicates the OMC to which the record is destined.

The message includes a *Trace Reference* IE which is allocated by the entity which triggered the trace.

The *Trigger ID* IE, if present, indicates the entity which triggered the trace.

The *Trace Reference* and *Trigger ID* IEs are used to tag the trace record to allow simpler construction of the total record by the entity which combines trace records.

Interaction with Relocation:

The order to perform tracing is lost in UTRAN at successful Relocation of SRNS. If the tracing shall continue also after the relocation has been performed, the CN Invoke Trace procedure shall thus be re-initiated from the CN towards the future SRNC after the Relocation Resource Allocation procedure has been executed successfully.

8.17.3 Abnormal Conditions

8.18 Security Mode Control

8.18.1 General

The purpose of the Security Mode Control procedure is to allow the CN to pass cipher and integrity mode information to the UTRAN. UTRAN uses this information to select and load the encryption device for user and signalling data with the appropriate parameters, and also to store the appropriate parameters for the integrity algorithm. The procedure uses connection oriented signalling.

8.18.2 Successful Operation
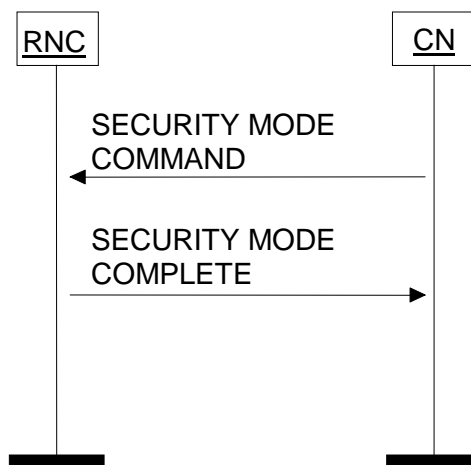
Figure 19: Security Mode Control procedure. Successful operation

The CN shall start the procedure by sending to the UTRAN a SECURITY MODE COMMAND message. This message shall specify which ciphering, if any, and integrity protection algorithms that may be used by the UTRAN.

The *Permitted Encryption Algorithms* IE may contain "no encryption" within its list in order to allow the RNC not to cipher the respective connection if it cannot support any of the indicated UEAs. In the absence of the *Encryption Information* group IE in SECURITY MODE COMMAND message, the RNC shall handle it as no encryption.

Upon reception of the SECURITY MODE COMMAND message, the UTRAN shall internally select appropriate algorithms, taking into account the UE/UTRAN capabilities. The UTRAN shall then trigger the execution of the corresponding radio interface procedure and, if applicable, invoke the encryption device and also start the integrity protection.

When the execution of the radio interface procedure is successfully finished, UTRAN shall return a SECURITY MODE COMPLETE message to the CN. This message shall include the chosen integrity protection and encryption algorithms.

The set of permitted algorithms specified in the SECURITY MODE COMMAND message shall remain applicable for subsequent RAB Assignments and Intra-UTRAN Relocations.

In case of a UE with Radio Access Bearers towards both core networks, the user data towards CS shall always be ciphered according to the information received from CS and the user data towards PS with the information received from PS. The signalling data shall always be ciphered with the last received ciphering information and integrity protected with the last received integrity protection information.

8.18.3 Unsuccessful Operation
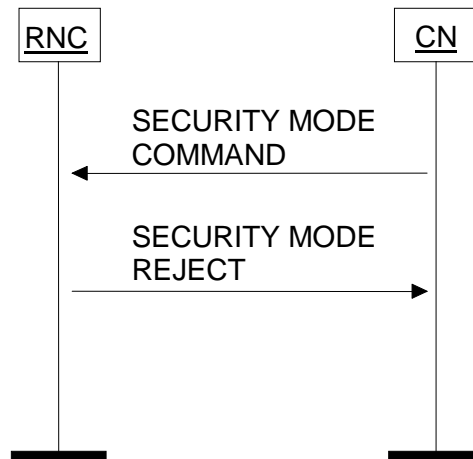
Figure 20: Security Mode Control procedure. Unsuccessful operation

If the UTRAN or the UE is unable to support the ciphering and/or integrity protection algorithms specified in the SECURITY MODE COMMAND message, then the UTRAN shall return to CN a SECURITY MODE REJECT message with cause value "Requested Ciphering and/or Integrity Protection Algorithms are not Supported". If the radio interface Security Control procedure fails, a SECURITY MODE REJECT message shall be sent to CN with cause value "Failure in the Radio Interface Procedure".

8.18.4 Abnormal Conditions

A SECURITY MODE REJECT message shall be returned if a CN requests a change of ciphering and/or integrity protection algorithms for a UE when ciphering or integrity protection is already active for that CN and such a change of algorithms is not supported by UTRAN and/or the UE. A cause value shall be set to "Change of Ciphering and/or Integrity Protection is not Supported".

8.19 Location Reporting Control

8.19.1 General

The purpose of the Location Reporting Control procedure is to allow the CN to request information on the location of a given UE. The procedure uses connection oriented signalling.

8.19.2 Successful Operation

Figure 21: Location Reporting Control procedure

The CN shall initiate the procedure by generating a LOCATION REPORTING CONTROL message.

The *Request Type* IE shall indicate to the serving RNC whether:

- to report directly;

- to report upon change of Service area, or

- to stop reporting.

The *Request Type* IE shall also indicate what type of location information the serving RNC shall report. The location information is either of the following types:

- Service Area Identifier, or

- Geographical coordinates, with or without requested accuracy.

A request for a direct report can be done in parallel with having an active request to report upon change of Service Area for the same UE. The request to report upon change of Service Area shall not be affected by this.

<u>Interaction with Relocation:</u>

The order to perform location reporting at change of Service Area is lost in UTRAN at successful Relocation of SRNS. If the location reporting at change of Service Area shall continue also after the relocation has been performed, the Location Reporting Control procedure shall thus be re-initiated from the CN towards the future SRNC after the Relocation Resource Allocation procedure has been executed successfully.

8.19.3   Abnormal Conditions

8.20   Location Report

8.20.1   General

The purpose of the Location Report procedure is to provide the UE's location information to the CN. The procedure uses connection oriented signalling.

8.20.2   Successful Operation
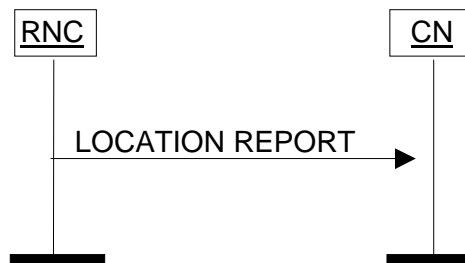
Figure 22: Location Report procedure

The serving RNC shall initiate the procedure by generating a LOCATION REPORT message. The LOCATION REPORT message may be used as a response for the LOCATION REPORTING CONTROL message. Also, when a user enters or leaves a classified zone set by O&M, e.g. zone where a disaster occurred, a LOCATION REPORT message shall be sent to the CN including the Service Area of the UE in the *Area Identity* IE. The *Cause* IE shall indicate the appropriate cause value to CN, e.g. 'User Restriction Start Indication' and 'User Restriction End Indication'. The CN shall react to the LOCATION REPORT message with CN vendor specific actions.

In case reporting at change of Service Area is requested by the CN, then the RNC shall issue a LOCATION REPORT message

- whenever the information given in the previous LOCATION REPORT message or INITIAL UE MESSAGE is not anymore valid.

- after a performed relocation as soon as SAI becomes available in the new SRNC.

In this case, the RNC shall include to the LOCATION REPORT message in the *Area Identity* IE the Service Area, which includes at least one of the cells from which the UE is consuming radio resources.

If the RNC can not deliver the location information as requested by the CN, the RNC shall indicate the UE location to be "Undetermined" by omitting the *Area Identity* IE. A cause value shall instead be added to indicate the reason for the undetermined location, e.g. "Requested Report Type not supported".

If the Location Report procedure was triggered by a LOCATION REPORTING CONTROL message, which included a request for a geographical area with a specific accuracy, the LOCATION REPORT message shall include either a point with indicated uncertainty or a polygon, which both shall fulfill the requested accuracy as accurately as possible. If, on the other hand, no specific accuracy level was requested in the LOCATION REPORTING CONTROL message, it is up to UTRAN to decide with which accuracy to report.

8.20.3   Abnormal Conditions

8.21   Data Volume Report

8.21.1   General

The Data Volume Report procedure is used by CN to request the unsuccessfully transmitted DL data volume for specific RABs. This procedure only applies to PS domain. The procedure uses connection oriented signalling.

8.21.2   Successful Operation
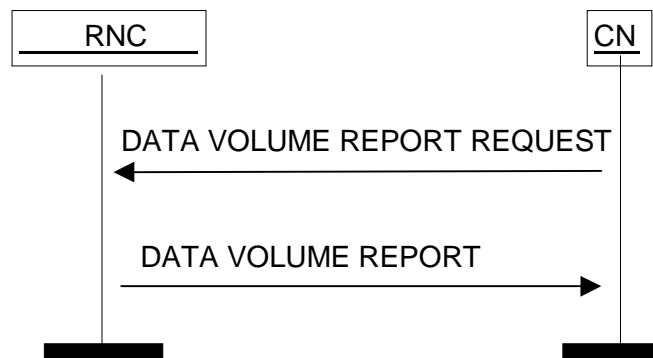
Figure 23: Data Volume Report procedure

The procedure is initiated by CN by sending DATA VOLUME REPORT REQUEST message to UTRAN. This message shall contain the list of *RAB ID* IEs to identify the RABs for which the unsuccessfully transmitted DL data volume shall be reported.

At reception of DATA VOLUME REPORT REQUEST message UTRAN shall produce the DATA VOLUME REPORT message indicating the amount of unsuccessfully transmitted DL data for the addressed RABs since the last data volume indication to CN. UTRAN shall also reset the data volume counter for the reported RABs. UTRAN shall send the DATA VOLUME REPORT message to CN. Transmission and reception of DATA VOLUME REPORT terminates the procedure in UTRAN and CN respectively.

8.21.3   Unsuccessful Operation

The RAB ID for each RAB for which UTRAN is not able to transfer a data volume report is included in the Data Volume Report message together with a *Cause* IE, e.g. Invalid RAB ID.

8.21.4 Abnormal Conditions

8.22 Initial UE Message

8.22.1 General

The purpose of the Initial UE Message procedure is to establish an Iu signalling connection between a CN domain and the RNC and to transfer the initial NAS-PDU to the CN. The procedure uses connection oriented signalling.

8.22.2 Successful Operation
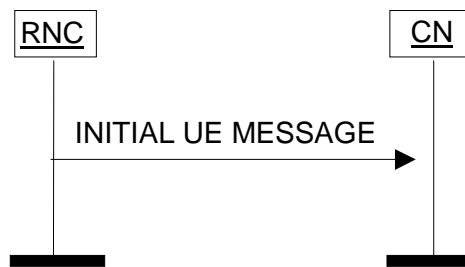
Figure 24: Initial UE Message procedure

When RNC has received from radio interface a NAS message (see ref. [8]) to be forwarded to CN domain to which the Iu signalling connection for the UE does not exist, RNC shall initiate the Initial UE Message procedure and send the INITIAL UE MESSAGE to the CN.

In addition to the received NAS-PDU, RNC shall add following information to the INITIAL UE MESSAGE:

- CN domain indicator, indicating the CN domain towards which this message is sent.

- For CS domain, the same LAI which was the last LAI indicated to the UE by UTRAN.

- For PS domain, the same LAI+RAC which were the last LAI+RAC indicated to the UE by UTRAN.

- Service Area corresponding to at least one of the cells from which the UE is consuming radio resources.

- Iu signalling connection identifier.

The Iu signalling connection identifier contains an Iu signalling connection identifier which is allocated by the RNC, and which the CN is required to store and remember for the duration of the Iu connection.

Whereas several processing entities within the CN (e.g. charging, interception, etc.) may make use of the location information given in the *SAI* IE and the *LAI* (and *RAC*) IE, the mobility management within the CN shall rely on the information given within the *LAI* IE (resp. *LAI* and *RAC* IEs) only.

8.23 Direct Transfer

8.23.1 General

The purpose of the Direct Transfer procedure is to carry UE – CN signalling messages over the Iu Interface. The UE - CN signalling messages are not interpreted by the UTRAN, and their content (e.g. MM or CC message) is outside the scope of this specification (see ref. [8]). The UE – CN signalling messages are transported as a parameter in the DIRECT TRANSFER messages. The procedure uses connection oriented signalling.

8.23.2   Successful Operation

8.23.2.1   CN Originated Direct Transfer

Figure 25: Direct Transfer, CN originated

If a UE – CN signalling message has to be sent from the CN to the UE, the CN shall send a DIRECT TRANSFER message to the RNC including the UE – CN signalling message as a *NAS-PDU* IE.

The use of the SAPI included in the DIRECT TRANSFER message enables the UTRAN to provide specific service for the transport of the messages.

8.23.2.2   UTRAN Originated Direct Transfer

Figure 26: Direct Transfer, RNC originated

If a UE – CN signalling message has to be sent from the RNC to the CN without interpretation, the RNC shall send a DIRECT TRANSFER message to the CN including the UE – CN signalling message as a *NAS-PDU* IE.

If the DIRECT TRANSFER message shall be sent to the PS domain, RNC shall also add the *LAI* and the *RAC* IEs, which were the last LAI+RAC indicated to the UE by UTRAN.

8.24   CN Information Broadcast

8.24.1   General

The purpose of the CN Information Broadcast procedure is to provide NAS information from the CN to be broadcast repetitively by UTRAN to all users. The procedure uses connectionless signalling.

8.24.2   Successful Operation
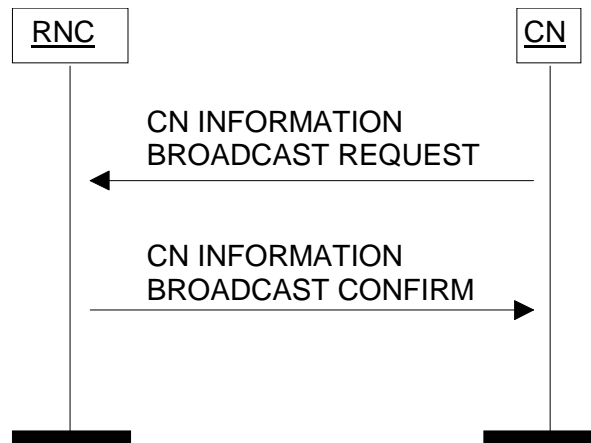
Figure 27: CN Information Broadcast procedure. Successful operation

CN sets or modifies the CN broadcast information to be broadcast by UTRAN, by sending a CN INFORMATION BROADCAST REQUEST message which contains:

- The information pieces to be broadcast. The internal structure of these information pieces is transparent to UTRAN, and is specified as part of the CN-UE protocols.

- With each broadcast information piece, a geographical area where to broadcast it. It is possible, through one single RANAP message, for the CN to request the RNC to broadcast the same CN information pieces within all cells controlled by the RNC and belonging to the given LA / RA, as well as just within a given Service Area or within an area indicated with geographical co-ordinates.

- With each broadcast information piece, a priority used by UTRAN to schedule the information.

- With each broadcast information piece, a request for the UTRAN to turn on or off the broadcast of the information piece.

If the UTRAN can broadcast the information as requested, a CN INFORMATION BROADCAST CONFIRM message is returned by the RNC to the CN.

Whether or not UTRAN shall treat equally broadcast request from different CN and having the same priority is under operator control.

Each information piece is broadcast in the intersection between the indicated geographical area and the area under control by the receiving RNC. It is broadcast until explicitly changed or a Reset occurs.

8.24.3   Unsuccessful Operation
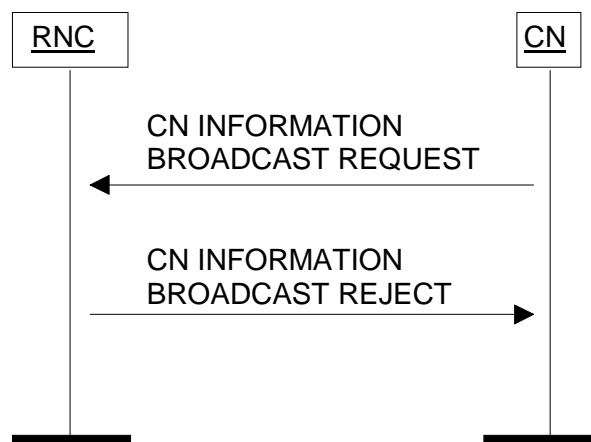
Figure 28: CN Information Broadcast procedure. Unsuccessful operation

If after receiving the CN INFORMATION BROADCAST REQUEST, the RNC can not broadcast the information as requested, a CN INFORMATION BROADCAST REJECT message shall be returned to the CN and the procedure is terminated.

8.24.4 Abnormal Conditions

8.25 Overload Control

8.25.1 General

This procedure is defined to give some degree of signalling flow control. At the UTRAN "Processor Overload" and "Overload in the Capability to Send Signalling Messages to the UE" are catered for, and at the CN "Processor Overload" is catered for. The procedure uses connectionless signalling.

8.25.2 Philosophy

The philosophy used is to stem the traffic at source with known effect on the service. The algorithm used is:

At the CN side:

- If T_{igOC} is not running and an OVERLOAD message or "Signalling Point Congested" information is received, the traffic should be reduced by one step. It is also possible, optionally, to indicate the number of steps to reduce the traffic. At the same time, timers T_{igOC} and T_{inTC} should be started.

- During T_{igOC} all received OVERLOAD messages or "Signalling Point Congested" information should be ignored.

- This step by step reduction of traffic should be continued until maximum reduction is obtained by arriving at the last step.

- If T_{inTC} expires (i.e. no OVERLOAD message or "Signalling Point Congested" information is received during T_{inTC}) the traffic should be increased by one step and T_{inTC} should be started unless normal load has been resumed.

At the UTRAN side:

- If T_{igOR} is not running and an OVERLOAD message or "Signalling Point Congested" information is received, the traffic should be reduced by one step. It is also possible, optionally, to indicate the number of steps to reduce the traffic. At the same time, timers T_{igOR} and T_{inTR} should be started.

- During T_{igOR} all received OVERLOAD messages or "Signalling Point Congested" information should be ignored.

- This step by step reduction of traffic should be continued until maximum reduction is obtained by arriving at the last step.

- If T_{inTR} expires (i.e. no OVERLOAD message or "Signalling Point Congested" information is received during T_{inTR}) the traffic should be increased by one step and T_{inTR} should be started unless normal load has been resumed.

The number of steps and the method of reducing the load are considered to be an implementation specific function.

There may be other traffic control mechanisms from O&M activities occurring simultaneously.

8.25.3 Successful Operation

8.25.3.1 Overload at the CN

Figure 29: Overload at the CN

The CN should indicate to the RNC that it is in a congested state by sending an OVERLOAD message.

At the UTRAN receipt of this message should cause the reduction of traffic to the CN node sending the message.

8.25.3.2 Overload at the UTRAN

Figure 30: Overload at the UTRAN

If the UTRAN is not capable to send signalling messages to the UE due to overloaded resources then the UTRAN should send an OVERLOAD message to the CN.

8.25.4 Abnormal Conditions

8.26 Reset

8.26.1 General

The purpose of the Reset procedure is to initialise the UTRAN in the event of a failure in the CN or vice versa. The procedure uses connectionless signalling.

8.26.2 Successful Operation

8.26.2.1 Reset Procedure Initiated from the CN
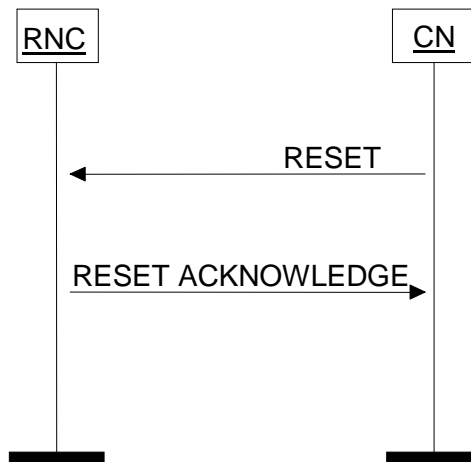
Figure 31: Reset procedure initiated from the CN. Successful operation

In the event of a failure at the CN, which has resulted in the loss of transaction reference information, a RESET message shall be sent to the RNC. This message is used by the UTRAN to release affected Radio Access Bearers and to erase all affected references for the CN that sent the RESET message.

After a guard period of T(RatC) seconds a RESET ACKNOWLEDGE message shall be returned to the CN, indicating that all UEs which were involved in a call are no longer transmitting and that all references at the UTRAN have been cleared.

Interactions with other procedures:

In case of interactions with other procedures, the Reset procedure always overrides all other procedures.

8.26.2.2 Reset Procedure Initiated from the UTRAN
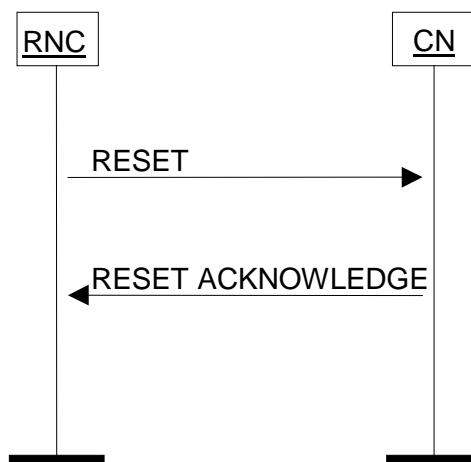
Figure 32: Reset procedure initiated from the UTRAN. Successful operation

In the event of a failure at the UTRAN which has resulted in the loss of transaction reference information, a RESET message shall be sent to the CN. This message is used by the CN to release affected Radio Access Bearers and to erase all affected references.

After a guard period of T(RatR) seconds a RESET ACKNOWLEDGE message shall be returned to the UTRAN indicating that all references have been cleared.

Interactions with other procedures:

In case of interactions with other procedures, the Reset procedure always overrides all other procedures.

8.26.3   Abnormal Conditions

8.26.3.1   Abnormal Condition at the CN

If the CN sends a RESET message to the RNC and receives no RESET ACKNOWLEDGE message within a period T(RafR) then it shall repeat the entire Reset procedure. The sending of the RESET message shall be repeated a maximum of "n" times where n is an operator matter. After the n-th unsuccessful repetition the procedure shall be stopped and e.g. the maintenance system be informed.

8.26.3.2   Abnormal Condition at the UTRAN

If the RNC sends a RESET message to the CN and receives no RESET ACKNOWLEDGE message within a period T(RafC) then it shall repeat the entire Reset procedure. The sending of the RESET message shall be repeated a maximum of "n" times where n is an operator matter. After the n-th unsuccessful repetition the procedure shall be stopped and e.g. the maintenance system be informed.

8.26.3.3   Crossing of Reset Messages

When an entity that has sent a RESET message and is waiting for a RESET ACKNOWLEDGE message, instead receives a RESET message from the peer entity, it shall stop timer T(RafC or RafR) and send a RESET ACKNOWLEDGE message to the peer entity.

8.27   Error Indication

8.27.1   General

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

If the error situation arises due to reception of a message utilising dedicated signalling, then the Error Indication procedure uses connection oriented signalling. Otherwise the procedure uses connectionless signalling.

8.27.2   Successful Operation

Figure 33: Error Indication procedure, CN originated

Figure 34: Error Indication procedure, RNC originated

When the conditions defined in chapter [*Handling of unknown, unforeseen and erroneous protocol data*] are fulfilled, the Error Indication procedure is initiated by an ERROR INDICATION message sent from the receiving node.

When the ERROR INDICATION message is triggered due to the reception of an Iu user plane PDU(s) with an unknown Iu transport association, the appropriate cause value and both the *Iu Transport Association* IE and the *Transport Layer Address* IE shall be included in the message.

Examples for possible cause values for protocol error indications are:

- "Transfer Syntax Error".

- "Logical Error: Unknown Iu Transport Association".

- "Semantic Error".

- "Message not compatible with receiver state".

8.27.3 Abnormal Conditions

8.28 CN Deactivate Trace

8.28.1 General

The purpose of the CN Deactivate Trace procedure is to inform the RNC that it should stop producing a trace record for the indicated trace reference. The procedure uses the connection oriented mode signalling.

8.28.2 Successful Operation
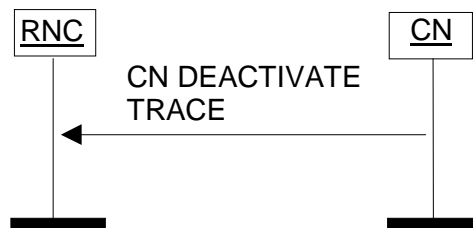
Figure 35: CN Deactivate Trace Procedure

The trace deactivate is invoked by the CN sending a CN DEACTIVATE TRACE message to the UTRAN.

The *Trace Reference* IE and, if present, the *Trigger ID* IE are used to indicate which trace shall be stopped.

8.28.3 Abnormal Conditions

If the RNC receives a CN DEACTIVATE TRACE message with an unknown trace reference, the RNC shall take no action.

8.29 Reset resource

8.29.1 General

The purpose of the Reset resource release procedure is to initialise part of the UTRAN in the event of an abnormal failure in the CN or vice versa (e.g. Signalling Transport processor reset). The procedure uses connectionless signalling.

8.29.1.1 Reset Resource procedure initiated from the RNC
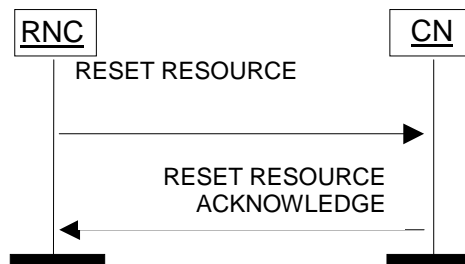
Figure 36: RNC initiated Reset Resource procedure

The RNC initiates this procedure by sending a RESET RESOURCE message to the CN.

On reception of this message the CN shall release locally the resources and references (i.e. resources and Iu signalling connection identities) associated to the Iu signalling connection identities indicated in the received message. The CN shall always return the RESET RESOURCE ACKNOWLEDGE message to the RNC when all resources and references have been released.

The CN shall provide means to prevent the immediate re-assignment of released Iu signalling connection identitifiers to minimise the risk that the Reset Resource procedure releases the same Iu signalling connection identifiers re-assigned to new Iu connections by the CN.

