

ETSI TS 125 469 V8.0.0 (2009-01)

Technical Specification

**Universal Mobile Telecommunications System (UMTS);
Technical Specification Group Radio
Access Network (UTRAN);
UTRAN Iuh Interface HNBAP signalling
(3GPP TS 25.469 version 8.0.0 Release 8)**



ReferenceDTS/TSGR-0325469v800

KeywordsUMTS

ETSI

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
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

http://portal.etsi.org/chaicor/ETSI_support.asp

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2009.
All rights reserved.

DECTTM, **PLUGTESTS**TM, **UMTS**TM, **TIPHON**TM, the TIPHON logo and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.

3GPPTM is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

LTETM is a Trade Mark of ETSI currently being registered

for the benefit of its Members and of the 3GPP Organizational Partners.

GSM[®] and the GSM logo are Trade Marks registered and owned by the GSM Association.

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://webapp.etsi.org/IPR/home.asp>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

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

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

Contents

Intellectual Property Rights	2
Foreword.....	2
Foreword.....	5
1 Scope	6
2 References	6
3 Definitions and abbreviations.....	6
3.1 Definitions	6
3.2 Abbreviations	7
4 General	7
4.1 Procedure Specification Principles.....	7
4.2 Forwards and Backwards Compatibility	8
4.3 Specification Notations	8
5 HNBAP Services.....	8
6 Services expected from the Transport layer	8
7 Functions of HNBAP	8
8 HNBAP Procedures.....	9
8.1 Elementary Procedures.....	9
8.2 HNB Registration Procedure	9
8.2.1 General.....	9
8.2.2 Successful Operation	9
8.2.3 Unsuccessful Operation	10
8.2.4 Abnormal Conditions.....	10
8.3 HNB De-registration Procedure	10
8.3.1 Successful Operation (HNB Originated)	10
8.3.2 Successful Operation (HNB-GW Originated)	11
8.3.3 Abnormal Conditions.....	11
8.4 UE Registration	11
8.4.1 General.....	11
8.4.2 Successful Operation	11
8.4.3 Unsuccessful Operation	12
8.4.4 Abnormal Conditions.....	12
8.5 UE De-Registration	12
8.5.1 General.....	12
8.5.2 Successful Operation (HNB Originated)	12
8.5.3 Successful Operation (HNB-GW Originated)	13
8.5.4 Abnormal Conditions.....	13
8.6 Error Indication	13
8.6.1 General.....	13
8.6.2 Successful Operation	14
9 Elements for HNBAP Communication	14
9.1 Message Functional Definition and Content	14
9.1.1 General.....	14
9.1.2 Message Contents	14
9.1.2.1 Presence	14
9.1.2.2 Criticality	15
9.1.2.3 Range	15
9.1.2.4 Assigned Criticality.....	15
9.1.3 HNB REGISTER REQUEST	15
9.1.4 HNB REGISTER ACCEPT.....	15
9.1.5 HNB REGISTER REJECT.....	16
9.1.6 UE REGISTER REQUEST	16
9.1.7 UE REGISTER ACCEPT.....	16
9.1.8 UE REGISTER REJECT	16

9.1.9	HNB DE-REGISTER	17
9.1.10	UE DE-REGISTER	17
9.1.11	ERROR INDICATION.....	17
9.2	Information Element Definitions.....	17
9.2.0	General.....	17
9.2.1	Message Type	18
9.2.2	HNB Identity	18
9.2.3	HNB Location Information.....	18
9.2.4	Geographical Location.....	18
9.2.5	Geographical Coordinates.....	19
9.2.6	Altitude and Direction	19
9.2.7	Macro Coverage Information.....	19
9.2.8	IP Address.....	20
9.2.9	Context-ID	20
9.2.10	IMSI.....	20
9.2.11	LAC	20
9.2.12	RAC	21
9.2.13	SAC	21
9.2.14	PLMN-ID.....	21
9.2.15	Cause	21
9.2.16	Criticality Diagnostics	23
9.2.17	UE Identity.....	24
9.2.18	IMEI.....	24
9.2.19	TMSI (GSM-MAP).....	24
9.2.20	LAI.....	25
9.2.21	Registration Cause	25
9.2.22	P-TMSI (GSM-MAP).....	25
9.2.23	Routing Area Identification	25
9.2.24	UE Capabilities	25
9.2.25	Cell-ID	26
9.2.26	RNC-ID	26
9.2.27	CSG-ID	26
9.3	Message and Information Element Abstract Syntax (with ASN.1).....	26
9.3.0	General.....	26
9.3.1	Usage of private message mechanism for non-standard use.....	27
9.3.2	Elementary Procedure Definitions	28
9.3.3	PDU Definitions	31
9.3.4	Information Element Definitions	37
9.3.5	Common Definitions.....	43
9.3.6	Constant Definitions	44
9.3.7	Container Definitions.....	46
9.4	Message Transfer Syntax	50
10	Handling of unknown, unforeseen, and erroneous protocol data	50
10.1	General	50
10.2	Transfer Syntax Error.....	50
10.3	Abstract Syntax Error.....	50
10.3.1	General.....	50
10.3.2	Criticality Information	51
10.3.3	Presence Information	51
10.3.4	Not comprehended IE/IE group	52
10.3.4.1	Procedure Code	52
10.3.4.1A	Type of Message	52
10.3.4.2	IEs other than the Procedure Code and Type of Message	52
10.3.5	Missing IE or IE group	53
10.3.6	IEs or IE groups received in wrong order or with too many occurrences or erroneously present	54
10.4	Logical Error	55
10.5	Exceptions	55
Annex A (informative): Change history		56
History		57

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:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the *Home Node B Application Part (HNBAP)* between the Home Node B (HNB) and the Home Node B Gateway (HNB-GW). It fulfils the HNB- HNB-GW communication requirements specified in [3] and is defined over the Iuh – reference point. It provides control and management procedures between HNB and HNB-GW.

2 References

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

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

- [1] 3GPP TS 25.401: "UTRAN Overall Description".
- [2] 3GPP TS 25.413: 'RANAP'
- [3] 3GPP TS 25.467: 'UTRAN architecture for 3G Home NodeB'
- [4] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".
- [5] 3GPP TR 25.921: "Guidelines and Principles for Protocol Description and Error Handling".
- [6] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [7] ITU-T Recommendation X.691 (07/2002): "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)".
- [8] ITU-T Recommendation X.680 (07/2002): "Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation".
- [9] ITU-T Recommendation X.681 (07/2002): "Information technology - Abstract Syntax Notation One (ASN.1): Information object specification".
- [10] 3GPP TS 25.331: 'Radio Resource Control (RRC) Protocol Specification'
- [11] IETF RFC 4960 (09/2007): "Stream Control Transmission Protocol".

3 Definitions and abbreviations

3.1 Definitions

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

Elementary Procedure: HNBAP consists of Elementary Procedures (EPs). An Elementary Procedure is a unit of interaction between the HNB and HNB-GW. These EPs 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. Two kinds of EPs are used:

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

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

Successful

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

Unsuccessful

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

Class 2 EPs are considered always successful.

3.2 Abbreviations

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

EP	Elementary Procedure
ESN	Electronic Serial Number
HNB	Home Node B
HNB-GW	Home Node B Gateway
HNBAP	HNB Application Part
PDU	Protocol Data Unit
PER	Packed Encoding Rules
SAC	Service Area Code
SCTP	Stream Control Transmission Protocol

4 General

The protocol described in the present document is the protocol between HNB-GW and HNB.

4.1 Procedure Specification Principles

The principle for specifying the procedure logic is to specify the functional behaviour of the HNB & HNB-GW exactly and completely..

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

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

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

- The procedure text indicates that the receiving node "shall, if supported," perform a certain function Y under a certain condition. If the receiving node supports procedure X, but does not support functionality Y, the receiving node shall proceed with the execution of the EP, possibly informing the requesting node about the not supported functionality.
- Any required inclusion of an optional IE in a response message is explicitly indicated in the procedure text. If the procedure text does not explicitly indicate that an optional IE shall be included in a response message, the optional IE shall not be included.

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. HNB Registration 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. HNB REGISTRATION REQUEST message.
IE	When referring to an information element (IE) in the specification the <i>Information Element Name</i> is written with the first letters in each word in upper case characters and all letters in Italic font followed by the abbreviation "IE", e.g. <i>HNB Identity IE</i> .
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 "Background".

5 HNBAP Services

HNBAP provides the signalling service between the HNB and the HNB-GW that is required to fulfil the HNBAP functions in Clause 7.

6 Services expected from the Transport layer

Following service is expected from the transport layer:

- reliable and in sequence delivery of Signalling data using SCTP[11].

7 Functions of HNBAP

The HNBAP has the following functions:

- HNB Registration
- UE Registration

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

These functions are implemented by one or several HNBAP elementary procedures described in the following clauses.

