TSG RAN Meeting #23 **RP-040072**
Phoenix, Arizona, USA, 10 - 12 March 2004

Title **CRs (Rel-5 and Rel-6 Category A) to TS 25.453**
Source **TSG RAN WG3**
Agenda Item **7.4.5**

RAN3 Tdoc	CR.	Rev.	Cat	Spec.	curr. Vers.	new Vers.	REL	Work Item	Title
R3-040510	70	1	F	25.453	5.8.0	5.9.0	REL-5	TEI5	PCAP Review
R3-040511	71	1	A	25.453	6.3.0	6.4.0	REL-6	TEI5	PCAP Review

Rien 3GPP TSG-RAN WG3 Meeting #41 ⌘***R3-040510***
Malaga, Spain, 16th – 20th February 2004

CR-Form-v7

CHANGE REQUEST

⌘ **25.453** **CR** **70** ⌘ **rev** **1** ⌘ Current version: **5.8.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☒ Core Network ☐

Title:	⌘	PCAP Review
Source:	⌘	RAN3
Work item code:	⌘	TEI5
Date:	⌘	16/02/2004
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change: ⌘ PCAP Review for Release 5 freeze

Summary of change: ⌘ Rev.0:

Alignment of the whole protocol to the extension rules for future backward compatibility. Additionally the tabular format was aligned with the ASN.1.

Rev.1:

Crosscheck with the RRC (25.331) specification.

Impact Analysis:

Impact assessment towards the previous version of the specification (same release):

This CR has isolated impact with the previous version of the specification (same release) because it affects no functions.

This CR has an impact under protocol point of view.

The impact can be considered isolated because the change only aligns ASN.1 and tabular format of the messages.

Consequences if not approved: ⌘ Misalignment of the whole protocol to the extension rules for future backward compatibility. Tables and ASN.1 remain misaligned.

Clauses affected: ⌘ Many paragraphs of chapters 9 and Annex A

		Y	N			
Other specs	⌘	X		Other core specifications	⌘	CR 71 25.453 Rel-6

affected:	X	Test specifications
	X	O&M Specifications
Other comments: ⌘		

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9 Elements for PCAP Communication

9.1 Message Functional Definition and Content

9.1.1 General

Clause 9.1 presents the contents of PCAP messages in tabular format. The corresponding ASN.1 definitions are presented in clause 9.3. In case there is contradiction between the tabular format in clause 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 [12].

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 4.

Table 4: Meaning of abbreviations used in PCAP messages

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

9.1.2.2 Criticality

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

Table 5: 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 clause 10.3.2, if applicable.

9.1.3 ~~Position Calculation Request~~POSITION CALCULATION REQUEST

Table 6

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	reject
Transaction ID	M		9.2.2.28		–	
Initial UE Position Estimate	M		Geographical Area 9.2.2.6		YES	reject
Measured Results		~~0~~1..<*maxNoOfSets*>			GLOBAL	reject
>GPS Measured Results	M		9.2.2.12		–	

Table 7

Range bound	Explanation
MaxNoOfSets	Maximum number of sets of GPS Measured Results included in the Position Calculation Request message. The value for maxNoOfSets is 3.

9.1.4 ~~Position Calculation Response~~POSITION CALCULATION RESPONSE

Table 8

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	reject
Transaction ID	M		9.2.2.28		–	
UE Position Estimate	M		Geographical Area 9.2.2.6		YES	ignore
Criticality Diagnostics	O		9.2.2.4		YES	ignore

9.1.5 POSITION CALCULATION FAILURE

Table 9

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	reject
Transaction ID	M		9.2.2.28		–	
Cause	M		9.2.2.3		YES	ignore
Criticality Diagnostics	O		9.2.2.4		YES	ignore

9.1.6 ~~Information Exchange Initiation Request~~INFORMATION EXCHANGE INITIATION REQUEST

Table 10

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	reject
Transaction ID	M		9.2.2.28		–	
Information Exchange ID	M		9.2.2.19		YES	reject
~~Information Exchange Object Type~~	~~M~~		~~9.2.2.20~~		~~YES~~	~~reject~~
CHOICE *Information Exchange Object Type*	M				YES	reject
>Reference Position					–	
>>Reference Position Estimate/UE Initial Position	M		Geographical Area 9.2.2.6		–	
Information Type	M		9.2.2.22		YES	reject
Information Report Characteristics	M		9.2.2.21		YES	reject
GPS-UTRAN Time Relationship Uncertainty	C-GPS		9.2.2.18		YES	reject

Table 11

Condition	Explanation
GPS	The IE shall be present if the information requested in the *Information Type* IE contains GPS-related data

9.1.7 ~~Information Exchange Initiation Response~~INFORMATION EXCHANGE INITIATION RESPONSE

Table 12

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	reject
Transaction ID	M		9.2.2.28		–	
Information Exchange ID	M		9.2.2.19		YES	ignore
CHOICE *Information Exchange Object Type*	O				YES	ignore
>Reference Position					–	
>>Requested Data Value	M		9.2.2.26		–	
Criticality Diagnostics	O		9.2.2.4		YES	ignore

9.1.8 ~~Information Exchange Initiation Failure~~INFORMATION EXCHANGE INITIATION FAILURE

Table 13

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	reject
Transaction ID	M		9.2.2.28		~~–~~	
Information Exchange ID	M		9.2.2.19		YES	ignore
Cause	M		9.2.2.3		YES	ignore
Criticality Diagnostics	O		9.2.2.4		YES	ignore

9.1.9 ~~Information Report~~INFORMATION REPORT

Table 14

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	ignore
Transaction ID	M		9.2.2.28		–	
Information Exchange ID	M		9.2.2.19		YES	ignore
CHOICE *Information Exchange Object Type*	M				YES	ignore
>Reference Position					~~–~~	
~~>>Requested Data Value Information~~	~~M~~		~~9.2.2.27~~		~~–~~	
>>Requested Data Value Information	M		9.2.2.27		~~–~~	

9.1.10 ~~Information Exchange Termination Request~~INFORMATION EXCHANGE TERMINATION REQUEST

Table 15

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	ignore
Transaction ID	M		9.2.2.28		–	
Information Exchange ID	M		9.2.2.19		YES	ignore

9.1.11 ~~Information Exchange Failure Indication~~INFORMATION EXCHANGE FAILURE INDICATION

Table 16

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	ignore
Transaction ID	M		9.2.2.28		–	
Information Exchange ID	M		9.2.2.19		YES	ignore
Cause	M		9.2.2.3		YES	ignore

9.1.12 ~~Error Indication~~ERROR INDICATION

Table 17

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	ignore
Transaction ID	M		9.2.2.28		–	
Cause	O		9.2.2.3		YES	ignore
Criticality Diagnostics	O		9.2.2.4		YES	ignore

9.2 Information Element Functional Definitions and Contents

9.2.1 General

Clause 9.2 presents the PCAP IE definitions in tabular format. The corresponding ASN.1 definitions are presented in clause 9.3. In case there is contradiction between the tabular format in clause 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 bitstrings, if not otherwise specifically stated in the semantics description of the concerned IE or elsewhere, the following principle applies with regards to the ordering of bits:

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

9.2.2 Radio Network Layer Related IEs

9.2.2.1 Almanac and Satellite Health SIB

Table 18

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS Almanac and Satellite Health	M		9.2.2.9	
SatMask	M		BIT STRING~~it string~~ (1..32)	indicates the satellites that contain the pages being broadcast in this data set
LSB TOW	M		BIT~~it~~ STRING~~string~~ (8)	

9.2.2.2 Altitude and direction

Table 19

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

9.2.2.3 Cause

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

Table 20

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Cause Group*				
>Radio Network Layer				
>>Radio Network Layer Cause	M		ENUMERATED (invalid reference information, information temporarily not available, information provision not supported for the object, position calculation error: invalid GPS measured results, ...)	
>Transport Layer				
>>Transport Layer Cause	M		ENUMERATED (Transport Resource Unavailable, Unspecified, ...)	
>Protocol				
>>Protocol Cause	M		ENUMERATED (Transfer Syntax Error, Abstract Syntax Error (Reject), Abstract Syntax Error (Ignore and Notify), Message not Compatible with Receiver State, Semantic Error, Unspecified, Abstract Syntax Error (Falsely Constructed Message), ...)	
> Misc				
>>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. In general, "not supported" cause values indicate that the concerning capability is missing. On the other hand, "not available" cause values indicate that the concerning capability is present, but insufficient resources were available to perform the requested action.

Table 21

Radio Network Layer cause	Meaning
Invalid reference information	The reference information (GPS-UTRAN Time Relationship Uncertainty and/or Initial UE Position Estimate) provided by the RNC are invalid
Information temporarily not available	The information requested by RNC is temporarily not available
Information Provision not supported for the object	The SAS does not support provision of the requested information for the concerned object types
Position calculation error: invalid GPS measured results	The SAS cannot calculate position due to invalid GPS measured results

Table 22

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

Table 23

Protocol cause	Meaning
Abstract Syntax Error (Reject)	The received message included an abstract syntax error and the concerning criticality indicated "reject" (see clause 10.3)
Abstract Syntax Error (Ignore and Notify)	The received message included an abstract syntax error and the concerning criticality indicated "ignore and notify" (see clause 10.3)
Abstract syntax error (falsely constructed message)	The received message contained IEs or IE groups in wrong order or with too many occurrences (see clause 10.3)
Message not Compatible with Receiver State	The received message was not compatible with the receiver state (see clause 10.4)
Semantic Error	The received message included a semantic error (see clause 10.4)
Transfer Syntax Error	The received message included a transfer syntax error (see clause 10.2)
Unspecified	Sent when none of the above cause values applies but still the cause is Protocol related

Table 24

Miscellaneous cause	Meaning
Processing Overload	RNC/SAS processing overload
Hardware Failure	RNC/SAS hardware failure
O&M Intervention	Operation and Maintenance intervention related to RNC/SAS equipment
Unspecified	Sent when none of the above cause values applies and the cause is not related to any of the categories Radio Network Layer, Transport Network Layer or Protocol

9.2.2.4 Criticality Diagnostics

The *Criticality Diagnostics* IE is sent by the RNC or the SAS when parts of a received message have not been comprehended or are missing. It contains information about which IE was not comprehended or is missing.

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

Table 25

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Procedure Code	O		INTEGER (0..255)	
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 Criticality	O		ENUMERATED (reject, ignore, notify)	This Procedure Criticality is used for reporting the Criticality of the Triggering message (Procedure).
Transaction ID	O		~~Transaction ID~~9.2.2.28	
Information Element Criticality Diagnostics		*0..<maxnoof 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 never be used.
>IE Id	M		INTEGER (0..65535)	The IE Id of the not understood or missing IE as defined in the ASN.1 part of the specification.
>Repetition Number	O		INTEGER (0..255)	The *Repetition Number* IE gives - in case of a not understood IE: The number of occurrences of the reported IE up to and including the not understood occurrence - in case of a missing IE: The number of occurrences up to but not including the missing occurrence. Note: All the counted occurrences of the reported IE must have the same top-down hierarchical message structure of IEs with assigned criticality above them.
>Message Structure	O		9.2.2.23	The *Message Structure* IE describes the structure where the not understood or missing IE was detected. This IE is included if the not understood IE is not the top level of the message.
>Type of Error	M		ENUMERATED (not understood, missing, ...~~,...~~)	

Table 26

Range bound	Explanation
Maxnooferrors	Maximum number of IE errors allowed to be reported with a single message.

9.2.2.5 DGPS Corrections

This IE contains DGPS corrections, which may be employed to compensate for ranging errors due to atmospheric delay, orbital modelling, and satellite clock drift.

Table 27

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS TOW sec	M		INTE-GERnteger (0..604799)	In seconds GPS time-of-week when the DGPS corrections were calculated
Status/Health	M		ENUMER-ATEDnumerated (UDRE scale 1.0, UDRE scale 0.75, UDRE scale 0.5, UDRE scale 0.3, UDRE scale 0.2, UDRE scale 0.1, no data, invalid data)	
DPGS information	C-Status/Health	*1..<maxSat>*		
>SatID	M		Enumerated (0...63)	
>IODE	M		Integer(0..25539)	
>UDRE	M		Enumerated(UDRE ≤ 1.0 m, 1.0m < UDRE ≤ 4.0m, 4.0m < UDRE ≤ 8.0m, 8.0m < UDRE)	The value in this field shall be multiplied by the UDRE Scale Factor in the IE Status/Health to determine the final UDRE estimate for the particular satellite.
>PRC	M		Integer (-2047..2047)	Scaling factor 0.32 Meters
>Range Rate Correction	M		Integer (-127..127)	Scaling factor 0.032 meters/sec

Table 28

Condition	Explanation
Status/Health	This IE shall be present if the *Status/Health* IE is not equal to "no data" or "invalid data"

Table 29

Range bound	Explanation
MaxSat	Maximum number of satellites for which data is included in this IE.

9.2.2.6 Geographical Area

Geographical Area IE is used to identify an area using geographical coordinates. The reference system is the same as the one used in [11].

Table 30

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Geographical Area*				
>*Point*				Ellipsoid point
>>Geographical Coordinates	M		9.2.2.7	
>*Point With Uncertainty*				Ellipsoid point with uncertainty circle
>>Geographical Coordinates	M		9.2.2.7	
>>Uncertainty Code	M		INTEGER (0..127)	The uncertainty "r" is derived from the "uncertainty code" k by $r = 10x(1.1^k-1)$
>*Polygon*				List of Ellipsoid points
>>Polygon		*1..<maxnoofPoints>*		
>>>Geographical Coordinates	M		9.2.2.7	
>*Ellipsoid point with uncertainty Ellipse*				
>>Geographical Coordinates	M		9.2.2.7	
>>Uncertainty Ellipse	M		9.2.2.30	
>>Confidence	M		INTEGER (0..100)	
>*Ellipsoid point with altitude*				
>>Geographical Coordinates	M		9.2.2.7	
>>Altitude and direction	M		9.2.2.2	
>*Ellipsoid point with altitude and uncertainty Ellipsoid*				
>>Geographical Coordinates	M		9.2.2.7	
>>Altitude and direction	M		9.2.2.2	
>>Uncertainty Ellipse	M		9.2.2.30	
>>Uncertainty Altitude	M		INTEGER (0..127)	
>>Confidence	M		INTEGER (0..100)	
>*Ellipsoid Arc*				
>>Geographical Coordinates	M		9.2.2.7	
>>Inner radius	M		INTEGER ($0..2^{16}-1$)	The relation between the value (N) and the radius (r) in meters it describes is $5N \leq r < 5(N+1)$, except for $N=2^{16}-1$ for which the range is extended to include all grater values of (r).
>>Uncertainty radius	M		INTEGER (0..127)	The uncertainty "r" is derived from the "uncertainty code" k by $r = 10x(1.1^k-1)$
>>Offset angle	M		INTEGER (0..179)	The relation between the value (N) and the angle (a) in degrees it describes is $2N \leq a < 2(N+1)$

IE/Group Name	Presence	Range	IE type and reference	Semantics description
>>Included angle	M		INTEGER(0~~,~~..179)	The relation between the value (N) and the angle (a) in degrees it describes is 2N≤ a <2(N+1)
>>Confidence	M		INTEGER(0~~,~~..100~~27~~)	

Table 31

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

9.2.2.7 Geographical Coordinates

This IE contains the geographical coordinates.

Table 32

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≤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≤2^{24} X /360 < N+1 X being the longitude in degree (-180°..+180°)

9.2.2.8 GPS Acquisition Assistance

This IE contains parameters that enable fast acquisition of the GPS signals in UE-assisted GPS positioning.

Table 33

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS TOW msec	M		Integer NTEGER (0..6.048*10^8 -1)	GPS Time of Week in millisec-onds (rounded down to the nearest millisecond unit).
Satellite information		*1..<maxSat>*		
>SatID	M		Integer NTE-GER(0..63)	
>Doppler (0th order term)	M		Integer IN-TEGER (-2048..2047)	Scaling factor 2.5Hz
>**Extra Doppler**		*0..1*		
>>Doppler (1st order term)	M		Integer IN-TEGER (-42..21)	Scaling factor 1/42
>>Doppler Uncertainty	M		Enumerat-ed NUMER-ATED (12.5,25,50, 100,200,....)	In Hz
>Code Phase	M		Integer IN-TEGER (0..1022)	In Chips, specifies the centre of the search window
>Integer Code Phase	M		INTE-GERnteger (0..19)	Number of 1023 chip seg-ments
>GPS Bit number	M		INTE-GERnteger (0..3)	Specifies GPS bit number (20 1023 chip segments)
>Code Phase Search Window	M		ENUMER-ATEDInteger (1023,1,2,3, 4,6,8,12,16,2 4,32,48,64,9 6,128,192)	Specifies the width of the search window.
>**Azimuth and Elevation**		*0..1*		
>>Azimuth	M		INTE-GERnteger (0..31)	Scaling factor 11.25 Degrees
>>Elevation	M		INTE-GERnteger (0..7)	Scaling factor 11.25 Degrees

Table 34

Range bound	Explanation
MaxSat	Maximum number of satellites for which data is included in this IE.

9.2.2.9 GPS Almanac and Satellite Health

This IE contains a reduced-precision subset of the clock and ephemeris parameters.