8.29.1.2 Reset Resource procedure initiated from the CN
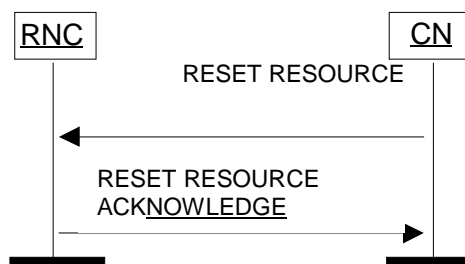
Figure 37: CN initiated Reset Resource procedure

The CN initiates this procedure by sending a RESET RESOURCE message to the RNC.

On reception of this message the RNC shall release locally the resources and references (i.e. radio resources and Iu signalling connection identities) associated to the Iu signalling connection identities indicated in the received message. The RNC shall always return the RESET RESOURCE ACKNOWLEDGE message to the CN when all resources and references have been released.

The RNC shall provide means to prevent the immediate re-assignment of released Iu signalling connection identitifiers to minimise the risk that the Reset Resource procedure releases the same Iu signalling connection identifiers re-assigned to new Iu connections by the RNC.

9 Elements for RANAP Communication

9.1 Message Functional Definition and Content

9.1.1 General

Section 9.1 presents the contents of RANAP messages in tabular format. The corresponding ASN.1 definition is presented in section 9.3. In case there is contradiction between the tabular format in section 9.1 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.

> NOTE: The messages have been defined in accordance to the guidelines specified in UMTS 25.921.

9.1.2 Message Contents

9.1.2.1 Presence

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

Table 1: Meaning of abbreviations used in RANAP messages

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

9.1.2.2 Criticality

Each Information Element or Group of Information Elements may have a criticality information applied to it. Following cases are possible:

Table 3: 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 RAB ASSIGNMENT REQUEST

This message is sent by the CN to request the establishment, modification or release of one or more RABs for the same UE.

Direction: CN $\rightarrow$ RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
RABs to be setup or modified	C – ifNoOtherG roup	0 to \<maxnoofRABs\>			EACH	ignore
>First setup or modify item	M			Grouping reason: same criticality	YES	reject
>>RAB ID	M		9.2.1.2	The same RAB ID must only be present in one group.	-	
>>NAS Synchronisation Indicator	C- ifNASInfoP rovided		9.2.3.18		-	
>>RAB parameters	M		9.2.1.3	Includes all necessary parameters for RABs (both for MSC and SGSN) including QoS.	-	
>>User Plane Information	M				-	
>>>User Plane mode	M		9.2.1.18		–	
>>>UP Mode Versions	M		9.2.1.19		–	
>>Transport Layer Address	M		9.2.2.1		-	
>>Iu Transport Association	M		9.2.2.2		-	
>Second setup or modify item	M			Grouping reason: same criticality	YES	ignore
>> PDP Type Information	C - ifPS		9.2.1.40		-	
>>Data Volume Reporting Indication	C - ifPS		9.2.1.17		-	
>>DL GTP-PDU sequence number	C- ifPS		9.2.2.3		-	
>>UL GTP-PDU sequence number	C- ifPS		9.2.2.4		-	
>>DL N-PDU sequence number	C- ifPS		9.2.1.33		-	
>>UL N-PDU sequence number	C- ifPS		9.2.1.34		-	
RABs to be released	C - ifNoOtherG roup	0 to \<maxnoofRABs\>			EACH	ignore
>RAB ID	M		9.2.1.2	The same RAB ID must only be present in one group.	-	
>Cause	M		9.2.1.4		-	

Condition	Explanation
IfPS	This IE is only present for RABs towards the PS domain.
IfNoOtherGroup	This group must be present at least when no other group is present, i.e. at least one group must be present.
IfNASInfoProvided	This IE is present if the relevant NAS information is provided by the CN.

Range bound	Explanation
MaxnoofRABs	Maximum no. of RABs for one UE. Value is 256.

9.1.4 RAB ASSIGNMENT RESPONSE

This message is sent by the RNC to report the outcome of the request from the message RAB ASSIGNMENT REQUEST.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
RABs setup or modified	C - ifNoOtherGroup	0 to \<maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2	The same RAB ID must only be present in one group.	-	
>Transport Layer Address	C - ifPS		9.2.2.1		-	
>Iu Transport Association	C - ifPS		9.2.2.2		-	
>Data Volume	C – ifModReqPS	0 to \<maxnoofVol>			-	
>>Unsuccessfully Transmitted DL DataVolume	M		9.2.3.12		-	
>>Data Volume Reference	O		9.2.3.13		-	
RABs released	C – ifNoOtherGroup	0 to \<maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2	The same RAB ID must only be present in one group.	-	
>Data Volume	C – ifReqPS	0 to \<maxnoofVol>			-	
>>Unsuccessfully Transmitted DL DataVolume	M		9.2.3.12		-	
>>Data Volume Reference	O		9.2.3.13		-	
>DL GTP-PDU Sequence Number	C-ifUiPS		9.2.2.3		-	
>UL GTP-PDU Sequence Number	C-ifUiPS		9.2.2.4		-	
RABs queued	C – ifNoOtherGroup	0 to \<maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2	The same RAB ID must only be present in one group.	-	
RABs failed to setup or modify	C – ifNoOtherGroup	0 to \<maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2	The same RAB ID must only be present in one group.	-	
>Cause	M		9.2.1.4		-	
RABs failed to release	C – ifNoOtherGroup	0 to \<maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2	The same	-	

				RAB ID must only be present in one group.		
>Cause	M		9.2.1.4.		-	
Criticality Diagnostics	O		9.2.1.35		YES	ignore

Condition	Explanation
IfPS	This IE is only present for RABs towards the PS domain.
IfNoOtherGroup	This group must be present at least when no other group is present, i.e. at least one group must be present.
IfReqPS	This IE is only present if data volume reporting for PS domain is required.
C – ifModReqPS	This IE is only present if the RAB has been modified and the data volume reporting for PS domain is required.
IfUiPS	This group is only present for RABs towards the PS domain when the release was initiated by UTRAN.

Range bound	Explanation
MaxnoofRABs	Maximum no. of RABs for one UE. Value is 256.
MaxnoofVol	Maximum no. of reported data volume for one RAB(value is 2).

9.1.5   RAB RELEASE REQUEST

This message is sent by the RNC, to request the CN to release one or more RABs for the same UE.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
RABs to be released		1 to <maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2		-	
>Cause	M		9.2.1.4		-	

Range bound	Explanation
MaxnoofRABs	Maximum no. of RABs for one UE. Value is 256.

9.1.6   IU RELEASE REQUEST

This message is sent by the RNC to request the CN to release the Iu connection.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Cause	M		9.2.1.4		YES	ignore

9.1.7   IU RELEASE COMMAND

This message is sent by the CN to order RNC to release all resources related to the Iu connection.

Direction: CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Cause	M		9.2.1.4		YES	ignore

9.1.8 IU RELEASE COMPLETE

This message is sent by the RNC as response to the IU RELEASE COMMAND message.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	**ignore**
RABs Data Volume Report	C – ifReqPS	0 to <maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2		-	
>Data Volume		1 to <maxnoofVol>			-	
>>Unsuccessfully Transmitted DL Data Volume	M		9.2.3.12		-	
>>Data Volume Reference	O		9.2.3.13		-	
RABs Released	C-ifUiPS	0 to <maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2		-	
>DL GTP-PDU Sequence Number	M		9.2.2.3		-	
>UL GTP-PDU Sequence Number	M		9.2.2.4		-	
Criticality Diagnostics	O		9.2.1.35		YES	ignore

Condition	Explanation
IfReqPS	This Group is only present if data volume reporting for PS domain is required.
IfUiPS	This group is only present for RABs towards the PS domain when the release was initiated by UTRAN.

Range bound	Explanation
maxnoofRABs	Maximum no. of RABs for one UE. Value is 256.
MaxnoofVol	Maximum no. of reported data volume for one RAB. (value is 2)

9.1.9 RELOCATION REQUIRED

This message is sent by the source RNC to inform the CN that a relocation is to be performed.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Relocation Type	M		9.2.1.23		YES	ignore
Cause	M		9.2.1.4		YES	ignore
Source ID	M		9.2.1.24		YES	ignore
Target ID	M		9.2.1.25		YES	reject
MS Classmark 2	C - ifGSMtarget		9.2.1.26	Defined in UMTS 24.008 [8].	YES	ignore
MS Classmark 3	C - ifGSMtarget		9.2.1.27	Defined in UMTS 24.008 [8].	YES	ignore
Source RNC to target RNC transparent container	C - ifUMTStarget		9.2.1.28		YES	reject
Old BSS to new BSS Information	C - ifGSMtarget		9.2.1.29	Defined in GSM 08.08 [11].	YES	ignore

Condition	Explanation
ifGSMtarget	This IE is only present when initiating an inter system handover towards GSM BSS.
if UMTStarget	This IE shall be present when initiating relocation of SRNS.

9.1.10 RELOCATION REQUEST

This message is sent by the CN to request the target RNC to allocate necessary resources for a relocation.

Direction: CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Permanent NAS UE Identity	C – ifAvail		9.2.3.1		YES	ignore
Cause	M		9.2.1.4		YES	ignore
CN Domain Indicator	M		9.2.1.5		YES	ignore
Source RNC to target RNC transparent container	M		9.2.1.28		YES	reject
RABs to be setup		0 to <maxnoofRABs>			EACH	reject
>RAB ID	M		9.2.1.2		-	
>NAS Synchronisation Indicator	C-ifNASInfoProvided		9.2.3.18		-	
>RAB parameters	M		9.2.1.3		-	
>Data Volume Reporting Indication	C – ifPS		9.2.1.17		-	
> PDP Type Information	C - ifPS		9.2.1.40		-	
>User Plane Information	M				-	
>>User Plane mode	M		9.2.1.18		-	
>>UP Mode Versions	M		9.2.1.19		–	
>Transport Layer Address	M		9.2.2.1		–	
>Iu Transport Association	M		9.2.2.2		-	
Integrity Protection Information	C – ifAvail		9.2.1.11	Integrity Protection Information includes key and permitted algorithms.	YES	ignore
Encryption Information	O		9.2.1.12	Encryption Information includes key and permitted algorithms.	YES	ignore
Iu signalling connection identifier	M		9.2.1.38		YES	ignore

Condition	Explanation
ifAvail	This IE is only present if available at the sending side.
IfPS	This IE is only present for RABs towards the PS domain.
IfNASInfoProvided	This IE is present if the relevant NAS information is provided by the CN.

Range bound	Explanation
maxnoofRABs	Maximum no. of RABs for one UE. Value is 256.

9.1.11   RELOCATION REQUEST ACKNOWLEDGE

This message is sent by the target RNC to inform the CN about the result of the resource allocation for the requested relocation.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	**ignore**
Target RNC to Source RNC Transparent Container	C - IfApplNotOtherCN		9.2.1.30		YES	ignore
RABs setup		0 to <maxnoofRABs			EACH	reject
>RAB ID	M		9.2.1.2		-	
>Transport Layer Address	C – ifPS		9.2.2.1		-	
>Iu Transport Association	C – ifPS		9.2.2.2			
RABs failed to setup		0 to <maxnoofRABs			EACH	ignore
>RAB ID	M		9.2.1.2		-	
>Cause	M		9.2.1.4		-	
Chosen Integrity Protection Algorithm	C - ifAvail		9.2.1.13	Indicates which algorithm that will be used by the target RNC.	YES	ignore
Chosen Encryption Algorithm	O		9.2.1.14	Indicates which algorithm that will be used by the target RNC.	YES	ignore
Criticality Diagnostics	O		9.2.1.35		YES	ignore

Condition	Explanation
IfPS	This Group is only present for RABs towards the PS domain.
IfApplNotOtherCN	Must be included if applicable and if not sent via the other CN.
ifAvail	This IE is only present if available at the sending side.

Range bound	Explanation
maxnoofRABs	Maximum no. of RABs for one UE. Value is 256.

9.1.12   RELOCATION COMMAND

This message is sent by the CN to source RNC to inform that resources for the relocation are allocated in target RNC.

Direction: CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Target RNC to Source RNC Transparent Container	C - ifRecdFrom RelocTarget		9.2.1.30		YES	reject
L3 Information	C - ifRecdFrom RelocTarget		9.2.1.31	Defined in GSM 08.08 [11].	YES	ignore
RABs to be released		0 to <maxnoofRABs			EACH	ignore
>RAB ID	M		9.2.1.2		-	
RABs subject to data forwarding	C - ifPS	0 to <maxnoofRABs >			EACH	ignore
>RAB ID	M		9.2.1.2		-	
>Transport Layer Address	M		9.2.2.1		-	
>Iu Transport Association	M		9.2.2.2		-	
Criticality Diagnostics	O		9.2.1.35		YES	ignore

Condition	Explanation
ifRecdFromRelocTarget	This IE shall be included if it is received by the CN from the relocation target.
IfPS	This Group is only present for RABs towards the PS domain.

Range bound	Explanation
maxnoofRABs	Maximum no. of RABs for one UE. Value is 256.

9.1.13   RELOCATION DETECT

This message is sent by the target RNC to inform the CN that the relocation execution trigger has been received.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore

9.1.14   RELOCATION COMPLETE

This message is sent by the target RNC to inform the CN that the relocation is completed.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore

9.1.15 RELOCATION PREPARATION FAILURE

This message is sent by the CN to the source RNC if the relocation preparation failed.

Direction: CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Cause	M		9.2.1.4		YES	ignore
Criticality Diagnostics	O		9.2.1.35		YES	ignore

9.1.16 RELOCATION FAILURE

This message is sent by the target RNC to inform the CN that the requested resource allocation failed.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Cause	M		9.2.1.4		YES	ignore
Criticality Diagnostics	O		9.2.1.35		YES	ignore

9.1.17 RELOCATION CANCEL

This message is sent by the source RNC to the CN to cancel an ongoing relocation.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Cause	M		9.2.1.4		YES	ignore

9.1.18 RELOCATION CANCEL ACKNOWLEDGE

This message is sent by the CN to the source RNC when the relocation has been cancelled.

Direction: CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Criticality Diagnostics	O		9.2.1.35		YES	ignore

9.1.19 SRNS CONTEXT REQUEST

This message is sent by the CN to source RNC to indicate the PS RABs for which context transfer shall be performed.

Direction: CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
RABs subject to data forwarding		1 to <maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2		-	

Range bound	Explanation
maxnoofRABs	Maximum no. of RABs for one UE. Value is 256.

9.1.20   SRNS CONTEXT RESPONSE

This message is sent by the source RNC as a response to SRNS CONTEXT REQUEST.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
RABs Contexts	C - ifNoOtherGroup	0 to <maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2		-	
>DL GTP-PDU Sequence Number	M		9.2.2.3		-	
>UL GTP-PDU Sequence Number	M		9.2.2.4		-	
>DL N-PDU Sequence Number	M		9.2.1.33		-	
>UL N-PDU Sequence Number	M		9.2.1.34		-	
RABs Contexts failed to transfer	C - ifNoOtherGroup	0 to <maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2		-	
>Cause	M		9.2.1.4		-	
Criticality Diagnostics	O		9.2.1.35		YES	ignore

Condition	Explanation
IfNoOtherGroup	This group must be present at least when no other group is present, i.e. at least one group must be present.

Range bound	Explanation
maxnoofRABs	Maximum no. of RABs for one UE. Value is 256.

9.1.21   SRNS DATA FORWARD COMMAND

This message is sent by the CN to the RNC to trigger the transfer of N-PDUs from the RNC to the CN in inter system forward handover.

Direction: CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
RABs subject to data forwarding	C - ifPS	0 to <maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2		-	
>Transport Layer Address	M		9.2.2.1		-	
>Iu Transport Association	M		9.2.2.2		-	

Condition	Explanation
ifPS	This Group is only present for RABs towards the PS domain.

Range bound	Explanation
maxnoofRABs	Maximum no. of RABs for one UE. Value is 256.

9.1.22   FORWARD SRNS CONTEXT

This message is sent either by source RNC to the CN or by the CN to target RNC.

Direction: CN → RNC and RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
RAB Contexts x n		1 to <maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2		-	
>DL GTP-PDU Sequence Number	M		9.2.2.3		-	
>UL GTP-PDU Sequence Number	M		9.2.2.4		-	
>DL N-PDU Sequence Number	M		9.2.1.33		-	
>UL N-PDU Sequence Number	M		9.2.1.34		-	

Range bound	Explanation
maxnoofRABs	Maximum no. of RABs for one UE. Value is 256.

9.1.23   PAGING

This message is sent by the CN to request UTRAN to page a specific UE.

Direction: CN → RNC.

Signalling bearer mode: Connectionless.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
CN Domain Indicator	M		9.2.1.5		YES	ignore
Permanent NAS UE Identity	M		9.2.3.1		YES	ignore
Temporary UE Identity	O		9.2.3.2		YES	ignore
Paging Area ID	O		9.2.1.21		YES	ignore
Paging Cause	O		9.2.3.3		YES	ignore
Non Searching Indication	O		9.2.1.22		YES	ignore
DRX Cycle Length Coefficient	O		9.2.1.37		YES	ignore

9.1.24   COMMON ID

This message is sent by the CN to inform RNC about the permanent NAS UE identity for a user.

Direction: CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Permanent NAS UE Identity	M		9.2.3.1		YES	ignore

9.1.25   CN INVOKE TRACE

This message is sent by the CN to request the RNC to start to produce a trace record.

Direction: CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Trace Type	M		9.2.1.6		YES	ignore
Trace Reference	M		9.2.1.8		YES	ignore
Trigger ID	O		9.2.1.7		YES	ignore
UE Identity	O		9.2.1.9		YES	ignore
OMC ID	O		9.2.1.10		YES	ignore

9.1.26   SECURITY MODE COMMAND

This message is sent by the CN to trigger the integrity and ciphering functions over the radio interface.

Direction: CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Integrity Protection Information	M		9.2.1.11	Integrity information includes key and permitted algorithms.	YES	ignore
Encryption Information	O		9.2.1.12	Encryption information includes key and permitted algorithms.	YES	ignore
Key status	M		9.2.1.36		YES	ignore

9.1.27   SECURITY MODE COMPLETE

This message is sent by the RNC as a successful response to SECURITY MODE COMMAND.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Chosen Integrity Protection Algorithm	M		9.2.1.13		YES	ignore
Chosen Encryption Algorithm	O		9.2.1.14		YES	ignore
Criticality Diagnostics	O		9.2.1.35		YES	ignore

9.1.28   SECURITY MODE REJECT

This message is sent by the RNC as a unsuccessful response to SECURITY MODE COMMAND.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Cause	M		9.2.1.4		YES	ignore
Criticality Diagnostics	O		9.2.1.35		YES	ignore

9.1.29   LOCATION REPORTING CONTROL

This message is sent by the CN to initiate, modify or stop location reporting from the RNC to the CN.

Direction: CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Request Type	M		9.2.1.16		YES	ignore

9.1.30 LOCATION REPORT

This message is sent by the RNC to the CN with information about the UE location.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Area Identity	O		9.2.3.10		YES	ignore
Cause	O		9.2.1.4		YES	ignore

9.1.31 DATA VOLUME REPORT REQUEST

This message is sent by the CN to request unsuccessfully transmitted data volumes for specific RABs.

Direction: CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
RABs Data Volume Report		1 to <maxnoofRABs>			EACH	ignore
>RAB ID	M		0		-	

Range bound	Explanation
maxnoofRABs	Maximum no. of RABs for one UE. Value is 256.

9.1.32 DATA VOLUME REPORT

This message is sent by the RNC and informs the CN about unsuccessfully transmitted data volumes for requested RABs.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
RABs Data Volume Report	C - ifNoOtherGroup	0 to <maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2		-	
>Data Volume		0 to <maxnoofVol>			-	
>>Unsuccessfully Transmitted DL Data Volume	M		9.2.3.12		-	
>>Data Volume Reference	O		9.2.3.13		-	
RABs failed to report	C - ifNoOtherGroup	0 to <maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2		-	
>Cause	M		9.2.1.4		-	
Criticality Diagnostics	O		9.2.1.35		YES	ignore

Condition	Explanation
IfNoOtherGroup	This group must be present at least when no other group is present, i.e. at least one group must be present.

Range bound	Explanation
maxnoofRABs	Maximum no. of RABs for one UE. Value is 256.
MaxnoofVol	Maximum no. of reported data volume for one RAB. (value is 2)

9.1.33   INITIAL UE MESSAGE

This message is sent by the RNC to transfer the radio interface initial layer 3 message to the CN.

Direction: RNC → CN.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
CN Domain Indicator	M		9.2.1.5		YES	ignore
LAI	M		9.2.3.6		YES	ignore
RAC	C - ifPS		9.2.3.7		YES	ignore
SAI	M		9.2.3.9		YES	ignore
NAS-PDU	M		9.2.3.5		YES	ignore
Iu signalling connection identifier	M		9.2.1.38		YES	ignore
Global RNC-ID	M		9.2.1.39		YES	ignore

Condition	Explanation
ifPS	This IE is only present for RABs towards the PS domain.

9.1.34   DIRECT TRANSFER

This message is sent by both the CN and the RNC and is used for carrying NAS information over the Iu interface.

Direction: RNC → CN and CN → RNC.

Signalling bearer mode: Connection oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
NAS-PDU	M		9.2.3.5		YES	ignore
LAI	C – ifPS2CN		9.2.3.6		YES	ignore
RAC	C – ifPS2CN		9.2.3.7		YES	ignore
SAPI	C – ifDL		9.2.3.8		YES	ignore

Condition	Explanation
IfPS2CN	This IE is only present if the message is directed to the PS domain.
IfDL	This IE is always used in downlink direction.

9.1.35 CN INFORMATION BROADCAST REQUEST

This message is sent by the CN and includes information to be broadcast to all users.

Direction: CN → RNC.

Signalling bearer mode: Connectionless.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
CN Domain Indicator	M		9.2.1.5		YES	ignore
CN Broadcast Information piece		1 to <maxnoofPieces>			EACH	ignore
>Information Identity	M		9.2.3.14		-	
>NAS Broadcast Information	C-ifBroadcast		9.2.3.4		-	
>CN Broadcast Area	C-ifBroadcast		9.2.3.17		-	
>Information Priority	C-ifBroadcast		9.2.3.15		-	
>Information Control	M		9.2.3.16		-	

Range bound	Explanation
maxnoofPieces	Maximum no. of Broadcast Information Pieces in one message. Value is 16.

Condition	Explanation
IfBroadcast	This IE is only present if CN requests the Broadcast of the corresponding information piece

9.1.36 CN INFORMATION BROADCAST CONFIRM

This message is sent by the RNC as a successful response to CN INFORMATION BROADCAST REQUEST.

Direction: RNC → CN.

Signalling bearer mode: Connectionless.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
CN Domain Indicator	M		9.2.1.5		YES	ignore
Criticality Diagnostics	O		9.2.1.35		YES	ignore
Global RNC-ID	M		9.2.1.39		YES	ignore

9.1.37 CN INFORMATION BROADCAST REJECT

This message is sent by the RNC as a unsuccessful response to CN INFORMATION BROADCAST REQUEST.

Direction: RNC → CN.

Signalling bearer mode: Connectionless.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
CN Domain Indicator	M		9.2.1.5		YES	ignore
Cause	M		9.2.1.4		YES	ignore
Criticality Diagnostics	O		9.2.1.35		YES	ignore
Global RNC-ID	M		9.2.1.39		YES	ignore

9.1.38   OVERLOAD

This message is sent by both the CN and the RNC to indicate that the node is overloaded.

Direction: RNC → CN and CN → RNC.

Signalling bearer mode: Connectionless.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Number of steps	O		9.2.1.32		YES	ignore
Global RNC-ID	C- ifUL		9.2.1.39		YES	ignore

Condition	Explanation
IfUL	This IE is always used in uplink direction

9.1.39   RESET

This message is sent by both the CN and the RNC and is used to request that the other node shall be reset.

Direction: RNC → CN and CN → RNC.

Signalling bearer mode: Connectionless.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Cause	M		9.2.1.4		YES	ignore
CN Domain Indicator	M		9.2.1.5		YES	ignore
Global RNC-ID	C - ifUL		9.2.1.39		YES	ignore

Condition	Explanation
IfUL	This IE is always used in uplink direction

9.1.40   RESET ACKNOWLEDGE

This message is sent by both the CN and the RNC as a response to RESET.

Direction: RNC → CN and CN → RNC.

Signalling bearer mode: Connectionless.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
CN Domain Indicator	M		9.2.1.5		YES	ignore
Criticality Diagnostics	O		9.2.1.35		YES	ignore
Global RNC-ID	C - ifUL		9.2.1.39		YES	ignore

Condition	Explanation
IfUL	This IE is always used in uplink direction

9.1.41 ERROR INDICATION

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

Direction: RNC → CN and CN → RNC.

Signalling bearer mode: Connection oriented or connectionless.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Cause	C - ifalone		9.2.1.4		YES	ignore
Criticality Diagnostics	C - ifalone		9.2.1.35		YES	ignore
CN Domain Indicator	O		9.2.1.5		YES	ignore
Transport Layer Address	O		9.2.2.1		YES	ignore
Iu Transport Association	O		9.2.2.2		YES	ignore
Global RNC-ID	C – ifULandCL		9.2.1.39		YES	ignore

Condition	Explanation
ifalone	At least either Cause IE or Criticality Diagnostics IE shall be present.
ifULandCL	This IE is always used in uplink direction when message is sent connectionless

9.1.42 CN DEACTIVATE TRACE

This message is sent by the CN to request the RNC to stop producing a trace record for the indicated trace reference.

Direction: CN → RNC.

Signalling bearer mode: Connection Oriented.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Trace Reference	M		9.2.1.8		YES	ignore
Trigger ID	O		9.2.1.7		YES	ignore

9.1.43 RANAP RELOCATION INFORMATION

This message is part of a special RANAP Relocation Information procedure, and is sent between RNCs during Relocation.

Direction: RNC - RNC.