8 HNBAP Procedures

8.1 Elementary Procedures

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

Table 1: Class 1

Elementary Procedure	Initiating Message	Successful Outcome	Unsuccessful Outcome
		Response message	Response message
HNB Registration	HNB REGISTER REQUEST	HNB REGISTER ACCEPT	HNB REGISTER REJECT
UE Registration	UE REGISTER REQUEST	UE REGISTER ACCEPT	UE REGISTER REJECT

Table 2: Class 2

Elementary Procedure	Message
HNB De-Registration	HNB DE-REGISTER
UE De-Registration	UE DE-REGISTER
Error Indication	ERROR INDICATION

8.2 HNB Registration Procedure

8.2.1 General

The purpose of the HNB Registration Procedure is to register the HNB with the HNB-GW to enable the HNB-GW to provide service and core network connectivity for the HNB. This procedure shall be the first HNBAP procedure triggered after the SCTP association has become operational.

8.2.2 Successful Operation

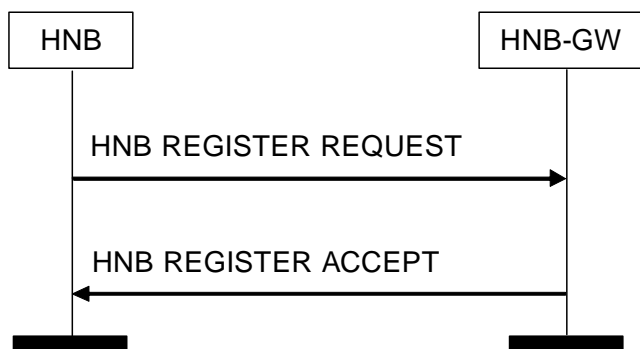


Figure 1: HNB Register Procedure: Successful Operation

The HNB shall initiate this procedure by sending a HNB REGISTER REQUEST message whenever it needs to commence operations and requiring service from the HNB-GW.

If the registration is successful, the HNB-GW will respond with a HNB REGISTER ACCEPT message indicating acceptance and registration.

8.2.3 Unsuccessful Operation

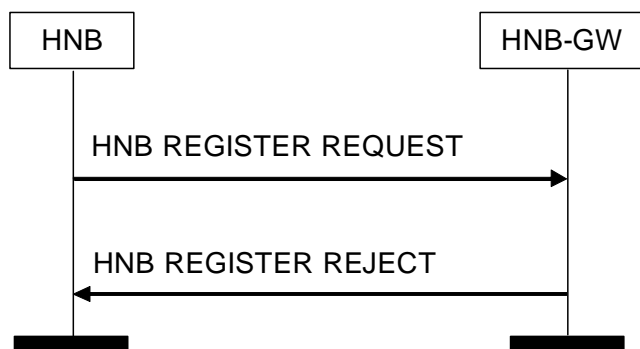


Figure 2: HNB Register Procedure: Un-Successful Operation

If the HNB-GW cannot register the HNB, the HNB-GW will respond with a HNB REGISTER REJECT message.

Typical cause values are:

Radio Network Layer Cause:

- Unauthorised Location
- Unauthorised HNB
- Overload
- HNB Parameter Mismatch
- Unspecified

8.2.4 Abnormal Conditions

-

8.3 HNB De-registration Procedure

8.3.1 Successful Operation (HNB Originated)



Figure 3: HNB De-register Procedure: Successful Operation

The HNB will initiate this procedure whenever it needs to terminate operations.

The HNB-GW shall clear all related resources associated with the HNB.

8.3.2 Successful Operation (HNB-GW Originated)



Figure 4: HNB De-register Procedure: Successful Operation

The HNB-GW will initiate this procedure whenever it needs to terminate operations with a HNB.
 The HNB-GW shall clear all related resources associated with the HNB.

8.3.3 Abnormal Conditions

-

8.4 UE Registration

8.4.1 General

The UE Registration procedure provides means for the HNB to convey UE identification data to the HNB-GW in order to perform access control for the UE in the HNB-GW. The UE Registration also establishes a UE specific context identifier to be used between HNB and HNB-GW. The procedure triggered when the UE attempts to access the HNB via an initial NAS message and there is no context in the HNB allocated for that UE.

8.4.2 Successful Operation

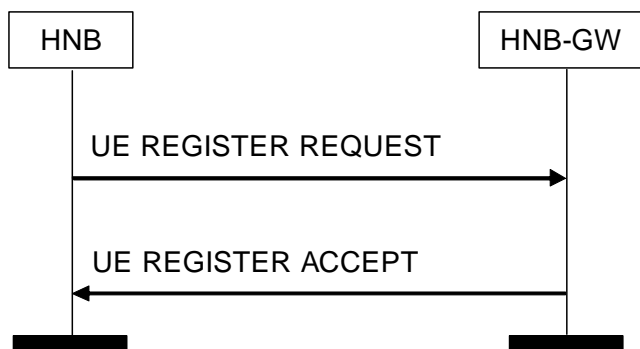


Figure 5: UE Register Procedure: Successful Operation

The HNB shall initiate the procedure by sending a UE REGISTER REQUEST message to the HNB-GW including UE specific data.

The HNB-GW shall perform access control for the UE on the specific HNB and if successful respond with a UE REGISTER ACCEPT message including the *Context-ID* IE.

8.4.3 Unsuccessful Operation

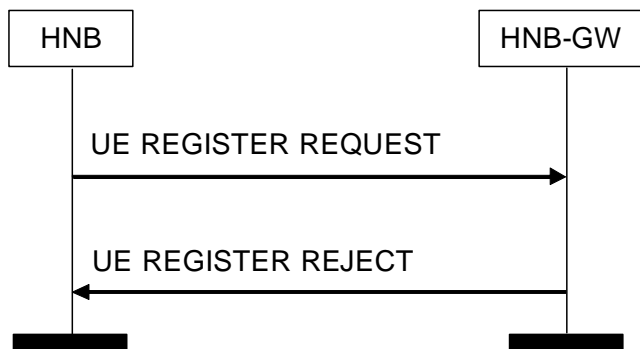


Figure 6: UE Register Procedure: Unsuccessful Operation

If the HNB-GW is unable to accept the UE registration it shall reject the procedure with a UE REGISTER REJECT message.

Typical Cause values:

Radio Network Layer Cause:

- Invalid UE identity
- UE not allowed on HNB
- HNB not registered (FFS)
- Unspecified

8.4.4 Abnormal Conditions

-

8.5 UE De-Registration

8.5.1 General

The purpose of the UE De-Registration Procedure is to disconnect a UE context in the HNB-GW

8.5.2 Successful Operation (HNB Originated)



Figure 7 UE De-Register Procedure: HNB Originated Successful Operation

The HNB shall initiate the procedure by sending a UE DE-REGISTER message. When receiving the UE DE-REGISTER message the HNB-GW shall release the included Context-ID.

Typical Cause values:

Radio Network Layer Cause:

- Connection with UE lost
- UE RRC Release
- Unspecified

8.5.3 Successful Operation (HNB-GW Originated)



Figure 8 UE De-Register Procedure: HNB-GW Originated Successful Operation

The HNB-GW shall initiate the procedure by sending a UE DE-REGISTER message. When receiving the UE DE-REGISTER message the HNB shall release the included Context-ID.

Typical Cause values:

Radio Network Layer Cause:

- Unspecified

8.5.4 Abnormal Conditions

--

8.6 Error Indication

8.6.1 General

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

8.6.2 Successful Operation

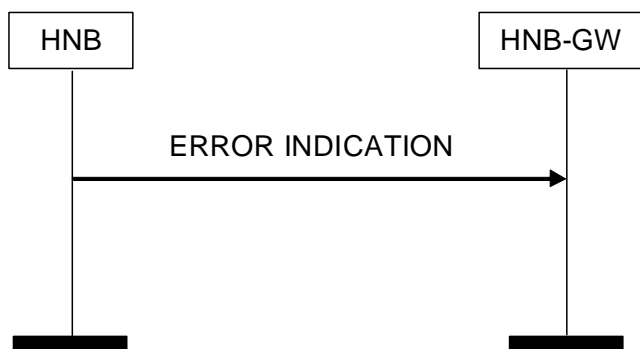


Figure 9 Error Indication HNB Originated, Successful Operation

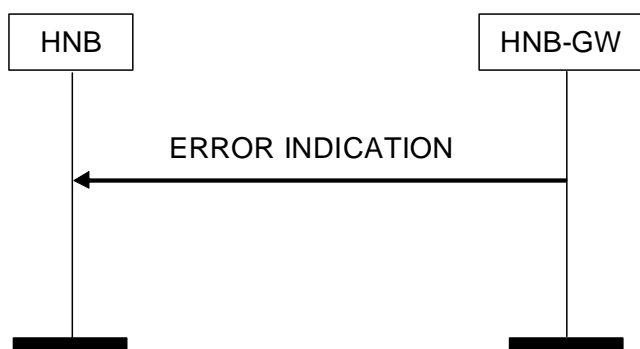


Figure 10 Error Indication HNB-GW Originated, Successful Operation

9 Elements for HNBAP Communication

9.1 Message Functional Definition and Content

9.1.1 General

Section 9.1 presents the contents of HNBAP 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 [5].

For each message there is, a table listing the signalling elements in their order of appearance in the transmitted message.

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 table 3

Table 3: Meaning of abbreviations used in HNBAP 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 criticality information applied to it. Following cases are possible.