Table 35

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
WN_a	M		BIT~~it~~ STRING ~~string~~(8)	
Satellite information		*1..<maxSat Almanac>*		
>DataID	M		BIT STRING~~it string~~ (2)	See [10]
>SatID	M		INTEGER~~E numerated~~ (0..63)	Satellite ID
>e	M		BIT~~it~~ STRING~~strin g~~ (16)	Eccentricity [10]
>t_{oa}	M		BIT~~it string~~STRIN G (8)	Reference Time Ephemeris [10]
>δI	M		BIT~~it string~~STRIN G (16)	
>OMEGADOT	M		BIT~~it string~~STRIN G (16)	Longitude of Ascending Node of Orbit Plane at Weekly Ep-och (semi-circles/sec) [10]
>SV Health	M		BIT~~it string~~STRIN G (8)	
>$A^{1/2}$	M		BIT~~it string~~STRIN G (24)	Semi-Major Axis (meters)$^{1/2}$ [10]
>$OMEGA_0$	M		BIT~~it string~~STRIN G (24)	Longitude of Ascending Node of Orbit Plane at Weekly Ep-och (semi-circles) [10]
>M_0	M		BIT~~it string~~STRIN G (24)	Mean Anomaly at Reference Time (semi-circles) [10]
>ω	M		BIT~~it string~~STRIN G (24)	Argument of Perigee (semi-circles) [10]
>af_0	M		BIT~~it string~~STRIN G (11)	apparent clock correction [10]
>af_1	M		BIT~~it string~~STRIN G (11)	apparent clock correction [10]
SV Global Health	O		BIT~~it string~~STRIN G (364)	This enables GPS time recov-ery and possibly extended GPS correlation intervals

Table 36

Range bound	Explanation
MaxSatAlmanac	Maximum number of satellites for which data is included in this IE.

9.2.2.10 GPS Clock and Ephemeris Parameters

The IE contains the GPS clock information and GPS Ephemeris.

Table 37

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
C/A or P on L2	M		~~Bit string~~BIT STRING (2)	Code(s) on L2 Channel [10]
URA Index	M		~~Bit string~~BIT STRING (4)	User Range Accuracy [10]
SV Health	M		~~Bit string~~BIT STRING (6)	[10]
IODC	M		~~Bit string~~BIT STRING (10)	Issue of Data, Clock [10]
L2 P Data Flag	M		~~Bit string~~BIT STRING (1)	[10]
SF 1 Reserved	M		~~Bit string~~BIT STRING (87)	[10]
T_{GD}	M		~~Bit string~~BIT STRING (8)	Estimated group delay differential [10]
t_{oc}	M		~~Bit string~~BIT STRING (16)	apparent clock correction [10]
af_2	M		~~Bit string~~BIT STRING (8)	apparent clock correction [10]
af_1	M		BIT~~it string~~STRING (16)	apparent clock correction [10]
af_0	M		B~~it string~~IT STRING (22)	apparent clock correction [10]
C_{rs}	M		B~~it string~~IT STRING(16)	Amplitude of the Sine Harmonic Correction Term to the Orbit Radius (meters) [10]
Δn	M		B~~it string~~IT STRING (16)	Mean Motion Difference From Computed Value (semi-circles/sec) [10]
M_0	M		B~~it string~~IT STRING (32)	Mean Anomaly at Reference Time (semi-circles) [10]
C_{uc}	M		B~~it string~~IT STRING (16)	Amplitude of the Cosine Harmonic Correction Term To The Argument Of Latitude (radians) [10]
E	M		B~~it string~~IT STRING (32)	C
C_{us}	M		B~~it string~~IT STRING (16)	Amplitude of the Sine Harmonic Correction Term To The Argument Of Latitude (radians) [10]
$(A)^{1/2}$	M		B~~it string~~IT STRING (32)	Semi-Major Axis (meters)$^{1/2}$ [10]
t_{oe}	M		B~~it string~~IT STRING (16)	Reference Time Ephemeris [10]
Fit Interval Flag	M		B~~it string~~IT STRING (1)	[10]
AODO	M		B~~it string~~IT STRING (5)	Age Of Data Offset [10]
C_{ic}	M		B~~it string~~IT STRING (16)	Amplitude of the Cosine Harmonic Correction Term To The Angle Of Inclination (radians) [10]
$OMEGA_0$	M		B~~it string~~IT STRING (32)	Longitude of Ascending Node of Orbit Plane at Weekly Epoch (semi-circles) [10]
C_{is}	M		B~~it string~~IT STRING (16)	Amplitude of the Sine Harmonic Correction Term To The Angle Of Inclination (radians) [10]
i_0	M		B~~it string~~IT STRING (32)	Inclination Angle at Reference Time (semi-circles) [10]
C_{rc}	M		B~~it string~~IT STRING (16)	Amplitude of the Cosine Harmonic Correction Term to the Orbit Radius (meters) [10]

ω	M		Bit stringIT STRING (32)	Argument of Perigee (semi-circles) [10]
OMEGAdot	M		Bit stringIT STRING (24)	Longitude of Ascending Node of Orbit Plane at Weekly Epoch (semi-circles/sec) [10]
Idot	M		Bit stringIT STRING (14)	Rate of Inclination Angle (semi-circles/sec) [10]

9.2.2.11 GPS Ionospheric Model

The IE contains fields needed to model the propagation delays of the GPS signals through the ionosphere.

Table 38

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
α_0	M		Bit stringIT STRING (8)	note 1
α_1	M		Bit stringIT STRING (8)	note 1
α_2	M		Bit stringIT STRING (8)	note 1
α_3	M		Bit stringIT STRING (8)	note 1
β_0	M		Bit stringIT STRING (8)	note 2
β_1	M		Bit stringIT STRING (8)	note 2
β_2	M		Bit stringIT STRING (8)	note 2
β_3	M		Bit stringIT STRING (8)	note 2
NOTE 1: The parameters αn are the coefficients of a cubic equation representing the amplitude of the vertical delay [10]. NOTE 2: The parameters βn are the coefficients of a cubic equation representing the period of the ionospheric model [10].				

NOTE 1: The parameters α_n are the coefficients of a cubic equation representing the amplitude of the vertical delay [10].
NOTE 2: The parameters β_n are the coefficients of a cubic equation representing the period of the ionospheric model [10].

9.2.2.12 GPS Measured Results

The purpose of this information element is to provide reported GPS measurement information from the SRNC to the SAS.

Table 39

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS TOW msec	M		~~Inte-ger~~NTEGER (0..6.048*10^8 -1)	GPS Time of Week in milliseconds (rounded down to the nearest millisecond unit). This time is the GPS TOW measured by the UE. GPS Time of Week in microseconds = 1000 * GPS TOW msec + GPS TOW rem usec
~~GPS TOW rem usec~~	~~O~~		~~Integer(0..999)~~	~~GPS Time of Week in microseconds MOD 1000.~~
Measurement Parameters		*1..<maxSat>*		
>Satellite ID	M		INTEGER~~E-numerated~~ (0..63)	
>C/N_0	M		~~Inte-ger~~NTEGER (0..63)	The estimate of the carrier-to-noise ratio of the received signal from the particular satellite used in the measurement. It is given in units of dB-Hz (Typical levels will be in the range of 20 – 50 dB-Hz).
>Doppler	M		~~Inte-ger~~NTEGER (-32768..-32768)	Hz, scale factor 0.2.
>Whole GPS Chips	M		~~Inte-ger~~NTEGER (0..1022)	Unit in GPS chips
>Fractional GPS Chips	M		~~Inte-ger~~NTEGER (0..(2^{10}-1))	Scale factor 2^{-10}
>Multipath Indicator	M		ENUMERATED~~nu-merated~~ (NM, low, medium, high)	See note 1
>Pseudorange RMS Error	M		INTEGER~~E-numerated~~ (~~range index~~ 0..~~range index~~ 63)	See note 2
~~NOTE 1: Table 41 gives the mapping of the multipath indicator field.~~ ~~NOTE 2: Table 42 gives the bitmapping of the Pseudorange RMS Error field.~~				

NOTE 1: Table 41 gives the mapping of the multipath indicator field.
NOTE 2: Table 42 gives the bitmapping of the Pseudorange RMS Error field.

Table 40

Range bound	Explanation
MaxSat	Maximum number of satellites for which data is included in this IE.

Table 41

Value	Multipath Indication
NM	Not measured
Low	MP error < 5m
Medium	5m < MP error < 43m
High	MP error > 43m

Table 42

Value~~Range In~~	Mantissa	Exponent	Floating-Point value, x_i	Pseudorange value, P
0	000	000	0.5	P < 0.5
1	001	000	0.5625	0.5 <= P < 0.5625
i	X	Y	0.5 * (1 + x/8) * 2y	xi-1 <= P < xi
62	110	111	112	104 <= P < 112
63	111	111	--	112 <= P

9.2.2.13 GPS Navigation Model

This IE contain information required to manage the transfer of precise navigation data to the GPS-capable UE.

Table 43

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Satellite information		*1..<maxSat>*		
>SatID	M		INTEGER-~~numerated~~ (0..63)	Satellite ID
>Satellite Status	M		ENUMER-ATED~~numerated~~ (NS_NN, ES_SN, ES_NN, REVD)	See note
>GPS Clock and Ephemeris parameters	C-*Satellite status*		9.2.2.10	
~~NOTE: The UE shall interpret enumerated symbols as follows.~~				

NOTE: The UE shall interpret enumerated symbols as follows.

Table 44

Value	Indication
NS_NN	New satellite, new Navigation Model
ES_SN	Existing satellite, same Navigation Model
ES_NN	Existing satellite, new Navigation Model
REVD	Reserved

Table 45

Condition	Explanation
Satellite status	The IE shall be present if the *Satellite Status* IE is not set to ES_SN

Table 46

Range bound	Explanation
MaxSat	Maximum number of satellites for which data is included in this IE.

9.2.2.14 GPS Real Time Integrity

Table 47

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Bad Satellites Presence*	~~M~~			
>Bad Satellites				
>>**Satellite information**		*1..<maxNoSat>*		
>>>BadSatID	M		INTEGER-~~numerated~~ (0..63)	Satellite ID
>No Bad Satellites			NULL	

Table 48

Range bound	Explanation
MaxNoSat	Maximum number of satellites for which data is included in this IE.

9.2.2.15 GPS Reference Time

Table 49

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS Week	M		Inte-gerNTEGER (0..1023)	
GPS TOW msec	M		Inte-gerNTEGER ($0..6.048*10^8-1$)	GPS Time of Week in milliseconds (rounded down to the nearest millisecond unit).
~~GPS TOW rem usec~~	~~O~~		~~Inte-ger(0..999)~~	~~GPS Time of Week in micro-seconds MOD 1000. GPS Time of Week in microseconds = 1000 * GPS TOW msec + GPS TOW rem usec~~
GPS TOW Assist		*0.. <max-Sat>*		
>SatID	M		INTEGER-numerated (0..63)	
>TLM Message	M		Bit stringIT STRING (14)	
>Anti-Spoof	M		BOOLEAN ~~Enumerated (present, not present)~~	
>Alert	M		BOO-LEAN~~Enu-merated (present, not present)~~	
>TLM Reserved	M		Bit stringIT STRING (2)	

Table 50

Range bound	Explanation
MaxSat	Maximum number of satellites for which data is included in this IE.

9.2.2.16 GPS Transmission TOW

Table 51

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS Transmission TOW			Inte-gerNTEGER (0..604799)	The GPS time-of-week in seconds

9.2.2.17 GPS UTC Model

The UTC Model field contains a set of parameters needed to relate GPS time to Universal Time Coordinate (UTC).

Table 52

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
A_1	M		Bit stringIT STRING (24)	sec/sec [10]
A_0	M		Bit stringIT STRING (32)	seconds [10]
t_{ot}	M		Bit stringIT STRING (8)	seconds [10]
Δt_{LS}	M		Bit stringIT STRING (8)	seconds [10]
WN_t	M		Bit stringIT STRING (8)	weeks [10]
WN_{LSF}	M		Bit stringIT STRING (8)	weeks [10]
DN	M		Bit stringIT STRING (8)	days [10]
Δt_{LSF}	M		Bit stringIT STRING (8)	seconds [10]

9.2.2.18 GPS-UTRAN Time Relationship Uncertainty

This IE contains the uncertainty of the GPS and UTRAN time relationship.

Table 53

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS-UTRAN Time Relationship Uncertainty			ENUMERATED (50ns, 500ns, 1us, 10us, 1ms, 10ms, 100ms, unreliable)	RNC estimate of uncertainty in GPS-UTRAN time relationship

9.2.2.19 Information Exchange ID

The Information Exchange ID uniquely identifies any requested information per RNC-SAS pair.

Table 54

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Information Exchange ID			Integer NTEGER (0 .. 2^20-1)	

9.2.2.20 Information Exchange Object Type

Void.

9.2.2.21 Information Report Characteristics

The information report characteristics define how the reporting shall be performed.

Table 56

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Information Report Characteristics Type	M		ENUMERATED(On Demand, Periodic, On Modification,...)	
CHOICE *Information Report Periodicity*	C-Periodic			Indicates the frequency with which the SAS shall send broadcast data reports.
>Min				
>>Minutes	M		INTEGER (1..60, ...)	
>Hour				
>>Hours	M		INTEGER (1..24, ...)	

~~IE/Group Name~~	~~Presence~~	~~Range~~	~~IE Type and Reference~~	~~Semantics Description~~
~~Information Report Characteristics Type~~	~~M~~		~~ENUMERATED(On Demand, Periodic, On Modification,...)~~	
~~Information Report Periodicity~~	~~C-Periodic~~		~~ENUMERATED (1min…1hr, …) step 1min, (1hr…24hr, …) step 1hr, …~~	~~Indicates the frequency with which the SAS shall send broadcast data reports.~~

Table 57

Condition	Explanation
Periodic	This IE shall be present if the *Information Report Characteristics Type* IE indicates 'periodic'

9.2.2.22 Information Type

The Information Type indicates which kind of information the SAS shall provide.

Table 58

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Information Type*	~~M~~			
>Implicit				
>>Method Type	M		9.2.2.25	
>Explicit				
>>**Explicit Information**		*1..<maxnoofExpInfo>*		
>>>CHOICE *Explicit Information Item*	M			
>>>>*Almanac and Satellite Health*			NULL	
>>>>*UTC Model*				
>>>>>Transmission TOW Indicator	M		9.2.2.29	
>>>>*Ionospheric Model*				
>>>>>Transmission TOW Indicator	M		9.2.2.29	
>>>>*Navigation Model*				
>>>>>Transmission TOW Indicator	M		9.2.2.29	
>>>>>**Nav. Model Additional Data**		*0..1*		
>>>>>>GPS Week	M		I~~nteger~~NTE-GER (0..1023)	
>>>>>>GPS_Toe	M		I~~nteger~~NTE-GER-(0..167)	GPS time of ephemeris in hours of the latest ephemeris set
>>>>>>T-Toe limit	M		I~~nteger~~NTE-GER (0..10)	ephemeris age tolerance in hours
>>>>>>**Satellite related data**		*0..<maxSat>*		
>>>>>>>SatID	M		I~~nteger~~NTE-GER (0..63)	
>>>>>>>IODE	M		I~~nteger~~NTE-GER (0..255~~39~~)	Issue of Data Ephemeris for SatID
>>>>*DGPS Corrections*			NULL	
>>>>*Reference Time*			NULL	
>>>>*Acquisition Assistance*			NULL	
>>>>*Real Time Integrity*			NULL	
>>>>*Almanac and Satellite Health SIB*				
>>>>>Transmission TOW Indicator	M		9.2.2.29	

Table 59

Range Bound	Explanation
maxnoofExpInfo	Maximum number of Explicit Information supported in one Information Exchange.
MaxSat	Maximum number of satellites for which data is included in this IE.

9.2.2.23 Message Structure

The *Message Structure* IE gives information for each level with assigned criticality in an hierachical message structure from top level down to the lowest level above the reported level for the occured error (reported in the *Information Element Criticality Diagnostics* IE).

Table 60

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message structure		*1..<maxnoofIElevels>*		The first repetition of the *Message Structure* IE corresponds to the top level of the message. The last repetition of the *Message Structure* IE corresponds to the level above the reported level for the occured error of the message.	GLOBAL	ignore
>IE ID	M		INTEGER (0..65535)	The IE ID of this level's IE containing the not understood or missing IE.	-	
>Repetition Number	O		INTEGER (1..256)	The *Repetition Number* IE gives, if applicable, the number of occurrences of this level's reported IE up to and including the occurrence containing the not understood or missing IE. Note: All the counted occurrences of the reported IE must have the same top-down hierachical message structure of IEs with assigned criticality above them.	-	

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Message structure		*1..<maxnooflevels>*		The first repetition of the *Message Structure* IE corresponds to the top level of the message. The last repetition of the *Message Structure* IE corresponds to the level above the reported level for the occurred error of the message.
>IE ID	M		INTEGER (0..65535)	The IE ID of this level's IE containing the not understood or missing IE.
>Repetition Number	O		INTEGER (1..256)	The *Repetition Number* IE gives, if applicable, the number of occurrences of this level's reported IE up to and including the occurrence containing the not understood or missing IE. Note: All the counted occurrences of the reported IE must have the same top-down hierarchical message structure of IEs with assigned criticality above them.

Table 61

Range bound	Explanation
maxnooflevels	Maximum no. of message levels to report. The value for maxnooflevels is 256.

9.2.2.24 Message Type

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

Table 62

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Procedure Code	M		~~ENUMERATED (Position Calculation, Information Exchange Initiation, Information Reporting, Information Exchange Termination, Information Exchange Failure, Error Indication, ...)~~INTEGER(0..255)	"1" = Position Calculation "2" = Information Exchange Initiation "3" = Information Reporting "4" = Information Exchange Termination, "5" = Information Exchange Failure "6" = Error Indication,
Type of Message	M		ENUMERATED (Initiating Message, Successful Outcome, Unsuccessful Outcome, Outcome)	

9.2.2.25 Method Type

Table 63

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Method Type			ENUMERATED (UE_Assisted, UE_Based)	

9.2.2.26 Requested Data Value

The Requested Data Value contains the relevant data concerning the ongoing information exchange.

Table 64

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS Almanac and Satellite Health	O		9.2.2.9	
GPS UTC Model	O		9.2.2.17	
GPS Ionospheric Model	O		9.2.2.11	
GPS Navigation Model	O		9.2.2.13	
DGPS Corrections	O		9.2.2.5	
GPS Reference Time	O		9.2.2.15	
GPS Acquisition Assistance	O		9.2.2.8	
GPS Real Time Integrity	O		9.2.2.14	
Almanac and Satellite Health SIB	O		9.2.2.1	
GPS Transmission TOW	O		9.2.2.16	

9.2.2.27 Requested Data Value Information

The *Requested Data Value Information* IE provides information on whether or not the Requested Data Value is available in the message and also the Requested Data Value itself if available.