Signalling bearer mode: Not applicable.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Direct Transfer Information		0 to <MaxnoofDT>		Information received in one or more DIRECT TRANSFER messages and that needs to be transferred to target RNC for further transmission to the UE.	EACH	ignore
>NAS-PDU	M		9.2.3.5		-	
>SAPI	M		9.2.3.8		-	
RAB Contexts		0 to <maxnoofRABs>			EACH	ignore
>RAB ID	M		9.2.1.2		-	
>DL GTP-PDU Sequence Number	M		9.2.2.3		-	
>UL GTP-PDU Sequence Number	M		9.2.2.4		-	
>DL N-PDU Sequence Number	M		9.2.1.33		-	
>UL N-PDU Sequence Number	M		9.2.1.34		-	

Range bound	Explanation
maxnoofDT	Maximum no. of DT information. Value is 15.
maxnoofRABs	Maximum no. of RABs for one UE. Value is 256.

9.1.44   RESET RESOURCE

This message is sent by either CN or RNC. The sending entity informs the receiving entity that the sending requests the receiving entity to release resources and references associated to Iu signalling connection identities in the message.

Direction: CN $\leftarrow\rightarrow$ RNC.

Signalling bearer mode: Connectionless.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
CN Domain Indicator	M		9.2.1.5		YES	ignore
Cause	M		9.2.1.4		YES	ignore
Iu signalling connections to be released		1 to <maxnoofIuSigConIds			EACH	ignore
>Iu signalling connection identifier	M		9.2.1.38		-	
Global RNC-ID	C - ifUL		9.2.1.39		YES	ignore

Condition	Explanation
IfUL	This IE is always used in uplink direction

Range bound	Explanation
MaxnoofIuSigConIds	Maximum no. of Iu signalling connection identities. Value is 1000.

9.1.45   RESET RESOURCE ACKNOWLEDGE

This message is sent by either the CN or RNC inform the CN or RNC that the RESET RESOURCE has been received.

Direction: CN ←→ RNC.

Signalling bearer mode: Connectionless.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
CN Domain Indicator	M		9.2.1.5		YES	ignore
lu signalling connections released		1 to <maxnooflu SigConIds			EACH	ignore
>lu signalling connection identifier	M		9.2.1.38		-	
Global RNC-ID	C - ifUL		9.2.1.39		YES	ignore
Criticality Diagnostics	O		9.2.1.35		YES	ignore

Condition	Explanation
IfUL	This IE is always used in uplink direction

Range bound	Explanation
MaxnoofluSigConIds	Maximum no. of lu signalling connection identities. Value is 1000.

9.2   Information Element Definitions

9.2.0   General

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

9.2.1 Radio Network Layer Related IEs

9.2.1.1 Message Type

Message type uniquely identifies the message being sent. It is mandatory for all messages.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Message Type				Assumed max no of messages is 256.
>Procedure Code	M		ENUMERATED (RAB Assignment, RAB Release Request, Iu Release Request, Iu Release, Relocation Preparation, Relocation Resource Allocation, Relocation Detect, Relocation Complete Relocation Cancel, SRNS Context Transfer, SRNS Data Forwarding Initiation, SRNS Context Forwarding from Source RNC to CN, SRNS Context Forwarding to Target RNC from CN, Paging, Common ID, CN Invoke Trace, Security Mode Control, Location Reporting Control Location Report, Data Volume Report, Initial UE Message Direct Transfer, CN Information Broadcast, Overload Control, Reset, Error Indication, CN Deactivate Trace, RANAP Relocation Information, Reset Resource, Reset Resource Acknowledge, …)	
>Type of Message	M		ENUMERATED (Initiating Message, Successful Outcome, Unsuccessful Outcome, Outcome)	

9.2.1.2 RAB ID

This element uniquely identifies the radio access bearer for a specific CN domain for a particular UE, which makes the RAB ID unique over one Iu connection. The RAB ID shall remain the same for the duration of the RAB even when the RAB is relocated to another Iu connection.

The purpose of the element is to bind data stream from the Non-Access Stratum point of view (e.g. bearer of call or PDP context) and radio access bearer in Access Stratum. The value is also used in the RNC to relate Radio Bearers to a RAB. The content of this information element is transferred unchanged from the CN node (i.e., MSC or SGSN) via RNC to UE by RANAP messages and RRC messages. For RRC messages refer to TS 25.331 [10].

The element contains binary representation of either the Stream Identifier (SI) for CS domain or the Network Service Access Point Identifier (NSAPI) for PS domain. These identifiers are coded in the RAB ID element in accordance with the coding of the Stream Identifier IE and with the coding of the NSAPI IE in TS 24.008 [8].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAB ID	M		BIT STRING (8)	

9.2.1.3   RAB Parameters

The purpose of the RAB parameters IE group and other parameters within the RAB parameters IE group is to indicate all RAB attributes as defined in [7] for both directions.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAB parameters				
>Traffic Class	M		ENUMERATED (conversational, streaming, interactive, background, ...)	**Desc.:** This IE indicates the type of application for which the Radio Access Bearer service is optimised
>RAB Asymmetry Indicator	M		ENUMERATED (Symmetric bidirectional, Asymmetric Uni directional downlink, Asymmetric Uni directional Uplink, Asymmetric Bidirectional, ...)	**Desc.:** This IE indicates asymmetry or symmetry of the RAB and traffic direction
>Maximum Bit Rate	M	1 to <Nbr-SeparateTrafficDirections>	INTEGER (1..16,000,000)	**Desc.:** This IE indicates the maximum number of bits delivered by UTRAN and to UTRAN at a SAP within a period of time, divided by the duration of the period. The unit is: bit/s **Usage**: When Nbr-SeparateTrafficDirections is equal to 2, then Maximum Bit Rate attribute for downlink is signalled first, then Maximum Bit Rate attribute for uplink
>Guaranteed Bit Rate	C-iftrafficConv-Stream	0 to <Nbr-SeparateTrafficDirections>	INTEGER (0..16,000,000)	**Desc.:** This IE indicates the guaranteed number of bits delivered at a SAP within a period of time (provided that there is data to deliver), divided by the duration of the period. The unit is: bit/s **Usage:** 1. When Nbr-SeparateTrafficDirections is equal to 2, then Guaranteed Bit Rate for downlink is signalled first, then Guaranteed Bit Rate for uplink 2. Delay and reliability attributes only apply up to the guaranteed bit rate 3. Conditional value:

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAB parameters				
				• Set to lowest rate controllable RAB Subflow Combination rate given by the largest RAB Subflow Combination SDU size, when present and calculated Iu Transmission Interval • Set to N/A (=0) when traffic class indicates Interactive or Background
>Delivery Order	M		ENUMERATED (delivery order requested, delivery order not requested)	**Desc:** This IE indicates that whether the RAB shall provide in-sequence SDU delivery or not **Usage:** Delivery order requested: in sequence delivery shall be guaranteed by UTRAN on all RAB SDUs Delivery order not requested: in sequence delivery is not required from UTRAN
>Maximum SDU size	M		INTEGER (0..32768)	**Desc.:** This IE indicates the maximum allowed SDU size The unit is: bit. **Usage:** Conditional value: set to largest RAB Subflow Combination compound SDU size when present among the different RAB Subflow Combination
>SDU parameters		1 to <maxRABSubflows>	See below	**Desc.:** This IE contains the parameters characterizing the RAB SDUs **Usage** Given per subflow with first occurence corresponding to subflow#1 etc…
>Transfer Delay	C-iftrafficConv-Stream		INTEGER (0..65535)	**Desc.:** This IE indicates the maximum delay for 95th percentile of the distribution of delay for all delivered SDUs during the lifetime of a RAB, where delay for an SDU is defined as the time from a request to transfer an SDU at one SAP to its delivery at the other SAP The unit is: millisecond. **Usage:** -
>Traffic Handling priority	C - iftrafficInteractiv		INTEGER {spare (0), highest (1), lowest (14), no priority used (15)} (0…15)	**Desc.:** This IE specifies the relative importance for handling of all SDUs belonging to the radio access bearer compared to the SDUs of other bearers **Usage:** -
>Allocation/Retention priority	O		See below	**Desc.:** This IE specifies the relative importance compared to other Radio access bearers for allocation and retention of the Radio access bearer. **Usage:** If this IE is not received, the request is regarded as it cannot trigger the preemption process and it is vulnerable to the preemption process.
>Source Statistics descriptor	C-iftrafficConv-Stream		ENUMERATED (speech, unknown, …)	**Desc.:** This IE specifies characteristics of the source of submitted SDUs

ETSI

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAB parameters				
				Usage: -

Range Bound	Explanation
Nbr-SeparateTrafficDirection	Number of Traffic Directions being signalled separately

Range Bound	Explanation
MaxRABSubflows	Number of RAB Subflows

Condition	Explanation
IftrafficConv-Stream	This IE is only present when traffic class indicates "Conversational" or "Streaming"
IftrafficInteractiv	This IE is only present when traffic class indicates "Interactiv"

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SDU parameters				
>SDU Error Ratio	C-ifErrorneousSDU			**Desc.:** This IE indicates the fraction of SDUs lost or detected as erroneous. This is a Reliability attribute **Usage:** The attribute is coded as follows: Mantissa * $10^{-exponent}$
>>Mantissa	M		INTEGER (1..9)	
>>Exponent	M		INTEGER (1..6)	
>Residual Bit Error Ratio	M			**Desc.:** This IE indicates the undetected bit error ratio for each subflow in the delivered SDU. This is a Reliability attribute. **Usage:** The attribute is coded as follows: Mantissa * $10^{-exponent}$
>>Mantissa	M		INTEGER (1..9)	
>>Exponent	M		INTEGER (1..8)	
>Delivery of Erroneous SDU	M		ENUMERATED (yes, no, no-error-detection-consideration)	**Desc.:** This IE indicates whether SDUs with detected errors shall be delivered or not. In case of unequal error protection, the attribute is set per subflow This is a Reliability attribute **Usage:** Yes: error detection applied, erroneous SDU delivered No. Error detection is applied , erroneous SDU discarded no-error-detection-consideration: SDUs delivered without considering error detection
>SDU format information Parameter	C - ifratecontrollableRAB	1 to <maxRABSubflow Combinations>		**Desc.:** This IE contains the list of possible exact sizes of SDUs and/or RAB Subflow Combination bitrates **Usage:** 1. The SDU sizes only are present when the RAB SDU of predefined sizes are transferred, when transferred, at constant time interval

				2. The RAB Subflow Combination bit rates only are present when the RAB SDU are transferred at pre-defined time intervals

Range Bound	Explanation
MaxRABSubflowCombination	Number of RAB Sublflow Combination

Condition	Explanation
IfErroneousSDU	This IE is not present when Delivery Of Erroneous SDU is set to "-"
IfratecontrollableRAB	When signalled, this IE indicates that the RAB is rate controllable

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SDU format information Parameter				
>Subflow SDU size	C-ifalone		INTEGER (0…4095)	**Desc.:** This IE indicates the exact size of the SDU. The unit is: bit. **Usage:** This IE is only present for RABs that have predefined SDU size(s). When this IE is not present and SDU parameters is present, then all Subflow SDU sizes equals the Maximum SDU size.
>RAB Subflow Combination bit rate	C-ifalone		INTEGER (0..16,000,000)	**Desc.:** This IE indicates the RAB Subflow Combination bit rate. The unit is: bit/s. **Usage:** This IE is only present for RABs that have predefined rate controllable bit rates. When this IE is not present and SDU format information parameter is present then all Subflow SDUs are transmitted (when there is data to be transmitted) at a constant time interval. The value of this IE shall not exceed the maximum value of the IEs 'Maximum Bit Rate'. The value 0 of RAB Subflow Combination bitrate indicates that the RAB uses discontinuous transfer of the SDUs.

Ifalone	At least either of Subflow SDU size IE or RAB Subflow Combination bit rate IE shall be present when SDU format information parameter is present

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Allocation/Retention priority				
>Priority level	M		Integer {spare (0), highest (1), lowest (14), no priority used (15)} (0..15)	**Desc.**: This IE indicates the priority of the request. **Usage:** The priority level and the preemption indicators may be used to determine whether the request has to be performed unconditionally and immediately
>Pre-emption Capability	M		ENUMERATED(cannot trigger pre-emption, can trigger pre-emption)	**Descr.:** This IE indicates the pre-emption capability of the request on other RABs **Usage:** The RAB shall not pre-empt other RABs or , theRAB may pre-empt other RABs The Preemption Capability indicator applies to the allocation of resources for a RAB and as such it provides the trigger to the preemption procedures/processes of the RNS.
>Pre-emption Vulnerability	M		ENUMERATED(not vulnerable to pre-emption, vulnerable to pre-emption)	**Desc.:** This IE indicates the vulnerability of the RAB to preemption of other RABs. **Usage**: The RAB shall not be pre-empted by other RABs or the RAB might be pre-empted by other RABs. Preemption Vulnerability indicator applies for the entire duration of the RAB, unless modified and as such indicates whether the RAB is a target of the preemption procedures/processes of the RNS
>Queuing allowed	M		ENUMERATED(queueing not allowed, queueing allowed)	**Desc.:** This IE indicates whether the request can be placed into a resource allocation queue or not. **Usage:** Queuing of the RAB is allowed Queuing of the RAB is not allowed Queuing allowed indicator applies for the entire duration of the RAB, unless modified.

9.2.1.4 Cause

The purpose of the cause information element is to indicate the reason for a particular event for the RANAP protocol.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Cause**				
>Radio Network Layer Cause			INTEGER (RAB pre-empted(1), Trelocoverall Expiry(2), Trelocprep Expiry(3), Treloccomplete Expiry(4), Tqueing Expiry(5), Relocation Triggered(6), Unable to Establish During Relocation(8), Unknown Target RNC(9), Relocation Cancelled(10), Successful Relocation(11), Requested Ciphering and/or Integrity Protection Algorithms not Supported(12), Change of Ciphering and/or Integrity Protection is not supported(13), Failure in the Radio Interface Procedure(14), Release due to UTRAN Generated Reason(15), User Inactivity(16), Time Critical Relocation(17), Requested Traffic Class not Available(18),	Value range is 1 – 64.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Cause**				
			Invalid RAB Parameters Value(19),	
			Requested Maximum Bit Rate not Available(20),	
			Requested Maximum Bit Rate for DL not Available(33),	
			Requested Maximum Bit Rate for UL not Available(34),	
			Requested Guaranteed Bit Rate not Available(21),	
			Requested Guaranteed Bit Rate for DL not Available(35),	
			Requested Guaranteed Bit Rate for UL not Available(36),	
			Requested Transfer Delay not Achievable(22),	
			Invalid RAB Parameters Combination(23),	
			Condition Violation for SDU Parameters(24),	
			Condition Violation for Traffic Handling Priority(25),	
			Condition Violation for Guaranteed Bit Rate(26),	
			User Plane Versions not Supported(27),	
			Iu UP Failure(28),	
			TRELOCalloc Expiry (7),	
			Relocation Failure in Target CN/RNC or Target System	

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Cause**				
			(29),	
			Invalid RAB ID(30),	
			No remaining RAB(31),	
			Interaction with other procedure(32),	
			Repeated Integrity Checking Failure(37),	
			Requested Report Type not supported(38),	
			Request superseded(39),	
			Release due to UE generated signalling connection release(40)	
			…)	

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Cause**				
>Transport Layer Cause			INTEGER (Logical Error: Unknown Iu Transport Association(65), …)	Value range is 65 – 80.
>NAS Cause			INTEGER (User Restriction Start Indication(81), User Restriction End Indication(82), Normal Release(83), …)	Value range is 81 – 96.
>Protocol Cause			INTEGER (Transfer Syntax Error(97), Semantic Error (98), Message not compatible with receiver state (99), Abstract Syntax Error (Reject) (100), Abstract Syntax Error (Ignore and Notify) (101), …)	Value range is 97 – 112.
>Miscellaneous Cause			INTEGER (O&M Intervention(113), No Resource Available(114), Unspecified Failure(115), Network Optimisation(116), …)	Value range is 113 – 128.
>Non-standard Cause			INTEGER (…)	Value range is 129 – 256.

9.2.1.5 CN Domain Indicator

Indicates the CN domain from which the message originates or to which the message shall be sent.

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

9.2.1.6 Trace Type

A fixed length element indicating the type of trace information to be recorded.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Trace Type	M		OCTET STRING (1)	Coded as the Trace Type specified in UMTS TS based on GSM TS 12.08 [12].

9.2.1.7 Trigger ID

A variable length element indicating the identity of the entity which initiated the trace.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Trigger ID	M		OCTET STRING (3..22)	Typically an OMC identity.

9.2.1.8 Trace Reference

A fixed length element providing a trace reference number allocated by the triggering entity.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Trace Reference	M		OCTET STRING (2..3)	

9.2.1.9   UE Identity

This element identifies the element to be traced i.e. the subscriber or the user equipment.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **UE Identity**				
>**IMSI**			OCTET STRING (SIZE (3..8))	- digits 0 to 9, two digits per octet, - each digit encoded 0000 to 1001, - 1111 used as filler - bit 4 to 1 of octet n encoding digit 2n-1 - bit 8 to 5 of octet n encoding digit 2n -Number of decimal digits shall be from 6 to 15 starting with the digits from the PLMN-ID.
>**IMEI**			OCTET STRING (SIZE (8))	- hexadecimal digits 0 to F, two hexadecimal digits per octet, - each hexadecimal digit encoded 0000 to 1111, - 1111 used as filler for bits 8 to 5 of last octet - bit 4 to 1 of octet n encoding digit 2n-1 - bit 8 to 5 of octet n encoding digit 2n Number of hexadecimal digits shall be 15.

9.2.1.10   OMC ID

A variable length element indicating the destination address of the Operation and Maintenance Center (OMC) to which trace information is to be sent.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
OMC ID	M		OCTET STRING (3..22)	Coded as the OMC ID specified in UMTSTS based on GSM TS 12.20.

9.2.1.11   Integrity Protection Information

This element contains the integrity protection information (key and permitted algorithms).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Integrity Protection Information				
>**Permitted integrity Protection Algorithms**				
>>Integrity Protection Algorithm	M	1 to 16	INTEGER (standard UIA1 (0))	Value range is 0 to 15. Only one value used.
>Integrity Protection Key	M		BIT STRING (128)	

9.2.1.12   Encryption Information

This element contains the user data encryption information (key and permitted algorithms) used to control any encryption equipment at the RNC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Encryption Information				
>Permitted Encryption Algorithms				
>>Encryption Algorithm	M	1 to 16	INTEGER (no encryption (0), standard UEA1 (1))	Value range is 0 to 15. Only two values used.
>Encryption Key	M		Bit string (128)	

9.2.1.13   Chosen Integrity Protection Algorithm

This element indicates the integrity protection algorithm being used by the RNC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Chosen Integrity Protection Algorithm	M		INTEGER (standard UIA1 (0))	Value range is 0 to 15. Only one value used.

9.2.1.14   Chosen Encryption Algorithm

This element indicates the encryption algorithm being used by the RNC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Chosen Encryption Algorithm	M		INTEGER (no encryption (0), standard UEA1 (1))	Value range is 0 to 15. Only two values used.

9.2.1.15   Categorisation Parameters

Void.

9.2.1.16   Request Type

This element indicates the type of UE location to be reported from RNC and it is either a Service Area or geographical co-ordinates.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Request Type				
>Event	M		ENUMERATED(Stop, Direct, Change of service area, ...)	
>Report area	M		ENUMERATED(Service Area, Geographical Coordinates, ...)	
>Accuracy code	C – ifGeoCoor dandAccur acy		INTEGER(0...127)	The requested accuracy "r" is derived from the "accuracy code" k by $r = 10 \times (1.1^k - 1)$

Condition	Explanation
IfGeoCoordandAccuracy	To be used if Geographical Coordinates shall be reported with a requested accuracy.

9.2.1.17 Data Volume Reporting Indication

This information element indicates whether or not RNC has to calculate the unsuccessfully transmitted NAS data amount for the RAB and to report the amount of data when the RAB is released.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Data Volume Reporting Indication	M		ENUMERAT ED (do report, do not report)	

9.2.1.18 User Plane Mode

This element indicates the mode of operation of the Iu User plane requested for realising the RAB. The Iu user plane modes are defined in UMTS 25.415 [6].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
User Plane Mode	M		ENUMERAT ED (transparent mode, support mode for predefined SDU sizes, ...)	This IE contains the mode of operation of the Iu UP protocol

9.2.1.19 UP Mode Versions

UP mode versions IE is an information element that is sent by CN to RNC. It is a bit string that indicates the versions for the selected UP mode that are supported by the CN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UP Mode Versions	M		BIT STRING (16)	Indicates the versions of the selected UP mode that are supported by the CN Bit 0 set to '1' equals version 1 Bit 1 set to '1' equals version 2 , …

9.2.1.20 Chosen UP Version

Void.

9.2.1.21 Paging Area ID

This element uniquely identifies the area, where the PAGING message shall be broadcasted. The Paging area ID is either a Location Area ID or Routing Area ID.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Paging Area ID**				
>LAI			9.2.3.6	
>RAI				
>>LAI	M		9.2.3.6	
>>RAC	M		9.2.3.7	

9.2.1.22 Non Searching Indication

This parameter allows the RNC not to search Common ID when receiving a PAGING message from the CN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Non Searching Indication	M		ENUMERATED (non-searching, searching)	

9.2.1.23 Relocation Type

This information element indicates whether the relocation of SRNS is to be executed with ot without involvement of the UE. If the UE is involved then a radio interface handover command shall be sent to the UE to trigger the execution of the relocation. If the UE is not involved then the relocation execution is triggerd via Iur.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Relocation Type	M		ENUMERATED (UE not involved in relocation of SRNS,UE involved in relocation of SRNS)	

9.2.1.24 Source ID

Source ID identifies the source for the relocation of SRNS. The Source ID may be e.g. Source RNC-ID or serving cell ID.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Source ID**				
>Source RNC-ID	C - ifUMTStarget			
>>PLMN-ID	M		OCTET STRING (SIZE (3))	- digits 0 to 9, two digits per octet, - each digit encoded 0000 to 1001, - 1111 used as filler - bit 4 to 1 of octet n encoding digit 2n-1 - bit 8 to 5 of octet n encoding digit 2n -The PLMN-ID consists of 3 digits from MCC followed by either -a filler plus 2 digits from MNC (in case of 2 digit MNC) or -3 digits from MNC (in case of a 3 digit MNC).
>>RNC-ID	M		INTEGER (0..4095)	
>SAI	C - ifGSMtarget			

9.2.1.25 Target ID

Target ID identifies the target for the relocation of SRNS. The target ID may be e.g. Target RNC-ID (for UMTS-UMTS relocation) or Cell Global ID of the relocation target (in case of UMTS to GSM relocation).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Target ID**				
>Target RNC-ID				
>>Choice CN Domain ID				
>>>CS Domain ID				See ref. [3].
>>>>LAI	M		9.2.3.6	
>>>PS Domain ID				See ref. [3].
>>>>LAI	M		9.2.3.6	
>>>>RAC	M		9.2.3.7	
>>RNC-ID	M		INTEGER (0..4095)	
>CGI				
>>LAI	M		9.2.3.6	
>>CI	M		OCTET STRING (2)	

9.2.1.26 MS Classmark 2

The coding of this element is described in 24.008 [8].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MS Classmark 2	M		OCTET STRING	Contents defined in TS 24.008 [8]

9.2.1.27 MS Classmark 3

The coding of this element is described in 24.008 [8].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MS Classmark 3	M		OCTET STRING	Contents defined in TS 24.008 [8]

9.2.1.28 Source RNC to Target RNC Transparent Container

Source RNC to Target RNC Transparent Container IE is an information element that is produced by Source RNC and is transmitted to target RNC. In inter system relocation the IE is transmitted from external relocation source to target RNC.

This IE is transparent to CN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RRC Container	M		OCTET STRING	Either "RRC initialisation information, source RNC to target RNC" or "RRC initialisation information, source system to target RNC" as defined in TS 25.331 [10]
Number of Iu Instances	M		INTEGER (1...2)	
Relocation Type	M		9.2.1.23	
Chosen Integrity Protection Algorithm	C – ifIntraUMTSandAvail		9.2.1.13	Indicates which integrity protection algorithm that has been used by the source RNC.
Integrity Protection Key	C – ifIntraUMTSandAvail		Bit String (128)	Indicates which integrity protection key that has been used by the source RNC.
Chosen Encryption Algorithm	C - ifIntraUMTSandCiph		9.2.1.14	Indicates which algorithm that has been used by the source RNC for ciphering of signalling data.
Ciphering Key	C - ifIntraUMTSandCiph		Bit String (128)	Indicates which ciphering key that has been used by the source RNC for ciphering of signalling data.
Chosen Encryption Algorithm	C - ifIntraUMTSandCiph		9.2.1.14	Indicates which algorithm that has been used by the source RNC for ciphering of CS user data.
Chosen Encryption Algorithm	C - ifIntraUMTSandCiph		9.2.1.14	Indicates which algorithm that has been used by the source RNC for ciphering of PS user data.
d-RNTI	C - ifUEnotinvolved		INTEGER (0..1048575)	
Target Cell ID	C - ifUEinvolved		INTEGER (0..268435455)	This information element identifies a cell unambiguously within a PLMN.
RAB TrCH mapping	C – ifUEnotinvolvedandRABsUseDCHorDSCHorUSCH	1 to \<MaxnoofRABs>		
>RAB ID	M		9.2.1.2	
>**RAB Subflow**	M	1 to \<MaxRAB-Subflows>		The RAB Subflows shall be presented in an order that corresponds to the order in which the RBs are presented per RAB in the RRC container included in this IE.
>> **Transport Channel Ids**				
>>>**DCH ID**	C-atleastone		INTEGER (0..255)	The DCH ID is the identifier of an active dedicated transport channel. It is unique for each active DCH among the active

IE/Group Name					
					DCHs simultaneously allocated for the same UE.
>>>**DSCH ID**	C-atleastone		INTEGER (0..255)		The DSCH ID is the identifier of an active downlink shared transport channel. It is unique for each DSCH among the active DSCHs simultaneously allocated for the same UE.
>>>**USCH ID**	C-atleastone		INTEGER (0..255)		The USCH ID is the identifier of an active uplink shared transport channel. It is unique for each USCH among the active USCHs simultaneously allocated for the same UE.

Condition	Explanation
IfIntraUMTSandAvail	Must be present for intra UMTS Handovers if available
IfIntraUMTSandCiph	Must be present for intra UMTS Handovers if ciphering is active
IfUEnotinvolved	Included for SRNS Relocation without UE involvement
IfUEinvolved	Included for SRNS Relocation with UE involvement
IfUEnotinvolvedandRABsUseDCHorDSCHorUSCH	Included for SRNS Relocation without UE involvement and if RABs are carried on DCH, USCH or DSCH transport channels.
AtLeastOne	At least one of these IEs shall be included

Range bound	Explanation
MaxnoofRABs	Maximum no. of RABs for one UE. Value is 256.
MaxRABSubflows	Maximum no. of subflows per RAB. Value is 7.