Table 4: Meaning of content within "Criticality" column

Abbreviation	Meaning
–	No criticality information is applied explicitly.
YES	Criticality information is applied. This is usable only for non-repeatable IEs
GLOBAL	The IE and all its repetitions together have 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.

9.1.2.3 Range

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

9.1.2.4 Assigned Criticality

This column provides the actual criticality information as defined in subclause 10.3.2, if applicable.

9.1.3 HNB REGISTER REQUEST

This message is sent by the HNB to the HNB-GW to register the HNB at the HNB-GW.

Direction: HNB → HNB-GW

PARAMETER	PRESENCE	RANGE	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.1		YES	reject
HNB Identity	M		9.2.2		YES	reject
HNB Location Information	M		9.2.3		YES	reject
PLMN-ID	M		9.2.14		YES	reject
Cell-ID	M		9.2.25		YES	reject
LAC	M		9.2.11		YES	reject
RAC	M		9.2.12		YES	reject
SAC	M		9.2.13		YES	reject
CSG-ID	M		9.2.27		YES	reject

9.1.4 HNB REGISTER ACCEPT

This message is sent by the HNB-GW to the HNB as a successful response to a HNB REGISTER REQUEST message.

Direction: HNB-GW → HNB

PARAMETER	PRESENCE	RANGE	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.1		YES	reject
RNC-ID	M		9.2.26		YES	reject

9.1.5 HNB REGISTER REJECT

This message is sent by the HNB-GW to the HNB as unsuccessful response to a HNB REGISTER REQUEST message.

Direction: HNB-GW → HNB

PARAMETER	PRESENCE	RANGE	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.1		YES	reject
Cause	M		9.2.15		YES	ignore
Criticality Diagnostics	O		9.2.16		YES	ignore

9.1.6 UE REGISTER REQUEST

This message is sent by the HNB to the HNB-GW to register a UE at HNB-GW for service.

Direction: HNB → HNB-GW

PARAMETER	PRESENCE	RANGE	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.1		YES	reject
UE Identity	M		9.2.17		YES	reject
Registration Cause	M		9.2.21		YES	ignore
UE Capabilities	M		9.2.24		YES	reject

9.1.7 UE REGISTER ACCEPT

This message is sent by the HNB-GW to the HNB as a successful response to a UE REGISTER REQUEST message.

Direction: HNB-GW → HNB

PARAMETER	PRESENCE	RANGE	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.1		YES	reject
UE Identity	M		9.2.17		YES	reject
Context-ID	M		9.2.9		YES	reject

9.1.8 UE REGISTER REJECT

This message is sent by the HNB-GW to the HNB as unsuccessful response to a UE REGISTER REQUEST message.

Direction: HNB-GW → HNB

PARAMETER	PRESENCE	RANGE	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.1		YES	reject
UE Identity	M		9.2.17		YES	reject
Cause	M		9.2.15		YES	ignore
Criticality Diagnostics	O		9.2.16		YES	ignore

9.1.9 HNB DE-REGISTER

This message is sent by the HNB to the HNB-GW or HNB-GW to HNB to deregister the HNB,

Direction: HNB → HNB-GW or HNB-GW → HNB

PARAMETER	PRESENCE	RANGE	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.1		YES	reject
Cause	M		9.2.15		YES	ignore

9.1.10 UE DE-REGISTER

This message is sent by the HNB to the HNB-GW or HNB-GW to HNB to de-register a UE.

Direction: HNB → HNB-GW, HNB-GW → HNB

PARAMETER	PRESENCE	RANGE	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.1		YES	reject
Context-ID	M		9.2.9		YES	reject
Cause	M		9.2.15		YES	ignore

9.1.11 ERROR INDICATION

This message is sent by the HNB to HNB-GW or HNB-GW to HNB and is used to indicate that some errors have been detected.

Direction: HNB → HNB-GW, HNB-GW → HNB

PARAMETER	PRESENCE	RANGE	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.1		YES	ignore
Cause	M		9.2.15		YES	ignore
Criticality Diagnostics	O		9.2.16		YES	ignore

9.2 Information Element Definitions

9.2.0 General

Section 9.2 presents the HNBAP 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.

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

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

9.2.1 Message Type

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

IE/GROUP NAME	Presence	Range	IE Type and Reference	Semantics Description
Message Type				
>Procedure Code	M		ENUMERATED (HNB register, UE Register, UE De-Register, HNB De-Register Error Indication ,...)	
>Type of Message	M		ENUMERATED (Initiating Message, Successful Outcome, Unsuccessful Outcome, Outcome)	

9.2.2 HNB Identity

HNB Identity IE is sent from the HNB to the HNB-GW and identifies the HNB.

IE/GROUP NAME	Presence	Range	IE Type and Reference	Semantics Description
HNB Identity			OCTET STRING	Length FFS.

9.2.3 HNB Location Information

HNB Location Information IE is sent from the HNB to HNB-GW to provide information on the location of the HNB.

IE/GROUP NAME	PRESENCE	RANGE	IE Type and Reference	Semantics Description
<i>HNB Location Information</i>				
> Macro Coverage Information	O		9,2,7	
> Geographic Location	O		9.2.4	
> HNB Internet Information	O		IP Address 9.2.8	

9.2.4 Geographical Location

This IE identifies the Ellipsoid point with altitude as in ref [4].

IE/GROUP NAME	PRESENCE	RANGE	IE type and reference	Semantics description
Geographical Coordinates	M		9.2.5	
Altitude and Direction	M		9.2.6	

9.2.5 Geographical Coordinates

This IE contains the geographical coordinates of an ellipsoid point.

IE/GROUP NAME	PRESENCE	RANGE	IE type and reference	Semantics description
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°)

9.2.6 Altitude and Direction

This IE contains the altitude and direction of an ellipsoid point.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Altitude and direction				
>Direction of Altitude	M		ENUMERATED (Height, Depth)	
>Altitude	M		INTEGER (0..2 ¹⁵ -1)	The relation between the value (N) and the altitude (a) in meters it describes is $N \leq a < N+1$, except for $N=2^{15}-1$ for which the range is extended to include all greater values of (a).

9.2.7 Macro Coverage Information

The *Macro Coverage Information* IE identifies the macro cell used by the HNB for location. This may be e.g. a GERAN Cell ID or a UTRAN Cell ID .

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice Cell Identifier				
>GERAN Cell ID Information				
>>PLMN-ID	M		9.2.14	
>>LAC	M		9.2.11	0000 and FFFE not allowed.
>>CI	M		OCTET STRING (2)	
>UTRAN Cell ID Information				
>>LAC	M		9.2.11	
>>RAC	M		9.2.12	
>>PLMN-ID	M		9.2.14	
>>Cell-ID	M		9.2.25	

9.2.8 IP Address

This IE defines a IP address.

IE/GROUP NAME	Presence	Range	IE Type and Reference	Semantics Description
CHOICE <i>IP Address</i>				
>Internet Address ipv4	M		OCTET STRING(4)	
>Internet Address ipv6	M		OCTET STRING(16)	

9.2.9 Context-ID

Context ID IE identifies a particular UE. It is unique for a CN domain.

IE/GROUP NAME	PRESENCE	RANGE	IE Type and	Semantics Description
Context-ID			BIT STRING(24)	

9.2.10 IMSI

The IMSI is used to uniquely identify a UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
IMSI			OCTET STRING (SIZE (3..8))	<ul style="list-style-type: none"> - digits 0 to 9, encoded 0000 to 1001, - 1111 used as filler digit, two digits per octet, - bit 4 to 1 of octet n encoding digit 2n-1 - bit 8 to 5 of octet n encoding digit 2n <p>-Number of decimal digits shall be from 6 to 15 starting with the digits from the PLMN identity.</p> <p>When the IMSI is made of an odd number of digits, the filler digit shall be added at the end to make an even number of digits of length 2N. The filler digit shall then be consequently encoded as bit 8 to 5 of octet N.</p>

9.2.11 LAC

This element is used to identify a Location Area.

IE/GROUP NAME	PRESENCE	RANGE	IE Type and Reference	Semantics Description
LAC	E		OCTET STRING(2)	

9.2.12 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			OCTET STRING(1)	

9.2.13 SAC

The SAC identifies the Service Area.

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

9.2.14 PLMN-ID

The PLMN-ID identifies a Public Land Mobile Network.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN-ID			OCTET STRING (SIZE (3))	<ul style="list-style-type: none"> - digits 0 to 9, encoded 0000 to 1001, - 1111 used as filler digit, two digits per octet, - bits 4 to 1 of octet n encoding digit 2n-1- bits 8 to 5 of octet n encoding digit 2n <p>-The PLMN identity consists of 3 digits from MCC followed by either</p> <ul style="list-style-type: none"> - a filler digit plus 2 digits from MNC (in case of 2 digit MNC) or - 3 digits from MNC (in case of a 3 digit MNC).