In case of "Periodic" and "On Modification" reporting, "Information Not Available" shall be used when at least one part of the requested information was not available at the moment of initiating the Information Reporting procedure.

Table 65

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
CHOICE *Information Availability Indicator*	M				–	
>***Information Available***					–	
>>Requested Data Value	M		9.2.2.26		–	
>*Information not Available*			NULL			

9.2.2.28 Transaction ID

The Transaction ID is used to associate all the messages belonging to the same procedure. Messages belonging to the same procedure shall use the same Transaction ID.

The Transaction ID is determined by the initiating peer of a procedure.

The Transaction ID shall uniquely identify a procedure among all ongoing parallel procedures using the same procedure code, and initiated by the same protocol peer.

Table 66

~~IE/Group Name~~	~~Presence~~	~~Range~~	~~IE Type and Reference~~	~~Semantics Description~~
~~Transaction ID~~			~~CHOICE INTEGER (0..127) or INTEGER (0..32767)~~	~~The Transaction ID shall be interpreted for its integer value, not for the type of encoding ("short" or "long").~~

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Transaction ID Length*				The Transaction ID shall be interpreted for its integer value, not for the type of encoding ("short" or "long").
>Short				
>>Transaction ID Value	M		INTEGER (0..127)	
>Long				
>>Transaction ID Value	M		INTEGER (0..32767)	

9.2.2.29 Transmission TOW Indicator

Table 67

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Transmission TOW Indicator			ENUMERATED (requested, not requested)	

9.2.2.30 Uncertainty Ellipse

This IE contains the uncertainty ellipse of a geographical area.

Table 68

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Uncertainty semi-major	M		INTEGER (0..127)	The uncertainty "r" is derived from the "uncertainty code" k by $r = 10x(1.1^k-1)$
Uncertainty semi-minor	M		INTEGER (0..127)	The uncertainty "r" is derived from the "uncertainty code" k by $r = 10x(1.1^k-1)$
Orientation of major axis	M		INTEGER (0..89)	The relation between the IE value (N) and the angle (a) in degrees it describes is $2N \leq a < 2(N+1)$

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

9.3.0 General

PCAP ASN.1 definition conforms with [7], [8], and [9].

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

Clause 9.3 presents the Abstract Syntax of PCAP protocol with ASN.1. In case there is contradiction between the ASN.1 definition in this clause and the tabular format in clauses 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
--
```

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

PCAP-PDU-Descriptions  {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
umts-Access (20) modules (3) pcap(4) version1 (1) pcap-PDU-Descriptions (0)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    ProcedureCode,
    TransactionID
FROM PCAP-CommonDataTypes

    PositionCalculationRequest,
    PositionCalculationResponse,
    PositionCalculationFailure,
    InformationExchangeInitiationRequest,
    InformationExchangeInitiationResponse,
    InformationExchangeInitiationFailure,
    InformationReport,
    InformationExchangeTerminationRequest,
    InformationExchangeFailureIndication,
    ErrorIndication,
    PrivateMessage
FROM PCAP-PDU-Contents

    id-PositionCalculation,
    id-InformationExchangeInitiation,
    id-InformationReporting,
    id-InformationExchangeTermination,
    id-InformationExchangeFailure,
    id-ErrorIndication,
    id-privateMessage
FROM PCAP-Constants;

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

PCAP-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 definitions
--
-- **************************************************************

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


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

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

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

Outcome ::= SEQUENCE {
    procedureCode   PCAP-ELEMENTARY-PROCEDURE.&procedureCode    ({PCAP-ELEMENTARY-PROCEDURES}),
```

```
    criticality     PCAP-ELEMENTARY-PROCEDURE.&criticality   ____    ({PCAP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    transactionID   TransactionID,
    value           PCAP-ELEMENTARY-PROCEDURE.&Outcome       ____    ({PCAP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

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

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

PCAP-ELEMENTARY-PROCEDURES-CLASS-1 PCAP-ELEMENTARY-PROCEDURE ::= {
    positionCalculation         ____    |
    informationExchangeInitiation,
    ...
}


PCAP-ELEMENTARY-PROCEDURES-CLASS-2 PCAP-ELEMENTARY-PROCEDURE ::= {
    informationReporting            |
    informationExchangeTermination  |
    informationExchangeFailure      |
    errorIndication         ____    |
    privateMessage,
    ...
}


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

positionCalculation PCAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PositionCalculationRequest
    SUCCESSFUL OUTCOME      PositionCalculationResponse
    UNSUCCESSFUL OUTCOME    PositionCalculationFailure
    PROCEDURE CODE          id-PositionCalculation
    CRITICALITY             reject~~ignore~~
}


informationExchangeInitiation PCAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      InformationExchangeInitiationRequest
    SUCCESSFUL OUTCOME      InformationExchangeInitiationResponse
    UNSUCCESSFUL OUTCOME    InformationExchangeInitiationFailure
```

```
    PROCEDURE CODE          id-InformationExchangeInitiation
    CRITICALITY             reject
}


informationReporting PCAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      InformationReport
    PROCEDURE CODE          id-InformationReporting
    CRITICALITY             ignore
}


informationExchangeTermination PCAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      InformationExchangeTerminationRequest
    PROCEDURE CODE          id-InformationExchangeTermination
    CRITICALITY             ignore
}


informationExchangeFailure PCAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      InformationExchangeFailureIndication
    PROCEDURE CODE          id-InformationExchangeFailure
    CRITICALITY             ignore
}


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

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


END
```

9.3.3 PDU Definitions

```
-- **************************************************************
--
-- PDU definitions for PCAP.
--
-- **************************************************************

PCAP-PDU-Contents {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
```

```
umts-Access (20) modules (3) pcap(4) version1 (1) pcap-PDU-Contents (1) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Cause,
    CriticalityDiagnostics,
    GPS-UTRAN-TRU,
    InformationExchangeID,
    InformationReportCharacteristics,
    InformationType,
    MeasuredResultsList,
    RequestedDataValue,
    RequestedDataValueInformation,
    UE-PositionEstimate
FROM PCAP-IEs

    TransactionID
FROM PCAP-CommonDataTypes

    PrivateIE-Container{},
    ProtocolExtensionContainer{},
    ProtocolIE-ContainerList{},
    ProtocolIE-Container{},
    PrivateIE-Container{},
    PCAP-PRIVATE-IES,
    PCAP-PROTOCOL-EXTENSION,
    PCAP-PROTOCOL-IES
FROM PCAP-Containers

    id-Cause,
    id-CriticalityDiagnostics,
    id-GPS-UTRAN-TRU,
    id-InformationExchangeID,
    id-InformationExchangeObjectType-InfEx-Rprt,
    id-InformationExchangeObjectType-InfEx-Rqst,
    id-InformationExchangeObjectType-InfEx-Rsp,
    id-InformationReportCharacteristics,
    id-InformationType,
    id-MeasuredResultsList,
    id-RequestedDataValue,
    id-RequestedDataValueInformation,
    id-TransactionID,
    id-UE-PositionEstimate
FROM PCAP-Constants;
```

```
-- **************************************************************
--
-- POSITION CALCULATION REQUEST
--
-- **************************************************************

PositionCalculationRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {PositionCalculationRequestIEs} },
    protocolExtensions  ProtocolExtensionContainer { {PositionCalculationRequestExtensions} }   OPTIONAL,
    ...
}

PositionCalculationRequestIEs PCAP-PROTOCOL-IES ::= {
    { ID id-UE-PositionEstimate     CRITICALITY reject  TYPE UE-PositionEstimate    PRESENCE mandatory  } |
    { ID id-MeasuredResultsList     CRITICALITY reject  TYPE MeasuredResultsList    PRESENCE mandatory  },
    ...
}

PositionCalculationRequestExtensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- POSITION CALCULATION RESPONSE
--
-- **************************************************************

PositionCalculationResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {PositionCalculationResponseIEs} },
    protocolExtensions  ProtocolExtensionContainer { {PositionCalculationResponseExtensions} }  OPTIONAL,
    ...
}

PositionCalculationResponseIEs PCAP-PROTOCOL-IES ::= {
    { ID id-UE-PositionEstimate         CRITICALITY ignore  TYPE UE-PositionEstimate        PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional },
    ...
}

PositionCalculationResponseExtensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- POSITION CALCULATION FAILURE
--
-- **************************************************************

PositionCalculationFailure ::= SEQUENCE {
```

```
    protocolIEs         ProtocolIE-Container       { {PositionCalculationFailureIEs} },
    protocolExtensions  ProtocolExtensionContainer { {PositionCalculationFailureExtensions} }   OPTIONAL,
    ...
}

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

PositionCalculationFailureExtensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- INFORMATION EXCHANGE INITIATION REQUEST
--
-- **************************************************************

InformationExchangeInitiationRequest ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container    {{InformationExchangeInitiationRequest-IEs}},
    protocolExtensions      ProtocolExtensionContainer  {{InformationExchangeInitiationRequest-Extensions}}     OPTIONAL,
    ...
}

InformationExchangeInitiationRequest-IEs PCAP-PROTOCOL-IES ::= {
    { ID id-InformationExchangeID                       CRITICALITY reject  TYPE InformationExchangeID                  PRESENCE mandatory }|
    { ID id-InformationExchangeObjectType-InfEx-Rqst    CRITICALITY reject  TYPE InformationExchangeObjectType-InfEx-Rqst   PRESENCE mandatory }|
    -- This IE represents both the Information Exchange Object Type IE and the choice based on the Information Exchange Object Type
    -- as described in the tabular message format in clause 9.1.
    { ID id-InformationType                             CRITICALITY reject  TYPE InformationType                        PRESENCE mandatory }|
    { ID id-InformationReportCharacteristics            CRITICALITY reject  TYPE InformationReportCharacteristics       PRESENCE mandatory }|
    { ID id-GPS-UTRAN-TRU                               CRITICALITY reject  TYPE GPS-UTRAN-TRU                          PRESENCE conditional },
    -- This IE shall be present if the information requested in the Information Type IE contains GPS-related data
    ...
}

InformationExchangeInitiationRequest-Extensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

InformationExchangeObjectType-InfEx-Rqst ::= CHOICE {
    referencePosition               RefPosition-InfEx-Rqst,
    ...
}

RefPosition-InfEx-Rqst ::= SEQUENCE {
    referencePositionEstimate       UE-PositionEstimate,
    iE-Extensions                   ProtocolExtensionContainer  { { RefPositionItem-InfEx-Rqst-ExtIEs} }     OPTIONAL,
    ...
```

```
}

RefPositionItem-InfEx-Rqst-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}



-- **************************************************************
--
-- INFORMATION EXCHANGE INITIATION RESPONSE
--
-- **************************************************************

InformationExchangeInitiationResponse ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container    {{InformationExchangeInitiationResponse-IEs}},
    protocolExtensions      ProtocolExtensionContainer  {{InformationExchangeInitiationResponse-Extensions}}    OPTIONAL,
    ...
}

InformationExchangeInitiationResponse-IEs PCAP-PROTOCOL-IES ::= {
    { ID    id-InformationExchangeID                    CRITICALITY ignore  TYPE InformationExchangeID              PRESENCE mandatory }|
    { ID    id-InformationExchangeObjectType-InfEx-Rsp  CRITICALITY ignore  TYPE InformationExchangeObjectType-InfEx-Rsp    PRESENCE optional }|
    { ID    id-CriticalityDiagnostics                   CRITICALITY ignore  TYPE CriticalityDiagnostics             PRESENCE optional },
    ...
}

InformationExchangeInitiationResponse-Extensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

InformationExchangeObjectType-InfEx-Rsp ::= CHOICE {
    referencePosition               RefPosition-InfEx-Rsp,
    ...
}

RefPosition-InfEx-Rsp ::= SEQUENCE {
    requestedDataValue              RequestedDataValue,
    iE-Extensions                   ProtocolExtensionContainer  { { RefPositionItem-InfEx-Rsp-ExtIEs} }   OPTIONAL,
    ...
}

RefPositionItem-InfEx-Rsp-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- INFORMATION EXCHANGE INITIATION FAILURE
--
-- **************************************************************
```

```
InformationExchangeInitiationFailure ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container    {{InformationExchangeInitiationFailure-IEs}},
    protocolExtensions      ProtocolExtensionContainer  {{InformationExchangeInitiationFailure-Extensions}}     OPTIONAL,
    ...
}

InformationExchangeInitiationFailure-IEs PCAP-PROTOCOL-IES ::= {
    { ID    id-InformationExchangeID        CRITICALITY ignore  TYPE InformationExchangeID    PRESENCE mandatory }|
    { ID    id-Cause                        CRITICALITY ignore  TYPE Cause                   PRESENCE mandatory }|
    { ID    id-CriticalityDiagnostics       CRITICALITY ignore  TYPE CriticalityDiagnostics  PRESENCE optional },
    ...
}

InformationExchangeInitiationFailure-Extensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- INFORMATION REPORT
--
-- **************************************************************

InformationReport ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container        {{InformationReport-IEs}},
    protocolExtensions      ProtocolExtensionContainer  {{InformationReport-Extensions}}        OPTIONAL,
    ...
}

InformationReport-IEs PCAP-PROTOCOL-IES ::= {
    { ID    id-InformationExchangeID                        CRITICALITY ignore  TYPE InformationExchangeID                  PRESENCE mandatory }|
    { ID    id-InformationExchangeObjectType-InfEx-Rprt     CRITICALITY ignore  TYPE InformationExchangeObjectType-InfEx-Rprt  PRESENCE mandatory },
    ...
}

InformationReport-Extensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

InformationExchangeObjectType-InfEx-Rprt ::= CHOICE {
    referencePosition               RefPosition-InfEx-Rprt,
    ...
 }

RefPosition-InfEx-Rprt ::= SEQUENCE {
    requestedDataValueInformation   RequestedDataValueInformation,
    iE-Extensions                   ProtocolExtensionContainer  {{ RefPositionItem-InfEx-Rprt-ExtIEs }}    OPTIONAL,
    ...

 }

RefPositionItem-InfEx-Rprt-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}


-- **************************************************************
--
-- INFORMATION EXCHANGE TERMINATION REQUEST
--
-- **************************************************************

InformationExchangeTerminationRequest ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container        {{InformationExchangeTerminationRequest-IEs}},
    protocolExtensions      ProtocolExtensionContainer  {{InformationExchangeTerminationRequest-Extensions}} ——OPTIONAL,
    ...
}

InformationExchangeTerminationRequest-IEs PCAP-PROTOCOL-IES ::= {
    { ID    id-InformationExchangeID            CRITICALITY     ignore  TYPE InformationExchangeID        PRESENCE mandatory},
    ...
}

InformationExchangeTerminationRequest-Extensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- INFORMATION EXCHANGE FAILURE INDICATION
--
-- **************************************************************

InformationExchangeFailureIndication ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container        {{InformationExchangeFailureIndication-IEs}},
    protocolExtensions      ProtocolExtensionContainer  {{InformationExchangeFailureIndication-Extensions}}  ————OPTIONAL,
    ...
}

InformationExchangeFailureIndication-IEs PCAP-PROTOCOL-IES ::= {
    { ID    id-InformationExchangeID            CRITICALITY ignore          TYPE InformationExchangeID      PRESENCE mandatory   }|
    { ID    id-Cause                            CRITICALITY ignore          TYPE Cause                      PRESENCE mandatory   },
    ...
}

InformationExchangeFailureIndication-Extensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


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

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

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

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


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

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

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

END
```