9.2.1.29   Old BSS to New BSS Information

The coding of this element is described in GSM 08.08 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Old BSS to New BSS Information	M		OCTET STRING	Contents defined in GSM 08.08 [11].

9.2.1.30   Target RNC to Source RNC Transparent Container

Target RNC to Source RNC Transparent Container IE is an information element that is produced by Target RNC and is transmitted to Source RNC. In inter system relocation the IE is transmitted from target RNC to the external relocation source.

This IE is transparent to CN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RRC Container	M		OCTET STRING	"RRC Information, target RNC to source system" as defined in TS 25.331 [10]
d-RNTI	O		INTEGER (0..1048575)	May be included to allow the triggering of the Relocation Detect procedure from the Iur Interface

9.2.1.31 L3 Information

The coding of this element is described in GSM 08.08 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
L3 Information	M		OCTET STRING	Contents defined in GSM 08.08 [11].

9.2.1.32 Number of Steps

Indicates the number of steps to reduce traffic in overload situation.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Number of Steps	M		INTEGER (1...16)	

9.2.1.33 DL N-PDU Sequence Number

This IE indicates the radio interface sequence number (PDCP) of the next downlink N-PDU (PDCP SDU) that would have been sent to the UE by a source system.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL N-PDU Sequence Number	M		INTEGER (0 ..65535)	This IE indicates the sequence number of the next DL N-PDU that would have been sent to the UE by a source system. This is the 16 bit sequence number.

9.2.1.34 UL N-PDU Sequence Number

This IE indicates the radio interface sequence number (PDCP) of the next uplink N-PDU (PDCP SDU) that would have been expected from the UE by a source system.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UL N-PDU Sequence Number	M		I INTEGER (0 ..65535)	This IE indicates the sequence number of the next UL N-PDU that would have been expected from the UE by a source system. This is the 16 bit sequence number.

9.2.1.35 Criticality Diagnostics

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

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

9.2.1.36 Key Status

This IE tells if the keys included in Security Mode Command are new or if the have been used previously.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Key status			ENUMERATED (old, new, …)	

9.2.1.37 DRX Cycle Length Coefficient

This IE indicates the DRX cycle length coefficient(k) as defined in TS25.331.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DRX Cycle Length Coefficient	M		INTEGER (2...12)	

9.2.1.38   Iu signalling connection identifier

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Iu signalling connection identifier	M		BIT STRING (SIZE(24))	The most significant bit of this IE shall indicate the node, that has assigned the value. MSB = "0": assigned by the RNC MSB = "1": assigned by the CN

9.2.1.39   Global RNC-ID

Global RNC-ID is used to globally identify an RNC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Global RNC-ID				
>PLMN-ID			OCTET STRING (SIZE (3))	- digits 0 to 9, two digits per octet, - each digit encoded 0000 to 1001, - 1111 used as filler - bit 4 to 1 of octet n encoding digit 2n-1 - bit 8 to 5 of octet n encoding digit 2n -The PLMN-ID consists of 3 digits from MCC followed by either -a filler plus 2 digits from MNC (in case of 2 digit MNC) or -3 digits from MNC (in case of a 3 digit MNC).
>RNC-ID	M		INTEGER (0..4095)	

9.2.1.40   PDP Type Information

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PDP Type Information				
>PDP Type	M	1 to <maxnoofPDPDirections>	ENUMERATED(empty, PPP, OSP:IHOSS, IPv4, IPv6,…)	PDP Type is defined in 24.008 [8], and the restrictions on usage shall comply with 24.008 [8]. **Usage**: When the IE is repeated then PDP Type for downlink is signalled first, followed by PDP Type for uplink; when the IE is not repeated, the PDP Type shall apply to both uplink and downlink.

Range bound	Explanation
MaxnoofPDPDirections	Number of directions for which PDP Type is signalled separately

9.2.2 Transport Network Layer Related IEs

9.2.2.1 Transport Layer Address

For the PS domain this information element is an IP address to be used for the user plane transport. For the CS domain this address is to be used for Transport Network Control Plane signalling to set up the U-Plane connection.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Transport Layer Address	M		BIT STRING (1..160, …)	The Radio Network layer is not supposed to interpret the address information. It should pass it to the transport layer for interpretation. For details on the Transport Layer Address, see ref. 25.414 [9].

9.2.2.2 Iu Transport Association

This element is used to associate the RAB and the corresponding user plane connection. For the CS domain this information element is the Binding ID to be used in Transport Network Control Plane signalling during set up of the U-Plane connection. In PS domain this information element is the GTP Tunnel Endpoint Identifier.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Iu transport association**				
>GTP TEID	C – ifPS		OCTET STRING (4)	
>Binding ID	C - ifCS		OCTET STRING (4)	

Condition	Explanation
IfPS	This IE is only present for RABs towards the PS domain.
IfCS	This IE is only present for RABs towards the CS domain.

9.2.2.3 DL GTP-PDU Sequence Number

This IE indicates the sequence number of the GTP-PDU which is the next to be sent to the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL GTP-PDU Sequence Number	M		INTEGER (0 ..65535)	This IE indicates the sequence number of the GTP-PDU which is next to be sent to the UE.

9.2.2.4 UL GTP-PDU Sequence Number

This IE indicates the sequence number of the GTP-PDU which is the next to be sent to the SGSN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UL GTP-PDU Sequence Number	M		INTEGER (0 ..65535)	This IE indicates the sequence number of the GTP-PDU which is next to be sent to the SGSN.

9.2.3 NAS Related IEs

9.2.3.1 Permanent NAS UE Identity

This element is used to identify the UE commonly in UTRAN and in CN. RNC uses it to find other existing signalling connections of this same UE (e.g. RRC or Iu signalling connections) Initially this is of the type of IMSI.

NOTE: IMSI is specified in the TS 23.003.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Permanent NAS UE Identity**				
>**IMSI**	M		OCTET STRING (SIZE (3..8))	- digits 0 to 9, two digits per octet, - each digit encoded 0000 to 1001, - 1111 used as filler - bit 4 to 1 of octet n encoding digit 2n-1 - bit 8 to 5 of octet n encoding digit 2n -Number of decimal digits shall be from 6 to 15 starting with the digits from the PLMN-ID.

9.2.3.2 Temporary UE ID

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Temporary UE ID**				
>**TMSI**	M		OCTET STRING (4)	
>**P-TMSI**	M		OCTET STRING (4)	

9.2.3.3 Paging Cause

This element indicates the cause of paging to the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Paging cause	M		ENUMERATED(speech call, CS data call, PS data call, SMS, ...)	

9.2.3.4   NAS Broadcast Information

This element identifies broadcast information that belongs to the non-access stratum. This information is transparent to RNC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
NAS Broadcast Information	M		OCTET STRING	

9.2.3.5   NAS PDU

This information element contains the CN – UE or UE – CN message that is transferred without interpretation in the RNC. Typically it contains call control, session management, supplementary services, short message service and mobility management messages.

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

9.2.3.6   LAI

This element is used to uniquely identify a Location Area.

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

9.2.3.7   RAC

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

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

9.2.3.8   SAPI

The SAPI element is used to indicate the specific service provided for the message.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SAPI	M		ENUMERATED (SAPI 0, SAPI 3, ...)	

9.2.3.9   SAI

Service Area Identifier (SAI) information (see ref. [3]) element is used to uniquely identify an area consisting of one or more cells belonging to the same Location Area. Such an area is called a Service Area and can be used for indicating the location of a UE to the CN.

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

9.2.3.10   Area Identity

This information element is used for indicating the location of a UE and is either a Service Area or Geographical Area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Area Identity**				
>**SAI**			9.2.3.9	
>**Geographical Area**			9.2.3.11	

9.2.3.11   Geographical Area

Geographical Area is used to identify an area, as seen from the CN, using geographical coordinates. The reference system is the same as the one used in UMTS 23.032.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Geographical Area**				
>Point			See below	Ellipsoid point
>Point with uncertainty			See below	Ellipsoid point with inceratinty circle
>Polygon			See below	List of Ellipsoid points

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Point				
>Geographical Coordinates	M		See below	

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Point with uncertainty				
>Geographical Coordinates	M		See below	
>Uncertainty Code	M		INTEGER(0...127)	The uncertainty "r" is derived from the "uncertainty code" k by $r = 10 \times (1.1^k - 1)$

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Polygon	M			
>Geographical Coordinates	M	1 to \<maxnoofPoints>	See below	

Range bound	Explanation
maxnoofPoints	Maximum no. of points in polygon. Value is 15.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Geographical Coordinates				
>Latitude Sign	M		ENUMERATED (North, South)	
>Degrees of Latitude	M		INTEGER (0...2^{23}-1)	The IE value (N) is derived by this formula: $N \leq 2^{23} X /90 < N+1$ X being the latitude in degree (0°.. 90°)
>Degrees of Longitude	M		INTEGER (-2^{23}...2^{23}-1)	The IE value (N) is derived by this formula: $N \leq 2^{24} X /360 < N+1$ X being the longitude in degree (-180°..+180°)

9.2.3.12   Unsuccessfully Transmitted Data Volume

This information element indicates the data volume (octets) that is unsuccessfully transmitted over the radio interface in DL direction for the RAB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Unsuccessfully Transmitted Data Volume	M		INTEGER (0.. 2^{32}-1)	Unit is octet.

9.2.3.13   Data Volume Reference

This information element indicates the time when the data volume is counted.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Data Volume Reference	M		INTEGER (0..255)	

9.2.3.14   Information Identity

This element is used to identify Broadcast Information piece for a given CN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Information Identity	M		INTEGER (0..255)	

9.2.3.15   Information Priority

This element is the priority of the corresponding Information piece. Thie IE is used by UTRAN to schedule the NAS Broadcast Information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Information Priority	M		INTEGER (0..15)	spare (0), highest (1), lowest (14), no priority used (15)} (0..15)

9.2.3.16   Information Control

This element is used to control the Broadcast of an Information piece.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Information Control	M		ENUMERATED(on,off)	on: UTRAN shall start broadcasting the information piece off: UTRAN shall stop broadcasting the information piece

9.2.3.17 CN Broadcast Area

This information element is used for indicating the area where CN Broadcast Information shall be broadcast and is either a Location Area, a Routing Area, a Service Area or a Geographical Area

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **CN Broadcast Area**				
>LAI			9.2.3.6	
>RAI				
>>LAI	M		9.2.3.6	
>>RAC	M		9.2.3.7	
>SAI			9.2.3.9	
>Geographical Area			9.2.3.11	

9.2.3.18 NAS Synchronisation Indicator

This information element contains transparent NAS information that is transferred without interpretation in the RNC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
NAS Synchronisation Indicator	M		BIT STRING (4)	

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

9.3.0 General

The ASN.1 definition specifies the structure and content of RANAP messages. RANAP messages can contain any IEs specified in the object set definitions for that message without the order or number of occurrence being restricted by ASN.1. However, for this version of the standard, a sending entity shall construct a RANAP message according to the PDU definitions module and with the following additional rules (Note that in the following IE means an IE in the object set with an explicit id. If one IE needed to appear more than once in one object set, then the different occurrences have different IE ids):

- IEs shall be ordered (in an IE container) in the order they appear in object set definitions..

- Object set definitions specify how many times IEs may appear. An IE shall appear exactly once if the presence field in an object has value "mandatory". An IE may appear at most once if the presence field in an object has value "optional" or "conditional". If in a tabular format there is multiplicity specified for an IE (i.e. an IE list) then in the corresponding ASN.1 definition the list definition is separated into two parts. The first part defines an IE container list where the list elements reside. The second part defines list elements. The IE container list appears as an IE of its own. For this version of the standard an IE container list may contain only one kind of list elements.

If a RANAP 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 section 10.

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

9.3.1 Usage of private message mechanism for non-standard use

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

- for special operator- (and/or vendor) specific features considered not to be part of the basic functionality, i.e. the functionality required for a complete and high-quality specification in order to guarantee multivendor interoperability;

- by vendors for research purposes, e.g. to implement and evaluate new algorithms/features before such features are proposed for standardisation.

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

9.3.2 Elementary Procedure Definitions

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

RANAP-PDU-Descriptions -- { object identifier to be allocated }--
DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    ProcedureCode
FROM RANAP-CommonDataTypes

    Iu-ReleaseCommand,
    Iu-ReleaseComplete,
    RelocationCommand,
    RelocationPreparationFailure,
    RelocationRequired,
    RelocationRequest,
    RelocationRequestAcknowledge,
    RelocationFailure,
    RelocationCancel,
    RelocationCancelAcknowledge,
    SRNS-ContextRequest,
    SRNS-ContextResponse,
    SecurityModeCommand,
    SecurityModeComplete,
    SecurityModeReject,
    DataVolumeReportRequest,
    DataVolumeReport,
    CN-InformationBroadcastRequest,
    CN-InformationBroadcastConfirm,
    CN-InformationBroadcastReject,
    Reset,
    ResetAcknowledge,
    RAB-ReleaseRequest,
    Iu-ReleaseRequest,
    RelocationDetect,
    RelocationComplete,
    Paging,
    CommonID,
    CN-InvokeTrace,
    CN-DeactivateTrace,
    LocationReportingControl,
    LocationReport,
    InitialUE-Message,
    DirectTransfer,
    Overload,
    ErrorIndication,
    SRNS-DataForwardCommand,
    ForwardSRNS-Context,
    RAB-AssignmentRequest,
    RAB-AssignmentResponse,
    PrivateMessage,
    ResetResource,
    ResetResourceAcknowledge,
    RANAP-RelocationInformation
FROM RANAP-PDU-Contents

    id-CN-DeactivateTrace,
    id-CN-InformationBroadcast,
    id-CN-InvokeTrace,
    id-CommonID,
    id-DataVolumeReport,
    id-DirectTransfer,
    id-ErrorIndication,
```

```
        id-ForwardSRNS-Context,
        id-InitialUE-Message,
        id-Iu-Release,
        id-Iu-ReleaseRequest,
        id-LocationReport,
        id-LocationReportingControl,
        id-OverloadControl,
        id-Paging,
        id-privateMessage,
        id-RAB-Assignment,
        id-RAB-ReleaseRequest,
        id-RANAP-Relocation,
        id-RelocationCancel,
        id-RelocationComplete,
        id-RelocationDetect,
        id-RelocationPreparation,
        id-RelocationResourceAllocation,
        id-Reset,
        id-SRNS-ContextTransfer,
        id-SRNS-DataForward,
        id-SecurityModeControl,
        id-ResetResource
FROM RANAP-Constants;

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

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

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

RANAP-PDU ::= CHOICE {
    initiatingMessage   InitiatingMessage,
    successfulOutcome   SuccessfulOutcome,
    unsuccessfulOutcome UnsuccessfulOutcome,
    outcome         Outcome,
    ...
}

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

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

UnsuccessfulOutcome ::= SEQUENCE {
```

```
    procedureCode   RANAP-ELEMENTARY-PROCEDURE.&procedureCode   ({RANAP-ELEMENTARY-PROCEDURES}),
    criticality RANAP-ELEMENTARY-PROCEDURE.&criticality    ({RANAP-ELEMENTARY-
PROCEDURES}{@procedureCode}),
    value        RANAP-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome ({RANAP-ELEMENTARY-
PROCEDURES}{@procedureCode})
}

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

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

RANAP-ELEMENTARY-PROCEDURES RANAP-ELEMENTARY-PROCEDURE ::= {
    RANAP-ELEMENTARY-PROCEDURES-CLASS-1 |
    RANAP-ELEMENTARY-PROCEDURES-CLASS-2 |
    RANAP-ELEMENTARY-PROCEDURES-CLASS-3 ,
    ...
}


RANAP-ELEMENTARY-PROCEDURES-CLASS-1 RANAP-ELEMENTARY-PROCEDURE ::= {
    iu-Release          |
    relocationPreparation      |
    relocationResourceAllocation    |
    relocationCancel       |
    sRNS-ContextTransfer       |
    securityModeControl     |
    dataVolumeReport       |
    cN-InformationBroadcast     |
    reset      |
    resetResource             ,
    ...
}

RANAP-ELEMENTARY-PROCEDURES-CLASS-2 RANAP-ELEMENTARY-PROCEDURE ::= {
    rAB-ReleaseRequest      |
    iu-ReleaseRequest       |
    relocationDetect        |
    relocationComplete      |
    paging              |
    commonID            |
    cN-InvokeTrace       |
    cN-DeactivateTrace      |
    locationReportingControl    |
    locationReport          |
    initialUE-Message       |
    directTransfer          |
    overloadControl         |
    errorIndication         |
    sRNS-DataForward        |
    forwardSRNS-Context     |
    privateMessage       |
    rANAP-Relocation    ,
    ...
}

RANAP-ELEMENTARY-PROCEDURES-CLASS-3 RANAP-ELEMENTARY-PROCEDURE ::= {
    rAB-Assignment          ,
    ...
}

-- *************************************************************
--
-- Interface Elementary Procedures
--
-- *************************************************************

iu-Release RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  Iu-ReleaseCommand
```

```
    SUCCESSFUL OUTCOME   Iu-ReleaseComplete
    PROCEDURE CODE       id-Iu-Release
    CRITICALITY     ignore
}

relocationPreparation RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE   RelocationRequired
    SUCCESSFUL OUTCOME   RelocationCommand
    UNSUCCESSFUL OUTCOME     RelocationPreparationFailure
    PROCEDURE CODE           id-RelocationPreparation
    CRITICALITY     ignore
}

relocationResourceAllocation RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE   RelocationRequest
    SUCCESSFUL OUTCOME   RelocationRequestAcknowledge
    UNSUCCESSFUL OUTCOME     RelocationFailure
    PROCEDURE CODE           id-RelocationResourceAllocation
    CRITICALITY     ignore
}

relocationCancel RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE   RelocationCancel
    SUCCESSFUL OUTCOME   RelocationCancelAcknowledge
    PROCEDURE CODE       id-RelocationCancel
    CRITICALITY     ignore
}

sRNS-ContextTransfer RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE   SRNS-ContextRequest
    SUCCESSFUL OUTCOME   SRNS-ContextResponse
    PROCEDURE CODE       id-SRNS-ContextTransfer
    CRITICALITY     ignore
}

securityModeControl RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE   SecurityModeCommand
    SUCCESSFUL OUTCOME   SecurityModeComplete
    UNSUCCESSFUL OUTCOME     SecurityModeReject
    PROCEDURE CODE       id-SecurityModeControl
    CRITICALITY     ignore
}

dataVolumeReport RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE   DataVolumeReportRequest
    SUCCESSFUL OUTCOME   DataVolumeReport
    PROCEDURE CODE       id-DataVolumeReport
    CRITICALITY     ignore
}

cN-InformationBroadcast RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE   CN-InformationBroadcastRequest
    SUCCESSFUL OUTCOME   CN-InformationBroadcastConfirm
    UNSUCCESSFUL OUTCOME     CN-InformationBroadcastReject
    PROCEDURE CODE           id-CN-InformationBroadcast
    CRITICALITY     ignore
}

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

rAB-ReleaseRequest RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE   RAB-ReleaseRequest
    PROCEDURE CODE       id-RAB-ReleaseRequest
    CRITICALITY     ignore
}

iu-ReleaseRequest RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE   Iu-ReleaseRequest
    PROCEDURE CODE       id-Iu-ReleaseRequest
    CRITICALITY     ignore
}

relocationDetect RANAP-ELEMENTARY-PROCEDURE ::= {
```

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

relocationComplete RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  RelocationComplete
    PROCEDURE CODE       id-RelocationComplete
    CRITICALITY     ignore
}

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

commonID RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  CommonID
    PROCEDURE CODE       id-CommonID
    CRITICALITY     ignore
}

cN-InvokeTrace RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  CN-InvokeTrace
    PROCEDURE CODE       id-CN-InvokeTrace
    CRITICALITY     ignore
}

cN-DeactivateTrace RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  CN-DeactivateTrace
    PROCEDURE CODE           id-CN-DeactivateTrace
    CRITICALITY     ignore
}

locationReportingControl RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  LocationReportingControl
    PROCEDURE CODE       id-LocationReportingControl
    CRITICALITY     ignore
}

locationReport RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  LocationReport
    PROCEDURE CODE       id-LocationReport
    CRITICALITY     ignore
}

initialUE-Message RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  InitialUE-Message
    PROCEDURE CODE       id-InitialUE-Message
    CRITICALITY     ignore
}

directTransfer RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  DirectTransfer
    PROCEDURE CODE       id-DirectTransfer
    CRITICALITY     ignore
}

overloadControl RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  Overload
    PROCEDURE CODE       id-OverloadControl
    CRITICALITY     ignore
}

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

sRNS-DataForward RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  SRNS-DataForwardCommand
    PROCEDURE CODE       id-SRNS-DataForward
    CRITICALITY     ignore
}

forwardSRNS-Context RANAP-ELEMENTARY-PROCEDURE ::= {
```

```
    INITIATING MESSAGE  ForwardSRNS-Context
    PROCEDURE CODE      id-ForwardSRNS-Context
    CRITICALITY    ignore
}

rAB-Assignment RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  RAB-AssignmentRequest
    OUTCOME             RAB-AssignmentResponse
    PROCEDURE CODE      id-RAB-Assignment
    CRITICALITY    ignore
}

privateMessage RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  PrivateMessage

    PROCEDURE CODE  id-privateMessage
    CRITICALITY    ignore
}

resetResource RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  ResetResource
    SUCCESSFUL OUTCOME  ResetResourceAcknowledge
    PROCEDURE CODE         id-ResetResource
    CRITICALITY    ignore
}

rANAP-Relocation RANAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  RANAP-RelocationInformation
    PROCEDURE CODE         id-RANAP-Relocation
    CRITICALITY    ignore
}

END
```