9.2.15 Cause

Cause IE indicates the reason for a particular error event for the HNBAP protocol.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE <i>Cause Group</i>				
> <i>Radio Network Layer</i>				
>>Radio Network Layer Cause	M		ENUMERATED (overload, unauthorised-Location, unauthorised-HNB, HNB Parameter mismatch, Invalid UE identity, UE not allowed on this HNB, UE unauthorised, Connection with UE lost, UE RRC Release, HNB not registered, unspecified, ...,)	
> <i>Transport Layer</i>				
>>Transport Layer Cause	M		ENUMERATED (Transport Resource Unavailable, Unspecified, ...)	
> <i>Protocol</i>				
>>Protocol Cause	M		ENUMERATED (Transfer Syntax Error, Abstract Syntax Error (Reject), Abstract Syntax Error (Ignore and Notify), Message not Compatible with Receiver State, Semantic Error, Unspecified, Abstract Syntax Error (Falsely Constructed Message), ...)	
> <i>Misc</i>				
>>Misc Cause	M		ENUMERATED (Processing Overload, Hardware Failure, O&M Intervention, Unspecified, ...)	

The meaning of the different cause values is described in the following table. Cause values for information "not valid" indicates that the information is not valid in the context that it was received.

Radio Network Layer cause	Meaning
Overload	The HNB-GW cannot handle the registration request due to overload.
Unauthorised-Location	The HNB-GW cannot register the HNB because the location information provided is not valid.
Unauthorised-HNB	The HNB-GW cannot register the HNB because its supplied information is not considered valid
HNB Parameter Mismatch	The HNB-GW cannot register the HNB because of mismatch in parameters between HNB and HNB-GW
Invalid UE identity	The UE ID supplied for UE registration is not valid
UE not allowed on this HNB	The UE is identified as not being allowed to use services on this HNB. (temporary rejection)
UE not authorised	The UE is identified as not being allowed to use services on a HNB (permanent rejection).
Connection with UE lost	The connection to a Registered UE has been lost
UE RRC release	The Registered UE"s RRC is released
HNB not registered	The HNB is not registered on this gateway
Unspecified	Sent when none of the above cause values applies but still the cause is Radio Network layer related.

9.2.16 Criticality Diagnostics

For further details on how to use the *Criticality Diagnostics* IE, see annex A.

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

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 procedure that caused the error
>Triggering Message	O		ENUMERATED (initiating message, successful outcome, unsuccessful outcome)	The Triggering Message is used only if the Criticality Diagnostics is part of Error Indication procedure.
>Procedure Criticality	O		ENUMERATED(reject, ignore, notify)	This Procedure Criticality is used for reporting the Criticality of the Triggering message (Procedure).
Information Element Criticality Diagnostics		0 to <maxnof errors>		
>IE Criticality	M		ENUMERATED(reject, ignore, notify)	The IE Criticality is used for reporting the criticality of the triggering IE. The value "ignore" shall not be used.
>IE ID	M		INTEGER (0..65535)	The IE Id of the not understood or missing IE
>Type of Error	M		ENUMERATED(not	

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Criticality Diagnostics				
			understood, missing, ...)	

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

9.2.17 UE Identity

This is a unique identifier for the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE UE Identity				
> IMSI			9.2.10	
> TMSI and LAI (GSM-MAP)				
>>TMSI	M		9.2.19	
>>LAI	M		9.2.20	
>P- TMSI and RAI (GSM-MAP)				
>>P-TMSI	M		9.2.22	
>>RAI (GSM-MAP)	M		9.2.23	
> IMEI			9.2.18	
> ESN (DS-41)			BIT STRING (SIZE (32))	
> IMSI (DS-41)			OCTET STRING (SIZE (5..7))	
>IMSI and ESN (DS-41)				
>> ESN (DS-41)	M		BIT STRING(SIZE (32))	
>> IMSI (DS-41)	M		OCTET STRING (SIZE (5..7))	
>TMSI (DS-41)			OCTET STRING (SIZE (2..17))	

9.2.18 IMEI

This IE contains an International Mobile Equipment Identity.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
IMEI			BIT STRING(60)	

9.2.19 TMSI (GSM-MAP)

This IE contains a Temporary Mobile Subscriber Identity, used towards a GSM-MAP type of PLMN.

Information Element/Group name	Presence	Range	Type and reference	Semantics description
TMSI (GSM-MAP)			BIT STRING (32)	Setting specified in [11]. The first/leftmost bit of the bit string contains the most significant bit of the TMSI.

9.2.20 LAI

Location Area Identification identifies uniquely a location area for a GSM-MAP type of PLMN.

Information Element/Group name	Presence	Range	Type and reference	Semantics description
PLMN-ID	M		9.2.14	
LAC	M		9.2.11	

9.2.21 Registration Cause

Indicates if a UE registration is for an emergency call.

Information Element/Group name	Presence	Range	Type and reference	Semantics description
Registration cause			Enumerated { emergency call, normal, ... }	

9.2.22 P-TMSI (GSM-MAP)

This IE contains a Packet Temporary Mobile Subscriber Identity (P-TMSI), used towards a GSM-MAP type of PLMN.

Information Element/Group name	Presence	Range	Type and reference	Semantics description
P-TMSI			BIT STRING (32)	The first/leftmost bit of the bit string contains the most significant bit of the P-TMSI.

9.2.23 Routing Area Identification

Identifies uniquely a routing area for a GSM-MAP type of PLMN.

Information Element/Group name	Presence	Range	Type and reference	Semantics description
LAI	M		9.2.20	
RAC	M		9.2.12	

9.2.24 UE Capabilities

Identifies UE capabilities and release.

Information Element/Group name	Presence	Range	Type and reference	Semantics description
UE Capabilities				
>Access Stratum Release Indicator	M		Enumerated { R99, Rel-4, Rel-5, Rel-6, Rel-7, Rel-8, ... }	Values as defined in [10]
>CSG Capability	M		Enumerated { CSG capable, Not CSG capable, ... }	Indicates a CSG capable UE.

9.2.25 Cell-ID

Identifies uniquely a cell within a PLMN.

Information Element/Group name	Presence	Range	Type and reference	Semantics description
Cell-ID			INTEGER (0..268435455)	This information element identifies a cell uniquely within UTRAN.

9.2.26 RNC-ID

Uniquely identifies the HNB-GW towards the CN on a particular Iu interface.

Information Element/Group name	Presence	Range	Type and reference	Semantics description
RNC-ID			INTEGER (0..65535)	Values greater than 4095 are extended (16bit) RNC Ids.

9.2.27 CSG-ID

Indicates the CSG-ID of a particular HNB.

Information Element/Group name	Need	Multi	Type and reference	Semantics description
CSG-ID			BIT STRING (SIZE(28))	Length FFS

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

9.3.0 General

HNBAP ASN.1 definition conforms with [8] and [9].

The ASN.1 definition specifies the structure and content of HNBAP messages. HNBAP 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 HNBAP 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 HNBAP message that is not constructed as defined above is received, this shall be considered as Abstract Syntax Error, and the message shall be handled as defined for Abstract Syntax error in subclause 10.3.6.

9.3.1 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
--
-- *****
-- Editor notes - new OID needed.
HNBAP-PDU-Descriptions {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
umts-Access (20) modules (3) hnbap(0) version1 (1) hnbap-PDU-Descriptions (0)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    ProcedureCode
FROM HNBAP-CommonDataTypes

    HNBRegisterRequest,
    HNBRegisterAccept,
    HNBRegisterReject,
    HNBDe-Register,
    UERegisterRequest,
    UERegisterAccept,
    UERegisterReject,
    UEDe-Register,
    ErrorIndication,
    PrivateMessage

FROM HNBAP-PDU-Contents
    id-HNBRegister,
    id-UERegister,
    id-UEDe-Register,
    id-HNBDe-Register,
    id-ErrorIndication,
    id-privateMessage
FROM HNBAP-Constants;

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

```

HNBAP-ELEMENTARY-PROCEDURE ::= CLASS {
    &InitiatingMessage          ,
    &SuccessfulOutcome          OPTIONAL,
    &UnsuccessfulOutcome        OPTIONAL,
    &procedureCode              ProcedureCode UNIQUE,
    &criticality                 Criticality   DEFAULT ignore
}

WITH SYNTAX {
    INITIATING MESSAGE          &InitiatingMessage
    [SUCCESSFUL OUTCOME         &SuccessfulOutcome]
    [UNSUCCESSFUL OUTCOME       &UnsuccessfulOutcome]
    PROCEDURE CODE              &procedureCode
    [CRITICALITY                 &criticality]
}

-- *****
--
-- Interface PDU definitions
--
-- *****

HNBAP-PDU ::= CHOICE {
    initiatingMessage          InitiatingMessage,
    successfulOutcome           SuccessfulOutcome,
    unsuccessfulOutcome         UnsuccessfulOutcome,
    ...
}

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

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

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

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

```

```

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

HNBAP-ELEMENTARY-PROCEDURES-CLASS-1 HNBAP-ELEMENTARY-PROCEDURE ::= {
  hNBRegister |
  uERegister,
  ...
}

HNBAP-ELEMENTARY-PROCEDURES-CLASS-2 HNBAP-ELEMENTARY-PROCEDURE ::= {
  uEDe-Register |
  hNBDe-Register |
  errorIndication |
  privateMessage,
  ...
}

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

hNBRegister HNBAP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      HNBRegisterRequest
  SUCCESSFUL OUTCOME      HNBRegisterAccept
  UNSUCCESSFUL OUTCOME    HNBRegisterReject
  PROCEDURE CODE          id-HNBRegister
  CRITICALITY              reject
}

uERegister HNBAP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      UERegisterRequest
  SUCCESSFUL OUTCOME      UERegisterAccept
  UNSUCCESSFUL OUTCOME    UERegisterReject
  PROCEDURE CODE          id-UERegister
  CRITICALITY              reject
}

uEDe-Register HNBAP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      UEDe-Register
  PROCEDURE CODE          id-UEDe-Register
  CRITICALITY              ignore
}

hNBDe-Register HNBAP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      HNBDe-Register
  PROCEDURE CODE          id-HNBDe-Register
  CRITICALITY              ignore
}