9.3.4 Information Element Definitions

```
-- **************************************************************
--
-- Information Element Definitions
--
-- **************************************************************

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

DEFINITIONS AUTOMATIC TAGS ::=
```

```
BEGIN

IMPORTS
    maxNrOfErrors,
    maxSat,
    maxSatAlmanac,
    maxNrOfLevels,
    maxNrOfPoints,
    maxNrOfExpInfo,
    id-TypeOfError,
    id-MessageStructure
FROM PCAP-Constants

    Criticality,
    ProcedureCode,
    ProtocolIE-ID,
    TransactionID,
    TriggeringMessage
FROM PCAP-CommonDataTypes

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


-- **************************************************************
--
-- Almanac and Satellite Health SIB
--
-- **************************************************************

AlmanacAndSatelliteHealthSIB ::=    SEQUENCE {
    gpsAlmanacAndSatelliteHealth        GPS-AlmanacAndSatelliteHealth,
    satMask                             BIT STRING (SIZE (1..32)),
    lsbTOW                              BIT STRING (SIZE (8)),
    iE-Extensions                       ProtocolExtensionContainer { { AlmanacAndSatelliteHealthSIB-ExtIEs } }   OPTIONAL,
    ...
}

AlmanacAndSatelliteHealthSIB-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- Cause IE
--
-- **************************************************************

Cause ::= CHOICE {
    radioNetwork            CauseRadioNetwork,
```

```
    transport               CauseTransport,
    protocol                CauseProtocol,
    misc                    CauseMisc,
    ...
}
CauseRadioNetwork ::= ENUMERATED {
    invalid-reference-information,
    information-temporarily-not-available,
    information-provision-not-supported-for-the-object,
    position-calculation-error-invalid-GPS-measured-results,
    ...
}

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,
    ...
}


-- **************************************************************
--
-- CriticalityDiagnostics
--
-- **************************************************************

CriticalityDiagnostics ::= SEQUENCE {
    procedureCode           ProcedureCode                                   OPTIONAL,
    triggeringMessage       TriggeringMessage                               OPTIONAL,
    procedureCriticality    Criticality                                     OPTIONAL,
    transactionID           TransactionID                                   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,
        repetitionNumber        CriticalityDiagnosticsRepetitionNumber0          OPTIONAL,
        messageStructure        MessageStructure                                 OPTIONAL,
        typeOfError             TypeOfError,
        iE-Extensions           ProtocolExtensionContainer { {CriticalityDiagnostics-IE-List-ExtIEs} }  OPTIONAL,
        ...
    }

CriticalityDiagnostics-IE-List-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
{   ID id-MessageStructure      CRITICALITY ignore      EXTENSION MessageStructure      PRESENCE optional }|
{   ID id-TypeOfError           CRITICALITY ignore      EXTENSION TypeOfError           PRESENCE mandatory },
    ...
}

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

CriticalityDiagnosticsRepetitionNumber0 ::= INTEGER (0..255, ...)
RepetitionNumber1 ::= INTEGER (1..256, ...)


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

-- **************************************************************
--
-- DGPSCorrections
--
-- **************************************************************


DGPSCorrections ::=                 SEQUENCE {
    gps-TOW-sec                         INTEGER (0..604799),
    statusHealth                        DiffCorrectionStatus,
    dgps-CorrectionSatInfoList          DGPS-CorrectionSatInfoList                  OPTIONAL,
    -- not included if satelliteHealth is equal to noData or invalidData
    iE-Extensions                       ProtocolExtensionContainer { { DGPSCorrections-ExtIEs } }   OPTIONAL,
    ...
}

DGPSCorrections-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}


DiffCorrectionStatus ::=            ENUMERATED {
                                        udre-1-0, udre-0-75, udre-0-5, udre-0-3,
                                        udre-0-2, udre-0-1, noData, invalidData}

DGPS-CorrectionSatInfoList ::=      SEQUENCE (SIZE (1..maxSat)) OF
                                        DGPS-CorrectionSatInfo

DGPS-CorrectionSatInfo ::=          SEQUENCE {
    satID                               INTEGER (0..63),
    iode                                INTEGER (0..255),
    udre                                UDRE,
    prc                                 PRC,
    rrc                                 RRC,
    iE-Extensions                       ProtocolExtensionContainer { { DGPS-CorrectionSatInfo-ExtIEs } }     OPTIONAL,
    ...
}

DGPS-CorrectionSatInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

UDRE ::=                            ENUMERATED {
                                        lessThan1,
                                        between1-and-4,
                                        between4-and-8,
                                        over8}

PRC ::=                             INTEGER (-2047..2047)

RRC ::=                             INTEGER (-127..127)




-- **************************************************************
--
-- UE-PositionEstimate (i.e., Geographical Area)
--
-- **************************************************************

-- UE-PositionEstimate is based on Geographical Area Description in 23.032

UE-PositionEstimate ::= CHOICE {
    point                       GA-Point,
    pointWithUnCertainty        GA-PointWithUnCertainty,
    polygon                     GA-Polygon,
    pointWithUncertaintyEllipse GA-PointWithUnCertaintyEllipse,
```

```
    pointWithAltitude           GA-PointWithAltitude,
    pointWithAltitudeAndUncertaintyEllipsoid        GA-PointWithAltitudeAndUncertaintyEllipsoid,
    ellipsoidArc                GA-EllipsoidArc,
    ...
}

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

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

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

GA-EllipsoidArc ::= SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    innerRadius                 INTEGER (0..65535),
    uncertaintyRadius           INTEGER (0..127),
    offsetAngle                 INTEGER (0..179),
    includedAngle               INTEGER (0..179),
    confidence                  INTEGER (0..10027),
    iE-Extensions               ProtocolExtensionContainer { { GA-EllipsoidArc-ExtIEs} } OPTIONAL,
    ...
}

GA-EllipsoidArc-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-Point ::= SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    iE-Extensions               ProtocolExtensionContainer { {GA-Point-ExtIEs} } OPTIONAL,
    ...
}

GA-Point-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-PointWithAltitude ::= SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    altitudeAndDirection        GA-AltitudeAndDirection,
    iE-Extensions               ProtocolExtensionContainer { { GA-PointWithAltitude-ExtIEs} } OPTIONAL,
```

```
    ...
}

GA-PointWithAltitude-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-PointWithAltitudeAndUncertaintyEllipsoid ::= SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    altitudeAndDirection        GA-AltitudeAndDirection,
    uncertaintyEllipse          GA-UncertaintyEllipse,
    uncertaintyAltitude         INTEGER (0..127),
    confidence                  INTEGER (0..10027),
    iE-Extensions               ProtocolExtensionContainer { { GA-PointWithAltitudeAndUncertaintyEllipsoid-ExtIEs} } OPTIONAL,
    ...
}

GA-PointWithAltitudeAndUncertaintyEllipsoid-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-PointWithUnCertainty ::=SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    uncertaintyCode             INTEGER (0..127),
    iE-Extensions               ProtocolExtensionContainer { {GA-PointWithUnCertainty-ExtIEs} } OPTIONAL,
    ...uncertaintyCode          INTEGER (0..127)
}

GA-PointWithUnCertainty-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-PointWithUnCertaintyEllipse ::= SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    uncertaintyEllipse          GA-UncertaintyEllipse,
    confidence                  INTEGER (0..10027),
    iE-Extensions               ProtocolExtensionContainer { { GA-PointWithUnCertaintyEllipse-ExtIEs} } OPTIONAL,
    ...
}

GA-PointWithUnCertaintyEllipse-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-Polygon ::= SEQUENCE (SIZE (1..maxNrOfPoints)) OF
    SEQUENCE {
        geographicalCoordinates     GeographicalCoordinates,
        iE-Extensions               ProtocolExtensionContainer { {GA-Polygon-ExtIEs} } OPTIONAL,
        ...
    }

GA-Polygon-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}

GA-UncertaintyEllipse ::= SEQUENCE {
    uncertaintySemi-major       INTEGER (0..127),
    uncertaintySemi-minor       INTEGER (0..127),
    orientationOfMajorAxis      INTEGER (0..89),
    ...
}



-- **************************************************************
--
-- GPS-AcquisitionAssistance:
--
-- **************************************************************


GPS-AcquisitionAssistance ::=   SEQUENCE {
    gps-TOW-1msec                       INTEGER (0..604799999),
    satelliteInformationList            AcquisitionSatInfoList,
    iE-Extensions                       ProtocolExtensionContainer { { GPS-AcquisitionAssistance-ExtIEs } }    OPTIONAL,
    ...
}

GPS-AcquisitionAssistance-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

AcquisitionSatInfoList ::=          SEQUENCE (SIZE (1..maxSat)) OF
                                        AcquisitionSatInfo

AcquisitionSatInfo ::=              SEQUENCE {
    satID                               INTEGER (0..63),
    doppler0thOrder                     INTEGER (-2048..2047),
    extraDopplerInfo                    ExtraDopplerInfo                                    OPTIONAL,
    codePhase                           INTEGER (0..1022),
    integerCodePhase                    INTEGER (0..19),
    gps-BitNumber                       INTEGER (0..3),
    codePhaseSearchWindow               CodePhaseSearchWindow,
    azimuthAndElevation                 AzimuthAndElevation                                 OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { AcquisitionSatInfo-ExtIEs } }    OPTIONAL,
    ...
}

AcquisitionSatInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

ExtraDopplerInfo ::=                SEQUENCE {
    doppler1stOrder                     INTEGER (-42..21),
```

```
    dopplerUncertainty                  DopplerUncertainty,
    iE-Extensions                       ProtocolExtensionContainer { { ExtraDopplerInfo-ExtIEs } }   OPTIONAL,
    ...
}

ExtraDopplerInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

DopplerUncertainty ::=              ENUMERATED {
                                        hz12-5, hz25, hz50, hz100, hz200,... }

CodePhaseSearchWindow ::=           ENUMERATED {
                                        w1023, w1, w2, w3, w4, w6, w8,
                                        w12, w16, w24, w32, w48, w64,
                                        w96, w128, w192 }

AzimuthAndElevation ::=             SEQUENCE {
    azimuth                             INTEGER (0..31),
    elevation                           INTEGER (0..7),
    iE-Extensions                       ProtocolExtensionContainer { { AzimuthAndElevation-ExtIEs } }   OPTIONAL,
    ...
}

AzimuthAndElevation-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- GPS Almanac and Satellite Health
--
-- **************************************************************


GPS-AlmanacAndSatelliteHealth ::=   SEQUENCE {
    wn-a                                BIT STRING (SIZE (8)),
    almanacSatInfoList                  AlmanacSatInfoList,
    svGlobalHealth                      BIT STRING (SIZE (364)) OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { GPS-AlmanacAndSatelliteHealth-ExtIEs } }   OPTIONAL,
    ...
}

GPS-AlmanacAndSatelliteHealth-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
AlmanacSatInfoList ::=              SEQUENCE (SIZE (1..maxSatAlmanac)) OF
                                        AlmanacSatInfo

AlmanacSatInfo ::=                  SEQUENCE {
    dataID                              BIT STRING (SIZE (2)),
    satID                               INTEGER (0..63),
    e                                   BIT STRING (SIZE (16)),
    t-oa                                BIT STRING (SIZE (8)),
    deltaI                              BIT STRING (SIZE (16)),
    omegaDot                            BIT STRING (SIZE (16)),
    satHealth                           BIT STRING (SIZE (8)),
    a-Sqrt                              BIT STRING (SIZE (24)),
    omega0                              BIT STRING (SIZE (24)),
    m0                                  BIT STRING (SIZE (24)),
    omega                               BIT STRING (SIZE (24)),
    af0                                 BIT STRING (SIZE (11)),
    af1                                 BIT STRING (SIZE (11)),
    iE-Extensions                       ProtocolExtensionContainer { { AlmanacSatInfo-ExtIEs } }  OPTIONAL,
    ...
}

AlmanacSatInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- GPS Clock And Ephemeris Parameters
--
-- **************************************************************

GPS-ClockAndEphemerisParameters ::= SEQUENCE {
    codeOnL2                            BIT STRING (SIZE (2)),
    uraIndex                            BIT STRING (SIZE (4)),
    satHealth                           BIT STRING (SIZE (6)),
    iodc                                BIT STRING (SIZE (10)),
    l2Pflag                             BIT STRING (SIZE (1)),
    sf1Revd                             SubFrame1Reserved,
    t-GD                                BIT STRING (SIZE (8)),
    t-oc                                BIT STRING (SIZE (16)),
    af2                                 BIT STRING (SIZE (8)),
    af1                                 BIT STRING (SIZE (16)),
    af0                                 BIT STRING (SIZE (22)),
    c-rs                                BIT STRING (SIZE (16)),
    delta-n                             BIT STRING (SIZE (16)),
    m0                                  BIT STRING (SIZE (32)),
    c-uc                                BIT STRING (SIZE (16)),
    e                                   BIT STRING (SIZE (32)),
    c-us                                BIT STRING (SIZE (16)),
    a-Sqrt                              BIT STRING (SIZE (32)),
```

```
    t-oe                                BIT STRING (SIZE (16)),
    fitInterval                         BIT STRING (SIZE (1)),
    aodo                                BIT STRING (SIZE (5)),
    c-ic                                BIT STRING (SIZE (16)),
    omega0                              BIT STRING (SIZE (32)),
    c-is                                BIT STRING (SIZE (16)),
    i0                                  BIT STRING (SIZE (32)),
    c-rc                                BIT STRING (SIZE (16)),
    omega                               BIT STRING (SIZE (32)),
    omegaDot                            BIT STRING (SIZE (24)),
    iDot                                BIT STRING (SIZE (14)),
    iE-Extensions                       ProtocolExtensionContainer { { GPS-ClockAndEphemerisParameters-ExtIEs } }    OPTIONAL,
    ...
}

GPS-ClockAndEphemerisParameters-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

SubFrame1Reserved ::=               SEQUENCE {
    reserved1                           BIT STRING (SIZE (23)),
    reserved2                           BIT STRING (SIZE (24)),
    reserved3                           BIT STRING (SIZE (24)),
    reserved4                           BIT STRING (SIZE (16))
}


-- **************************************************************
--
-- GPS Ionospheric Model
--
-- **************************************************************


GPS-Ionospheric-Model ::=           SEQUENCE {
    alfa0                               BIT STRING (SIZE (8)),
    alfa1                               BIT STRING (SIZE (8)),
    alfa2                               BIT STRING (SIZE (8)),
    alfa3                               BIT STRING (SIZE (8)),
    beta0                               BIT STRING (SIZE (8)),
    beta1                               BIT STRING (SIZE (8)),
    beta2                               BIT STRING (SIZE (8)),
    beta3                               BIT STRING (SIZE (8)),
    iE-Extensions                       ProtocolExtensionContainer { { GPS-Ionospheric-Model-ExtIEs } }    OPTIONAL,
    ...
}

GPS-Ionospheric-Model-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
-- **************************************************************
--
-- GPS Measured Results
--
-- **************************************************************

MeasuredResultsList ::=             SEQUENCE (SIZE (01..maxNrOfSets)) OF
    GPS-MeasuredResults

maxNrOfSets                         INTEGER ::= 3

GPS-MeasuredResults ::=             SEQUENCE {
    gps-TOW-1msec                       INTEGER (0..604799999),
    gps-MeasurementParamList            GPS-MeasurementParamList,
    gps-TOW-rem-usec                    INTEGER (0..999)            OPTIONAL,
    gps-MeasurementParamList            GPS-MeasurementParamList,
    iE-Extensions                       ProtocolExtensionContainer { { GPS-MeasuredResults-ExtIEs } }    OPTIONAL,
    ...
}

GPS-MeasuredResults-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GPS-MeasurementParamList ::=        SEQUENCE (SIZE (1..maxSat)) OF
                                        GPS-MeasurementParam

GPS-MeasurementParam ::=            SEQUENCE {
    satelliteID                         INTEGER (0..63),
    c-N0                                INTEGER (0..63),
    doppler                             INTEGER (-32768..32768),
    wholeGPS-Chips                      INTEGER (0..1022),
    fractionalGPS-Chips                 INTEGER (0..1023),
    multipathIndicator                  MultipathIndicator,
    pseudorangeRMS-Error                INTEGER (0..63),
    iE-Extensions                       ProtocolExtensionContainer { { GPS-MeasurementParam-ExtIEs } }  OPTIONAL,
    ...
}

MultipathIndicator ::=              ENUMERATED {
                                        nm,
                                        low,
                                        medium,
                                        high }

GPS-MeasurementParam-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

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

```
--
-- GPS Navigation Model
--
-- **************************************************************


GPS-NavigationModel ::=              SEQUENCE {
    navigationModelSatInfoList          NavigationModelSatInfoList
}

GPS-NavigationModelNavigationModelSatInfoList ::=       SEQUENCE (SIZE (1..maxSat)) OF
                                        NavigationModelSatInfo

NavigationModelSatInfo ::=          SEQUENCE {
    satID                               INTEGER (0..63),
    satelliteStatus                     SatelliteStatus,
    gps-clockAndEphemerisParms          GPS-ClockAndEphemerisParameters                 OPTIONAL,
    -- This IE is not present if satelliteStatus is es-SN
    iE-Extensions                       ProtocolExtensionContainer { { NavigationModelSatInfo-ExtIEs } }   OPTIONAL,
    ...
}

NavigationModelSatInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

SatelliteStatus ::=                 ENUMERATED {
                                        ns-NN,
                                        es-SN,
                                        es-NN,
                                        rev2,
                                        revreserved }



-- **************************************************************
--
-- GPS Real Time Integrity
--
-- **************************************************************

GPS-RealTimeIntegrity ::= CHOICE {
    badSatellites       BadSatList,
    noBadSatellites     NoBadSatellites,
    ...
}

BadSatList ::=                      SEQUENCE (SIZE (1..maxSat)) OF
                                        INTEGER (0..63)

NoBadSatellites ::= NULL
```

```
-- **************************************************************
--
-- GPS Reference Time
--
-- **************************************************************

GPS-ReferenceTime ::=               SEQUENCE {
    gps-Week                            INTEGER (0..1023),
    gps-TOW-1msec                       INTEGER (0..604799999),
    gps-TOW-rem-usec                    INTEGER (0..999)                    OPTIONAL,
    gps-TOW-AssistList                  GPS-TOW-AssistList                      OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { GPS-ReferenceTime-ExtIEs } }    OPTIONAL,
    ...
}

GPS-ReferenceTime-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GPS-TOW-AssistList ::=              SEQUENCE (SIZE (1..maxSat)) OF
                                        GPS-TOW-Assist

GPS-TOW-Assist ::=                  SEQUENCE {
    satID                               INTEGER (0..63),
    tlm-Message                         BIT STRING (SIZE (14)),
    antiSpoof                           BOOLEANENUMERATED {present, notPresent},
    alert                               BOOLEANENUMERATED {present, notPresent},
    tlm-Reserved                        BIT STRING (SIZE (2)),
    iE-Extensions                       ProtocolExtensionContainer { { GPS-TOW-Assist-ExtIEs } }  OPTIONAL,
    ...