9.3.3   PDU Definitions

9.3.3   PDU Definitions

```
-- **************************************************************
--
-- PDU definitions for RANAP.
--
-- **************************************************************

RANAP-PDU-Contents -- { object identifier to be allocated }--
DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    DataVolumeReference,
    AreaIdentity,
    CN-BroadcastArea,
    CN-DomainIndicator,
    Cause,
    CriticalityDiagnostics,
    ChosenEncryptionAlgorithm,
    ChosenIntegrityProtectionAlgorithm,
    ClassmarkInformation2,
    ClassmarkInformation3,
    DL-GTP-PDU-SequenceNumber,
    DL-N-PDU-SequenceNumber,
    DataVolumeReportingIndication,
    DRX-CycleLengthCoefficient,
    EncryptionInformation,
    GlobalRNC-ID,
    IntegrityProtectionInformation,
    IuSignallingConnectionIdentifier,
    IuTransportAssociation,
```

```
    KeyStatus,
    L3-Information,
    LAI,
    NAS-BroadcastInformation,
    InformationIdentity,
    InformationPriority,
    InformationControl,
    NAS-PDU,
    NAS-SynchronisationIndicator,
    NonSearchingIndication,
    NumberOfSteps,
    OMC-ID,
    OldBSS-ToNewBSS-Information,
    PagingAreaID,
    PagingCause,
    PDP-TypeInformation,
    PermanentNAS-UE-ID,
    RAB-ID,
    RAB-Parameters,
    RAC,
    RelocationType,
    RequestType,
    SAI,
    SAPI,
    SourceID,
    SourceRNC-ToTargetRNC-TransparentContainer,
    TargetID,
    TargetRNC-ToSourceRNC-TransparentContainer,
    TemporaryUE-ID,
    TraceReference,
    TraceType,
    UnsuccessfullyTransmittedDataVolume,
    TransportLayerAddress,
    TriggerID,
    UE-ID,
    UL-GTP-PDU-SequenceNumber,
    UL-N-PDU-SequenceNumber,
    UP-ModeVersions,
    UserPlaneMode
FROM RANAP-IEs


    PrivateIE-Container{},
    ProtocolExtensionContainer{},
    ProtocolIE-ContainerList{},
    ProtocolIE-ContainerPair{},
    ProtocolIE-ContainerPairList{},
    ProtocolIE-Container{},
    RANAP-PRIVATE-IES,
    RANAP-PROTOCOL-EXTENSION,
    RANAP-PROTOCOL-IES,
    RANAP-PROTOCOL-IES-PAIR
FROM RANAP-Containers

    maxNrOfDTs,
    maxNrOfErrors,
    maxNrOfIuSigConIds,
    maxNrOfPieces,
    maxNrOfRABs,
    maxNrOfVol,

    id-AreaIdentity,
    id-CN-BroadcastInformationPiece,
    id-CN-BroadcastInformationPieceList,
    id-CN-DomainIndicator,
    id-Cause,
    id-ChosenEncryptionAlgorithm,
    id-ChosenIntegrityProtectionAlgorithm,
    id-ClassmarkInformation2,
    id-ClassmarkInformation3,
    id-CriticalityDiagnostics,
    id-DRX-CycleLengthCoefficient,
    id-DirectTransferInformationItem-RANAP-RelocInf,
    id-DirectTransferInformationList-RANAP-RelocInf,
    id-DL-GTP-PDU-SequenceNumber,
    id-EncryptionInformation,
    id-GlobalRNC-ID,
    id-IntegrityProtectionInformation,
```

```
    id-IuSigConId,  id-IuSigConIdItem,
    id-IuSigConIdList,
    id-IuTransportAssociation,
    id-KeyStatus,
    id-L3-Information,
    id-LAI,
    id-NAS-PDU,
    id-NonSearchingIndication,
    id-NumberOfSteps,
    id-OMC-ID,
    id-OldBSS-ToNewBSS-Information,
    id-PagingAreaID,
    id-PagingCause,
    id-PermanentNAS-UE-ID,
    id-RAB-ContextItem,
    id-RAB-ContextList,
    id-RAB-ContextFailedtoTransferItem,
    id-RAB-ContextFailedtoTransferList,
    id-RAB-ContextItem-RANAP-RelocInf,
    id-RAB-ContextList-RANAP-RelocInf,
    id-RAB-DataForwardingItem,
    id-RAB-DataForwardingItem-SRNS-CtxReq,
    id-RAB-DataForwardingList,
    id-RAB-DataForwardingList-SRNS-CtxReq,
    id-RAB-DataVolumeReportItem,
    id-RAB-DataVolumeReportList,
    id-RAB-DataVolumeReportRequestItem,
    id-RAB-DataVolumeReportRequestList,
    id-RAB-FailedItem,
    id-RAB-FailedList,
    id-RAB-FailedtoReportItem,
    id-RAB-FailedtoReportList,
    id-RAB-ID,
    id-RAB-QueuedItem,
    id-RAB-QueuedList,
    id-RAB-ReleaseFailedList,
    id-RAB-ReleaseItem,
    id-RAB-ReleasedItem-IuRelComp,
    id-RAB-ReleaseList,
    id-RAB-ReleasedItem,
    id-RAB-ReleasedList,
    id-RAB-ReleasedList-IuRelComp,
    id-RAB-RelocationReleaseItem,
    id-RAB-RelocationReleaseList,
    id-RAB-SetupItem-RelocReq,
    id-RAB-SetupItem-RelocReqAck,
    id-RAB-SetupList-RelocReq,
    id-RAB-SetupList-RelocReqAck,
    id-RAB-SetupOrModifiedItem,
    id-RAB-SetupOrModifiedList,
    id-RAB-SetupOrModifyItem,
    id-RAB-SetupOrModifyList,
    id-RAC,
    id-RelocationType,
    id-RequestType,
    id-SAI,
    id-SAPI,
    id-SourceID,
    id-SourceRNC-ToTargetRNC-TransparentContainer,
    id-TargetID,
    id-TargetRNC-ToSourceRNC-TransparentContainer,
    id-TemporaryUE-ID,
    id-TraceReference,
    id-TraceType,
    id-TransportLayerAddress,
    id-TriggerID,
    id-UE-ID,
    id-UL-GTP-PDU-SequenceNumber
FROM RANAP-Constants;

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

RAB-IE-ContainerList                    { RANAP-PROTOCOL-IES     : IEsSetParam } ::= ProtocolIE-
ContainerList    { 1, maxNrOfRABs,   {IEsSetParam} }
```

```
RAB-IE-ContainerPairList          { RANAP-PROTOCOL-IES-PAIR : IEsSetParam } ::= ProtocolIE-
ContainerPairList { 1, maxNrOfRABs,   {IEsSetParam} }
ProtocolError-IE-ContainerList    { RANAP-PROTOCOL-IES      : IEsSetParam } ::= ProtocolIE-
ContainerList    { 1, maxNrOfRABs,   {IEsSetParam} }
CN-BroadcastInfPiece-IE-ContainerList { RANAP-PROTOCOL-IES  : IEsSetParam } ::= ProtocolIE-
ContainerList    { 1, maxNrOfPieces, {IEsSetParam} }
IuSigConId-IE-ContainerList       { RANAP-PROTOCOL-IES      : IEsSetParam } ::= ProtocolIE-
ContainerList    { 1, maxNrOfIuSigConIds,  {IEsSetParam} }
DirectTransfer-IE-ContainerList   { RANAP-PROTOCOL-IES      : IEsSetParam } ::= ProtocolIE-
ContainerList    { 1, maxNrOfDTs,    {IEsSetParam} }

-- **********************************************************
--
-- Iu RELEASE ELEMENTARY PROCEDURE
--
-- **********************************************************

-- **********************************************************
--
-- Iu Release Command
--
-- **********************************************************

Iu-ReleaseCommand ::= SEQUENCE {
    protocolIEs        ProtocolIE-Container       { {Iu-ReleaseCommandIEs} },
    protocolExtensions      ProtocolExtensionContainer { {Iu-ReleaseCommandExtensions} }
    OPTIONAL,
    ...
}

Iu-ReleaseCommandIEs RANAP-PROTOCOL-IES ::= {
    { ID id-Cause                    CRITICALITY ignore  TYPE Cause                PRESENCE
mandatory   },
    ...
}

Iu-ReleaseCommandExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **********************************************************
--
-- Iu Release Complete
--
-- **********************************************************

Iu-ReleaseComplete ::= SEQUENCE {
    protocolIEs        ProtocolIE-Container       { {Iu-ReleaseCompleteIEs} },
    protocolExtensions      ProtocolExtensionContainer { {Iu-ReleaseCompleteExtensions} }
    OPTIONAL,
    ...
}

Iu-ReleaseCompleteIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-DataVolumeReportList       CRITICALITY ignore  TYPE RAB-DataVolumeReportList
    PRESENCE conditional
    -- This group is only present if data volume reporting for PS domain is required --
                    } |
    { ID id-RAB-ReleasedList-IuRelComp     CRITICALITY ignore  TYPE RAB-ReleasedList-IuRelComp
    PRESENCE conditional
    -- This group is only present for RABs towards the PS domain when the release was initiated by
UTRAN --                    } |
    { ID id-CriticalityDiagnostics         CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional   },
    ...
}

RAB-DataVolumeReportList                 ::= RAB-IE-ContainerList { {RAB-DataVolumeReportItemIEs} }

RAB-DataVolumeReportItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-DataVolumeReportItem       CRITICALITY ignore  TYPE RAB-DataVolumeReportItem
    PRESENCE mandatory   },
    ...
}

RAB-DataVolumeReportItem ::= SEQUENCE {
    rAB-ID                    RAB-ID,
    dl-UnsuccessfullyTransmittedDataVolume    DataVolumeList    OPTIONAL
```

```
    -- This IE is only present if data volume reporting for PS domain is required --,
    iE-Extensions                      ProtocolExtensionContainer { {RAB-DataVolumeReportItem-ExtIEs} }
            OPTIONAL,
    ...
}

RAB-DataVolumeReportItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RAB-ReleasedList-IuRelComp              ::= RAB-IE-ContainerList { {RAB-ReleasedItem-IuRelComp-IEs}
}

RAB-ReleasedItem-IuRelComp-IEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-ReleasedItem-IuRelComp         CRITICALITY ignore  TYPE RAB-ReleasedItem-IuRelComp
            PRESENCE mandatory  },
    ...
}

RAB-ReleasedItem-IuRelComp  ::= SEQUENCE {
        rAB-ID                    RAB-ID,
        dL-GTP-PDU-SequenceNumber DL-GTP-PDU-SequenceNumber,
        uL-GTP-PDU-SequenceNumber UL-GTP-PDU-SequenceNumber,
        iE-Extensions             ProtocolExtensionContainer { {RAB-ReleasedItem-IuRelComp-ExtIEs}
}        OPTIONAL,
    ...
}

RAB-ReleasedItem-IuRelComp-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}


Iu-ReleaseCompleteExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ************************************************************
--
-- RELOCATION PREPARATION ELEMENTARY PROCEDURE
--
-- ************************************************************

-- ************************************************************
--
-- Relocation Required
--
-- ************************************************************

RelocationRequired ::= SEQUENCE {
    protocolIEs        ProtocolIE-Container       { {RelocationRequiredIEs} },
    protocolExtensions     ProtocolExtensionContainer { {RelocationRequiredExtensions} }
    OPTIONAL,
        ...
}

RelocationRequiredIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RelocationType             CRITICALITY ignore  TYPE RelocationType
    PRESENCE mandatory  } |
    { ID id-Cause                  CRITICALITY ignore  TYPE Cause                      PRESENCE
mandatory   } |
    { ID id-SourceID               CRITICALITY ignore  TYPE SourceID              PRESENCE
mandatory   } |
    { ID id-TargetID               CRITICALITY reject  TYPE TargetID              PRESENCE
mandatory   } |
    { ID id-ClassmarkInformation2          CRITICALITY ignore  TYPE ClassmarkInformation2
    PRESENCE conditional
    -- This is only present when initiating an inter system handover towards GSM BSC --
            } |
    { ID id-ClassmarkInformation3          CRITICALITY ignore  TYPE ClassmarkInformation3
    PRESENCE conditional
    -- This is only present when initiating an inter system handover towards GSM BSC --
            } |
    { ID id-SourceRNC-ToTargetRNC-TransparentContainer
                        CRITICALITY reject  TYPE SourceRNC-ToTargetRNC-TransparentContainer
PRESENCE conditional
    -- This IE shall be present when initiating relocation of SRNS  --
            } |
```

```
    { ID id-OldBSS-ToNewBSS-Information    CRITICALITY ignore  TYPE OldBSS-ToNewBSS-Information
    PRESENCE conditional
    -- This is only present when initiating an inter system handover towards GSM BSC --
            } ,
    ...
}

RelocationRequiredExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- Relocation Command
--
-- *************************************************************

RelocationCommand ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {RelocationCommandIEs} },
    protocolExtensions      ProtocolExtensionContainer { {RelocationCommandExtensions} }
    OPTIONAL,
    ...
}

RelocationCommandIEs RANAP-PROTOCOL-IES ::= {
    { ID id-TargetRNC-ToSourceRNC-TransparentContainer
                        CRITICALITY reject  TYPE TargetRNC-ToSourceRNC-TransparentContainer
PRESENCE conditional
    -- This IE shall be included if it is received by the CN from the relocation target. --
            } |
    { ID id-L3-Information           CRITICALITY ignore  TYPE L3-Information          PRESENCE
conditional
    -- This IE shall be included if it is received by the CN from the relocation target. --
            } |
    { ID id-RAB-RelocationReleaseList      CRITICALITY ignore  TYPE RAB-RelocationReleaseList
    PRESENCE optional    } |
    { ID id-RAB-DataForwardingList      CRITICALITY ignore  TYPE RAB-DataForwardingList
    PRESENCE conditional
    -- This group if applicable is only present for RABs towards the PS domain --
            } |
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional    },
    ...
}

RAB-RelocationReleaseList                ::= RAB-IE-ContainerList { {RAB-RelocationReleaseItemIEs} }

RAB-RelocationReleaseItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-RelocationReleaseItem     CRITICALITY ignore  TYPE RAB-RelocationReleaseItem
    PRESENCE mandatory  },
    ...
}

RAB-RelocationReleaseItem ::= SEQUENCE {
    rAB-ID                  RAB-ID,
    iE-Extensions                ProtocolExtensionContainer { {RAB-RelocationReleaseItem-ExtIEs}
}        OPTIONAL,
    ...
}

RAB-RelocationReleaseItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RAB-DataForwardingList                ::= RAB-IE-ContainerList { {RAB-DataForwardingItemIEs} }

RAB-DataForwardingItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-DataForwardingItem       CRITICALITY ignore  TYPE RAB-DataForwardingItem
    PRESENCE mandatory  },
    ...
}

RAB-DataForwardingItem ::= SEQUENCE {
    rAB-ID                  RAB-ID,
    transportLayerAddress             TransportLayerAddress,
    iuTransportAssociation             IuTransportAssociation,
    iE-Extensions                ProtocolExtensionContainer { {RAB-DataForwardingItem-ExtIEs} }
            OPTIONAL,
```

```
    ...
}

RAB-DataForwardingItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RelocationCommandExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- Relocation Preparation Failure
--
-- *************************************************************

RelocationPreparationFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {RelocationPreparationFailureIEs} },
    protocolExtensions     ProtocolExtensionContainer { {RelocationPreparationFailureExtensions} }
          OPTIONAL,
        ...
}

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

RelocationPreparationFailureExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- RELOCATION RESOURCE ALLOCATION ELEMENTARY PROCEDURE
--
-- *************************************************************

-- *************************************************************
--
-- Relocation Request
--
-- *************************************************************

RelocationRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {RelocationRequestIEs} },
    protocolExtensions     ProtocolExtensionContainer { {RelocationRequestExtensions} }
    OPTIONAL,
    ...
}

RelocationRequestIEs RANAP-PROTOCOL-IES ::= {
    { ID id-PermanentNAS-UE-ID        CRITICALITY ignore  TYPE PermanentNAS-UE-ID
    PRESENCE conditional
    -- This IE is only present if available at the sending side --
        } |
    { ID id-Cause                     CRITICALITY ignore  TYPE Cause                 PRESENCE
mandatory   } |
    { ID id-CN-DomainIndicator        CRITICALITY ignore  TYPE CN-DomainIndicator
    PRESENCE mandatory  } |
    { ID id-SourceRNC-ToTargetRNC-TransparentContainer
                         CRITICALITY reject  TYPE SourceRNC-ToTargetRNC-TransparentContainer
    PRESENCE mandatory  } |
    { ID id-RAB-SetupList-RelocReq        CRITICALITY reject  TYPE RAB-SetupList-RelocReq
    PRESENCE optional   } |
    { ID id-IntegrityProtectionInformation    CRITICALITY ignore  TYPE
IntegrityProtectionInformation     PRESENCE conditional
    -- This IE is only present if available at the sending side --
        } |
    { ID id-EncryptionInformation         CRITICALITY ignore  TYPE EncryptionInformation
    PRESENCE optional   } |
    { ID id-IuSigConId  CRITICALITY ignore TYPE IuSignallingConnectionIdentifier  PRESENCE mandatory
},
    ...
```

```
}

RAB-SetupList-RelocReq                    ::= RAB-IE-ContainerList { {RAB-SetupItem-RelocReq-IEs} }

RAB-SetupItem-RelocReq-IEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-SetupItem-RelocReq        CRITICALITY reject  TYPE RAB-SetupItem-RelocReq
    PRESENCE mandatory  },
    ...
}

RAB-SetupItem-RelocReq ::= SEQUENCE {
    rAB-ID                      RAB-ID,
    nAS-SynchronisationIndicator   NAS-SynchronisationIndicator    OPTIONAL
    -- This IE is present if the relevant NAS information is provided by the CN --,
    rAB-Parameters                  RAB-Parameters,
    dataVolumeReportingIndication        DataVolumeReportingIndication   OPTIONAL
    -- This IE is only present if available at the sending side --,
    pDP-TypeInformation             PDP-TypeInformation    OPTIONAL
    -- This IE is only present for RABs towards the PS domain --,
    userPlaneInformation                UserPlaneInformation,
    transportLayerAddress               TransportLayerAddress,
    iuTransportAssociation              IuTransportAssociation,
    iE-Extensions                       ProtocolExtensionContainer { {RAB-SetupItem-RelocReq-ExtIEs} }
            OPTIONAL,
    ...
}

RAB-SetupItem-RelocReq-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

UserPlaneInformation ::= SEQUENCE {
    userPlaneMode                   UserPlaneMode,
    uP-ModeVersions                 UP-ModeVersions,
    iE-Extensions                   ProtocolExtensionContainer { {UserPlaneInformation-ExtIEs} }
        OPTIONAL,
    ...
}

UserPlaneInformation-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RelocationRequestExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- Relocation Request Acknowledge
--
-- *************************************************************

RelocationRequestAcknowledge ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {RelocationRequestAcknowledgeIEs} },
    protocolExtensions      ProtocolExtensionContainer { {RelocationRequestAcknowledgeExtensions} }
            OPTIONAL,
    ...
}

RelocationRequestAcknowledgeIEs RANAP-PROTOCOL-IES ::= {
    { ID id-TargetRNC-ToSourceRNC-TransparentContainer
                        CRITICALITY ignore  TYPE TargetRNC-ToSourceRNC-TransparentContainer
PRESENCE conditional
    -- Must be included if applicapble and if not sent via the other CN --
        } |
    { ID id-RAB-SetupList-RelocReqAck      CRITICALITY ignore  TYPE RAB-SetupList-RelocReqAck
    PRESENCE optional} |
    { ID id-RAB-FailedList              CRITICALITY ignore  TYPE RAB-FailedList           PRESENCE
optional }|
    { ID id-ChosenIntegrityProtectionAlgorithm CRITICALITY ignore  TYPE
ChosenIntegrityProtectionAlgorithm     PRESENCE conditional
    -- This IE is only present if available at the sending side --
        } |
    { ID id-ChosenEncryptionAlgorithm       CRITICALITY ignore  TYPE ChosenEncryptionAlgorithm
    PRESENCE optional    } |
    { ID id-CriticalityDiagnostics         CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional    },
```

```
    ...
}

RAB-SetupList-RelocReqAck                 ::= RAB-IE-ContainerList { {RAB-SetupItem-RelocReqAck-IEs} }

RAB-SetupItem-RelocReqAck-IEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-SetupItem-RelocReqAck      CRITICALITY reject  TYPE RAB-SetupItem-RelocReqAck
    PRESENCE mandatory  },
    ...
}

RAB-SetupItem-RelocReqAck ::= SEQUENCE {
    rAB-ID                      RAB-ID,
    transportLayerAddress                 TransportLayerAddress   OPTIONAL,
    --This IE is only present for RABS towards the PS Domain
    iuTransportAssociation               IuTransportAssociation   OPTIONAL,
    --This IE is only present for RABS towards the PS Domain
    iE-Extensions                   ProtocolExtensionContainer { {RAB-SetupItem-RelocReqAck-ExtIEs}
}          OPTIONAL,
    ...
}

RAB-SetupItem-RelocReqAck-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RAB-FailedList                     ::= RAB-IE-ContainerList { {RAB-FailedItemIEs} }

RAB-FailedItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-FailedItem              CRITICALITY ignore  TYPE RAB-FailedItem          PRESENCE
mandatory   },
    ...
}

RAB-FailedItem ::= SEQUENCE {
    rAB-ID                      RAB-ID,
    cause                     Cause,
    iE-Extensions                   ProtocolExtensionContainer { {RAB-FailedItem-ExtIEs} }
    OPTIONAL,
    ...
}

RAB-FailedItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RelocationRequestAcknowledgeExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ***********************************************************
--
-- Relocation Failure
--
-- ***********************************************************

RelocationFailure ::= SEQUENCE {
    protocolIEs        ProtocolIE-Container      { {RelocationFailureIEs} },
    protocolExtensions     ProtocolExtensionContainer { {RelocationFailureExtensions} }
    OPTIONAL,
    ...
}

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

RelocationFailureExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ***********************************************************
--
-- RELOCATION CANCEL ELEMENTARY PROCEDURE
```

```
--
-- ***************************************************************

-- ***************************************************************
--
-- Relocation Cancel
--
-- ***************************************************************

RelocationCancel ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {RelocationCancelIEs} },
    protocolExtensions     ProtocolExtensionContainer { {RelocationCancelExtensions} }
    OPTIONAL,
    ...
}

RelocationCancelIEs RANAP-PROTOCOL-IES ::= {
    { ID id-Cause                        CRITICALITY ignore  TYPE Cause                        PRESENCE
mandatory    },
    ...
}

RelocationCancelExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ***************************************************************
--
-- Relocation Cancel Acknowledge
--
-- ***************************************************************

RelocationCancelAcknowledge ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {RelocationCancelAcknowledgeIEs} },
    protocolExtensions     ProtocolExtensionContainer { {RelocationCancelAcknowledgeExtensions} }
            OPTIONAL,
    ...
}

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

RelocationCancelAcknowledgeExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ***************************************************************
--
-- SRNS CONTEXT TRANSFER OPEARATION
--
-- ***************************************************************

-- ***************************************************************
--
-- SRNS Context Request
--
-- ***************************************************************

SRNS-ContextRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {SRNS-ContextRequestIEs} },
    protocolExtensions     ProtocolExtensionContainer { {SRNS-ContextRequestExtensions} }
    OPTIONAL,
    ...
}

SRNS-ContextRequestIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-DataForwardingList-SRNS-CtxReq  CRITICALITY ignore  TYPE RAB-DataForwardingList-
SRNS-CtxReq     PRESENCE mandatory    },
    ...
}

RAB-DataForwardingList-SRNS-CtxReq              ::= RAB-IE-ContainerList { {RAB-DataForwardingItem-SRNS-
CtxReq-IEs} }

RAB-DataForwardingItem-SRNS-CtxReq-IEs RANAP-PROTOCOL-IES ::= {
```

```
    { ID id-RAB-DataForwardingItem-SRNS-CtxReq  CRITICALITY ignore  TYPE RAB-DataForwardingItem-
SRNS-CtxReq     PRESENCE mandatory  },
    ...
}

RAB-DataForwardingItem-SRNS-CtxReq ::= SEQUENCE {
    rAB-ID                       RAB-ID,
    iE-Extensions                    ProtocolExtensionContainer { {RAB-DataForwardingItem-SRNS-
CtxReq-ExtIEs} }         OPTIONAL,
    ...
}

RAB-DataForwardingItem-SRNS-CtxReq-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

SRNS-ContextRequestExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ************************************************************
--
-- SRNS Context Response
--
-- ************************************************************

SRNS-ContextResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {SRNS-ContextResponseIEs} },
    protocolExtensions      ProtocolExtensionContainer { {SRNS-ContextResponseExtensions} }
    OPTIONAL,
    ...
}

SRNS-ContextResponseIEs RANAP-PROTOCOL-IES ::= {

    { ID id-RAB-ContextList              CRITICALITY ignore  TYPE RAB-ContextList
    PRESENCE conditional
    -- This group must be present at least when no other group is present, ie. at least one group
must be present --  } |
    { ID id-RAB-ContextFailedtoTransferList    CRITICALITY ignore  TYPE RAB-
ContextFailedtoTransferList    PRESENCE conditional
    -- This group must be present at least when no other group is present, ie. at least one group
must be present --  }|
    { ID id-CriticalityDiagnostics        CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional   },
    ...
}

RAB-ContextList                     ::= RAB-IE-ContainerList { {RAB-ContextItemIEs} }

RAB-ContextItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-ContextItem            CRITICALITY ignore  TYPE RAB-ContextItem
    PRESENCE mandatory  },
    ...
}

RAB-ContextItem ::= SEQUENCE {
    rAB-ID                RAB-ID,
    dl-GTP-PDU-SequenceNumber           DL-GTP-PDU-SequenceNumber,
    ul-GTP-PDU-SequenceNumber           UL-GTP-PDU-SequenceNumber,
    dl-N-PDU-SequenceNumber           DL-N-PDU-SequenceNumber,
    ul-N-PDU-SequenceNumber           UL-N-PDU-SequenceNumber,
    iE-Extensions                ProtocolExtensionContainer { {RAB-ContextItem-ExtIEs} }
    OPTIONAL,
    ...
}

RAB-ContextItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RAB-ContextFailedtoTransferList               ::= RAB-IE-ContainerList { {RABs-
ContextFailedtoTransferItemIEs} }

RABs-ContextFailedtoTransferItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-ContextFailedtoTransferItem    CRITICALITY ignore  TYPE RABs-
ContextFailedtoTransferItem         PRESENCE mandatory  },
    ...
```

```
}

RABs-ContextFailedtoTransferItem::= SEQUENCE {
    rAB-ID                      RAB-ID,
    cause                       Cause,
    iE-Extensions                   ProtocolExtensionContainer { { RABs-ContextFailedtoTransferItem-
ExtIEs} }          OPTIONAL,
    ...
}


RABs-ContextFailedtoTransferItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

SRNS-ContextResponseExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- SECURITY MODE CONTROL ELEMENTARY PROCEDURE
--
-- *************************************************************

-- *************************************************************
--
-- Security Mode Command
--
-- *************************************************************

SecurityModeCommand ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container         { {SecurityModeCommandIEs} },
    protocolExtensions      ProtocolExtensionContainer { {SecurityModeCommandExtensions} }
    OPTIONAL,
    ...
}

SecurityModeCommandIEs RANAP-PROTOCOL-IES ::= {
    { ID id-IntegrityProtectionInformation      CRITICALITY ignore  TYPE
IntegrityProtectionInformation      PRESENCE mandatory  } |
    { ID id-EncryptionInformation            CRITICALITY ignore  TYPE EncryptionInformation
    PRESENCE optional   } |
    { ID id-KeyStatus                        CRITICALITY ignore  TYPE KeyStatus
    PRESENCE mandatory},
    ...
}

SecurityModeCommandExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- Security Mode Complete
--
-- *************************************************************

SecurityModeComplete ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container         { {SecurityModeCompleteIEs} },
    protocolExtensions      ProtocolExtensionContainer { {SecurityModeCompleteExtensions} }
    OPTIONAL,
    ...
}

SecurityModeCompleteIEs RANAP-PROTOCOL-IES ::= {
    { ID id-ChosenIntegrityProtectionAlgorithm CRITICALITY ignore  TYPE
ChosenIntegrityProtectionAlgorithm  PRESENCE mandatory  } |
    { ID id-ChosenEncryptionAlgorithm        CRITICALITY ignore  TYPE ChosenEncryptionAlgorithm
    PRESENCE optional   } |
    { ID id-CriticalityDiagnostics           CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional   },
    ...
}

SecurityModeCompleteExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
-- *************************************************************
--
-- Security Mode Reject
--
-- *************************************************************

SecurityModeReject ::= SEQUENCE {
    protocolIEs        ProtocolIE-Container       { {SecurityModeRejectIEs} },
    protocolExtensions      ProtocolExtensionContainer { {SecurityModeRejectExtensions} }
    OPTIONAL,
    ...
}

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

SecurityModeRejectExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- DATA VOLUME REPORT ELEMENTARY PROCEDURE
--
-- *************************************************************

-- *************************************************************
--
-- Data Volume Report Request
--
-- *************************************************************

DataVolumeReportRequest ::= SEQUENCE {
    protocolIEs        ProtocolIE-Container       { {DataVolumeReportRequestIEs} },
    protocolExtensions      ProtocolExtensionContainer { {DataVolumeReportRequestExtensions} }
    OPTIONAL,
    ...
}

DataVolumeReportRequestIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-DataVolumeReportRequestList    CRITICALITY ignore  TYPE RAB-
DataVolumeReportRequestList     PRESENCE mandatory  },
    ...
}

RAB-DataVolumeReportRequestList              ::= RAB-IE-ContainerList { {RAB-
DataVolumeReportRequestItemIEs} }

RAB-DataVolumeReportRequestItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-DataVolumeReportRequestItem    CRITICALITY ignore  TYPE RAB-
DataVolumeReportRequestItem     PRESENCE mandatory  },
    ...
}

RAB-DataVolumeReportRequestItem ::= SEQUENCE {
    rAB-ID                  RAB-ID,
    iE-Extensions                  ProtocolExtensionContainer { {RAB-DataVolumeReportRequestItem-
ExtIEs} }           OPTIONAL,
    ...
}

RAB-DataVolumeReportRequestItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

DataVolumeReportRequestExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- Data Volume Report
```

```
--
-- ***********************************************************
DataVolumeReport ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container        { {DataVolumeReportIEs} },
    protocolExtensions       ProtocolExtensionContainer { {DataVolumeReportExtensions} }
    OPTIONAL,
    ...
}

DataVolumeReportIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-DataVolumeReportList          CRITICALITY ignore  TYPE RAB-DataVolumeReportList
    PRESENCE conditional
    -- This group must be present at least when no other group is present, ie. at least one group
must be present -- } |
    { ID id-RAB-FailedtoReportList          CRITICALITY ignore  TYPE RAB-FailedtoReportList
    PRESENCE conditional
    -- This group must be present at least when no other group is present, ie. at least one group
must be present -- } |
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional   },
    ...
}

DataVolumeReportExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RAB-FailedtoReportList               ::= RAB-IE-ContainerList { {RABs-failed-to-reportItemIEs} }

RABs-failed-to-reportItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-FailedtoReportItem      CRITICALITY ignore  TYPE RABs-failed-to-reportItem
    PRESENCE mandatory  },
    ...
}

RABs-failed-to-reportItem::= SEQUENCE {
    rAB-ID                     RAB-ID,
    cause                      Cause,
    iE-Extensions                  ProtocolExtensionContainer { { RABs-failed-to-reportItem-ExtIEs}
}         OPTIONAL,
    ...
}


RABs-failed-to-reportItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ***********************************************************
--
-- CN INFORMATION BROADCAST
--
-- ***********************************************************

-- ***********************************************************
--
-- CN Information Broadcast Request
--
-- ***********************************************************

CN-InformationBroadcastRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container        { {CN-InformationBroadcastRequestIEs} },
    protocolExtensions       ProtocolExtensionContainer { {CN-InformationBroadcastRequestExtensions}
}       OPTIONAL,
    ...
}

CN-InformationBroadcastRequestIEs RANAP-PROTOCOL-IES ::= {
    { ID id-CN-DomainIndicator          CRITICALITY ignore  TYPE CN-DomainIndicator
    PRESENCE mandatory  } |
    { ID id-CN-BroadcastInformationPieceList   CRITICALITY ignore  TYPE CN-
BroadcastInformationPieceList       PRESENCE mandatory  },
    ...
}

CN-BroadcastInformationPieceList               ::= CN-BroadcastInfPiece-IE-ContainerList { {CN-
BroadcastInformationPieceIEs} }
```

```
CN-BroadcastInformationPieceIEs RANAP-PROTOCOL-IES ::= {
    { ID id-CN-BroadcastInformationPiece        CRITICALITY ignore  TYPE CN-
BroadcastInformationPiece       PRESENCE mandatory  },
    ...
}

CN-BroadcastInformationPiece ::= SEQUENCE {
    informationIdentity            InformationIdentity,
    nAS-BroadcastInformation       NAS-BroadcastInformation       OPTIONAL
    -- Included if CN requests UTRAN to broadcast the information piece --,
    cN-BroadcastArea               CN-BroadcastArea       OPTIONAL
    -- Included if CN requests UTRAN to broadcast the information piece --,
    informationPriority            InformationPriority    OPTIONAL
    -- Included if CN requests UTRAN to broadcast the information piece --,
    informationControl             InformationControl,
    iE-Extensions                  ProtocolExtensionContainer { {CN-BroadcastInformationPiece-
ExtIEs} }          OPTIONAL,
    ...
}

CN-BroadcastInformationPiece-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

CN-InformationBroadcastRequestExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- CN Information Broadcast Confirm
--
-- **************************************************************