```

```

}

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

privateMessage HNBAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PrivateMessage
    PROCEDURE CODE          id-privateMessage
    CRITICALITY              ignore
}

END

```

9.3.3 PDU Definitions

```

-- Editor notes - new OID needed.
-- *****
--
-- PDU definitions for HNBAP.
--
-- *****

HNBAP-PDU-Contents {
    itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
    umts-Access (20) modules (3) hnbap(0) version1 (1) hnbap-PDU-Contents (1) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Cause,
    CriticalityDiagnostics,
    HNB-Location-Information,
    HNB-Identity,
    Context-ID,
    UE-Identity,
    LAC,
    RAC,
    SAC,
    CN-DomainIndicator,
    IP-Address,
    Registration-Cause,
    UE-Capabilities,

```



```

PLMNIdentity,
CellIdentity,
RNC-ID,
CSG-ID

```

```
FROM HNBAP-IES
```

```

ProtocolExtensionContainer{},
ProtocolIE-ContainerList{},
ProtocolIE-Container{},
ProtocolIE-Single-Container{},
PrivateIE-Container{},
HNBAP-PRIVATE-IES,
HNBAP-PROTOCOL-EXTENSION,
HNBAP-PROTOCOL-IES

```

```
FROM HNBAP-Containers
```

```

id-Cause,
id-CriticalityDiagnostics,
id-HNB-Location-Information,
id-HNB-Identity,
id-Context-ID,
id-PLMNIdentity,
id-UE-Identity,
id-LAC,
id-RAC,
id-SAC,
id-UE-Capabilities,
id-Registration-Cause,
id-CellIdentity,
id-RNC-ID,
id-CSG-ID

```

```
FROM HNBAP-Constants;
```

```

-- *****
--
-- HNB Register REQUEST
--
-- *****

```

```

HNBRegisterRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { {HNBRegisterRequestIEs} },
    protocolExtensions  ProtocolExtensionContainer { {HNBRegisterRequestExtensions} } OPTIONAL,
    ...
}

```

```

HNBRegisterRequestIEs HNBAP-PROTOCOL-IES ::= {
    { ID id-HNB-Identity          CRITICALITY reject TYPE HNB-Identity          PRESENCE mandatory } |
    { ID id-HNB-Location-Information CRITICALITY reject TYPE HNB-Location-Information PRESENCE mandatory } |
    { ID id-PLMNIdentity          CRITICALITY reject TYPE PLMNIdentity          PRESENCE mandatory } |
    { ID id-CellIdentity          CRITICALITY reject TYPE CellIdentity          PRESENCE mandatory } |
}

```

```

    { ID id-LAC                CRITICALITY reject TYPE LAC                PRESENCE mandatory } |
    { ID id-RAC                CRITICALITY reject TYPE RAC                PRESENCE mandatory } |
    { ID id-SAC                CRITICALITY reject TYPE SAC                PRESENCE mandatory } |
    { ID id-CSG-ID            CRITICALITY reject TYPE CSG-ID            PRESENCE mandatory } ,
  ...
}

HNBRegisterRequestExtensions HNBAP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- HNB Register Accept
--
-- *****

HNBRegisterAccept ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    { {HNBRegisterResponseIEs} },
  protocolExtensions  ProtocolExtensionContainer { {HNBRegisterResponseExtensions} } OPTIONAL,
  ...
}

HNBRegisterResponseIEs HNBAP-PROTOCOL-IES ::= {
  { ID id-RNC-ID          CRITICALITY reject TYPE RNC-ID          PRESENCE mandatory },
  ...
}

HNBRegisterResponseExtensions HNBAP-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- HNB Register REJECT
--
-- *****

HNBRegisterReject ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    { {HNBRegisterRejectIEs} },
  protocolExtensions  ProtocolExtensionContainer { {HNBRegisterRejectExtensions} } OPTIONAL,
  ...
}

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

HNBRegisterRejectExtensions HNBAP-PROTOCOL-EXTENSION ::= {
  ...
}

```

```

-- *****
--
-- HNB De- Register
--
-- *****

HNBDe-Register ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { {HNBDe-RegisterIEs} },
    protocolExtensions  ProtocolExtensionContainer { {HNBDe-RegisterExtensions} } OPTIONAL,
    ...
}

HNBDe-RegisterIEs HNBAP-PROTOCOL-IES ::= {
    { ID id-Cause          CRITICALITY ignore  TYPE Cause          PRESENCE mandatory },
    ...
}

HNBDe-RegisterExtensions HNBAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- UE Register REQUEST
--
-- *****

UERegisterRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { {UERegisterRequestIEs} },
    protocolExtensions  ProtocolExtensionContainer { {UERegisterRequestExtensions} } OPTIONAL,
    ...
}

UERegisterRequestIEs HNBAP-PROTOCOL-IES ::= {
    { ID id-UE-Identity    CRITICALITY reject  TYPE UE-Identity    PRESENCE mandatory } |
    { ID id-Registration-Cause CRITICALITY ignore  TYPE Registration-Cause PRESENCE mandatory } |
    { ID id-UE-Capabilities CRITICALITY reject  TYPE UE-Capabilities PRESENCE mandatory },
    ...
}

UERegisterRequestExtensions HNBAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- UE Register ACCEPT
--
-- *****

```

```

UERRegisterAccept ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { {UERRegisterAcceptIEs} },
    protocolExtensions  ProtocolExtensionContainer { {UERRegisterAcceptExtensions} }   OPTIONAL,
    ...
}

UERRegisterAcceptIEs HNBAP-PROTOCOL-IES ::= {
    { ID id-UE-Identity          CRITICALITY reject  TYPE UE-Identity          PRESENCE mandatory } |
    { ID id-Context-ID          CRITICALITY ignore  TYPE Context-ID              PRESENCE mandatory },
    ...
}

UERRegisterAcceptExtensions HNBAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- UE Register REJECT
--
-- *****

UERRegisterReject ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { {UERRegisterRejectIEs} },
    protocolExtensions  ProtocolExtensionContainer { {UERRegisterRejectExtensions} }   OPTIONAL,
    ...
}

UERRegisterRejectIEs HNBAP-PROTOCOL-IES ::= {
    { ID id-UE-Identity          CRITICALITY reject  TYPE UE-Identity          PRESENCE mandatory } |
    { ID id-Cause                CRITICALITY ignore  TYPE Cause                PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional },
    ...
}

UERRegisterRejectExtensions HNBAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- UE De-Register
--
-- *****

UEDe-Register ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { {UEDe-RegisterIEs} },
    protocolExtensions  ProtocolExtensionContainer { {UEDe-RegisterExtensions} }   OPTIONAL,
    ...
}

UEDe-RegisterIEs HNBAP-PROTOCOL-IES ::= {

```

```

    { ID id-Context-ID          CRITICALITY reject  TYPE Context-ID          PRESENCE mandatory } |
    { ID id-Cause               CRITICALITY ignore TYPE Cause                PRESENCE mandatory } ,
    ...
}

UEDe-RegisterExtensions HNBAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- ERROR INDICATION
--
-- *****

ErrorIndication ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { {ErrorIndicationIEs} },
    protocolExtensions  ProtocolExtensionContainer { {ErrorIndicationExtensions} } OPTIONAL,
    ...
}

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

ErrorIndicationExtensions HNBAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- PRIVATE MESSAGE
--
-- *****

PrivateMessage ::= SEQUENCE {
    privateIEs          PrivateIE-Container    {{PrivateMessage-IEs}},
    ...
}

PrivateMessage-IEs HNBAP-PRIVATE-IES ::= {
    ...
}

END

```

9.3.4 Information Element Definitions

```

-- Editor notes - new OID needed.
-- *****
--
-- Information Element Definitions
--
-- *****

HNBAP-IEs {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
umts-Access (20) modules (3) hnbap(0) version1 (1) hnbap-IEs (2) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    maxNrOfErrors,
    maxUEs

FROM HNBAP-Constants

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

    ProtocolExtensionContainer{},
    HNBAP-PROTOCOL-EXTENSION
FROM HNBAP-Containers;

--A
Access-stratum-release-indicator ::= ENUMERATED {r99,
    rel-4, rel-5, rel-6, rel-7, rel-8,
    ...}

AltitudeAndDirection ::= SEQUENCE {
    directionOfAltitude    ENUMERATED {height, depth},
    altitude                INTEGER (0..32767),
    ...
}

--B
--C
Cause ::= CHOICE {
    radioNetwork           CauseRadioNetwork,
    transport              CauseTransport,
    protocol                CauseProtocol,
    misc                    CauseMisc,
    ...
}