}

GPS-TOW-Assist-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- GPS Transmission TOW
--
-- **************************************************************

GPS-Transmission-TOW ::= INTEGER (0..604799)


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

```
-- GPS UTC Model
--
-- ************************************************************

GPS-UTC-Model ::=                   SEQUENCE {
    a1                                  BIT STRING (SIZE (24)),
    a0                                  BIT STRING (SIZE (32)),
    t-ot                                BIT STRING (SIZE (8)),
    delta-t-LS                          BIT STRING (SIZE (8)),
    wn-t                                BIT STRING (SIZE (8)),
    wn-lsf                              BIT STRING (SIZE (8)),
    dn                                  BIT STRING (SIZE (8)),
    delta-t-LSF                         BIT STRING (SIZE (8)),
    iE-Extensions                       ProtocolExtensionContainer { { GPS-UTCmodel-ExtIEs } }   OPTIONAL,
    ...
}

GPS-UTCmodel-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- ************************************************************
--
-- GPS UTRAN Time Relationship Uncertainty
-- nsec=nanosecond, usec=microsecond, msec=millisecond, sec=second
--
-- ************************************************************

GPS-UTRAN-TRU ::=   ENUMERATED {
                        nsec-50,
                        nsec-500,
                        usec-1,
                        usec-10,
                        msec-1,
                        msec-10,
                        msec-100,
                        unreliable,
                        ... }


-- ************************************************************
--
-- Information Exchange ID
--
-- ************************************************************

InformationExchangeID ::= INTEGER (0..1048575)


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

```
-- Information Report Characteristics
--
-- ************************************************************

InformationReportCharacteristics ::= SEQUENCE {
    type                    InformationReportCharacteristicsType,
    periodicity             InformationReportPeriodicity        OPTIONAL,
    -- present if type indicates periodic
    ...
}

InformationReportCharacteristicsType ::= ENUMERATED {
    onDemand,
    periodic,
    onModification,
    ...
}


InformationReportPeriodicity ::= CHOICE {
    min             INTEGER (1..60,_...),
-- Unit min, Step 1min
    hour            INTEGER (1..24,_...),
-- Unit hour, Step 1hour
    ...
}

-- ************************************************************
--
-- Information Type
--
-- ************************************************************


InformationType ::= CHOICE {
    implicitInformation         MethodType,
    explicitInformation         ExplicitInformationList,
    ...
}


ExplicitInformationList ::= SEQUENCE (SIZE (1..maxNrOfExpInfo)) OF ExplicitInformation

ExplicitInformation ::= CHOICE {
    almanacAndSatelliteHealth       AlmanacAndSatelliteHealth,
    utcModel                        UtcModel,
    ionosphericModel                IonosphericModel,
    navigationModel                 NavigationModel,
    dgpsCorrections                 DgpsCorrections,
    referenceTime                   ReferenceTime,
    acquisitionAssistance           AcquisitionAssistance,
    realTimeIntegrity               RealTimeIntegrity,
    almanacAndSatelliteHealthSIB    AlmanacAndSatelliteHealthSIB-InfoType,
```

```
    ...
}

AlmanacAndSatelliteHealth ::= NULL

UtcModel ::= SEQUENCE {
    transmissionTOWIndicator        TransmissionTOWIndicator,
    iE-Extensions                   ProtocolExtensionContainer { { UtcModel-ExtIEs } } OPTIONAL,
    ...
}

UtcModel-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

IonosphericModel ::= SEQUENCE {
    transmissionTOWIndicator        TransmissionTOWIndicator,
    iE-Extensions                   ProtocolExtensionContainer { { IonosphericModel-ExtIEs } } OPTIONAL,
    ...
}

IonosphericModel-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

NavigationModel ::= SEQUENCE {
    transmissionTOWIndicator        TransmissionTOWIndicator,
    navModelAdditionalData          NavModelAdditionalData                  OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { { NavigationModel-ExtIEs } }   OPTIONAL,
    ...
}

NavigationModel-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


NavModelAdditionalData ::= SEQUENCE {
    gps-Week                        INTEGER (0..1023),
    gps-TOE                         INTEGER (0..167),
    t-TOE-limit                     INTEGER (0..10),
    satRelatedDataList              SatelliteRelatedDataList,
    iE-Extensions                   ProtocolExtensionContainer { { NavModelAdditionalData-ExtIEs } } OPTIONAL,
    ...
}

NavModelAdditionalData-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


SatelliteRelatedDataList ::= SEQUENCE (SIZE (0..maxSat)) OF SatelliteRelatedData
```

```
SatelliteRelatedData ::= SEQUENCE {
    satID                   INTEGER (0..63),
    iode                    INTEGER (0..255~~39~~),
    iE-Extensions           ProtocolExtensionContainer { { SatelliteRelatedData-ExtIEs } } OPTIONAL,
    ...
}

SatelliteRelatedData-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


DgpsCorrections ::= NULL

ReferenceTime ::= NULL

AcquisitionAssistance ::= NULL

RealTimeIntegrity ::= NULL

AlmanacAndSatelliteHealthSIB-InfoType ::= SEQUENCE {
    transmissionTOWIndicator    TransmissionTOWIndicator,
    iE-Extensions               ProtocolExtensionContainer { { AlmanacAndSatelliteHealthSIB-InfoType-ExtIEs } } OPTIONAL,
    ...
}

AlmanacAndSatelliteHealthSIB-InfoType-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


TransmissionTOWIndicator ::= ENUMERATED {
    requested,
    not-Requested
}

-- **************************************************************
--
-- Message Structure
--
-- **************************************************************

MessageStructure ::= SEQUENCE (SIZE (1..maxNrOfLevels)) OF
    SEQUENCE {
        iE-ID                   ProtocolIE-ID,
        repetitionNumber        MessageStructureRepetition~~Number1~~                    OPTIONAL,
        iE-Extensions           ProtocolExtensionContainer { {MessageStructure-ExtIEs} } ~~-~~OPTIONAL,
        ...
    }

MessageStructureRepetition ::= INTEGER (1..256)
```

```
MessageStructure-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- Method Type
--
-- **************************************************************

MethodType ::= ENUMERATED {
    ue-assisted,
    ue-based
}


-- **************************************************************
--
-- Requested Data Value
--
-- **************************************************************

RequestedDataValue ::= SEQUENCE {
    gpsAlmanacAndSatelliteHealth        GPS-AlmanacAndSatelliteHealth                   OPTIONAL,
    gps-UTC-Model                       GPS-UTC-Model                                   OPTIONAL,
    gps-Ionospheric-Model               GPS-Ionospheric-Model                           OPTIONAL,
    gps-NavigationModel                 GPS-NavigationModel                             OPTIONAL,
    dgpsCorrections                     DGPSCorrections                                 OPTIONAL,
    referenceTime                       GPS-ReferenceTime                               OPTIONAL,
    gps-AcquisitionAssistance           GPS-AcquisitionAssistance                       OPTIONAL,
    gps-RealTime-Integrity              GPS-RealTimeIntegrity                           OPTIONAL,
    almanacAndSatelliteHealthSIB        AlmanacAndSatelliteHealthSIB                    OPTIONAL,
    gps-Transmission-TOW                GPS-Transmission-TOW                            OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { RequestedDataValue-ExtIEs} }   OPTIONAL,
    ...
}

--at least one of the above IEs shall be present in the requested data value

RequestedDataValue-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- Requested Data Value Information
--
-- **************************************************************

RequestedDataValueInformation ::= CHOICE {
    informationAvailable        InformationAvailable,
```

```
    informationNotAvailable     InformationNotAvailable
}

InformationAvailable::= SEQUENCE {
    requestedDataValue      RequestedDataValue,
    iE-Extensions           ProtocolExtensionContainer { { InformationAvailable-ExtIEs} }    OPTIONAL,
    ...
}

InformationAvailable-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

InformationNotAvailable ::= NULL


END
```

9.3.5 Common Definitions

```
-- **************************************************************
--
-- Common definitions
--
-- **************************************************************

PCAP-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
umts-Access (20) modules (3) pcap(4) version1 (1) pcap-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)

TransactionID       ::= CHOICE {
    shortTID            INTEGER (0..127),
    longTID             INTEGER (0..32767)
}

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

END
```

9.3.6 Constant Definitions

```
-- **************************************************************
--
-- Constant definitions
--
-- **************************************************************

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

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    ProcedureCode,
    ProtocolIE-ID
FROM PCAP-CommonDataTypes;


-- **************************************************************
--
-- Elementary Procedures
--
-- **************************************************************
```

```
id-PositionCalculation              ProcedureCode ::= 1
id-InformationExchangeInitiation    ProcedureCode ::= 2
id-InformationReporting             ProcedureCode ::= 3
id-InformationExchangeTermination   ProcedureCode ::= 4
id-InformationExchangeFailure       ProcedureCode ::= 5
id-ErrorIndication                  ProcedureCode ::= 6
id-privateMessage                   ProcedureCode ::= 7



-- **************************************************************
--
-- Lists
--
-- **************************************************************

maxNrOfErrors                       INTEGER ::= 256
maxSat                              INTEGER ::= 16
maxSatAlmanac                       INTEGER ::= 32
maxNrOfLevels                       INTEGER ::= 256
maxNrOfPoints                       INTEGER ::= 15
maxNrOfExpInfo                      INTEGER ::= 32

-- **************************************************************
--
-- IEs
--
-- **************************************************************

id-Cause                                        ProtocolIE-ID ::= 1
id-CriticalityDiagnostics                       ProtocolIE-ID ::= 2
id-GPS-UTRAN-TRU                                ProtocolIE-ID ::= 3
id-InformationExchangeID                        ProtocolIE-ID ::= 4
id-InformationExchangeObjectType-InfEx-Rprt     ProtocolIE-ID ::= 5
id-InformationExchangeObjectType-InfEx-Rqst     ProtocolIE-ID ::= 6
id-InformationExchangeObjectType-InfEx-Rsp      ProtocolIE-ID ::= 7
id-InformationReportCharacteristics             ProtocolIE-ID ::= 8
id-InformationType                              ProtocolIE-ID ::= 9
id-MeasuredResultsList                          ProtocolIE-ID ::= 10
id-MessageStructure                             ProtocolIE-ID ::= 19
id-MethodType                                   ProtocolIE-ID ::= 11
id-RefPosition-InfEx-Rqst                       ProtocolIE-ID ::= 12
id-RefPosition-InfEx-Rsp                        ProtocolIE-ID ::= 13
id-RefPosition-Inf-Rprt                         ProtocolIE-ID ::= 14
id-RequestedDataValue                           ProtocolIE-ID ::= 15
id-RequestedDataValueInformation                ProtocolIE-ID ::= 16
id-TransactionID                                ProtocolIE-ID ::= 17
id-UE-PositionEstimate                          ProtocolIE-ID ::= 18
id-TypeOfError                                  ProtocolIE-ID ::= 21

END
```

9.3.7 Container Definitions

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

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

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

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

-- **************************************************************
--
-- Class Definition for Protocol IEs
--
-- **************************************************************

PCAP-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
--
-- **************************************************************

PCAP-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
--
-- **************************************************************

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

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