CN-InformationBroadcastConfirm ::= SEQUENCE {
    protocolIEs       ProtocolIE-Container     { {CN-InformationBroadcastConfirmIEs} },
    protocolExtensions    ProtocolExtensionContainer { {CN-InformationBroadcastConfirmExtensions}
}     OPTIONAL,
    ...
}

CN-InformationBroadcastConfirmIEs RANAP-PROTOCOL-IES ::= {
    { ID id-CN-DomainIndicator         CRITICALITY ignore  TYPE CN-DomainIndicator
    PRESENCE mandatory  } |
    { ID id-CriticalityDiagnostics        CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional   } |
    { ID id-GlobalRNC-ID               CRITICALITY ignore  TYPE GlobalRNC-ID          PRESENCE
mandatory },
    ...
}

CN-InformationBroadcastConfirmExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- CN Information Broadcast Reject
--
-- **************************************************************

CN-InformationBroadcastReject ::= SEQUENCE {
    protocolIEs       ProtocolIE-Container     { {CN-InformationBroadcastRejectIEs} },
    protocolExtensions    ProtocolExtensionContainer { {CN-InformationBroadcastRejectExtensions} }
        OPTIONAL,
    ...
}

CN-InformationBroadcastRejectIEs RANAP-PROTOCOL-IES ::= {
    { ID id-CN-DomainIndicator         CRITICALITY ignore  TYPE CN-DomainIndicator
    PRESENCE mandatory  } |
    { ID id-Cause                CRITICALITY ignore  TYPE Cause                    PRESENCE
mandatory    } |
    { ID id-CriticalityDiagnostics        CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional   } |
    { ID id-GlobalRNC-ID               CRITICALITY ignore  TYPE GlobalRNC-ID          PRESENCE
mandatory },
```

```
    ...
}

CN-InformationBroadcastRejectExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

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

Reset ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {ResetIEs} },
    protocolExtensions     ProtocolExtensionContainer { {ResetExtensions} }
    OPTIONAL,
    ...
}

ResetIEs RANAP-PROTOCOL-IES ::= {
    { ID id-Cause                   CRITICALITY ignore  TYPE Cause                       PRESENCE
mandatory    } |
    { ID id-CN-DomainIndicator         CRITICALITY ignore  TYPE CN-DomainIndicator
    PRESENCE mandatory  } |
    { ID id-GlobalRNC-ID               CRITICALITY ignore  TYPE GlobalRNC-ID               PRESENCE
conditional
    -- This IE is always used in the uplink direction --
    },
    ...
}

ResetExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

ResetAcknowledge ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {ResetAcknowledgeIEs} },
    protocolExtensions     ProtocolExtensionContainer { {ResetAcknowledgeExtensions} }
    OPTIONAL,
    ...
}

ResetAcknowledgeIEs RANAP-PROTOCOL-IES ::= {
    { ID id-CN-DomainIndicator         CRITICALITY ignore  TYPE CN-DomainIndicator
    PRESENCE mandatory  } |
    { ID id-CriticalityDiagnostics        CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional   } |
    { ID id-GlobalRNC-ID               CRITICALITY ignore  TYPE GlobalRNC-ID               PRESENCE
conditional
    -- This IE is always used in the uplink direction --
    },
    ...
}

ResetAcknowledgeExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}
-- ***************************************************************
--
-- RESET RESOURCE ELEMENTARY PROCEDURE
--
-- ***************************************************************


-- ***************************************************************
```

```
--
-- Reset Resource
--
-- ************************************************************

ResetResource ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container     { {ResetResourceIEs} },
    protocolExtensions   ProtocolExtensionContainer { {ResetResourceExtensions} }
    OPTIONAL,
    ...
}

ResetResourceIEs RANAP-PROTOCOL-IES ::= {
    { ID id-CN-DomainIndicator          CRITICALITY ignore  TYPE CN-DomainIndicator
    PRESENCE mandatory  } |
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE
mandatory    } |
    { ID id-IuSigConIdList              CRITICALITY ignore  TYPE ResetResourceList
    PRESENCE mandatory  } |
    { ID id-GlobalRNC-ID                CRITICALITY ignore  TYPE GlobalRNC-ID               PRESENCE
conditional
    -- This IE is always used in the uplink direction --
    },
    ...
}

ResetResourceList   ::= IuSigConId-IE-ContainerList{ {ResetResourceItemIEs} }

ResetResourceItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-IuSigConIdItem              CRITICALITY ignore  TYPE    ResetResourceItem
    PRESENCE mandatory  },
    ...
}

ResetResourceItem ::= SEQUENCE {
    iuSigConId                IuSignallingConnectionIdentifier,
    iE-Extensions             ProtocolExtensionContainer { { ResetResourceItem-ExtIEs} }
    OPTIONAL,
    ...
}

ResetResourceItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

ResetResourceExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

ResetResourceAcknowledge ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container     { {ResetResourceAcknowledgeIEs} },
    protocolExtensions   ProtocolExtensionContainer { {ResetResourceAcknowledgeExtensions} }
        OPTIONAL,
    ...
}

ResetResourceAcknowledgeIEs RANAP-PROTOCOL-IES ::= {
    { ID id-CN-DomainIndicator          CRITICALITY ignore  TYPE CN-DomainIndicator
    PRESENCE mandatory } |
    { ID id-IuSigConIdList              CRITICALITY ignore  TYPE ResetResourceAckList
    PRESENCE mandatory } |
    { ID id-GlobalRNC-ID                CRITICALITY ignore  TYPE GlobalRNC-ID               PRESENCE
conditional
    -- This IE is always used in the uplink direction --
    } |
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional   },
    ...
}
ResetResourceAckList    ::= IuSigConId-IE-ContainerList{ {ResetResourceAckItemIEs} }

ResetResourceAckItemIEs RANAP-PROTOCOL-IES ::= {
```

```
    { ID id-IuSigConIdItem              CRITICALITY ignore  TYPE    ResetResourceAckItem
    PRESENCE mandatory  },
    ...
}

ResetResourceAckItem ::= SEQUENCE {
    iuSigConId                 IuSignallingConnectionIdentifier,
    iE-Extensions              ProtocolExtensionContainer { { ResetResourceAckItem-ExtIEs} }
    OPTIONAL,
    ...
}

ResetResourceAckItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

ResetResourceAcknowledgeExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- RAB RELEASE REQUEST ELEMENTARY PROCEDURE
--
-- *************************************************************

-- *************************************************************
--
-- RAB Release Request
--
-- *************************************************************

RAB-ReleaseRequest ::= SEQUENCE {
    protocolIEs        ProtocolIE-Container      { {RAB-ReleaseRequestIEs} },
    protocolExtensions     ProtocolExtensionContainer { {RAB-ReleaseRequestExtensions} }
    OPTIONAL,
    ...
}

RAB-ReleaseRequestIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-ReleaseList            CRITICALITY ignore  TYPE RAB-ReleaseList
    PRESENCE mandatory  },
    ...
}

RAB-ReleaseList                    ::= RAB-IE-ContainerList { {RAB-ReleaseItemIEs} }

RAB-ReleaseItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-ReleaseItem            CRITICALITY ignore  TYPE RAB-ReleaseItem
    PRESENCE mandatory  },
    ...
}

RAB-ReleaseItem ::= SEQUENCE {
    rAB-ID                     RAB-ID,
    cause                      Cause,
    iE-Extensions              ProtocolExtensionContainer { {RAB-ReleaseItem-ExtIEs} }
    OPTIONAL,
    ...
}

RAB-ReleaseItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RAB-ReleaseRequestExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- Iu RELEASE REQUEST ELEMENTARY PROCEDURE
--
-- *************************************************************

-- *************************************************************
--
-- Iu Release Request
```

```
--
-- ************************************************************
Iu-ReleaseRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {Iu-ReleaseRequestIEs} },
    protocolExtensions      ProtocolExtensionContainer { {Iu-ReleaseRequestExtensions} }
    OPTIONAL,
    ...
}

Iu-ReleaseRequestIEs RANAP-PROTOCOL-IES ::= {
    { ID id-Cause                     CRITICALITY ignore  TYPE Cause                    PRESENCE
mandatory   },
    ...
}

Iu-ReleaseRequestExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ************************************************************
--
-- RELOCATION DETECT ELEMENTARY PROCEDURE
--
-- ************************************************************

-- ************************************************************
--
-- Relocation Detect
--
-- ************************************************************

RelocationDetect ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {RelocationDetectIEs} },
    protocolExtensions      ProtocolExtensionContainer { {RelocationDetectExtensions} }
    OPTIONAL,
    ...
}

RelocationDetectIEs RANAP-PROTOCOL-IES ::= {
    ...
}

RelocationDetectExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ************************************************************
--
-- RELOCATION COMPLETE ELEMENTARY PROCEDURE
--
-- ************************************************************

-- ************************************************************
--
-- Relocation Complete
--
-- ************************************************************

RelocationComplete ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {RelocationCompleteIEs} },
    protocolExtensions      ProtocolExtensionContainer { {RelocationCompleteExtensions} }
    OPTIONAL,
    ...
}

RelocationCompleteIEs RANAP-PROTOCOL-IES ::= {
    ...
}

RelocationCompleteExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ************************************************************
--
-- PAGING ELEMENTARY PROCEDURE
--
```

```
-- ***************************************************************

-- ***************************************************************
--
-- Paging
--
-- ***************************************************************

Paging ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {PagingIEs} },
    protocolExtensions      ProtocolExtensionContainer { {PagingExtensions} }
    OPTIONAL,
    ...
}

PagingIEs RANAP-PROTOCOL-IES ::= {
    { ID id-CN-DomainIndicator          CRITICALITY ignore  TYPE CN-DomainIndicator
    PRESENCE mandatory  } |
    { ID id-PermanentNAS-UE-ID          CRITICALITY ignore  TYPE PermanentNAS-UE-ID
    PRESENCE mandatory  } |
    { ID id-TemporaryUE-ID              CRITICALITY ignore  TYPE TemporaryUE-ID          PRESENCE
optional    } |
    { ID id-PagingAreaID                CRITICALITY ignore  TYPE PagingAreaID            PRESENCE
optional    } |
    { ID id-PagingCause             CRITICALITY ignore  TYPE PagingCause                 PRESENCE
optional    } |
    { ID id-NonSearchingIndication          CRITICALITY ignore  TYPE NonSearchingIndication
    PRESENCE optional    } |
    { ID id-DRX-CycleLengthCoefficient              CRITICALITY ignore  TYPE DRX-
CycleLengthCoefficient               PRESENCE optional   } ,
    ...
}

PagingExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ***************************************************************
--
-- COMMON ID ELEMENTARY PROCEDURE
--
-- ***************************************************************

-- ***************************************************************
--
-- Common ID
--
-- ***************************************************************

CommonID ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {CommonID-IEs} },
    protocolExtensions      ProtocolExtensionContainer { {CommonIDExtensions} }
    OPTIONAL,
    ...
}

CommonID-IEs RANAP-PROTOCOL-IES ::= {
    { ID id-PermanentNAS-UE-ID          CRITICALITY ignore  TYPE PermanentNAS-UE-ID
    PRESENCE mandatory  },
    ...
}

CommonIDExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ***************************************************************
--
-- CN INVOKE TRACE ELEMENTARY PROCEDURE
--
-- ***************************************************************

-- ***************************************************************
--
-- CN Invoke Trace
--
-- ***************************************************************
```

```
CN-InvokeTrace ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container       { {CN-InvokeTraceIEs} },
    protocolExtensions     ProtocolExtensionContainer { {CN-InvokeTraceExtensions} }
    OPTIONAL,
    ...
}

CN-InvokeTraceIEs RANAP-PROTOCOL-IES ::= {
    { ID id-TraceType                   CRITICALITY ignore  TYPE TraceType                  PRESENCE
mandatory   } |
    { ID id-TraceReference              CRITICALITY ignore  TYPE TraceReference             PRESENCE
mandatory   } |
    { ID id-TriggerID                   CRITICALITY ignore  TYPE TriggerID                  PRESENCE
optional    } |
    { ID id-UE-ID                       CRITICALITY ignore  TYPE UE-ID                 PRESENCE
optional    } |
    { ID id-OMC-ID                      CRITICALITY ignore  TYPE OMC-ID                PRESENCE
optional    },
    ...
}

CN-InvokeTraceExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- CN DEACTIVATE TRACE ELEMENTARY PROCEDURE
--
-- *************************************************************

-- *************************************************************
--
-- CN Deactivate Trace
--
-- *************************************************************

CN-DeactivateTrace ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container       { {CN-DeactivateTraceIEs} },
    protocolExtensions     ProtocolExtensionContainer { {CN-DeactivateTraceExtensions} }
    OPTIONAL,
    ...
}

CN-DeactivateTraceIEs RANAP-PROTOCOL-IES ::= {
    { ID id-TraceReference              CRITICALITY ignore  TYPE TraceReference             PRESENCE
mandatory } |
    { ID id-TriggerID                   CRITICALITY ignore  TYPE TriggerID                  PRESENCE
optional },
    ...
}

CN-DeactivateTraceExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- LOCATION REPORTING CONTROL ELEMENTARY PROCEDURE
--
-- *************************************************************

-- *************************************************************
--
-- Location Reporting Control
--
-- *************************************************************

LocationReportingControl ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container       { {LocationReportingControlIEs} },
    protocolExtensions     ProtocolExtensionContainer { {LocationReportingControlExtensions} }
    OPTIONAL,
    ...
}

LocationReportingControlIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RequestType                 CRITICALITY ignore  TYPE RequestType                PRESENCE
mandatory   },
```

```
    ...
}

LocationReportingControlExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- LOCATION REPORT ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Location Report
--
-- **************************************************************

LocationReport ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {LocationReportIEs} },
    protocolExtensions      ProtocolExtensionContainer { {LocationReportExtensions} }
    OPTIONAL,
    ...
}

LocationReportIEs RANAP-PROTOCOL-IES ::= {
    { ID id-AreaIdentity                CRITICALITY ignore  TYPE AreaIdentity              PRESENCE
optional    } |
    { ID id-Cause                   CRITICALITY ignore  TYPE Cause                  PRESENCE
optional    },
    ...
}

LocationReportExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- INITIAL UE MESSAGE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Initial UE Message
--
-- **************************************************************

InitialUE-Message ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {InitialUE-MessageIEs} },
    protocolExtensions      ProtocolExtensionContainer { {InitialUE-MessageExtensions} }
    OPTIONAL,
    ...
}

InitialUE-MessageIEs RANAP-PROTOCOL-IES ::= {
    { ID id-CN-DomainIndicator          CRITICALITY ignore  TYPE CN-DomainIndicator
    PRESENCE mandatory  } |
    { ID id-LAI                 CRITICALITY ignore  TYPE LAI                  PRESENCE mandatory
    } |
    { ID id-RAC                 CRITICALITY ignore  TYPE RAC                  PRESENCE conditional

    -- This IE is only present for RABs towards the PS domain --
        } |
    { ID id-SAI                 CRITICALITY ignore  TYPE SAI                  PRESENCE mandatory
    } |
    { ID id-NAS-PDU                 CRITICALITY ignore  TYPE NAS-PDU                  PRESENCE
mandatory   } |
    { ID id-IuSigConId              CRITICALITY ignore  TYPE IuSignallingConnectionIdentifier
    PRESENCE mandatory  } |
    { ID id-GlobalRNC-ID                CRITICALITY ignore  TYPE GlobalRNC-ID             PRESENCE
mandatory   },

    ...
}
```

```
InitialUE-MessageExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ****************************************************************
--
-- DIRECT TRANSFER ELEMENTARY PROCEDURE
--
-- ****************************************************************

-- ****************************************************************
--
-- Direct Transfer
--
-- ****************************************************************

DirectTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {DirectTransferIEs} },
    protocolExtensions      ProtocolExtensionContainer { {DirectTransferExtensions} }
    OPTIONAL,
    ...
}

DirectTransferIEs RANAP-PROTOCOL-IES ::= {
    { ID id-NAS-PDU                 CRITICALITY ignore  TYPE NAS-PDU               PRESENCE
mandatory   } |
    { ID id-LAI                 CRITICALITY ignore  TYPE LAI                    PRESENCE conditional
    -- This IE is only present if the message is directed to the PS domain --
        } |
    { ID id-RAC                 CRITICALITY ignore  TYPE RAC                    PRESENCE conditional
    -- This IE is only present if the message is directed to the PS domain --
        } |
    { ID id-SAPI                CRITICALITY ignore  TYPE SAPI                   PRESENCE
conditional
    -- This IE is always used in downlink direction--                                    },
    ...
}

DirectTransferExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ****************************************************************
--
-- OVERLOAD CONTROL ELEMENTARY PROCEDURE
--
-- ****************************************************************

-- ****************************************************************
--
-- Overload
--
-- ****************************************************************

Overload ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {OverloadIEs} },
    protocolExtensions      ProtocolExtensionContainer { {OverloadExtensions} }
    OPTIONAL,
    ...
}

OverloadIEs RANAP-PROTOCOL-IES ::= {
    { ID id-NumberOfSteps               CRITICALITY ignore  TYPE NumberOfSteps          PRESENCE
optional    } |
    { ID id-GlobalRNC-ID            CRITICALITY ignore  TYPE GlobalRNC-ID           PRESENCE
conditional
    -- This IE is always used in the uplink direction --
    },
    ...
}

OverloadExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ****************************************************************
--
-- ERROR INDICATION ELEMENTARY PROCEDURE
```

```
--
-- ***************************************************************

-- ***************************************************************
--
-- Error Indication
--
-- ***************************************************************

ErrorIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {ErrorIndicationIEs} },
    protocolExtensions      ProtocolExtensionContainer { {ErrorIndicationExtensions} }
    OPTIONAL,
    ...
}

ErrorIndicationIEs RANAP-PROTOCOL-IES ::= {
    { ID id-Cause                    CRITICALITY ignore  TYPE Cause                    PRESENCE
conditional
    -- At least either of Cause IE or Criticality IE shall be present --
            } |
    { ID id-CriticalityDiagnostics         CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE conditional
    -- At least either of Cause IE or Criticality IE shall be present --
            } |
    { ID id-CN-DomainIndicator         CRITICALITY ignore  TYPE CN-DomainIndicator
    PRESENCE optional    } |
    { ID id-TransportLayerAddress         CRITICALITY ignore  TYPE TransportLayerAddress
    PRESENCE optional    } |
    { ID id-IuTransportAssociation         CRITICALITY ignore  TYPE IuTransportAssociation
    PRESENCE optional    } |
    { ID id-GlobalRNC-ID             CRITICALITY ignore  TYPE GlobalRNC-ID             PRESENCE
conditional
    -- This IE is always used in the uplink direction when message is sent connectionless --
                },
    ...
}

ErrorIndicationExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ***************************************************************
--
-- SRNS DATA FORWARD ELEMENTARY PROCEDURE
--
-- ***************************************************************

-- ***************************************************************
--
-- SRNS Data Forward Command
--
-- ***************************************************************

SRNS-DataForwardCommand ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {SRNS-DataForwardCommandIEs} },
    protocolExtensions      ProtocolExtensionContainer { {SRNS-DataForwardCommandExtensions} }
    OPTIONAL,
    ...
}

SRNS-DataForwardCommandIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-DataForwardingList         CRITICALITY ignore  TYPE RAB-DataForwardingList
    PRESENCE conditional
    -- This group is only present for RABs towards the PS domain --
        },
    ...
}

SRNS-DataForwardCommandExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ***************************************************************
--
-- FORWARD SRNS CONTEXT ELEMENTARY PROCEDURE
--
-- ***************************************************************
```

```
-- ************************************************************
--
-- Forward SRNS Context
--
-- ************************************************************

ForwardSRNS-Context ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {ForwardSRNS-ContextIEs} },
    protocolExtensions      ProtocolExtensionContainer { {ForwardSRNS-ContextExtensions} }
    OPTIONAL,
    ...
}

ForwardSRNS-ContextIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-ContextList             CRITICALITY ignore  TYPE RAB-ContextList
    PRESENCE mandatory  },
    ...
}

ForwardSRNS-ContextExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ************************************************************
--
-- RAB ASSIGNMENT ELEMENTARY PROCEDURE
--
-- ************************************************************

-- ************************************************************
--
-- RAB Assignment Request
--
-- ************************************************************

RAB-AssignmentRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {RAB-AssignmentRequestIEs} },
    protocolExtensions      ProtocolExtensionContainer { {RAB-AssignmentRequestExtensions} }
    OPTIONAL,
    ...
}

RAB-AssignmentRequestIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-SetupOrModifyList           CRITICALITY ignore  TYPE RAB-SetupOrModifyList
    PRESENCE conditional
    -- This group must be present at least when no other group is present, ie. at least one group
must be present --            } |
    { ID id-RAB-ReleaseList             CRITICALITY ignore  TYPE RAB-ReleaseList
    PRESENCE conditional
    -- This group must be present at least when no other group is present, ie. at least one group
must be present --            },
    ...
}

RAB-SetupOrModifyList                       ::= RAB-IE-ContainerPairList { {RAB-SetupOrModifyItem-IEs} }

RAB-SetupOrModifyItem-IEs RANAP-PROTOCOL-IES-PAIR ::= {
    { ID id-RAB-SetupOrModifyItem           FIRST CRITICALITY  reject   FIRST TYPE  RAB-
SetupOrModifyItemFirst
                            SECOND CRITICALITY ignore   SECOND TYPE RAB-SetupOrModifyItemSecond
                                            PRESENCE mandatory  },
    ...
}

RAB-SetupOrModifyItemFirst ::= SEQUENCE {
    rAB-ID                  RAB-ID,
    nAS-SynchronisationIndicator    NAS-SynchronisationIndicator    OPTIONAL
    -- This IE is present if the relevant NAS information is provided by the CN --,
    rAB-Parameters              RAB-Parameters,
    userPlaneInformation            UserPlaneInformation,
    transportLayerAddress           TransportLayerAddress,
    iuTransportAssociation          IuTransportAssociation,
    iE-Extensions               ProtocolExtensionContainer { {RAB-SetupOrModifyItemFirst-ExtIEs}
}           OPTIONAL,
    ...
}
```

```
RAB-SetupOrModifyItemFirst-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}


RAB-SetupOrModifyItemSecond ::= SEQUENCE {
    pDP-TypeInformation              PDP-TypeInformation
    -- This IE is only present for RABs towards the PS domain -- OPTIONAL,
    dataVolumeReportingIndication            DataVolumeReportingIndication   OPTIONAL
    -- This IE, if applicable, is only present for RABs towards the PS domain --,
    dl-GTP-PDU-SequenceNumber        DL-GTP-PDU-SequenceNumber   OPTIONAL
    -- This IE, if applicable, is only present for RABs towards the PS domain --,
    ul-GTP-PDU-SequenceNumber        UL-GTP-PDU-SequenceNumber   OPTIONAL
    -- This IE, if applicable, is only present for RABs towards the PS domain --,
    dl-N-PDU-SequenceNumber          DL-N-PDU-SequenceNumber     OPTIONAL
    -- This IE, if applicable, is only present for RABs towards the PS domain --,
    ul-N-PDU-SequenceNumber          UL-N-PDU-SequenceNumber     OPTIONAL
    -- This IE, if applicable, is only present for RABs towards the PS domain --,
    iE-Extensions                    ProtocolExtensionContainer { {RAB-SetupOrModifyItemSecond-
ExtIEs} }          OPTIONAL,
    ...
}


RAB-SetupOrModifyItemSecond-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}


RAB-AssignmentRequestExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- *************************************************************
--
-- RAB Assignment Response
--
-- *************************************************************

RAB-AssignmentResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {RAB-AssignmentResponseIEs} },
    protocolExtensions      ProtocolExtensionContainer { {RAB-AssignmentResponseExtensions} }
    OPTIONAL,
    ...
}

RAB-AssignmentResponseIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-SetupOrModifiedList        CRITICALITY ignore  TYPE RAB-SetupOrModifiedList
    PRESENCE conditional
    -- This group must be present at least when no other group is present, ie. at least one group
must be present --            } |
    { ID id-RAB-ReleasedList           CRITICALITY ignore  TYPE RAB-ReleasedList
    PRESENCE conditional
    -- This group must be present at least when no other group is present, ie. at least one group
must be present --            } |
    { ID id-RAB-QueuedList             CRITICALITY ignore  TYPE RAB-QueuedList           PRESENCE
conditional
    -- This group must be present at least when no other group is present, ie. at least one group
must be present --            } |
    { ID id-RAB-FailedList             CRITICALITY ignore  TYPE RAB-FailedList           PRESENCE
conditional
    -- This group must be present at least when no other group is present, ie. at least one group
must be present --            } |
    { ID id-RAB-ReleaseFailedList           CRITICALITY ignore  TYPE RAB-ReleaseFailedList
    PRESENCE conditional
    -- This group must be present at least when no other group is present, ie. at least one group
must be present --            } |
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional },
    ...
}


RAB-SetupOrModifiedList                    ::= RAB-IE-ContainerList { {RAB-SetupOrModifiedItemIEs} }

RAB-SetupOrModifiedItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-SetupOrModifiedItem         CRITICALITY ignore  TYPE RAB-SetupOrModifiedItem
    PRESENCE mandatory  },
    ...
}
```

```
RAB-SetupOrModifiedItem ::= SEQUENCE {
    rAB-ID                      RAB-ID,
    transportLayerAddress                TransportLayerAddress   OPTIONAL
    -- This IE is only present for RABs towards the PS domain --,
    iuTransportAssociation           IuTransportAssociation  OPTIONAL
    -- This IE is only present for RABs towards the PS domain --,
    dl-dataVolumes                   DataVolumeList     OPTIONAL
    -- This IE is only present if the RAB has been modified and --
    -- RAB data volume reporting for PS domain is required --,
    iE-Extensions                    ProtocolExtensionContainer { {RAB-SetupOrModifiedItem-ExtIEs} }
            OPTIONAL,
    ...
}

RAB-SetupOrModifiedItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RAB-ReleasedList                    ::= RAB-IE-ContainerList { {RAB-ReleasedItemIEs} }

RAB-ReleasedItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-ReleasedItem          CRITICALITY ignore  TYPE RAB-ReleasedItem
    PRESENCE mandatory  },
    ...
}

RAB-ReleasedItem ::= SEQUENCE {
    rAB-ID                      RAB-ID,
    dl-dataVolumes                   DataVolumeList     OPTIONAL
    -- This IE is only present if data volume reporting for PS domain is required --,
    dL-GTP-PDU-SequenceNumber        DL-GTP-PDU-SequenceNumber        OPTIONAL
    -- This IE is only present for RABs towards the PS domain when the release is UTRAN initiated --
    ,
    uL-GTP-PDU-SequenceNumber        UL-GTP-PDU-SequenceNumber        OPTIONAL
    -- This IE is only present for RABs towards the PS domain when the release is UTRAN initiated --
    ,
    iE-Extensions                    ProtocolExtensionContainer { {RAB-ReleasedItem-ExtIEs} }
    OPTIONAL,
    ...
}

RAB-ReleasedItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

DataVolumeList ::= SEQUENCE (SIZE (1..maxNrOfVol)) OF
    SEQUENCE {
        dl-UnsuccessfullyTransmittedDataVolume    UnsuccessfullyTransmittedDataVolume,
        dataVolumeReference          DataVolumeReference OPTIONAL,
        iE-Extensions                ProtocolExtensionContainer { {DataVolumeList-ExtIEs} }
    OPTIONAL,
        ...
    }

DataVolumeList-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RAB-QueuedList                      ::= RAB-IE-ContainerList { {RAB-QueuedItemIEs} }

RAB-QueuedItemIEs RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-QueuedItem            CRITICALITY ignore  TYPE RAB-QueuedItem           PRESENCE
mandatory  },
    ...
}

RAB-QueuedItem ::= SEQUENCE {
    rAB-ID                      RAB-ID,
    iE-Extensions                    ProtocolExtensionContainer { {RAB-QueuedItem-ExtIEs} }
    OPTIONAL,
    ...
}

RAB-QueuedItem-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RAB-ReleaseFailedList ::= RAB-FailedList
```

```
RAB-AssignmentResponseExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- PRIVATE MESSAGE
--
-- **************************************************************

PrivateMessage ::= SEQUENCE {
    privateIEs      PrivateIE-Container  { {PrivateMessage-IEs } },
    ...
}

PrivateMessage-IEs RANAP-PRIVATE-IES ::= {
    ...
}

-- **************************************************************
--
-- RANAP RELOCATION INFORMATION ELEMENTARY PROCEDURE
--
-- **************************************************************

RANAP-RelocationInformation ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {RANAP-RelocationInformationIEs} },
    protocolExtensions      ProtocolExtensionContainer { {RANAP-RelocationInformationExtensions} }
            OPTIONAL,
    ...
}

RANAP-RelocationInformationIEs RANAP-PROTOCOL-IES ::= {
    { ID id-DirectTransferInformationList-RANAP-RelocInf
                        CRITICALITY ignore  TYPE DirectTransferInformationList-RANAP-RelocInf

                                                    PRESENCE optional   } |
    { ID id-RAB-ContextList-RANAP-RelocInf     CRITICALITY ignore  TYPE RAB-ContextList-RANAP-
RelocInf        PRESENCE optional   },
    ...
}

DirectTransferInformationList-RANAP-RelocInf        ::= DirectTransfer-IE-ContainerList {
{DirectTransferInformationItemIEs-RANAP-RelocInf} }

DirectTransferInformationItemIEs-RANAP-RelocInf RANAP-PROTOCOL-IES ::= {
    { ID id-DirectTransferInformationItem-RANAP-RelocInf
                        CRITICALITY ignore  TYPE DirectTransferInformationItem-RANAP-RelocInf
                                                PRESENCE mandatory  },
    ...
}

DirectTransferInformationItem-RANAP-RelocInf ::= SEQUENCE {
    nAS-PDU                     NAS-PDU,
    sAPI                        SAPI,
    iE-Extensions                   ProtocolExtensionContainer { {RANAP-
DirectTransferInformationItem-ExtIEs-RANAP-RelocInf} }          OPTIONAL,
    ...
}

RANAP-DirectTransferInformationItem-ExtIEs-RANAP-RelocInf RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RAB-ContextList-RANAP-RelocInf             ::= RAB-IE-ContainerList { {RAB-ContextItemIEs-RANAP-
RelocInf} }

RAB-ContextItemIEs-RANAP-RelocInf RANAP-PROTOCOL-IES ::= {
    { ID id-RAB-ContextItem-RANAP-RelocInf     CRITICALITY ignore  TYPE RAB-ContextItem-RANAP-
RelocInf            PRESENCE mandatory  },
    ...
}

RAB-ContextItem-RANAP-RelocInf ::= SEQUENCE {
    rAB-ID          RAB-ID,
    dl-GTP-PDU-SequenceNumber           DL-GTP-PDU-SequenceNumber,
    ul-GTP-PDU-SequenceNumber           UL-GTP-PDU-SequenceNumber,
```

```
    dl-N-PDU-SequenceNumber              DL-N-PDU-SequenceNumber,
    ul-N-PDU-SequenceNumber              UL-N-PDU-SequenceNumber,
    iE-Extensions                   ProtocolExtensionContainer { {RAB-ContextItem-ExtIEs-RANAP-
RelocInf} }          OPTIONAL,
    ...
}

RAB-ContextItem-ExtIEs-RANAP-RelocInf RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RANAP-RelocationInformationExtensions RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

END
```