```

```

}
CauseRadioNetwork ::= ENUMERATED {
    overload,
    unauthorised-Location,
    unauthorised-HNB,
    hNB-parameter-mismatch,
    invalid-UE-identity,
    uE-not-allowed-on-this-HNB,
    uE-unauthorised,
    connection-with-UE-lost,
    ue-RRC-telease,
    hNB-not-registered,
    unspecified,
    ...
}

CauseTransport ::= ENUMERATED {
    transport-resource-unavailable,
    unspecified,
    ...
}

CauseProtocol ::= ENUMERATED {
    transfer-syntax-error,
    abstract-syntax-error-reject,
    abstract-syntax-error-ignore-and-notify,
    message-not-compatible-with-receiver-state,
    semantic-error,
    unspecified,
    abstract-syntax-error-falsely-constructed-message,
    ...
}

CauseMisc ::= ENUMERATED {
    processing-overload,
    hardware-failure,
    o-and-m-intervention,
    unspecified,
    ...
}

CellIdentity ::=          BIT STRING (SIZE (28))

Context-ID ::=  BIT STRING (SIZE(24))

CriticalityDiagnostics ::= SEQUENCE {
    procedureCode           ProcedureCode           OPTIONAL,
    triggeringMessage       TriggeringMessage       OPTIONAL,
    procedureCriticality    Criticality              OPTIONAL,
    iEsCriticalityDiagnostics CriticalityDiagnostics-IE-List OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { {CriticalityDiagnostics-ExtIEs} } OPTIONAL,
    ...
}

```

```

CriticalityDiagnostics-IE-List ::= SEQUENCE (SIZE (1..maxNrOfErrors)) OF
  SEQUENCE {
    iECriticality          Criticality,
    iE-ID                 ProtocolIE-ID,
    typeOfError           TypeOfError,
    iE-Extensions         ProtocolExtensionContainer { {CriticalityDiagnostics-IE-List-ExtIEs} } OPTIONAL,
    ...
  }

CriticalityDiagnostics-IE-List-ExtIEs HNBAP-PROTOCOL-EXTENSION ::= {
  ...
}

CriticalityDiagnostics-ExtIEs HNBAP-PROTOCOL-EXTENSION ::= {
  ...
}

CSG-ID                ::= BIT STRING (SIZE (28))

CSG-Indicator         ::= ENUMERATED {
  csg-capable,
  not-csg-capable,
  ...
}

CGI ::= SEQUENCE {
  pLMNidentity        PLMNidentity,
  lAC                 LAC,
  cI                  CI,
  iE-Extensions       ProtocolExtensionContainer { {CGI-ExtIEs} } OPTIONAL
}

CGI-ExtIEs HNBAP-PROTOCOL-EXTENSION ::= {
  ...
}

CI                    ::= OCTET STRING (SIZE (2))

CN-DomainIndicator   ::= ENUMERATED {
  cs-domain,
  ps-domain
}

--D
--E
ESN                  ::= BIT STRING (SIZE(32))
--F
--G
GeographicalLocation ::= SEQUENCE {
  geographicalCoordinates    GeographicalCoordinates,
  altitudeAndDirection       AltitudeAndDirection,
  iE-Extensions              ProtocolExtensionContainer { { GeographicLocation-ExtIEs} } OPTIONAL,
  ...
}

```



```

GeographicLocation-ExtIEs HNBAP-PROTOCOL-EXTENSION ::= {
  ...
}

GeographicalCoordinates ::= SEQUENCE {
  latitudeSign      ENUMERATED {north, south},
  latitude          INTEGER (0..8388607),
  longitude         INTEGER (-8388608..8388607),
  iE-Extensions    ProtocolExtensionContainer { {GeographicalCoordinates-ExtIEs} } OPTIONAL,
  ...
}

GeographicalCoordinates-ExtIEs HNBAP-PROTOCOL-EXTENSION ::= {
  ...
}

--H
HNB-Location-Information ::= SEQUENCE {
  macroCoverageInfo      MacroCoverageInformation      OPTIONAL,
  geographicalCoordinates GeographicalLocation        OPTIONAL,
  iE-Extensions         ProtocolExtensionContainer { { HNB-Location-Information-ExtIEs } } OPTIONAL,
  ...
}

HNB-Location-Information-ExtIEs HNBAP-PROTOCOL-EXTENSION ::= {
  ...
}

HNB-Identity ::= SEQUENCE {
  hNB-Identity-Info      HNB-Identity-Info,
  iE-Extensions         ProtocolExtensionContainer { { HNB-Identity-ExtIEs } } OPTIONAL,
  ...
}

HNB-Identity-ExtIEs HNBAP-PROTOCOL-EXTENSION ::= {
  ...
}

-- Editors note: HNB-Identity-Info should be a constrained octet string
HNB-Identity-Info ::= OCTET STRING

--I

IMEI ::= BIT STRING (SIZE(60))

IMSI ::= OCTET STRING (SIZE (3..8))
-- Reference: 23.003
IMSIDS41 ::= OCTET STRING (SIZE (5..7))

```

```

IMSIESN          ::= SEQUENCE {
    iMSIDS41      IMSIDS41,
    eSN           ESN
}

IP-Address       ::=SEQUENCE {
    ipaddress     CHOICE {
        ipv4info  Ipv4Address,
        ipv6info  Ipv6Address,
        ...
    },
    iE-Extensions ProtocolExtensionContainer { { IP-Address-ExtIEs } } OPTIONAL,
    ...
}

IP-Address-ExtIEs HNBAP-PROTOCOL-EXTENSION ::= {
    ...
}

Ipv4Address      ::= OCTET STRING (SIZE (4))

Ipv6Address      ::= OCTET STRING (SIZE (16))

--J
--K
--L
LAC              ::= OCTET STRING(SIZE(2))

LAI              ::= SEQUENCE {
    pLMNID        PLMNidentity,
    LAC           LAC,
    ...
}

-- M

MacroCoverageInformation ::= SEQUENCE {
    cellIdentity  MacroCellID,
    iE-Extensions ProtocolExtensionContainer { { MacroCoverageInformation-ExtIEs } } OPTIONAL,
    ...
}

MacroCoverageInformation-ExtIEs HNBAP-PROTOCOL-EXTENSION ::= {
    ...
}

MacroCellID ::= CHOICE {
    uTRANCellID  UTRANCellID,
    gERANCellID  CGI,
    ...
}

```

```
}

--N
--O
--P
PLMNIdentity          ::= OCTET STRING (SIZE (3))

PTMSI                ::= BIT STRING (SIZE(32))

PTMSIRAI             ::= SEQUENCE {
    pTMSI             PTMSI,
    rAI               RAI,
    ...
}

--Q
--R
RAC                  ::= OCTET STRING(SIZE(1))

RAI                  ::= SEQUENCE {
    lAI               LAI,
    rAC               RAC,
    ...
}

Registration-Cause   ::= ENUMERATED {
    emergency-call,
    normal,
    ...
}

RNC-ID               ::= INTEGER(0..65535)

--S

SAC                  ::= OCTET STRING(SIZE(2))

--T
TMSILAI              ::= SEQUENCE {
    tMSI              BIT STRING(SIZE (32)),
    lAI               LAI
}

TMSIDS41             ::= OCTET STRING (SIZE (2..17))

TypeOfError          ::= ENUMERATED {
    not-understood,
    missing,
    ...
}

--U
UE-Capabilities      ::= SEQUENCE {
```

```

    access-stratum-release-indicator    Access-stratum-release-indicator,
    csg-indicator                       CSG-Indicator,
    iE-Extensions                       ProtocolExtensionContainer { { UE-Capabilities-ExtIEs } }    OPTIONAL,
...
}

UE-Capabilities-ExtIEs HNBAP-PROTOCOL-EXTENSION ::= {
    ...
}

UTRANCellID ::= SEQUENCE {
    lAC                                LAC,
    rAC                                RAC,
    pLMNidentity                       PLMNidentity,
    uTRANcellID                        CellIdentity,
    iE-Extensions                       ProtocolExtensionContainer { { UTRANCellID-ExtIEs } } OPTIONAL
}

UTRANCellID-ExtIEs HNBAP-PROTOCOL-EXTENSION ::= {
    ...
}

UE-Identity ::= CHOICE {
    IMSI                                IMSI,
    tMSILAI                             TMSILAI,
    pTMSIRAI                             PTMSIRAI,
    iMEI                                 IMEI,
    eSN                                  ESN,
    iMSIDS41                             IMSIDS41,
    iMSIESN                              IMSIESN,
    tMSIDS1                              TMSIDS41,
    ...
}

--V
--W
--X
--Y
--Z

END

```

9.3.5 Common Definitions

```

-- Editor notes - new OID needed.
-- *****
--
-- Common definitions

```

```

--
-- *****
HNBAP-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
umts-Access (20) modules (3) hnbap(0) version1 (1) hnbap-CommonDataTypes (3) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- *****
--
-- Extension constants
--
-- *****

maxPrivateIEs                INTEGER ::= 65535
maxProtocolExtensions        INTEGER ::= 65535
maxProtocolIEs               INTEGER ::= 65535

-- *****
--
-- Common Data Types
--
-- *****
Criticality ::= ENUMERATED { reject, ignore, notify }

Presence ::= ENUMERATED { optional, conditional, mandatory }

PrivateIE-ID ::= CHOICE {
    local          INTEGER (0..65535),
    global         OBJECT IDENTIFIER
}

ProcedureCode ::= INTEGER (0..255)

ProtocolIE-ID ::= INTEGER (0..maxProtocolIEs)

TriggeringMessage ::= ENUMERATED { initiating-message, successful-outcome, unsuccessful-outcome }

END