```
}

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

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

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

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

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

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

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

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

END
```

9.4 Message Transfer Syntax

PCAP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax, as specified in [9].

The following encoding rules apply in addition to what has been specified in X.691 [9]:

When a bitstring value is placed in a bit-field as specified in 15.6 to 15.11 in [9], the leading bit of the bitstring value shall be placed in the leading bit of the bit-field, and the trailing bit of the bitstring value shall be placed in the trailing bit of the bit-field.

NOTE - When using the "bstring" notation, the leading bit of the bitstring value is on the left, and the trailing bit of the bitstring value is on the right. The term ‘leading bit’ is to be interpreted as equal to the term ‘first bit’ defined in [7].

/* partly omitted */

Annex A (informative): Guidelines for Usage of the Criticality Diagnostics IE

A.1 EXAMPLE MESSAGE Layout

Assume the following message format:

Table A.1

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M				YES	Reject
Transaction ID	M				–	
A	M				YES	reject
B	M				YES	reject
>E		*1..<maxE>*			EACH	ignore
>>F		*1..<maxF>*			-	
>>>G		*0..3, ~~...~~...*			EACH	ignore
>>H		*1..<maxH>*			EACH	ignore
>>>G		*0..3, ~~...~~...*			EACH	ignore and notify
>>G	M				YES	reject
>>J		*1..<maxJ>*			-	
>>>G		*0..3, ~~...~~...*			EACH	reject
C	M				YES	reject
>K		*1..<maxK>*			EACH	ignore and notify
>>L		*1..<maxL>*			-	
>>>M	O				-	
D	M				YES	reject

NOTE: The IEs F, J, and L do not have assigned criticality. The IEs F, J, and L are consequently realised as the ASN.1 type SEQUENCE OF of "ordinary" ASN.1 type, e.g. INTEGER. On the other hand, the repeatable IEs with assigned criticality are realised as the ASN.1 type SEQUENCE OF of an IE object, e.g. ProtocolIE-Single-Container.

For the corresponding ASN.1 layout, see clause A.4.

A.2 Example on a Received EXAMPLE MESSAGE

Assume further more that a received message based on the above tabular format is according to figure A.1.

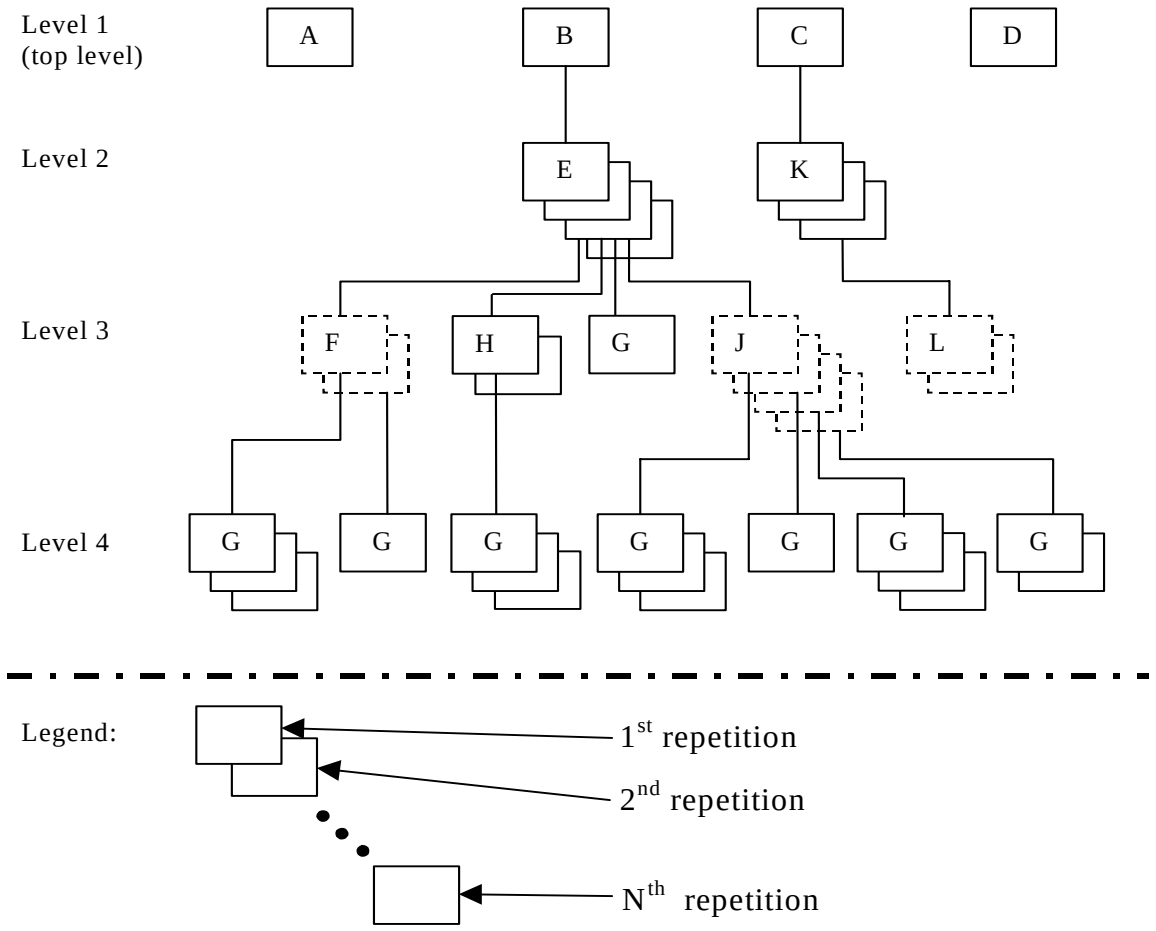

Figure A.1: Example of content of a received ~~NBAP~~PCAP message based on the EXAMPLE MESSAGE

A.3 Content of Criticality Diagnostics

A.3.1 Example 1

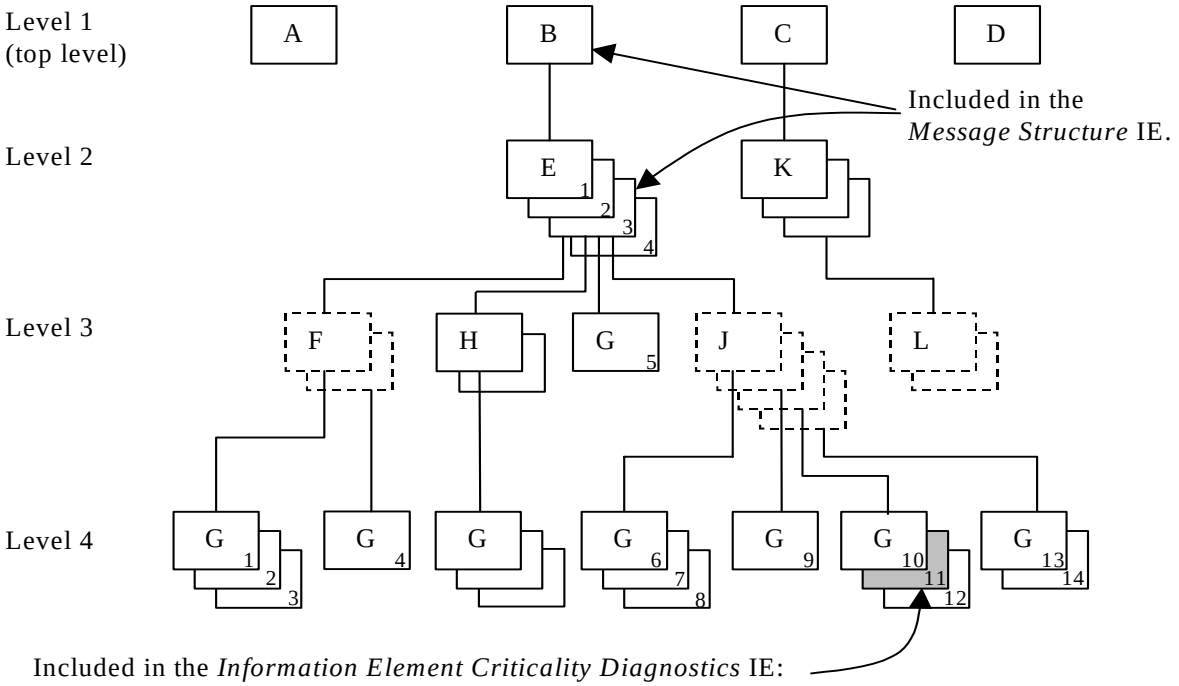

Figure A.2: Example of a received ~~NBAP~~PCAP message containing a not comprehended IE

If there is an error within the instance marked as grey in the IE G in the IE J shown in the figure A.2, this will be reported within the *Information Element Criticality Diagnostics* IE within the *Criticality Diagnostics* IEas in table A.2.

Table A.2

IE name	Value	Comment
IE Criticality	Reject	Criticality for IE on the reported level, i.e. level 4.
IE ID	id-G	IE ID from the reported level, i.e. level 4.
Repetition Number	11	Repetition number on the reported level, i.e. level 4. (Since the IE E (level 2) is the lowest level included in the *Message Structure* IE this is the eleventh occurrence of IE G within the IE E (level 2).
Type of Error	not under-stood	
Message Structure, *first repetition*		
>IE ID	id-B	IE ID from level 1.
Message Structure, *second repetition*		
>IE ID	id-E	IE ID from the lowest level above the reported level, i.e. level 2.
>Repetition Number	3	Repetition number from the lowest level above the reported level, i.e. level 2.

NOTE 1: The IE J on level 3 cannot be included in the *Message Structure* IE since they have no criticality of their own.

NOTE 2: The repetition number of the reported IE indicates the number of repetitions of IE G received up to the detected erroneous repetition, counting all occurrences of the IE G below the same instance of the previous level with assigned criticality (instance 3 of IE E on level 2).

A.3.2 Example 2

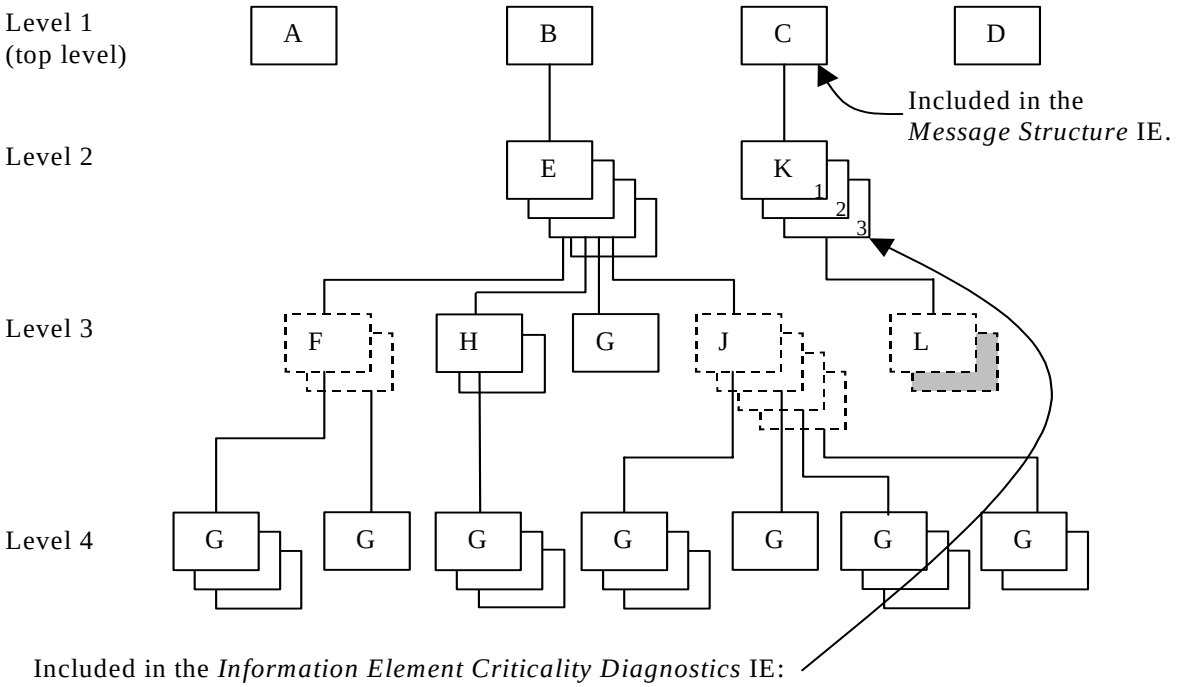

Figure A.3: Example of a received ~~NBAP~~PCAP message containing a not comprehended IE

If there is an error within the second instance (marked as grey) in the sequence (IE L in the tabular format) on level 3 below IE K in the structure shown in the figure A.3, this will be reported within the *Information Element Criticality Diagnostics* IE within the *Criticality Diagnostics* IEas in table A.3.

Table A.3

IE name	Value	Comment
IE Criticality	ignore and notify	Criticality for IE on the reported level, i.e. level 2.
IE ID	id-K	IE ID from the reported level, i.e. level 2.
Repetition Number	3	Repetition number on the reported level, i.e. level 2.
Type of Error	not under-stood	
Message Structure, *first repetition*		
>IE ID	id-C	IE ID from the lowest level above the reported level, i.e. level 1.

NOTE: The IE L on level 3 cannot be reported individually included in the *Message Structure* IE since it has no criticality of its own.

A.3.3 Example 3

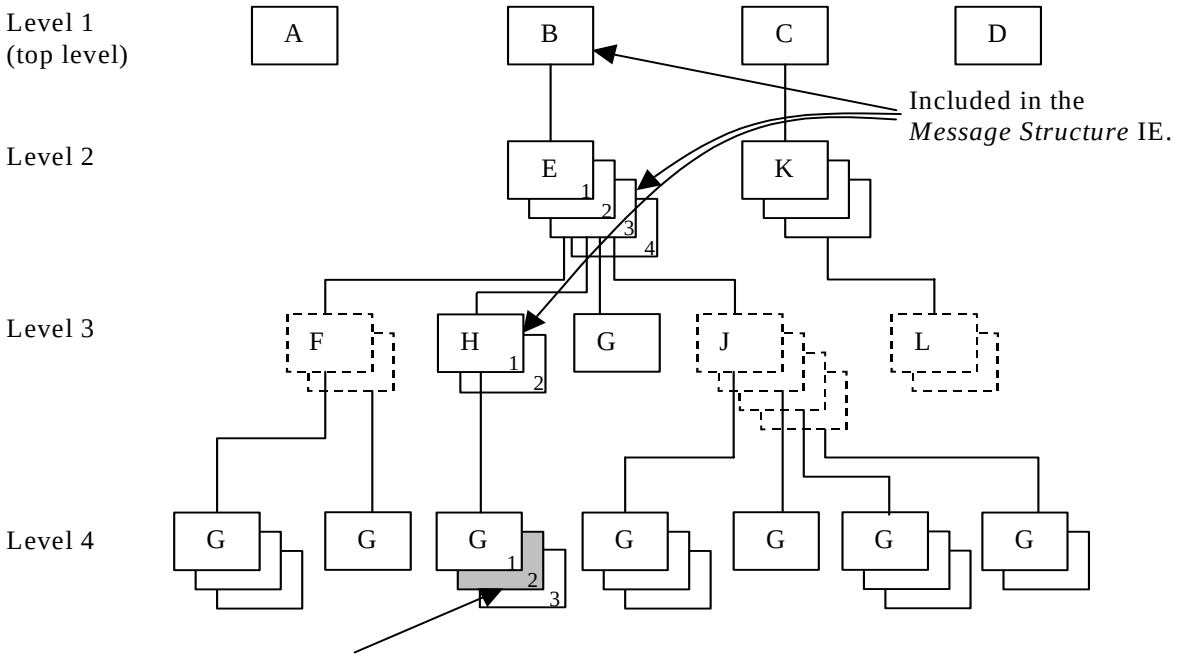

Figure A.4: Example of a received ~~NBAP~~PCAP message containing a not comprehended IE

If there is an error within the instance marked as grey in the IE G in the IE H shown in the figure A.4, this will be reported within the *Information Element Criticality Diagnostics* IE within the *Criticality Diagnostics* IEas in table A.4.

Table A.4

IE name	Value	Comment
IE Criticality	ignore and notify	Criticality for IE on the reported level, i.e. level 4.
IE ID	id-G	IE ID from the reported level, i.e. level 4.
Repetition Number	2	Repetition number on the reported level, i.e. level 4.
Type of Error	not under-stood	
Message Structure, *first repetition*		
>IE ID	id-B	IE ID from level 1.
Message Structure, *second repetition*		
>IE ID	id-E	IE ID from level 2.
>Repetition Number	3	Repetition number from level 2.
Message Structure, *third repetition*		
>IE ID	id-H	IE ID from the lowest level above the reported level, i.e. level 3.
>Repetition Number	1	Repetition number from the lowest level above the reported level, i.e. level 3.

NOTE: The repetition number of level 4 indicates the number of repetitions of IE G received up to the detected erroneous repetition, counted below the same instance of the previous level with assigned criticality (instance 1 of IE H on level 3).

A.3.4 Example 4

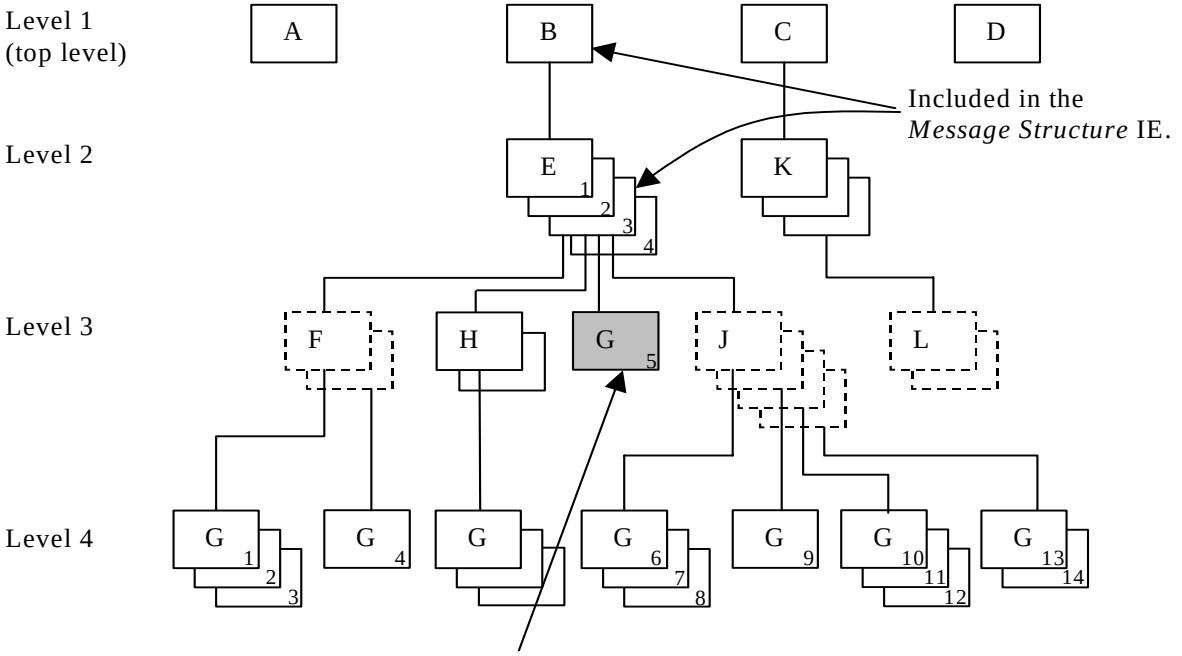

Figure A.5: Example of a received ~~NBAP~~PCAP message containing a not comprehended IE

If there is an error within the instance marked as grey in the IE G in the IE E shown in the figure A.5, this will be reported within the *Information Element Criticality Diagnostics* IE within the *Criticality Diagnostics* IE, as in table A.5.

Table A.5

IE name	Value	Comment
IE Criticality	Reject	Criticality for IE on the reported level, i.e. level 3.
IE ID	id-G	IE ID from the reported level, i.e. level 3.
Repetition Number	5	Repetition number on the reported level, i.e. level 3. (Since the IE E (level 2) is the lowest level included in the *Message Structure* IE this is the fifth occurrence of IE G within the IE E (level 2).
Type of Error	not under-stood	
Message Structure, *first repetition*		
>IE ID	id-B	IE ID from level 1.
Message Structure, *second repetition*		
>IE ID	id-E	IE ID from the lowest level above the reported level, i.e. level 2.
>Repetition Number	3	Repetition number from the lowest level above the reported level, i.e. level 2.

NOTE: The repetition number of the reported IE indicates the number of repetitions of IE G received up to the detected erroneous repetition, counting all occurrences of the IE G below the same instance of the previous level with assigned criticality (instance 3 of IE E on level 2).

A.3.5 Example 5

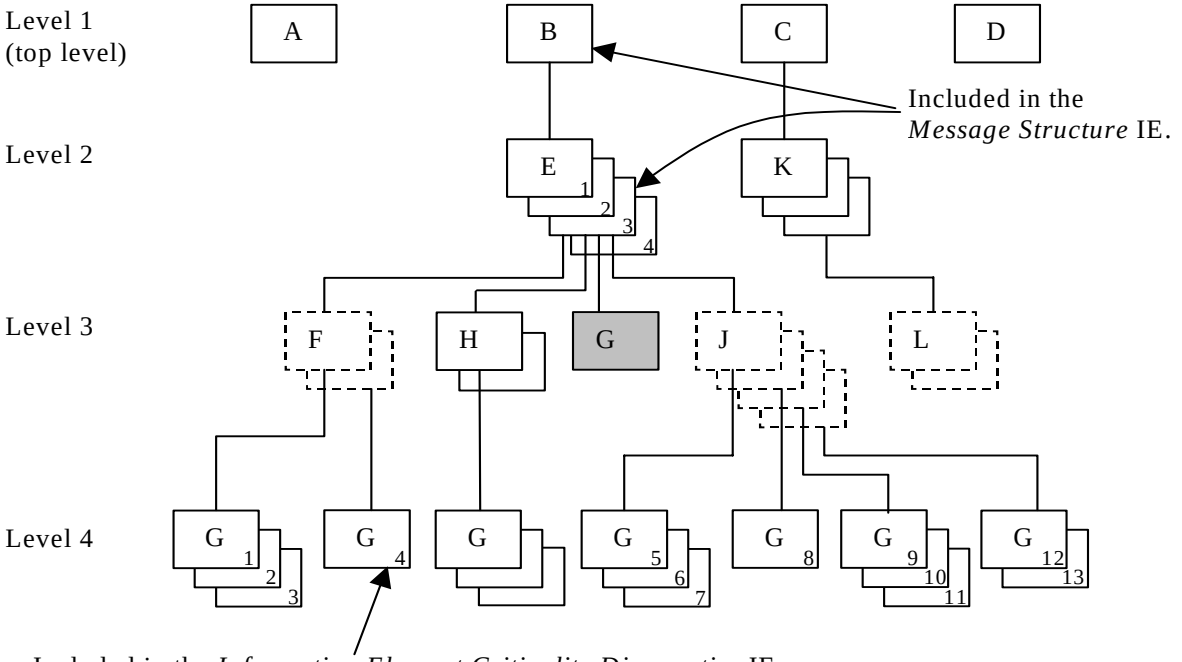

Figure A.6: Example of a received ~~NBAP~~PCAP message with a missing IE

If the instance marked as grey in the IE G in the IE E shown in the figure A.6, is missing this will be reported within the *Information Element Criticality Diagnostics* IE within the *Criticality Diagnostics* IE, as in table A.6.

Table A.6

IE name	Value	Comment
IE Criticality	reject	Criticality for IE on the reported level, i.e. level 3.
IE ID	id-G	IE ID from the reported level, i.e. level 3.
Repetition Number	4	Repetition number up to the missing IE on the reported level, i.e. level 3. (Since the IE E (level 2) is the lowest level included in the *Message Structure* IE there have been four occurrences of IE G within the IE E (level 2) up to the missing occurrence.
Type of Error	missing	
Message Structure, *first repetition*		
>IE ID	id-B	IE ID from level 1.
Message Structure, *second repetition*		
>IE ID	id-E	IE ID from the lowest level above the reported level, i.e. level 2.
>Repetition Number	3	Repetition number from the lowest level above the reported level, i.e. level 2.

NOTE: The repetition number of the reported IE indicates the number of repetitions of IE G received up to but not including the missing occurrence, counting all occurrences of the IE G below the same instance of the previous level with assigned criticality (instance 3 of IE E on level 2).

A.4 ASN.1 of EXAMPLE MESSAGE

```
ExampleMessage ::= SEQUENCE {
    ProtocolIEs         ProtocolIE-Container        {{ExampleMessage-IEs}},
    ProtocolExtensions  ProtocolExtensionContainer  {{ExampleMessage-Extensions}}   OPTIONAL,
    ...
}

ExampleMessage-IEs NBAPPCAP-PROTOCOL-IES ::= {
    { ID id-A   CRITICALITY reject  TYPE A  PRESENCE mandatory} |
    { ID id-B   CRITICALITY reject  TYPE B  PRESENCE mandatory} |
    { ID id-C   CRITICALITY reject  TYPE C  PRESENCE mandatory} |
    { ID id-D   CRITICALITY reject  TYPE D  PRESENCE mandatory} ,
    ...
}

B ::= SEQUENCE {
    e               E-List,
    iE-Extensions   ProtocolExtensionContainer { {B-ExtIEs} }   OPTIONAL,
    ...
}

B-ExtIEs NBAPPCAP-PROTOCOL-EXTENSION ::= {
    ...
}

E-List ::= SEQUENCE (SIZE (1..maxE)) OF ProtocolIE-Single-Container { {E-IEs} }

E-IEs NBAPPCAP-PROTOCOL-IES ::= {
    { ID id-E   CRITICALITY ignore  TYPE E  PRESENCE mandatory  }
}