9.3.4   Information Element Definitions

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

RANAP-IEs -- { object identifier to be allocated }--
DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    maxNrOfErrors,
    maxNrOfPDPDirections,
    maxNrOfPoints,
    maxNrOfRABs,
    maxNrOfSeparateTrafficDirections,
    maxRAB-Subflows,
    maxRAB-SubflowCombination

FROM RANAP-Constants

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

    ProtocolExtensionContainer{},
    RANAP-PROTOCOL-EXTENSION
FROM RANAP-Containers;

-- A

AllocationOrRetentionPriority ::= SEQUENCE {
    priorityLevel          PriorityLevel,
    pre-emptionCapability      Pre-emptionCapability,
    pre-emptionVulnerability   Pre-emptionVulnerability,
    queuingAllowed         QueuingAllowed,
    iE-Extensions          ProtocolExtensionContainer { {AllocationOrRetentionPriority-ExtIEs} }
OPTIONAL,
    ...
}

AllocationOrRetentionPriority-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

AreaIdentity ::= CHOICE {
    sAI          SAI,
    geographicalArea      GeographicalArea,
    ...
}

-- B

BindingID              ::= OCTET STRING (SIZE (4))
```

```
-- C


Cause ::= CHOICE {
    radioNetwork            CauseRadioNetwork,
    transmissionNetwork     CauseTransmissionNetwork,
    nAS             CauseNAS,
    protocol            CauseProtocol,
    misc                CauseMisc,
    non-Standard            CauseNon-Standard,
    ...
}

CauseMisc ::= INTEGER {
    om-intervention (113),
    no-resource-available (114),
    unspecified-failure (115),
    network-optimisation (116)
} (113..128)

CauseNAS ::= INTEGER {
    user-restriction-start-indication (81),
    user-restriction-end-indication (82),
    normal-release (83)
} (81..96)

CauseProtocol ::= INTEGER {
    transfer-syntax-error (97),
    semantic-error (98),
    message-not-compatible-with-receiver-state (99),
    abstract-syntax-error-reject (100),
    abstract-syntax-error-ignore-and-notify (101)

} (97..112)

CauseRadioNetwork ::= INTEGER {
    rab-pre-empted (1),
    trelocoverall-expiry (2),
    trelocprep-expiry (3),
    treloccomplete-expiry (4),
    tqueing-expiry (5),
    relocation-triggered (6),
    trellocalloc-expiry(7),
    unable-to-establish-during-relocation (8),
    unknown-target-rnc (9),
    relocation-cancelled (10),
    successful-relocation (11),
    requested-ciphering-and-or-integrity-protection-algorithms-not-supported (12),
    change-of-ciphering-and-or-integrity-protection-is-not-supported (13),
    failure-in-the-radio-interface-procedure (14),
    release-due-to-utran-generated-reason (15),
    user-inactivity (16),
    time-critical-relocation (17),
    requested-traffic-class-not-available (18),
    invalid-rab-parameters-value (19),
    requested-maximum-bit-rate-not-available (20),
    requested-guaranteed-bit-rate-not-available (21),
    requested-transfer-delay-not-achievable (22),
    invalid-rab-parameters-combination (23),
    condition-violation-for-sdu-parameters (24),
    condition-violation-for-traffic-handling-priority (25),
    condition-violation-for-guaranteed-bit-rate (26),
    user-plane-versions-not-supported (27),
    iu-up-failure (28),
    relocation-failure-in-target-CN-RNC-or-target-system(29),
    invalid-RAB-ID (30),
    no-remaining-rab (31),
    interaction-with-other-procedure (32),
    requested-maximum-bit-rate-for-dl-not-available (33),
    requested-maximum-bitr-ate-for-ul-not-available (34),
    requested-guaranteed-bit-rate-for-dl-not-available (35),
    requested-guaranteed-bit-rate-for-ul-not-available (36),
    repeated-integrity-checking-failure (37),
    requested-report-type-not-supported (38),
    request-superseded (39),
    release-due-to-UE-generated-signalling-connection-release (40)
} (1..64)
```

```
CauseNon-Standard ::= INTEGER (129..256)

CauseTransmissionNetwork ::= INTEGER {
    logical-error-unknown-iu-transport-association (65)
} (65..80)


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

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

CriticalityDiagnostics-IE-List ::= SEQUENCE (SIZE (1..maxNrOfErrors)) OF
    SEQUENCE {
        criticalityResponse     Criticality,
        iE-ID               ProtocolIE-ID,
        repetitionNumber        RepetitionNumber        OPTIONAL,
        iE-Extensions           ProtocolExtensionContainer { {CriticalityDiagnostics-IE-List-ExtIEs}
} OPTIONAL,
        ...
    }

CriticalityDiagnostics-IE-List-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

CGI ::= SEQUENCE {
    pLMN-ID         PLMN-ID,
    lAC             LAC,
    cI              CI,
    iE-Extensions           ProtocolExtensionContainer { {CGI-ExtIEs} } OPTIONAL
}

CGI-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

ChosenEncryptionAlgorithm       ::= EncryptionAlgorithm

ChosenIntegrityProtectionAlgorithm  ::= IntegrityProtectionAlgorithm

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

ClassmarkInformation2           ::= OCTET STRING

ClassmarkInformation3           ::= OCTET STRING

CN-DomainIndicator ::= ENUMERATED {
    cs-domain,
    ps-domain
}


CN-BroadcastArea ::= CHOICE {
    lAI             LAI,
    rAI             RAI,
    sAI             SAI,
    geographicalArea        GeographicalArea,
    ...
}

-- D

DataVolumeReference         ::= INTEGER (0..255)

DataVolumeReportingIndication ::= ENUMERATED {
    do-report,
    do-not-report
}
```

```
DCH-ID ::= INTEGER (0..255)

DeliveryOfErroneousSDU ::= ENUMERATED {
    yes,
    no,
    no-error-detection-consideration
}

DeliveryOrder::= ENUMERATED {
    delivery-order-requested,
    delivery-order-not-requested
}

DL-GTP-PDU-SequenceNumber        ::= INTEGER (0..65535)
-- Reference: xx.xxx

DL-N-PDU-SequenceNumber          ::= INTEGER (0..65535)
-- Reference: xx.xxx

D-RNTI                   ::= INTEGER (0..1048575)

DRX-CycleLengthCoefficient        ::= INTEGER (2..12)
DSCH-ID ::= INTEGER (0..255)

-- E

EncryptionAlgorithm              ::= INTEGER { no-encryption (0), standard-UMTS-encryption-algorith-
UEA1 (1) } (0..15)

EncryptionInformation ::= SEQUENCE {
    permittedAlgorithms    PermittedEncryptionAlgorithms,
    key             EncryptionKey,
    iE-Extensions          ProtocolExtensionContainer { {EncryptionInformation-ExtIEs} } OPTIONAL
}

EncryptionInformation-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

EncryptionKey             ::= BIT STRING (SIZE (128))
-- Reference: 33.102

Event ::= ENUMERATED {
    stop,
    direct,
    change-of-servicearea,
    ...
}

-- F
-- G

GeographicalArea ::= CHOICE {
    point              GA-Point,
    pointWithUnCertainty        GA-PointWithUnCertainty,
    polygon            GA-Polygon,
    ...
}

GeographicalCoordinates ::= SEQUENCE {
    latitudeSign          ENUMERATED { north, south },
    latitude           INTEGER (0..8388607),
    longitude          INTEGER (-8388608..8388607),
    iE-Extensions          ProtocolExtensionContainer { {GeographicalCoordinates-ExtIEs} }
OPTIONAL,
    ...
}

GeographicalCoordinates-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-Point ::= SEQUENCE {
    geographicalCoordinates    GeographicalCoordinates,
    iE-Extensions          ProtocolExtensionContainer { {GA-Point-ExtIEs} } OPTIONAL,
    ...
}
```

```
GA-Point-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-PointWithUnCertainty ::=SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    iE-Extensions               ProtocolExtensionContainer { {GA-PointWithUnCertainty-ExtIEs} }
OPTIONAL,
    uncertaintyCode         INTEGER (0..127)
}

GA-PointWithUnCertainty-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-Polygon ::= SEQUENCE (SIZE (1..maxNrOfPoints)) OF
    SEQUENCE {
        geographicalCoordinates     GeographicalCoordinates,
        iE-Extensions               ProtocolExtensionContainer { {GA-Polygon-ExtIEs} } OPTIONAL,
        ...
    }

GA-Polygon-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

GlobalRNC-ID ::= SEQUENCE {
    pLMN-ID             PLMN-ID,
    rNC-ID              RNC-ID
}

GTP-TEI                 ::= OCTET STRING (SIZE (4))
-- Reference: xx.xxx

GuaranteedBitrate           ::= INTEGER (0..16000000)
-- Unit is bits per sec

-- H

-- I
InformationIdentity ::= INTEGER (0..255)

InformationPriority ::= INTEGER (0..15)

InformationControl ::= ENUMERATED {
    on,
    off
}


IMEI                    ::= OCTET STRING (SIZE (8))
-- Reference: 23.003

IMSI                    ::= TBCD-STRING (SIZE (3..8))
-- Reference: 23.003

IntegrityProtectionAlgorithm        ::= INTEGER { standard-UMTS-integrity-algorithm-UIA1 (0) }
(0..15)

IntegrityProtectionInformation ::= SEQUENCE {
    permittedAlgorithms     PermittedIntegrityProtectionAlgorithms,
    key             IntegrityProtectionKey,
    iE-Extensions           ProtocolExtensionContainer { {IntegrityProtectionInformation-ExtIEs} }
OPTIONAL
}

IntegrityProtectionInformation-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

IuSignallingConnectionIdentifier    ::= BIT STRING (SIZE (24))

IuTransportAssociation ::= CHOICE {
    gTP-TEI             GTP-TEI,
    bindingID           BindingID,
    ...
```

```
}

-- J
-- K

KeyStatus    ::= ENUMERATED {
    old,
    new,
    ...
}
-- L

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

LAI ::= SEQUENCE {
    pLMN-ID           PLMN-ID,
    lAC           LAC,
    iE-Extensions           ProtocolExtensionContainer { {LAI-ExtIEs} } OPTIONAL
}

LAI-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

L3-Information            ::= OCTET STRING

-- M

MaxBitrate            ::= INTEGER (1..16000000)
-- Unit is bits per sec

MaxSDU-Size           ::= INTEGER (0..32768)
-- MaxSDU-Size
-- Unit is bit

MCC            ::= TBCD-STRING (SIZE (2))
-- Reference: 24.008

MNC            ::= TBCD-STRING (SIZE (2))
-- Reference: 24.008


-- N


NAS-BroadcastInformation       ::= OCTET STRING

NAS-PDU               ::= OCTET STRING

NAS-SynchronisationIndicator   ::= BIT STRING (SIZE (4))

NonSearchingIndication ::= ENUMERATED {
    non-searching,
    searching
}

NumberOfIuInstances        ::= INTEGER (1..2)

NumberOfSteps            ::= INTEGER (1..16)

-- O

OldBSS-ToNewBSS-Information     ::= OCTET STRING

OMC-ID            ::= OCTET STRING (SIZE (3..22))
-- Reference: GSM TS 12.20

-- P

PagingAreaID ::= CHOICE {
    lAI           LAI,
    rAI           RAI,
    ...
}

PagingCause ::= ENUMERATED {
    speech-call,
    cs-data-call,
    ps-data-call,
```

ETSI

```
    sms,
    ...
}

PDP-TypeInformation ::= SEQUENCE (SIZE (1..maxNrOfPDPDirections)) OF
    PDP-Type

PDP-Type ::= ENUMERATED {
    empty,
    ppp,
    osp-ihoss  -- this value is used for OSP:IHOSS -- ,
    ipv4,
    ipv6,
    ...
}

PermanentNAS-UE-ID ::= CHOICE {
    iMSI               IMSI,
    ...
}

PermittedEncryptionAlgorithms ::= SEQUENCE (SIZE (1..16)) OF
    EncryptionAlgorithm

PermittedIntegrityProtectionAlgorithms ::= SEQUENCE (SIZE (1..16)) OF
    IntegrityProtectionAlgorithm

PLMN-ID                ::= TBCD-STRING (SIZE (3))

Pre-emptionCapability ::= ENUMERATED {
    can-not-trigger-pre-emption,
    can-trigger-pre-emption
}

Pre-emptionVulnerability ::= ENUMERATED {
    not-vulnerable-to-pre-emption,
    vulnerable-to-pre-emption
}

PriorityLevel              ::= INTEGER { spare (0), highest (1), lowest (14), no-priority (15) }
(0..15)

P-TMSI                 ::= OCTET STRING (SIZE (4))

-- Q

QueuingAllowed ::= ENUMERATED {
    queueing-not-allowed,
    queueing-allowed
}

-- R
RAB-AsymmetryIndicator::= ENUMERATED {
    symmetric-bidirectional,
    asymmetric-unidirectional-downlink,
    asymmetric-unidirectional-uplink,
    asymmetric-bidirectional,
    ...
}

RAB-ID                 ::= BIT STRING (SIZE (8))

RAB-Parameter-GuaranteedBitrateList ::= SEQUENCE (SIZE (1..maxNrOfSeparateTrafficDirections)) OF
GuaranteedBitrate

RAB-Parameter-MaxBitrateList       ::= SEQUENCE (SIZE (1..maxNrOfSeparateTrafficDirections)) OF
MaxBitrate

RAB-Parameters ::= SEQUENCE {
    trafficClass          TrafficClass,
    rAB-AsymmetryIndicator         RAB-AsymmetryIndicator,
    maxBitrate         RAB-Parameter-MaxBitrateList,
    guaranteedBitRate       RAB-Parameter-GuaranteedBitrateList OPTIONAL
    -- This IE is only present when traffic class indicates Conversational or Streaming --,
    deliveryOrder          DeliveryOrder,
    maxSDU-Size         MaxSDU-Size,
    sDU-Parameters          SDU-Parameters,
    transferDelay        TransferDelay OPTIONAL
```

```
    -- This IE is only present when traffic class indicates Conversational or Streaming --,
    trafficHandlingPriority    TrafficHandlingPriority OPTIONAL
    -- This IE is only present when traffic class indicates Interactiv --,
    allocationOrRetentionPriority   AllocationOrRetentionPriority OPTIONAL,
    sourceStatisticsDescriptor  SourceStatisticsDescriptor OPTIONAL
    -- This IE is only present when traffic class indicates Conversational or Streaming --,
    iE-Extensions              ProtocolExtensionContainer { {RAB-Parameters-ExtIEs} } OPTIONAL,
    ...
}

RAB-Parameters-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RAB-SubflowCombinationBitRate   ::= INTEGER (0..16000000)

RAB-TrCH-Mapping ::=    SEQUENCE ( SIZE (1..maxNrOfRABs)) OF
    RAB-TrCH-MappingItem

RAB-TrCH-MappingItem ::= SEQUENCE {
    rAB-ID          RAB-ID,
    trCH-ID-List    TrCH-ID-List,
    ...
}

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

RAI ::= SEQUENCE {
    lAI             LAI,
    rAC             RAC,
    iE-Extensions           ProtocolExtensionContainer { {RAI-ExtIEs} } OPTIONAL,
    ...
}

RAI-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RateControlAllowed ::= ENUMERATED {
    not-allowed,
    allowed
}

RelocationType ::= ENUMERATED {
    ue-not-involved,
    ue-involved,
    ...
}

RepetitionNumber ::= INTEGER (0..255)

ReportArea ::= ENUMERATED {
    service-area,
    geographical-coordinates,
    ...
}

RequestType ::= SEQUENCE {
    event               Event,
    reportArea          ReportArea,
    accuracyCode        INTEGER (0..127)    OPTIONAL,
    -- To be used if Geographical Coordinates shall be reported with a requested accuracy. --
    ...
}

ResidualBitErrorRatio ::= SEQUENCE {
    mantissa            INTEGER (1..9),
    exponent            INTEGER (1..8),
    iE-Extensions           ProtocolExtensionContainer { {ResidualBitErrorRatio-ExtIEs} } OPTIONAL
}
-- ResidualBitErrorRatio = mantissa * 10^-exponent

ResidualBitErrorRatio-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

RNC-ID                  ::= INTEGER (0..4095)
-- RNC-ID                 ::= BIT STRING (SIZE (12))
```

```
-- Harmonized with RNSAP and NBAP definitions

RRC-Container                    ::= OCTET STRING

-- S

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

SAI ::= SEQUENCE {
    pLMN-ID             PLMN-ID,
    lAC             LAC,
    sAC             SAC,
    iE-Extensions           ProtocolExtensionContainer { {SAI-ExtIEs} } OPTIONAL
}

SAI-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

SAPI ::= ENUMERATED {
    normal-priority,
    low-priority,
    ...
}

SDU-ErrorRatio ::= SEQUENCE {
    mantissa            INTEGER (1..9),
    exponent           INTEGER (1..6),
    iE-Extensions           ProtocolExtensionContainer { {SDU-ErrorRatio-ExtIEs} } OPTIONAL
}
-- SDU-ErrorRatio = mantissa * 10^-exponent

SDU-ErrorRatio-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}
SDU-FormatInformationParameters ::= SEQUENCE (SIZE (1..maxRAB-SubflowCombination)) OF
    SEQUENCE {
        subflowSDU-Size        SubflowSDU-Size     OPTIONAL
        -- This IE is only present for RABs that have predefined SDU size(s) --,
        rAB-SubflowCombinationBitRate   RAB-SubflowCombinationBitRate   OPTIONAL
        -- At least either of subflowSDU-Size or rABsubflowCombinationBitRate --
        -- shall be present when SDUformatInformationParameter is present --,
        iE-Extensions           ProtocolExtensionContainer { {SDU-FormatInformationParameters-
ExtIEs} } OPTIONAL,
        ...
    }

SDU-FormatInformationParameters-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