```

9.3.6 Constant Definitions

```

-- Editor notes - new OID needed.
-- *****
--
-- Constant definitions
--

```

```

-- *****
HNBAP-Constants {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
umts-Access (20) modules (3) hnbap(0) version1 (1) hnbap-Constants (4) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    ProcedureCode,
    ProtocolIE-ID
FROM HNBAP-CommonDataTypes;

-- *****
--
-- Elementary Procedures
--
id-HNBRegister                ProcedureCode ::= 1
id-HNBDe-Register            ProcedureCode ::= 2
id-UERegister                ProcedureCode ::= 3
id-UEDe-Register            ProcedureCode ::= 4
id-ErrorIndication           ProcedureCode ::= 5
id-privateMessage            ProcedureCode ::= 6

-- *****
--
-- Lists
--
-- *****
maxNrOfErrors                INTEGER ::= 256
maxUEs                       INTEGER ::= 64

-- *****
--
-- IEs
--
-- *****
id-Cause                     ProtocolIE-ID ::= 1
id-CriticalityDiagnostics    ProtocolIE-ID ::= 2
id-HNB-Identity              ProtocolIE-ID ::= 3
id-Context-ID                ProtocolIE-ID ::= 4
id-UE-Identity               ProtocolIE-ID ::= 5
id-LAC                       ProtocolIE-ID ::= 6
id-RAC                       ProtocolIE-ID ::= 7
id-HNB-Location-Information  ProtocolIE-ID ::= 8
id-PLMNIdentity              ProtocolIE-ID ::= 9
id-SAC                       ProtocolIE-ID ::= 10

```

```

id-CellIdentity           ProtocolIE-ID ::= 11
id-Registration-Cause    ProtocolIE-ID ::= 12
id-UE-Capabilities       ProtocolIE-ID ::= 13
id-RNC-ID                 ProtocolIE-ID ::= 14
id-CSG-ID                 ProtocolIE-ID ::= 15

```

END

9.3.7 Container Definitions

```

-- Editor notes - new OID needed.

-- *****
--
-- Container definitions
--
-- *****

HNBAP-Containers {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
umts-Access (20) modules (3) hnbap(0) version1 (1) hnbap-Containers (5) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    Presence,
    PrivateIE-ID,
    ProtocolIE-ID,
    maxPrivateIEs,
    maxProtocolExtensions,
    maxProtocolIEs
FROM HNBAP-CommonDataTypes;

-- *****
--
-- Class Definition for Protocol IES
--
-- *****

HNBAP-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 Extensions
--
-- *****

HNBAP-PROTOCOL-EXTENSION ::= CLASS {
    &id                    ProtocolIE-ID UNIQUE,
    &criticality           Criticality,
    &Extension,
    &presence              Presence
}
WITH SYNTAX {
    ID                    &id
    CRITICALITY          &criticality
    EXTENSION            &Extension
    PRESENCE             &presence
}

-- *****
--
-- Class Definition for Private IEs
--
-- *****

HNBAP-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 {HNBAP-PROTOCOL-IES : IEsSetParam} ::=
  SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Single-Container {HNBAP-PROTOCOL-IES : IEsSetParam} ::=
  ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Field {HNBAP-PROTOCOL-IES : IEsSetParam} ::= SEQUENCE {
  id                HNBAP-PROTOCOL-IES.&id                ({{IEsSetParam}}),
  criticality       HNBAP-PROTOCOL-IES.&criticality       ({{IEsSetParam}}{@id}),
  value            HNBAP-PROTOCOL-IES.&Value            ({{IEsSetParam}}{@id})
}

-- *****
--
-- Container Lists for Protocol IE Containers
--
-- *****

ProtocolIE-ContainerList {INTEGER : lowerBound, INTEGER : upperBound, HNBAP-PROTOCOL-IES : IEsSetParam} ::=
  SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-Container {{IEsSetParam}}

-- *****
--
-- Container for Protocol Extensions
--
-- *****

ProtocolExtensionContainer {HNBAP-PROTOCOL-EXTENSION : ExtensionSetParam} ::=
  SEQUENCE (SIZE (1..maxProtocolExtensions)) OF
    ProtocolExtensionField {{ExtensionSetParam}}

ProtocolExtensionField {HNBAP-PROTOCOL-EXTENSION : ExtensionSetParam} ::= SEQUENCE {
  id                HNBAP-PROTOCOL-EXTENSION.&id                ({{ExtensionSetParam}}),
  criticality       HNBAP-PROTOCOL-EXTENSION.&criticality       ({{ExtensionSetParam}}{@id}),
  extensionValue    HNBAP-PROTOCOL-EXTENSION.&Extension        ({{ExtensionSetParam}}{@id})
}

-- *****
--
-- Container for Private IEs
--
-- *****

PrivateIE-Container {HNBAP-PRIVATE-IES : IEsSetParam} ::=
  SEQUENCE (SIZE (1.. maxPrivateIEs)) OF
    PrivateIE-Field {{IEsSetParam}}

PrivateIE-Field {HNBAP-PRIVATE-IES : IEsSetParam} ::= SEQUENCE {
  id                HNBAP-PRIVATE-IES.&id                ({{IEsSetParam}}),
  criticality       HNBAP-PRIVATE-IES.&criticality       ({{IEsSetParam}}{@id}),
  value            HNBAP-PRIVATE-IES.&Value            ({{IEsSetParam}}{@id})
}

```

END

9.4 Message Transfer Syntax

HNBAP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax as specified in ref. [7].

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:

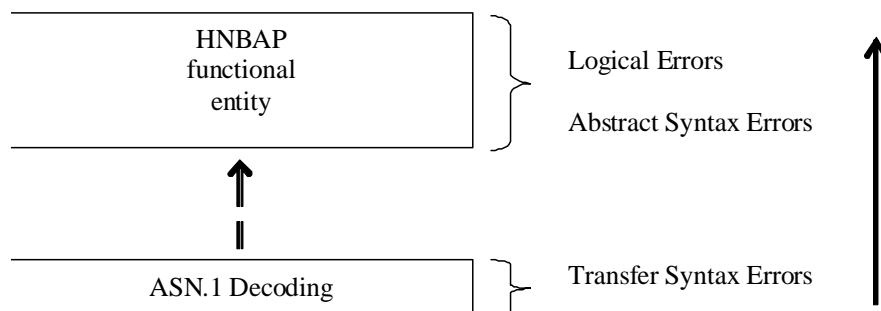


Figure 11: Protocol Errors in HNBAP

The information stated in subclauses 10.2, 10.3 and 10.4, to be included in the message used when reporting an error, is what at minimum shall be included. Other optional information elements within the message may also be included, if available. This is also valid for the case when the reporting is done with a response message. The latter is an exception to what is stated in subclause 4.1.

10.2 Transfer Syntax Error

A Transfer Syntax Error occurs when the receiver is not able to decode the received physical message. Transfer syntax errors are always detected in the process of ASN.1 decoding. If a Transfer Syntax Error occurs, the receiver should initiate Error Indication procedure with appropriate cause value for the Transfer Syntax protocol error.

10.3 Abstract Syntax Error

10.3.1 General

An Abstract Syntax Error occurs when the receiving functional HNBAP 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;
4. receives IEs or IE groups that are defined to be part of that message in wrong order or with too many occurrences of the same IE or IE group;
5. receives IEs or IE groups but according to the conditional presence of the concerning object and the specified condition, the IEs or IE groups should not have been present in the received message.

Cases 1 and 2 (not comprehended IE/IE group) are handled based on received Criticality information. Case 3 (missing IE/IE group) is handled based on Criticality information and Presence information for the missing IE/IE group specified in the version of the specification used by the receiver. Case 4 (IEs or IE groups in wrong order or with too many occurrences) and Case 5 (erroneously present conditional IEs or IE groups) result in rejecting the procedure.

If an Abstract Syntax Error occurs, the receiver shall read the remaining message and shall then for each detected Abstract Syntax Error act according to the Criticality Information and Presence Information for the IE/IE group due to which Abstract Syntax Error occurred in accordance with subclauses 10.3.4 and 10.3.5. The handling of cases 4 and 5 is specified in subclause 10.3.6.

10.3.2 Criticality Information

In the HNBAP messages there is criticality information set for individual IEs and/or IE groups. This criticality information instructs the receiver how to act when receiving an IE or an IE group that is not comprehended i.e. the entire item (IE or IE group) which is not (fully or partially) comprehended shall be treated in accordance with its own criticality information as specified in subclause 10.3.4.

In addition, the criticality information is used in case of the missing IE/IE group abstract syntax error (see subclause 10.3.5).

The receiving node shall take different actions depending on the value of the Criticality Information. The three possible values of the Criticality Information for an IE/IE group are:

- Reject IE;
- Ignore IE and Notify Sender;
- Ignore IE.