E ::= SEQUENCE {
    f               F-List,
    h               H-List,
    g               G-List1,
    j               J-List,
    iE-Extensions   ProtocolExtensionContainer { {E-ExtIEs} }   OPTIONAL,
    ...
}

E-ExtIEs NBAPPCAP-PROTOCOL-EXTENSION ::= {
    ...
}

F-List ::= SEQUENCE (SIZE (1..maxF)) OF F

F ::= SEQUENCE {
    g               G-List2 OPTIONAL,
    iE-Extensions   ProtocolExtensionContainer { {F-ExtIEs} }   OPTIONAL,
    ...
}

F-ExtIEs    NBAPPCAP-PROTOCOL-EXTENSION ::= {
    ...
}

G-List2 ::= SEQUENCE (SIZE (1..3, ...)) OF ProtocolIE-Single-Container { {G2-IEs} }

G2-IEs NBAPPCAP-PROTOCOL-IES ::= {
    { ID id-G   CRITICALITY ignore  TYPE G  PRESENCE mandatory  }
}

H-List ::= SEQUENCE (SIZE (1..maxH)) OF ProtocolIE-Single-Container { {H-IEs} }

H-IEs NBAPPCAP-PROTOCOL-IES ::= {
    { ID id-H   CRITICALITY ignore  TYPE H  PRESENCE mandatory  }
}

H ::= SEQUENCE {
    g               G-List3 OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { {H-ExtIEs} } OPTIONAL,
    ...
}

H-ExtIEs NBAPPCAP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}

G-List3 ::= SEQUENCE (SIZE (1..3, ...)) OF ProtocolIE-Single-Container { {G3-IEs} }

G3-IEs NBAPPCAP-PROTOCOL-IES ::= {
    { ID id-G   CRITICALITY notify  TYPE G  PRESENCE mandatory  }
}

G-List1 ::= ProtocolIE-Single-Container { {G1-IEs} }

G1-IEs NBAPPCAP-PROTOCOL-IES ::= {
    { ID id-G   CRITICALITY reject  TYPE G  PRESENCE mandatory  }
}

J-List ::= SEQUENCE (SIZE (1..maxJ)) OF J

J ::= SEQUENCE {
    g               G-List4 OPTIONAL,
    iE-Extensions   ProtocolExtensionContainer { {J-ExtIEs} }   OPTIONAL,
    ...
}

J-ExtIEs    NBAPPCAP-PROTOCOL-EXTENSION ::= {
    ...
}

G-List4 ::= SEQUENCE (SIZE (1..3, ...)) OF ProtocolIE-Single-Container { {G4-IEs} }

G4-IEs NBAPPCAP-PROTOCOL-IES ::= {
    { ID id-G   CRITICALITY reject  TYPE G  PRESENCE mandatory  }
}

C ::= SEQUENCE {
    k               K-List,
    iE-Extensions   ProtocolExtensionContainer { {C-ExtIEs} }   OPTIONAL,
    ...
}

C-ExtIEs NBAPPCAP-PROTOCOL-EXTENSION ::= {
    ...
}

K-List ::= SEQUENCE (SIZE (1..maxK)) OF ProtocolIE-Single-Container { {K-IEs} }

K-IEs NBAPPCAP-PROTOCOL-IES ::= {
    { ID id-K   CRITICALITY notify  TYPE K  PRESENCE mandatory  }
}

K ::= SEQUENCE {
    l               L-List,
    iE-Extensions   ProtocolExtensionContainer { {K-ExtIEs} }   OPTIONAL,
    ...
}

K-ExtIEs NBAPPCAP-PROTOCOL-EXTENSION ::= {
    ...
}

L-List ::= SEQUENCE (SIZE (1..maxL)) OF L

L ::= SEQUENCE {
    m               M   OPTIONAL,
    iE-Extensions   ProtocolExtensionContainer { {L-ExtIEs} }   OPTIONAL,
    ...
}

L-ExtIEs NBAPPCAP-PROTOCOL-EXTENSION ::= {
    ...
}

ExampleMessage-Extensions NBAPPCAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

3GPP TSG-RAN WG3 Meeting #41 ⌘***R3-040551***
Malaga, Spain, 16th – 20th February 2004

CR-Form-v7

CHANGE REQUEST

⌘ **25.453** **CR** **71** ⌘ **rev** **1** ⌘ Current version: **6.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☒ Core Network ☐

Title:	⌘	PCAP Review
Source:	⌘	RAN3
Work item code:	⌘	TEI5
Date:	⌘	16/02/2004
Category:	⌘	**A**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	PCAP Review for Release 5 freeze
Summary of change:	⌘	Rev.0: Alignment of the whole protocol to the extension rules for future backward compatibility. Additionally the tabular format was aligned with the ASN.1. Rev.1: Crosscheck with the RRC (25.331) specification. Impact Analysis: Impact assessment towards the previous version of the specification (same release): This CR has isolated impact with the previous version of the specification (same release) because it affects no functions. This CR has an impact under protocol point of view. The impact can be considered isolated because the change only aligns ASN.1 and tabular format of the messages.
Consequences if not approved:	⌘	Misalignment of the whole protocol to the extension rules for future backward compatibility. Tables and ASN.1 remain misaligned.

Clauses affected:	⌘	Many paragraphs of chapters 9 and Annex A				
Other specs	⌘	**Y** ☒	**N** ☐	Other core specifications	⌘	CR 70 25.453 Rel-5

affected:	X	Test specifications
	X	O&M Specifications
Other comments: ⌘		

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9 Elements for PCAP Communication

9.1 Message Functional Definition and Content

9.1.1 General

Clause 9.1 presents the contents of PCAP messages in tabular format. The corresponding ASN.1 definitions are presented in clause 9.3. In case there is contradiction between the tabular format in clause 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 [12].

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 4.

Table 4: Meaning of abbreviations used in PCAP messages

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

9.1.2.2 Criticality

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

Table 5: 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 clause 10.3.2, if applicable.

9.1.3 ~~Position Calculation Request~~POSITION CALCULATION REQUEST

Table 6

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	reject
Transaction ID	M		9.2.2.28		–	
Initial UE Position Estimate	M		Geographical Area 9.2.2.6		YES	reject
Measured Results		*0..<maxNoOfSets>*			GLOBAL	reject
~~>GPS Measured Results~~	~~M~~		~~9.2.2.12~~		–	
>GPS Measured Results	M		9.2.2.12		–	
Cell-ID Measured Results Sets		*0..<maxNoOfMeasurements>*			GLOBAL	reject
>Cell-ID Measured Results Info List	M		9.2.2.31		–	
OTDOA Measurement Group		*0..1*			YES	reject
>OTDOA Reference Cell Info	M		9.2.2.34		–	
>OTDOA Neighbour Cell Info List		*1..< maxNoOfMeasNCell >*			–	
>>OTDOA Neighbour Cell Info	M		9.2.2.33		–	
>OTDOA Measured Results Sets		*1..<maxNoOfMeasurements>*			–	
>>OTDOA Measured Results Info List	M		9.2.2.32		–	

Table 7

Range bound	Explanation
MaxNoOfMeasNCell	Maximum number of neighbouring cells on which information can be reported. The value of MaxNoOfMeasCell is 32.
MaxNoOfSets	Maximum number of sets of Measured Results included in the Position Calculation Request message. The value for maxNoOfSets is 3.
maxNoOfMeasurements	Maximum number of Measurements of Cell-ID Measured Results Info List and OTDOA Measured Results Info List included in the Position Calculation Request message. The value for maxNoOfMeasurements is 16.

9.1.4 ~~Position Calculation Response~~POSITION CALCULATION RESPONSE

Table 8

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	reject
Transaction ID	M		9.2.2.28		–	
UE Position Estimate	M		Geographical Area 9.2.2.6		YES	ignore
Criticality Diagnostics	O		9.2.2.4		YES	ignore

9.1.5 POSITION CALCULATION FAILURE

Table 9

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	reject
Transaction ID	M		9.2.2.28		–	
Cause	M		9.2.2.3		YES	ignore
Criticality Diagnostics	O		9.2.2.4		YES	ignore

9.1.6 ~~Information Exchange Initiation Request~~INFORMATION EXCHANGE INITIATION REQUEST

Table 10

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	reject
Transaction ID	M		9.2.2.28		–	
Information Exchange ID	M		9.2.2.19		YES	reject
~~Information Exchange Object Type~~	~~M~~		~~9.2.2.20~~		~~YES~~	~~reject~~
CHOICE *Information Exchange Object Type*	M				YES	reject
>Reference Position					–	
>>Reference Position Estimate/UE Initial Position	M		Geographical Area 9.2.2.6		–	
Information Type	M		9.2.2.22		YES	reject
Information Report Characteristics	M		9.2.2.21		YES	reject
GPS-UTRAN Time Relationship Uncertainty	C-GPS		9.2.2.18		YES	reject

Table 11

Condition	Explanation
GPS	The IE shall be present if the information requested in the *Information Type* IE contains GPS-related data

9.1.7 ~~Information Exchange Initiation Response~~INFORMATION EXCHANGE INITIATION RESPONSE

Table 12

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	reject
Transaction ID	M		9.2.2.28		–	
Information Exchange ID	M		9.2.2.19		YES	ignore
CHOICE *Information Exchange Object Type*	O				YES	ignore
>Reference Position					–	
>>Requested Data Value	M		9.2.2.26		–	
Criticality Diagnostics	O		9.2.2.4		YES	ignore

9.1.8 ~~Information Exchange Initiation Failure~~INFORMATION EXCHANGE INITIATION FAILURE

Table 13

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	reject
Transaction ID	M		9.2.2.28		–	
Information Exchange ID	M		9.2.2.19		YES	ignore
Cause	M		9.2.2.3		YES	ignore
Criticality Diagnostics	O		9.2.2.4		YES	ignore

9.1.9 ~~Information Report~~INFORMATION REPORT

Table 14

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	ignore
Transaction ID	M		9.2.2.28		–	
Information Exchange ID	M		9.2.2.19		YES	ignore
CHOICE *Information Exchange Object Type*	M				YES	ignore
>Reference Position					–	
~~>>Requested Data Value Information~~	~~M~~		~~9.2.2.27~~		~~–~~	
>>Requested Data Value Information	M		9.2.2.27		–	

9.1.10 ~~Information Exchange Termination Request~~INFORMATION EXCHANGE TERMINATION REQUEST

Table 15

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	ignore
Transaction ID	M		9.2.2.28		–	
Information Exchange ID	M		9.2.2.19		YES	ignore

9.1.11 ~~Information Exchange Failure Indication~~INFORMATION EXCHANGE FAILURE INDICATION

Table 16

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	ignore
Transaction ID	M		9.2.2.28		–	
Information Exchange ID	M		9.2.2.19		YES	ignore
Cause	M		9.2.2.3		YES	ignore

9.1.12 ~~Error Indication~~ERROR INDICATION

Table 17

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.2.24		YES	ignore
Transaction ID	M		9.2.2.28		–	
Cause	O		9.2.2.3		YES	ignore
Criticality Diagnostics	O		9.2.2.4		YES	ignore

9.2 Information Element Functional Definitions and Contents

9.2.1 General

Clause 9.2 presents the PCAP IE definitions in tabular format. The corresponding ASN.1 definitions are presented in clause 9.3. In case there is contradiction between the tabular format in clause 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 bitstrings, if not otherwise specifically stated in the semantics description of the concerned IE or elsewhere, the following principle applies with regards to the ordering of bits:

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

9.2.2 Radio Network Layer Related IEs

9.2.2.1 Almanac and Satellite Health SIB

Table 18

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS Almanac and Satellite Health	M		9.2.2.9	
SatMask	M		BIT STRING~~itstring~~(1..32)	indicates the satellites that contain the pages being broadcast in this data set
LSB TOW	M		B~~it string~~IT STRING (8)	

9.2.2.2 Altitude and direction

Table 19

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

9.2.2.3 Cause

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

Table 20

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Cause Group*				
>Radio Network Layer				
>>Radio Network Layer Cause	M		ENUMERATED (invalid reference information, information temporarily not available, information provision not supported for the object, position calculation error: invalid GPS measured results, ..., position calculation error: invalid Cell-ID measured results, position calculation error: invalid OTDOA measured results, position calculation error: A-GPS positioning method not supported, position calculation error: Cell-ID positioning method not supported, position calculation error: OTDOA positioning method not supported)	
>Transport Layer				
>>Transport Layer Cause	M		ENUMERATED (Transport Resource Unavailable, Unspecified, ...)	
>Protocol				
>>Protocol Cause	M		ENUMERATED (Transfer Syntax Error, Abstract Syntax Error (Reject), Abstract Syntax Error (Ignore and Notify), Message not Compatible with Receiver State, Semantic Error, Unspecified, Abstract Syntax Error (Falsely Constructed Message), ...)	
> Misc				
>>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. In general, "not supported" cause values indicate that the concerning capability is missing. On the other hand, "not available" cause values indicate that the concerning capability is present, but insufficient resources were available to perform the requested action.

Table 21

Radio Network Layer cause	Meaning
Invalid reference information	The reference information (GPS-UTRAN Time Relationship Uncertainty and/or Initial UE Position Estimate) provided by the RNC are invalid
Information temporarily not available	The information requested by RNC is temporarily not available
Information Provision not supported for the object	The SAS does not support provision of the requested information for the concerned object types
Position calculation error: invalid GPS measured results	The SAS cannot calculate position due to invalid GPS measured results
Position calculation error: invalid Cell-ID measured results	The SAS cannot calculate position due to invalid Cell-ID measured results
Position calculation error: invalid OTDOA measured results	The SAS cannot calculate position due to invalid OTDOA measured results
Position calculation error: A-GPS positioning method not supported	The SAS cannot calculate position because it does not support the A-GPS positioning method
Position calculation error: Cell-ID positioning method not supported	The SAS cannot calculate position because it does not support the Cell-ID positioning method
Position calculation error: OTDOA positioning method not supported	The SAS cannot calculate position because it does not support the OTDOA positioning method

Table 22

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

Table 23

Protocol cause	Meaning
Abstract Syntax Error (Reject)	The received message included an abstract syntax error and the concerning criticality indicated "reject" (see clause 10.3)
Abstract Syntax Error (Ignore and Notify)	The received message included an abstract syntax error and the concerning criticality indicated "ignore and notify" (see clause 10.3)
Abstract syntax error (falsely constructed message)	The received message contained IEs or IE groups in wrong order or with too many occurrences (see clause 10.3)
Message not Compatible with Receiver State	The received message was not compatible with the receiver state (see clause 10.4)
Semantic Error	The received message included a semantic error (see clause 10.4)
Transfer Syntax Error	The received message included a transfer syntax error (see clause 10.2)
Unspecified	Sent when none of the above cause values applies but still the cause is Protocol related

Table 24

Miscellaneous cause	Meaning
Processing Overload	RNC/SAS processing overload
Hardware Failure	RNC/SAS hardware failure
O&M Intervention	Operation and Maintenance intervention related to RNC/SAS equipment
Unspecified	Sent when none of the above cause values applies and the cause is not related to any of the categories Radio Network Layer, Transport Network Layer or Protocol

9.2.2.4 Criticality Diagnostics

The *Criticality Diagnostics* IE is sent by the RNC or the SAS when parts of a received message have not been comprehended or are missing. It contains information about which IE was not comprehended or is missing.

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

Table 25

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Procedure Code	O		INTEGER (0..255)	
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 Criticality	O		ENUMERATED (reject, ignore, notify)	This Procedure Criticality is used for reporting the Criticality of the Triggering message (Procedure).
Transaction ID	O		~~Transaction ID~~9.2.2.28	
Information Element Criticality Diagnostics		*0..<maxnoof 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 never be used.
>IE Id	M		INTEGER (0..65535)	The IE Id of the not understood or missing IE as defined in the ASN.1 part of the specification.
>Repetition Number	O		INTEGER (0..255)	The *Repetition Number* IE gives - in case of a not understood IE: The number of occurrences of the reported IE up to and including the not understood occurrence - in case of a missing IE: The number of occurrences up to but not including the missing occurrence. Note: All the counted occurrences of the reported IE must have the same top-down hierarchical message structure of IEs with assigned criticality above them.
>Message Structure	O		9.2.2.23	The *Message Structure* IE describes the structure where the not understood or missing IE was detected. This IE is included if the not understood IE is not the top level of the message.
>Type of Error	M		ENUMERATED(not understood, missing, ...~~,...~~)	

Table 26

Range bound	Explanation
Maxnooferrors	Maximum number of IE errors allowed to be reported with a single message.

9.2.2.5 DGPS Corrections

This IE contains DGPS corrections, which may be employed to compensate for ranging errors due to atmospheric delay, orbital modelling, and satellite clock drift.

Table 27

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS TOW sec	M		INTEGER~~nteger~~ (0..604799)	In seconds GPS time-of-week when the DGPS corrections were calculated
Status/Health	M		ENUMERATED~~numerated~~ (UDRE scale 1.0, UDRE scale 0.75, UDRE scale 0.5, UDRE scale 0.3, UDRE scale 0.2, UDRE scale 0.1, no data, invalid data)	
DPGS information	C-Status/Health	*1..<maxSat>*		
>SatID	M		ENUMERATED~~numerated~~ (0~~...~~..63)	
>IODE	M		INTEGER~~nteger~~ (0..2553~~9~~)	
>UDRE	M		ENUMERATED~~numerated~~ (UDRE ≤ 1.0 m, 1.0m < UDRE ≤ 4.0m, 4.0m < UDRE ≤ 8.0m, 8.0m < UDRE, ...)	The value in this field shall be multiplied by the UDRE Scale Factor in the IE Status/Health to determine the final UDRE estimate for the particular satellite.
>PRC	M		INTEGER~~nteger~~ (-2047..2047,)	Scaling factor 0.32 Meters
>Range Rate Correction	M		INTEGER~~nteger~~ (-127..127)	Scaling factor 0.032 meters/sec

Table 28

Condition	Explanation
Status/Health	This IE shall be present if the *Status/Health* IE is not equal to "no data" or "invalid data"

Table 29

Range bound	Explanation
MaxSat	Maximum number of satellites for which data is included in this IE.