SDU-Parameters ::= SEQUENCE (SIZE (1..maxRAB-Subflows)) OF
    SEQUENCE {
        sDU-ErrorRatio          SDU-ErrorRatio OPTIONAL
        -- This IE is not present when DeliveryOfErroneousSDU is set to no-error-detection-
consideration --,
        residualBitErrorRatio       ResidualBitErrorRatio,
        deliveryOfErroneousSDU      DeliveryOfErroneousSDU,
        sDU-FormatInformationParameters SDU-FormatInformationParameters OPTIONAL
        -- When signalled, this IE indicates that the RAB is rate controllable --,
        iE-Extensions           ProtocolExtensionContainer { {SDU-Parameters-ExtIEs} } OPTIONAL,
        ...
    }

SDU-Parameters-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

SourceID ::= CHOICE {
    sourceRNC-ID            SourceRNC-ID, -- If UMTS target
    sAI             SAI,          -- if GSM target
    ...
}

SourceRNC-ID ::= SEQUENCE {
    pLMN-ID             PLMN-ID,
    rNC-ID             RNC-ID,
```

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```
    iE-Extensions              ProtocolExtensionContainer { {SourceRNC-ID-ExtIEs} } OPTIONAL
}

SourceRNC-ID-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

SourceRNC-ToTargetRNC-TransparentContainer ::= SEQUENCE {
    rRC-Container            RRC-Container,
    numberOfIuInstances      NumberOfIuInstances,
    relocationType           RelocationType,
    chosenIntegrityProtectionAlgorithm ChosenIntegrityProtectionAlgorithm   OPTIONAL
    -- Must be present for intra UMTS Handovers if available --,
    integrityProtectionKey       IntegrityProtectionKey          OPTIONAL
    -- Must be present for intra UMTS Handovers if available --,
    chosenEncryptionAlgorithmForSignalling ChosenEncryptionAlgorithm    OPTIONAL
    -- Must be present for intra UMTS Handovers if ciphering is active --,
    cipheringKey             EncryptionKey               OPTIONAL
    -- Must be present for intra UMTS Handovers if ciphering is active --,
    chosenEncryptionAlgorithmForCS   ChosenEncryptionAlgorithm      OPTIONAL
    -- Must be present for intra UMTS Handovers if ciphering is active --,
    chosenEncryptionAlgorithmForPS   ChosenEncryptionAlgorithm      OPTIONAL
    -- Must be present for intra UMTS Handovers if ciphering is active --,
    d-RNTI            D-RNTI                  OPTIONAL
    -- Included for SRNS Relocation without UE involvement --,
    targetCellId          TargetCellId             OPTIONAL
    -- Included for SRNS Relocation with UE involvement --,
    rAB-TrCH-Mapping          RAB-TrCH-Mapping           OPTIONAL
    -- Included for SRNS Relocation without UE involvement and    --
    -- if RABs are carried on DCH, USCH or DSCH transport channels --,
    iE-Extensions          ProtocolExtensionContainer { {SourceRNC-ToTargetRNC-
TransparentContainer-ExtIEs} } OPTIONAL,
    ...
}

SourceRNC-ToTargetRNC-TransparentContainer-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

SourceStatisticsDescriptor ::= ENUMERATED {
    speech,
    unknown,
    ...
}

SubflowSDU-Size           ::= INTEGER (0..4095)
-- Unit is bit


-- T

TargetCellId              ::= INTEGER (0..268435455)

TargetID ::= CHOICE {
    targetRNC-ID            TargetRNC-ID, -- If UMTS target
    cGI            CGI,           -- If GSM target
    ...
}




TargetRNC-ID ::= SEQUENCE {
    lAI            LAI,
    rAC            RAC        OPTIONAL
    -- Must always be present towards the PS domain and never towards the CS domain --,
    rNC-ID            RNC-ID,
    iE-Extensions          ProtocolExtensionContainer { {TargetRNC-ID-ExtIEs} } OPTIONAL
}

TargetRNC-ID-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

TargetRNC-ToSourceRNC-TransparentContainer ::= SEQUENCE {
    rRC-Container         RRC-Container,
    d-RNTI            D-RNTI                  OPTIONAL
```

```
    -- May be included to allow the triggering of the Relocation Detect procedure from the Iur
Interface --,
    iE-Extensions          ProtocolExtensionContainer { {TargetRNC-ToSourceRNC-
TransparentContainer-ExtIEs} } OPTIONAL,
    ...
}

TargetRNC-ToSourceRNC-TransparentContainer-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

TBCD-STRING                 ::= OCTET STRING

TemporaryUE-ID ::= CHOICE {
    tMSI                TMSI,
    p-TMSI              P-TMSI,
    ...
}

TMSI                    ::= OCTET STRING (SIZE (4))

TraceReference          ::= OCTET STRING (SIZE (2..3))

TraceType               ::= OCTET STRING (SIZE (1))
-- Reference: GSM TS 12.08

TrafficClass ::= ENUMERATED {
    conversational,
    streaming,
    interactive,
    background,
    ...
}

TrafficHandlingPriority         ::= INTEGER { spare (0), highest (1), lowest (14), no-priority-used
(15) } (0..15)

TransferDelay               ::= INTEGER (0..65535)
-- Unit is millisecond

UnsuccessfullyTransmittedDataVolume ::= INTEGER (0..4294967295)

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

TrCH-ID ::= SEQUENCE {
    dCH-ID             DCH-ID     OPTIONAL
    -- At least one of these IEs shall be included --,
    dSCH-ID            DSCH-ID    OPTIONAL
    -- At least one of these IEs shall be included --,
    uSCH-ID            USCH-ID    OPTIONAL
    -- At least one of these IEs shall be included --,
    ...
}

TrCH-ID-List ::=  SEQUENCE (SIZE (1..maxRAB-Subflows)) OF
    TrCH-ID

TriggerID               ::= OCTET STRING (SIZE (3..22))

-- U

UE-ID ::= CHOICE {
    imsi               IMSI,
    imei               IMEI,
    ...
}

UL-GTP-PDU-SequenceNumber       ::= INTEGER (0..65535)

UL-N-PDU-SequenceNumber         ::= INTEGER (0..65535)

UP-ModeVersions             ::= BIT STRING (SIZE (16))

USCH-ID                 ::= INTEGER (0..255)

UserPlaneMode ::= ENUMERATED {
    transparent-mode,
    support-mode-for-predefined-SDU-sizes,
```

```
    ...
}

END
```

9.3.5 Common Definitions

```
-- *************************************************************
--
-- Common definitions
--
-- *************************************************************

RANAP-CommonDataTypes -- { object identifier to be allocated }--
DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

Criticality     ::= ENUMERATED { reject, ignore, notify }

Presence        ::= ENUMERATED { optional, conditional, mandatory }

PrivateIE-ID    ::= CHOICE {
    local               INTEGER (0..65535),
    global              OBJECT IDENTIFIER
}

ProcedureCode      ::= INTEGER (0..255)

ProtocolExtensionID ::= INTEGER (0..65535)

ProtocolIE-ID      ::= INTEGER (0..65535)

TriggeringMessage  ::= ENUMERATED { initiating-message, successful-outcome, unsuccessfull-outcome,
outcome }

END
```

9.3.6 Constant Definitions

```
-- *************************************************************
--
-- Constant definitions
--
-- *************************************************************

RANAP-Constants -- { object identifier to be allocated }--
DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- *************************************************************
--
-- Elementary Procedures
--
-- *************************************************************

id-RAB-Assignment                 INTEGER ::= 0
id-Iu-Release                     INTEGER ::= 1
id-RelocationPreparation          INTEGER ::= 2
id-RelocationResourceAllocation   INTEGER ::= 3
id-RelocationCancel               INTEGER ::= 4
id-SRNS-ContextTransfer           INTEGER ::= 5
id-SecurityModeControl            INTEGER ::= 6
id-DataVolumeReport               INTEGER ::= 7
id-CN-InformationBroadcast        INTEGER ::= 8
id-Reset                          INTEGER ::= 9
id-RAB-ReleaseRequest             INTEGER ::= 10
id-Iu-ReleaseRequest              INTEGER ::= 11
id-RelocationDetect               INTEGER ::= 12
id-RelocationComplete             INTEGER ::= 13
id-Paging                         INTEGER ::= 14
id-CommonID                       INTEGER ::= 15
id-CN-InvokeTrace                 INTEGER ::= 16
id-LocationReportingControl       INTEGER ::= 17
```

```
id-LocationReport                           INTEGER ::= 18
id-InitialUE-Message                        INTEGER ::= 19
id-DirectTransfer                           INTEGER ::= 20
id-OverloadControl                          INTEGER ::= 21
id-ErrorIndication                          INTEGER ::= 22
id-SRNS-DataForward                         INTEGER ::= 23
id-ForwardSRNS-Context                      INTEGER ::= 24
id-privateMessage                           INTEGER ::= 25
id-CN-DeactivateTrace                       INTEGER ::= 26
id-ResetResource                            INTEGER ::= 27
id-RANAP-Relocation                         INTEGER ::= 28


-- **************************************************************
--
-- Extension constants
--
-- **************************************************************

maxPrivateIEs                               INTEGER ::= 65535
maxProtocolExtensions                       INTEGER ::= 65535
maxProtocolIEs                              INTEGER ::= 65535


-- **************************************************************
--
-- Lists
--
-- **************************************************************

maxNrOfDTs                                  INTEGER ::= 15
maxNrOfErrors                               INTEGER ::= 256
maxNrOfIuSigConIds                          INTEGER ::= 1000
maxNrOfPDPDirections                        INTEGER ::= 2
maxNrOfPieces                               INTEGER ::= 16
maxNrOfPoints                               INTEGER ::= 15
maxNrOfRABs                                 INTEGER ::= 256
maxNrOfSeparateTrafficDirections            INTEGER ::= 2
maxNrOfVol                                  INTEGER ::= 2

maxRAB-Subflows                             INTEGER ::= 7
maxRAB-SubflowCombination                   INTEGER ::= 64


-- **************************************************************
--
-- IEs
--
-- **************************************************************

id-AreaIdentity                             INTEGER ::= 0
id-CN-BroadcastInformationPiece             INTEGER ::= 1
id-CN-BroadcastInformationPieceList         INTEGER ::= 2
id-CN-DomainIndicator                       INTEGER ::= 3
id-Cause                                    INTEGER ::= 4
id-ChosenEncryptionAlgorithm                INTEGER ::= 5
id-ChosenIntegrityProtectionAlgorithm       INTEGER ::= 6
id-ClassmarkInformation2                    INTEGER ::= 7
id-ClassmarkInformation3                    INTEGER ::= 8
id-CriticalityDiagnostics                   INTEGER ::= 9
id-DL-GTP-PDU-SequenceNumber                INTEGER ::= 10
id-EncryptionInformation                    INTEGER ::= 11
id-IntegrityProtectionInformation           INTEGER ::= 12
id-IuTransportAssociation                   INTEGER ::= 13
id-L3-Information                           INTEGER ::= 14
id-LAI                                      INTEGER ::= 15
id-NAS-PDU                                  INTEGER ::= 16
id-NonSearchingIndication                   INTEGER ::= 17
id-NumberOfSteps                            INTEGER ::= 18
id-OMC-ID                                   INTEGER ::= 19
id-OldBSS-ToNewBSS-Information              INTEGER ::= 20
id-PagingAreaID                             INTEGER ::= 21
id-PagingCause                              INTEGER ::= 22
id-PermanentNAS-UE-ID                       INTEGER ::= 23
id-RAB-ContextItem                          INTEGER ::= 24
id-RAB-ContextList                          INTEGER ::= 25
id-RAB-DataForwardingItem                   INTEGER ::= 26
id-RAB-DataForwardingItem-SRNS-CtxReq       INTEGER ::= 27
id-RAB-DataForwardingList                   INTEGER ::= 28
id-RAB-DataForwardingList-SRNS-CtxReq       INTEGER ::= 29
id-RAB-DataVolumeReportItem                 INTEGER ::= 30
```

```
id-RAB-DataVolumeReportList                            INTEGER ::= 31
id-RAB-DataVolumeReportRequestItem                     INTEGER ::= 32
id-RAB-DataVolumeReportRequestList                     INTEGER ::= 33
id-RAB-FailedItem                                      INTEGER ::= 34
id-RAB-FailedList                                      INTEGER ::= 35
id-RAB-ID                                              INTEGER ::= 36
id-RAB-QueuedItem                                      INTEGER ::= 37
id-RAB-QueuedList                                      INTEGER ::= 38
id-RAB-ReleaseFailedList                               INTEGER ::= 39
id-RAB-ReleaseItem                                     INTEGER ::= 40
id-RAB-ReleaseList                                     INTEGER ::= 41
id-RAB-ReleasedItem                                    INTEGER ::= 42
id-RAB-ReleasedList                                    INTEGER ::= 43
id-RAB-ReleasedList-IuRelComp                          INTEGER ::= 44
id-RAB-RelocationReleaseItem                           INTEGER ::= 45
id-RAB-RelocationReleaseList                           INTEGER ::= 46
id-RAB-SetupItem-RelocReq                              INTEGER ::= 47
id-RAB-SetupItem-RelocReqAck                           INTEGER ::= 48
id-RAB-SetupList-RelocReq                              INTEGER ::= 49
id-RAB-SetupList-RelocReqAck                           INTEGER ::= 50
id-RAB-SetupOrModifiedItem                             INTEGER }:= 51
id-RAB-SetupOrModifiedList                             INTEGER ::= 52
id-RAB-SetupOrModifyItem                               INTEGER ::= 53
id-RAB-SetupOrModifyList                               INTEGER ::= 54
id-RAC                                                 INTEGER ::= 55
id-RelocationType                                      INTEGER ::= 56
id-RequestType                                         INTEGER ::= 57
id-SAI                                                 INTEGER ::= 58
id-SAPI                                                INTEGER ::= 59
id-SourceID                                            INTEGER ::= 60
id-SourceRNC-ToTargetRNC-TransparentContainer          INTEGER ::= 61
id-TargetID                                            INTEGER ::= 62
id-TargetRNC-ToSourceRNC-TransparentContainer          INTEGER ::= 63
id-TemporaryUE-ID                                      INTEGER ::= 64
id-TraceReference                                      INTEGER ::= 65
id-TraceType                                           INTEGER ::= 66
id-TransportLayerAddress                               INTEGER ::= 67
id-TriggerID                                           INTEGER ::= 68
id-UE-ID                                               INTEGER ::= 69
id-UL-GTP-PDU-SequenceNumber                           INTEGER ::= 70
id-RAB-FailedtoReportItem                              INTEGER ::= 71
id-RAB-FailedtoReportList                              INTEGER ::= 72
id-KeyStatus                                           INTEGER ::= 75
id-DRX-CycleLengthCoefficient                          INTEGER ::= 76
id-IuSigConIdList                                      INTEGER ::= 77
id-IuSigConIdItem                                      INTEGER ::= 78
id-IuSigConId                                          INTEGER ::= 79
id-DirectTransferInformationItem-RANAP-RelocInf        INTEGER ::= 80
id-DirectTransferInformationList-RANAP-RelocInf        INTEGER ::= 81
id-RAB-ContextItem-RANAP-RelocInf                      INTEGER ::= 82
id-RAB-ContextList-RANAP-RelocInf                      INTEGER ::= 83
id-RAB-ContextFailedtoTransferItem                     INTEGER ::= 84
id-RAB-ContextFailedtoTransferList                     INTEGER ::= 85
id-GlobalRNC-ID                                        INTEGER ::= 86
id-RAB-ReleasedItem-IuRelComp                          INTEGER ::= 87

END
```

9.3.7   Container Definitions

```
-- **************************************************************
--
-- Container definitions
--
-- **************************************************************

RANAP-Containers -- { object identifier to be allocated }--
DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

```
IMPORTS
    Criticality,
    Presence,
    PrivateIE-ID,
    ProtocolExtensionID,
    ProtocolIE-ID
FROM RANAP-CommonDataTypes

    maxPrivateIEs,
    maxProtocolExtensions,
    maxProtocolIEs
FROM RANAP-Constants;

-- *************************************************************
--
-- Class Definition for Protocol IEs
--
-- *************************************************************

RANAP-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
--
-- *************************************************************

RANAP-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
--
-- *************************************************************

RANAP-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
--
```

```
-- ************************************************************
RANAP-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 {RANAP-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Field {RANAP-PROTOCOL-IES : IEsSetParam} ::= SEQUENCE {
    id               RANAP-PROTOCOL-IES.&id              ({IEsSetParam}),
    criticality          RANAP-PROTOCOL-IES.&criticality       ({IEsSetParam}{@id}),
    value                RANAP-PROTOCOL-IES.&Value             ({IEsSetParam}{@id})
}

-- ************************************************************
--
-- Container for Protocol IE Pairs
--
-- ************************************************************

ProtocolIE-ContainerPair {RANAP-PROTOCOL-IES-PAIR : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-FieldPair {{IEsSetParam}}

ProtocolIE-FieldPair {RANAP-PROTOCOL-IES-PAIR : IEsSetParam} ::= SEQUENCE {
    id               RANAP-PROTOCOL-IES-PAIR.&id            ({IEsSetParam}),
    firstCriticality         RANAP-PROTOCOL-IES-PAIR.&firstCriticality  ({IEsSetParam}{@id}),
    firstValue           RANAP-PROTOCOL-IES-PAIR.&FirstValue            ({IEsSetParam}{@id}),
    secondCriticality        RANAP-PROTOCOL-IES-PAIR.&secondCriticality ({IEsSetParam}{@id}),
    secondValue          RANAP-PROTOCOL-IES-PAIR.&SecondValue           ({IEsSetParam}{@id})
}

-- ************************************************************
--
-- Container Lists for Protocol IE Containers
--
-- ************************************************************

ProtocolIE-ContainerList {INTEGER : lowerBound, INTEGER : upperBound, RANAP-PROTOCOL-IES :
IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-Container {{IEsSetParam}}

ProtocolIE-ContainerPairList {INTEGER : lowerBound, INTEGER : upperBound, RANAP-PROTOCOL-IES-PAIR :
IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-ContainerPair {{IEsSetParam}}

-- ************************************************************
--
-- Container for Protocol Extensions
--
-- ************************************************************

ProtocolExtensionContainer {RANAP-PROTOCOL-EXTENSION : ExtensionSetParam} ::=
    SEQUENCE (SIZE (1..maxProtocolExtensions)) OF
    ProtocolExtensionField {{ExtensionSetParam}}

ProtocolExtensionField {RANAP-PROTOCOL-EXTENSION : ExtensionSetParam} ::= SEQUENCE {
    id               RANAP-PROTOCOL-EXTENSION.&id               ({ExtensionSetParam}),
    criticality          RANAP-PROTOCOL-EXTENSION.&criticality      ({ExtensionSetParam}{@id}),
```

```
    extensionValue           RANAP-PROTOCOL-EXTENSION.&Extension    ({ExtensionSetParam}{@id})
}

-- **********************************************************
--
-- Container for Private IEs
--
-- **********************************************************

PrivateIE-Container {RANAP-PRIVATE-IES : IEsSetParam } ::=
    SEQUENCE (SIZE (1.. maxPrivateIEs)) OF
    PrivateIE-Field {{IEsSetParam}}

PrivateIE-Field {RANAP-PRIVATE-IES : IEsSetParam} ::= SEQUENCE {
    id               RANAP-PRIVATE-IES.&id               ({IEsSetParam}),
    criticality      RANAP-PRIVATE-IES.&criticality      ({IEsSetParam}{@id}),
    value            RANAP-PRIVATE-IES.&Value            ({IEsSetParam}{@id})
}

END
```

9.4 Message Transfer Syntax

RANAP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax as specified in ref. [13].

9.5 Timers

$T_{RELOCprep}$

- Specifies the maximum time for *Relocation Preparation* in the source RNC.

$T_{RELOCoverall}$

- Specifies the maximum time for the protection of overall Relocation procedure in the source RNC.

$T_{RELOCalloc}$

- Specifies the maximum time for *Relocation Resource Allocation* in the CN.

$T_{RELOCcomplete}$

- Specifies the maximum time for waiting the relocation completion in the CN.

$T_{RABAssgt}$

- Specifies the maximum time in the CN for the whole *RAB Assignment* and *Queuing* procedures.

$T_{QUEUING}$

- Specifies the maximum time in the RNC for queuing of the request of RAB establishment or modification.

$T_{DATAfwd}$

- Specifies the maximum time for GTP-PDU forwarding at the source RNC during relocation of SRNS.

T_{igOC}

- While this timer is running, all *OVERLOAD* messages or signalling point congested information received at the CN are ignored.

T_{igOR}

- While this timer is running, all *OVERLOAD* messages or signalling point congested information received at the RNC are ignored.

T_{inTC}

- While this timer is running, the CN is not allowed to increase traffic.

T_{inTR}

- While this timer is running, the RNC is not allowed to increase traffic.

T_{RafC}

- Specifies the maximum time for *Reset* in the RNC.

T_{RatC}

- Specifies a guard period in the RNC before sending a *RESET ACKNOWLEDGE* message.

T_{RafR}

- Specifies the maximum time for *Reset* in the CN.

T_{RatR}

- Specifies a guard period in the CN before sending a *RESET ACKNOWLEDGE* message.

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:
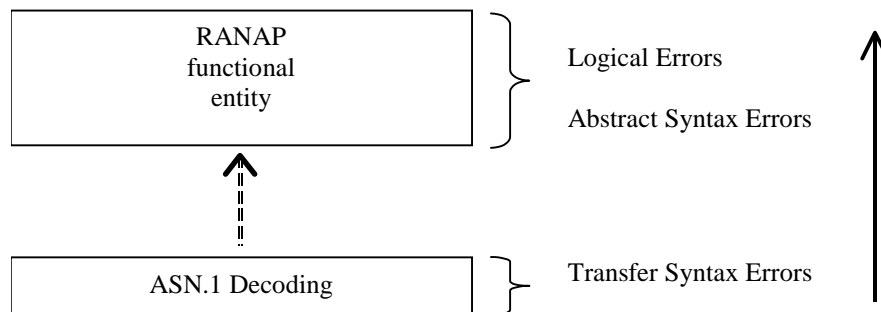

Figure 22: Protocol Errors in RANAP

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.

10.3 Abstract Syntax Error

10.3.1 General

An Abstract Syntax Error occurs when the receiving functional RANAP entity:

1. receives IEs or IE groups that cannot be understood (unknown IE id);

2. receives IEs for which the logical range is violated (e.g.: ASN.1 definition: 0 to 15, the logical range is 0 to 10 (values 11 to 15 are undefined), and 12 will be received; this case will be handled as an abstract syntax error using criticality information sent by the originator of the message);

3. does not receive IEs or IE groups but according to the specified presence of the concerning object, the IEs or IE groups should have been present in the received message.

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.

If an Abstract Syntax Error occurs, the receiver shall read the remaining message and shall then for each detected Abstract Syntax Error 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.

10.3.2   Criticality Information

In the RANAP 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 chapter 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.

10.3.3 Presence Information

For many IEs/IE groups which are optional according to the ASN.1 transfer syntax, RANAP 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 RANAP-PROTOCOL-IES, RANAP-PROTOCOL-IES-PAIR, RANAP-PROTOCOL-EXTENSION or RANAP-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.

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* according to the following:

Reject IE:

- If a message is received with a *Procedure Code* 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* 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* marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the procedure.

10.3.4.2 IEs other than the Procedure Code

The receiving node shall treat the different types of received criticality information of an IEs/IE group other than the *Procedure Code* 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.

- 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 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 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.

- 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 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.

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.

- 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 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 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 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.

- 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 initiate the Error Indication procedure.

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 continue with the procedure based on the other IEs/IE groups present in the message.

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 failure message, the failure 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 failure message, the ERROR INDICATION procedure shall be initiated with an appropriate cause value.

Where the logical error exists in a response message of a class 1 procedure, local error handling shall be initiated.

Class 2:

Where the logical error occurs in a message of a class 2 procedure, the ERROR INDICATION procedure shall be initiated with an appropriate cause value.

Class 3:

Where the logical error occurs in a request message of a class 3 procedure, and the procedure has a failure message, the failure 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 3 procedure, and the procedure does not have a failure message, the ERROR INDICATION procedure shall be initiated with an appropriate cause value.

Where the logical error exists in a response message of a class 3 procedure, local error handling shall be initiated.

11   Special Procedures for RNC to RNC Communication

11.1   General

This subclause specifies special procedures that are used for RNC to RNC communication, and use other transport means than the RANAP procedures specified in clause 8.

11.2 RANAP Relocation Information

11.2.1 General

The purpose of the RANAP Relocation Information procedure is to handle the RANAP related information that is carried transparently during relocation from source RNC to target RNC by RNSAP via Iur Interface.

11.2.2 Operation

When during relocation it becomes necessary in the Source RNC to generate RANAP information for transfer to the relocation target, the RNC shall form a RANAP RELOCATION INFORMATION message. The message shall be encoded according to the encoding rules specified for RANAP in the similar manner as for the normal RANAP messages. The outcome of the encoding will be an octet string, which shall not be sent to the CN via the Iu Interface, but it shall be given to the appropriate local process for transparent transfer to the target RNC.

When the RANAP process in the Target RNC receives an octet string containing RANAP RELOCATION INFORMATION message that had been transparently transferred from the Source RNC, it shall decode it according to the encoding rules specified for RANAP. This process is similar to receiving any normal RANAP message. The decoded information shall be passed to the appropriate processes in the RNC.

Annex A (informative): RANAP Guidelines

A.1 Rules for building RANAP messages

A.1.1 Rules for RANAP messages that shall contain the CN Domain Indicator IE

Based on the principles described in [3], following rules can be deduced:

1) Any RANAP message initiating a connection oriented signalling connection shall contain the *CN Domain Indicator* IE. For the time being, two such RANAP messages are known: INITIAL UE MESSAGE and RELOCATION REQUEST.

2) Any RANAP message belonging to class 1 procedures that uses connectionless signalling shall contain the *CN Domain Indicator* IE.

3) Following RANAP message belonging to class 2 procedures that uses connectionless signalling shall contain the *CN Domain Indicator* IE: PAGING and ERROR INDICATION.

Annex B (informative): Change history

Change history					
TSG RAN#	Version	CR	Tdoc RAN	New Version	Subject/Comment
RAN_06	-	-	RP-99746	3.0.0	Approved at TSG RAN #6 and placed under Change Control
RAN_07	3.0.0	-	-	3.1.0	Approved at TSG RAN #7
Rapporteur for TS25.413 is: Jyrki Jussila Nokia Telecommunications Tel.: +358 9 5113 8436 Fax: +358 9 5113 8452 Email: jyrki.jussila@nokia.com					

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