The following rules restrict when a receiving entity may consider an IE, an IE group or an EP not comprehended (not implemented), and when action based on criticality information is applicable:

1. IE or IE group: When one new or modified IE or IE group is implemented for one EP from a standard version, then other new or modified IEs or IE groups specified for that EP in that standard version shall be considered comprehended by the receiving entity (some may still remain unsupported).
2. EP: The comprehension of different EPs within a standard version or between different standard versions is not mandated. Any EP that is not supported may be considered not comprehended, even if another EP from that standard version is comprehended, and action based on criticality shall be applied.

10.3.3 Presence Information

For many IEs/IE groups which are optional according to the ASN.1 transfer syntax, HNBAP 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 HNBAP-PROTOCOL-IES, HNBAP-PROTOCOL-IES-PAIR, HNBAP-PROTOCOL-EXTENSION or HNBAP-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.

When using the Error Indication procedure to reject a procedure or to report an ignored procedure it shall include the *Procedure Code IE*, the *Triggering Message IE*, and the *Procedure Criticality IE* in the *Criticality Diagnostics IE*.

10.3.4.1A Type of Message

When the receiving node cannot decode the *Type of Message IE*, the Error Indication procedure shall be initiated with an appropriate cause value.

10.3.4.2 IEs other than the Procedure Code and Type of Message

The receiving node shall treat the different types of received criticality information of an IE/IE group other than the *Procedure Code IE* and *Type of Message IE* according to the following:

Reject IE:

- If a message *initiating* a procedure is received containing one or more IEs/IE groups 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 groups using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.
- If a message *initiating* a procedure that does not have a message to report unsuccessful outcome is received containing one or more IEs/IE groups marked with "*Reject IE*" which the receiving node does not comprehend, the receiving node shall terminate the procedure and initiate the Error Indication procedure.
- If a *response* message is received containing one or more IEs marked with "*Reject IE*" which the receiving node does not comprehend, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

Ignore IE and Notify Sender:

- If a message *initiating* a procedure is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups, and report in the response message of the procedure that one or more IEs/IE groups have been ignored. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the response message, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.
- if a message *initiating* a procedure that does not have a message to report the outcome of the procedure is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups, and initiate the Error Indication procedure to report that one or more IEs/IE groups have been ignored.
- If a *response* message is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IE/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups and initiate the Error Indication procedure.

Ignore IE:

- If a message *initiating* a procedure is received containing one or more IEs/IE groups marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups and continue with the procedure as if the not comprehended IEs/IE groups were not received using only the understood IEs/IE groups.
- If a *response* message is received containing one or more IEs/IE groups marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups and continue with the procedure as if the not comprehended IEs/IE groups were not received using the understood IEs/IE groups.

When reporting not comprehended IEs/IE groups marked with "*Reject IE*" or "*Ignore IE and Notify Sender*" using a response message defined for the procedure, the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group. In the *Information Element Criticality Diagnostics* IE the *Repetition Number* IE shall be included and in addition, if the not comprehended IE/IE group is not at message hierarchy level 1 (top level; see annex A) also the *Message Structure* IE shall be included.

When reporting not comprehended IEs/IE groups marked with "*Reject IE*" or "*Ignore IE and Notify Sender*" using the Error Indication procedure, the *Procedure Code* IE, the *Triggering Message* IE, *Procedure Criticality* IE, and the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group. In the *Information Element Criticality Diagnostics* IE the *Repetition Number* IE shall be included and in addition, if the not comprehended IE/IE group is not at message hierarchy level 1 (top level; see annex A) also the *Message Structure* IE shall be included.

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 the present document used by the receiver:

Reject IE:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality "*Reject IE*"; none of the functional requests of the message shall be executed. The receiving node shall reject the procedure and report the missing IEs/IE groups using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- if a received message *initiating* a procedure that does not have a message to report unsuccessful outcome is missing one or more IEs/IE groups with specified criticality "*Reject IE*", the receiving node shall terminate the procedure and initiate the Error Indication procedure.
- if a received *response* message is missing one or more IEs/IE groups with specified criticality "*Reject IE*", the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

Ignore IE and Notify Sender:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and report in the response message of the procedure that one or more IEs/IE groups were missing. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the response message, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.
- if a received message *initiating* a procedure that does not have a message to report the outcome of the procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and initiate the Error Indication procedure to report that one or more IEs/IE groups were missing.
- if a received *response* message is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and initiate the Error Indication procedure to report that one or more IEs/IE groups were missing.

Ignore IE:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message.
- if a received *response* message is missing one or more IEs/IE groups with specified criticality "*Ignore IE*", the receiving node shall ignore that those IEs/IE groups are missing and continue with the procedure based on the other IEs/IE groups present in the message.

When reporting missing IEs/IE groups with specified criticality "*Reject IE*" or "*Ignore IE and Notify Sender*" using a response message defined for the procedure, the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group. In the *Information Element Criticality Diagnostics* IE the *Repetition Number* IE shall be included and in addition, if the missing IE/IE group is not at message hierarchy level 1 (top level; see annex A) also the *Message Structure* IE shall be included.

When reporting missing IEs/IE groups with specified criticality "*Reject IE*" or "*Ignore IE and Notify Sender*" using the Error Indication procedure, the *Procedure Code* IE, the *Triggering Message* IE, *Procedure Criticality* IE, and the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group. In the *Information Element Criticality Diagnostics* IE the *Repetition Number* IE shall be included and in addition, if the missing IE/IE group is not at message hierarchy level 1 (top level; see annex A) also the *Message Structure* IE shall be included.

10.3.6 IEs or IE groups received in wrong order or with too many occurrences or erroneously present

If a message with IEs or IE groups in wrong order or with too many occurrences is received or if IEs or IE groups with a conditional presence are present when the condition is not met (i.e. erroneously present), the receiving node shall behave according to the following:

- If a message *initiating* a procedure is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, none of the functional requests of the message shall be executed. The receiving node shall reject the procedure and report the cause value "Abstract Syntax Error (Falsely Constructed Message)" using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- If a message *initiating* a procedure that does not have a message to report unsuccessful outcome is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, the receiving node shall terminate the procedure and initiate the Error Indication procedure, and use cause value "Abstract Syntax Error (Falsely Constructed Message)".
- If a *response* message is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

When determining the correct order only the IEs specified in the specification version used by the receiver shall be considered.

10.4 Logical Error

Logical error situations occur when a message is comprehended correctly, but the information contained within the message is not valid (i.e. semantic error), or describes a procedure which is not compatible with the state of the receiver. In these conditions, the following behaviour shall be performed (unless otherwise specified) as defined by the class of the elementary procedure, irrespective of the criticality information of the IE's/IE groups containing the erroneous values.

Class 1:

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

- Semantic Error;
- Message not compatible with receiver state.

Where the logical error is contained in a request message of a class 1 procedure, and the procedure does not have a message to report this unsuccessful outcome, the procedure shall be terminated and the Error Indication procedure shall be initiated with an appropriate cause value. The *Procedure Code* IE and the *Triggering Message* IE within the *Criticality Diagnostics* IE shall then be included in order to identify the message containing the logical error.

Where the logical error exists in a response message of a class 1 procedure, the procedure shall be considered as unsuccessfully terminated and local error handling shall be initiated.

Class 2:

Where the logical error occurs in a message of a class 2 procedure, the procedure shall be terminated and the Error Indication procedure shall be initiated with an appropriate cause value. The *Procedure Code* IE and the *Triggering Message* IE within the *Criticality Diagnostics* IE shall then be included in order to identify the message containing the logical error.

10.5 Exceptions

The error handling for all the cases described hereafter shall take precedence over any other error handling described in the other subclauses of clause 10.

- If any type of error (Transfer Syntax Error, Abstract Syntax Error or Logical Error) is detected in the ERROR INDICATION message, it shall not trigger the Error Indication procedure in the receiving Node but local error handling.
- In case a response message or Error Indication message needs to be returned, but the information necessary to determine the receiver of that message is missing, the procedure shall be considered as unsuccessfully terminated and local error handling shall be initiated.
- If an error that terminates a procedure occurs, the returned cause value shall reflect the error that caused the termination of the procedure even if one or more abstract syntax errors with criticality 'ignore and notify' have earlier occurred within the same procedure.

Annex A (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2008-10					Skeleton	-	0.0.0
2008-10					Rapporteur's Update	0.0.0	0.1.0
2008-10					Addition of messages, msg contents and IEs changes agreed at RAN3 HNB Adhoc	0.1.0	0.2.0
2008-10					Updates from e-mail discussion	0.2.0	0.3.0
2008-10					Rapporteur's Update	0.3.0	0.4.0
2008-11					Corrections, and changes from discussion in RAN3#62	0.4.0	0.5.0
2008-11					Editorial updates	0.5.0	0.5.1
2008-11					Updates from e-mail discussion	0.5.1	0.6.0
2008-11					Presentation to TSG RAN for Approval	0.6.0	1.0.0
2008-12	42	RP-080834			approved at TSG-RAN42 and placed under change control	1.0.0	8.0.0

History

Document history		
V8.0.0	January 2009	Publication