9.2.2.6 Geographical Area

Geographical Area IE is used to identify an area using geographical coordinates. The reference system is the same as the one used in [11].

Table 30

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Geographical Area*				
>*Point*				Ellipsoid point
>>Geographical Coordinates	M		9.2.2.7	
>*Point With Uncertainty*				Ellipsoid point with uncertainty circle
>>Geographical Coordinates	M		9.2.2.7	
>>Uncertainty Code	M		INTEGER (0..127)	The uncertainty "r" is derived from the "uncertainty code" k by $r = 10x(1.1^k-1)$
>*Polygon*				List of Ellipsoid points
>>Polygon		*1..<maxnoofPoints>*		
>>>Geographical Coordinates	M		9.2.2.7	
>*Ellipsoid point with uncertainty Ellipse*				
>>Geographical Coordinates	M		9.2.2.7	
>>Uncertainty Ellipse	M		9.2.2.30	
>>Confidence	M		INTEGER (0..100)	
>*Ellipsoid point with altitude*				
>>Geographical Coordinates	M		9.2.2.7	
>>Altitude and direction	M		9.2.2.2	
>*Ellipsoid point with altitude and uncertainty Ellipsoid*				
>>Geographical Coordinates	M		9.2.2.7	
>>Altitude and direction	M		9.2.2.2	
>>Uncertainty Ellipse	M		9.2.2.30	
>>Uncertainty Altitude	M		INTEGER (0..127)	
>>Confidence	M		INTEGER (0..100)	
>*Ellipsoid Arc*				
>>Geographical Coordinates	M		9.2.2.7	
>>Inner radius	M		INTEGER ($0..2^{16}-1$)	The relation between the value (N) and the radius (r) in meters it describes is $5N \leq r < 5(N+1)$, except for $N=2^{16}-1$ for which the range is extended to include all grater values of (r).
>>Uncertainty radius	M		INTEGER (0..127)	The uncertainty "r" is derived from the "uncertainty code" k by $r = 10x(1.1^k-1)$
>>Offset angle	M		INTEGER (0..179)	The relation between the value (N) and the angle (a) in degrees it describes is $2N \leq a < 2(N+1)$

IE/Group Name	Presence	Range	IE type and reference	Semantics description
>>Included angle	M		INTEGER (0..179)	The relation between the value (N) and the angle (a) in degrees it describes is 2N≤ a <2(N+1)
>>Confidence	M		INTEGER (0..100)	

Table 31

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

9.2.2.7 Geographical Coordinates

This IE contains the geographical coordinates.

Table 32

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≤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≤2^{24} X /360 < N+1 X being the longitude in degree (-180°..+180°)

9.2.2.8 GPS Acquisition Assistance

This IE contains parameters that enable fast acquisition of the GPS signals in UE-assisted GPS positioning.

Table 33

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS TOW msec	M		INTEGER~~nteger~~ (0..6.048*10^8 -1)	GPS Time of Week in milliseconds (rounded down to the nearest millisecond unit).
Satellite information		*1..<maxSat>*		
>SatID	M		INTEGER~~nteger~~ (0..63)	
>Doppler (0th order term)	M		INTEGER~~nteger~~ (-2048..2047)	Scaling factor 2.5Hz
>**Extra Doppler**		*0..1*		
>>Doppler (1st order term)	M		INTEGER~~nteger~~ (-42..21)	Scaling factor 1/42
>>Doppler Uncertainty	M		E~~numerated~~ NUMERATED (12.5,25,50, 100,200,…)	In Hz
>Code Phase	M		INTEGER~~nteger~~ (0..1022)	In Chips, specifies the centre of the search window
>Integer Code Phase	M		INTEGER~~nteger~~ (0..19)	Number of 1023 chip segments
>GPS Bit number	M		INTEGER~~nteger~~ (0..3)	Specifies GPS bit number (20 1023 chip segments)
>Code Phase Search Window	M		ENUMRATED~~Integer~~ (1023,1,2,3, 4,6,8,12,16,24,32,48,64,96,128,192)	Specifies the width of the search window.
>**Azimuth and Elevation**		*0..1*		
>>Azimuth	M		INTEGER~~nteger~~ (0..31)	Scaling factor 11.25 Degrees
>>Elevation	M		I~~nteger~~NTEGER (0..7)	Scaling factor 11.25 Degrees

Table 34

Range bound	Explanation
MaxSat	Maximum number of satellites for which data is included in this IE.

9.2.2.9 GPS Almanac and Satellite Health

This IE contains a reduced-precision subset of the clock and ephemeris parameters.

Table 35

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
WN_a	M		Bit stringIT STRING (8)	
Satellite information		*1..<maxSat Almanac>*		
>DataID	M		BIT STRINGitstring (2)	See [10]
>SatID	M		INTEGERnumerated (0..63, ...)	Satellite ID
>e	M		Bit stringIT STRING (16)	Eccentricity [10]
>t_{oa}	M		Bit stringIT STRING (8)	Reference Time Ephemeris [10]
>δI	M		Bit stringIT STRING (16)	
>OMEGADOT	M		Bit stringIT STRING (16)	Longitude of Ascending Node of Orbit Plane at Weekly Epoch (semi-circles/sec) [10]
>SV Health	M		Bit stringIT STRING (8)	
>$A^{1/2}$	M		Bit stringIT STRING (24)	Semi-Major Axis (meters)$^{1/2}$ [10]
>$OMEGA_0$	M		Bit stringIT STRING (24)	Longitude of Ascending Node of Orbit Plane at Weekly Epoch (semi-circles) [10]
>M_0	M		Bit stringIT STRING (24)	Mean Anomaly at Reference Time (semi-circles) [10]
>ω	M		Bit stringIT STRING (24)	Argument of Perigee (semi-circles) [10]
>af_0	M		Bit stringIT STRING (11)	apparent clock correction [10]
>af_1	M		Bit stringIT STRING (11)	apparent clock correction [10]
SV Global Health	O		Bit stringIT STRING (364)	This enables GPS time recovery and possibly extended GPS correlation intervals

Table 36

Range bound	Explanation
MaxSatAlmanac	Maximum number of satellites for which data is included in this IE.

9.2.2.10 GPS Clock and Ephemeris Parameters

The IE contains the GPS clock information and GPS Ephemeris.

Table 37

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
C/A or P on L2	M		Bit stringIT STRING (2)	Code(s) on L2 Channel [10]
URA Index	M		Bit stringIT STRING (4)	User Range Accuracy [10]
SV Health	M		Bit stringIT STRING (6)	[10]
IODC	M		Bit stringIT STRING (10)	Issue of Data, Clock [10]
L2 P Data Flag	M		Bit stringIT STRING (1)	[10]
SF 1 Reserved	M		Bit stringIT STRING (87)	[10]
T_{GD}	M		Bit stringIT STRING (8)	Estimated group delay differential [10]
t_{oc}	M		Bit stringIT STRING (16)	apparent clock correction [10]
af_2	M		Bit stringIT STRING (8)	apparent clock correction [10]
af_1	M		Bit stringIT STRING (16)	apparent clock correction [10]
af_0	M		Bit stringIT STRING (22)	apparent clock correction [10]
C_{rs}	M		Bit stringIT STRING (16)	Amplitude of the Sine Harmonic Correction Term to the Orbit Radius (meters) [10]
Δn	M		Bit stringIT STRING (16)	Mean Motion Difference From Computed Value (semi-circles/sec) [10]
M_0	M		Bit stringIT STRING (32)	Mean Anomaly at Reference Time (semi-circles) [10]
C_{uc}	M		Bit stringIT STRING (16)	Amplitude of the Cosine Harmonic Correction Term To The Argument Of Latitude (radians) [10]
E	M		Bit stringIT STRING (32)	C
C_{us}	M		Bit stringIT STRING (16)	Amplitude of the Sine Harmonic Correction Term To The Argument Of Latitude (radians) [10]
$(A)^{1/2}$	M		Bit stringIT STRING (32)	Semi-Major Axis (meters)$^{1/2}$ [10]
t_{oe}	M		Bit stringIT STRING (16)	Reference Time Ephemeris [10]
Fit Interval Flag	M		Bit stringIT STRING (1)	[10]
AODO	M		Bit stringIT STRING (5)	Age Of Data Offset [10]
C_{ic}	M		Bit stringIT STRING (16)	Amplitude of the Cosine Harmonic Correction Term To The Angle Of Inclination (radians) [10]
$OMEGA_0$	M		Bit stringIT STRING (32)	Longitude of Ascending Node of Orbit Plane at Weekly Epoch (semi-circles) [10]
C_{is}	M		Bit stringIT STRING (16)	Amplitude of the Sine Harmonic Correction Term To The Angle Of Inclination (radians) [10]
i_0	M		Bit stringIT STRING (32)	Inclination Angle at Reference Time (semi-circles) [10]
C_{rc}	M		Bit stringIT STRING (16)	Amplitude of the Cosine Harmonic Correction Term to the Orbit Radius (meters) [10]

ω	M		Bit stringIT STRING (32)	Argument of Perigee (semi-circles) [10]
OMEGAdot	M		Bit stringIT STRING (24)	Longitude of Ascending Node of Orbit Plane at Weekly Epoch (semi-circles/sec) [10]
Idot	M		Bit stringIT STRING (14)	Rate of Inclination Angle (semi-circles/sec) [10]

9.2.2.11 GPS Ionospheric Model

The IE contains fields needed to model the propagation delays of the GPS signals through the ionosphere.

Table 38

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
α_0	M		Bit stringIT STRING (8)	note 1
α_1	M		Bit stringIT STRING (8)	note 1
α_2	M		Bit stringIT STRING (8)	note 1
α_3	M		Bit stringIT STRING (8)	note 1
β_0	M		Bit stringIT STRING (8)	note 2
β_1	M		Bit stringIT STRING (8)	note 2
β_2	M		Bit stringIT STRING (8)	note 2
β_3	M		Bit stringIT STRING (8)	note 2
NOTE 1: The parameters αn are the coefficients of a cubic equation representing the amplitude of the vertical delay [10]. NOTE 2: The parameters βn are the coefficients of a cubic equation representing the period of the ionospheric model [10].				

NOTE 1: The parameters α_n are the coefficients of a cubic equation representing the amplitude of the vertical delay [10].
NOTE 2: The parameters β_n are the coefficients of a cubic equation representing the period of the ionospheric model [10].

9.2.2.12 GPS Measured Results

The purpose of this information element is to provide reported GPS measurement information from the SRNC to the SAS.

Table 39

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS TOW msec	M		INTEGER~~nteger~~ (0..6.048*10^8 -1)	GPS Time of Week in milliseconds (rounded down to the nearest millisecond unit). This time is the GPS TOW measured by the UE. GPS Time of Week in microseconds = 1000 * GPS TOW msec + GPS TOW rem usec
~~GPS TOW rem usec~~	~~O~~		~~Integer(0..999)~~	~~GPS Time of Week in microseconds MOD 1000.~~
Measurement Parameters		*1..<maxSat>*		
>Satellite ID	M		INTEGER~~numerated~~ (0..63)	
>C/N_0	M		INTEGER~~nteger~~ (0..63)	The estimate of the carrier-to-noise ratio of the received signal from the particular satellite used in the measurement. It is given in units of dB-Hz (Typical levels will be in the range of 20 – 50 dB-Hz).
>Doppler	M		INTEGER~~nteger~~ (-32768..-32768)	Hz, scale factor 0.2.
>Whole GPS Chips	M		INTEGER~~nteger~~ (0..1022)	Unit in GPS chips
>Fractional GPS Chips	M		I~~nteger~~NTEGER (0..(2^{10}-1))	Scale factor 2^{-10}
>Multipath Indicator	M		ENUMERATED~~numerated~~ (NM, low, medium, high)	See note 1
>Pseudorange RMS Error	M		INTEGER~~numerated~~ (~~range index~~ 0..~~range index~~ 63)	See note 2
~~NOTE 1: Table 41 gives the mapping of the multipath indicator field.~~ ~~NOTE 2: Table 42 gives the bitmapping of the Pseudorange RMS Error field.~~				

NOTE 1: Table 41 gives the mapping of the multipath indicator field.
NOTE 2: Table 42 gives the bitmapping of the Pseudorange RMS Error field.

Table 40

Range bound	Explanation
MaxSat	Maximum number of satellites for which data is included in this IE.

Table 41

Value	Multipath Indication
NM	Not measured
Low	MP error < 5m
Medium	5m < MP error < 43m
High	MP error > 43m

Table 42

Value~~Range Index~~	Mantissa	Exponent	Floating-Point value, x_i	Pseudorange value, P
0	000	000	0.5	P < 0.5
1	001	000	0.5625	0.5 <= P < 0.5625
i	X	Y	0.5 * (1 + x/8) * 2y	xi-1 <= P < xi
62	110	111	112	104 <= P < 112
63	111	111	--	112 <= P

9.2.2.13 GPS Navigation Model

This IE contain information required to manage the transfer of precise navigation data to the GPS-capable UE.

Table 43

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Satellite information		*1..<maxSat>*		
>SatID	M		INTEGER~~numerated~~ (0..63)	Satellite ID
>Satellite Status	M		ENUMERATED~~numerated~~ (NS_NN, ES_SN, ES_NN, REVD)	See note
>GPS Clock and Ephemeris parameters	C-*Satellite status*		9.2.2.10	
~~NOTE: The UE shall interpret enumerated symbols as follows.~~				

NOTE: The UE shall interpret enumerated symbols as follows.

Table 44

Value	Indication
NS_NN	New satellite, new Navigation Model
ES_SN	Existing satellite, same Navigation Model
ES_NN	Existing satellite, new Navigation Model
REVD	Reserved

Table 45

Condition	Explanation
Satellite status	The IE shall be present if the *Satellite Status* IE is not set to ES_SN

Table 46

Range bound	Explanation
MaxSat	Maximum number of satellites for which data is included in this IE.

9.2.2.14 GPS Real Time Integrity

Table 47

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Bad Satellites Presence*	~~M~~			
>Bad Satellites				
>>**Satellite information**		*1..<maxNo Sat>*		
>>>BadSatID	M		INTEGER~~nu merated~~ (0..63)	Satellite ID
>No Bad Satellites			NULL	

Table 48

Range bound	Explanation
MaxNoSat	Maximum number of satellites for which data is included in this IE.

9.2.2.15 GPS Reference Time

Table 49

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS Week	M		INTEGER~~nteger~~ (0..1023)	
GPS TOW msec	M		I~~nteger~~TEGER (0..6.048*10^8 -1)	GPS Time of Week in milliseconds (rounded down to the nearest millisecond unit).
~~GPS TOW rem usec~~	~~O~~		~~Integer(0..999)~~	~~GPS Time of Week in microseconds MOD 1000. GPS Time of Week in microseconds = 1000 * GPS TOW msec + GPS TOW rem usec~~
GPS TOW Assist		*0.. <maxSat>*		
>SatID	M		INTEGER~~numerated~~ (0..63)	
>TLM Message	M		B~~it string~~IT STRING (14)	
>Anti-Spoof	M		BOOLEAN~~E numerated (present, not present)~~	
>Alert	M		BOOLEAN~~E numerated (present, not present)~~	
>TLM Reserved	M		B~~it string~~IT STRING (2)	

Table 50

Range bound	Explanation
MaxSat	Maximum number of satellites for which data is included in this IE.

9.2.2.16 GPS Transmission TOW

Table 51

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS Transmission TOW			INTEGER~~nteger~~ (0..604799)	The GPS time-of-week in seconds

9.2.2.17 GPS UTC Model

The UTC Model field contains a set of parameters needed to relate GPS time to Universal Time Coordinate (UTC).

Table 52

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
A_1	M		Bit stringIT STRING (24)	sec/sec [10]
A_0	M		Bit stringIT STRING (32)	seconds [10]
t_{ot}	M		Bit stringIT STRING (8)	seconds [10]
Δt_{LS}	M		Bit stringIT STRING (8)	seconds [10]
WN_t	M		Bit stringIT STRING (8)	weeks [10]
WN_{LSF}	M		Bit stringIT STRING (8)	weeks [10]
DN	M		Bit stringIT STRING (8)	days [10]
Δt_{LSF}	M		Bit stringIT STRING (8)	seconds [10]

9.2.2.18 GPS-UTRAN Time Relationship Uncertainty

This IE contains the uncertainty of the GPS and UTRAN time relationship.

Table 53

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS-UTRAN Time Relationship Uncertainty			ENUMERATED (50ns, 500ns, 1us, 10us, 1ms, 10ms, 100ms, unreliable)	RNC estimate of uncertainty in GPS-UTRAN time relationship

9.2.2.19 Information Exchange ID

The Information Exchange ID uniquely identifies any requested information per RNC-SAS pair.

Table 54

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Information Exchange ID			INTEGERnteger (0 .. 2^20-1)	

9.2.2.20 Information Exchange Object Type

Void.

9.2.2.21 Information Report Characteristics

The information report characteristics define how the reporting shall be performed.

Table 56

~~IE/Group Name~~	~~Presence~~	~~Range~~	~~IE Type and Reference~~	~~Semantics Description~~
~~Information Report Characteristics Type~~	~~M~~		~~ENUMERATED(On Demand, Periodic, On Modification, ...)~~	
~~Information Report Periodicity~~	~~C-Periodic~~		~~ENUMERATED (1min…1hr, …) step 1min, (1hr…24hr, …) step 1hr, …~~	~~Indicates the frequency with which the SAS shall send broadcast data reports.~~

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Information Report Characteristics Type	M		ENUMERATED(On Demand, Periodic, On Modification, ...)	
CHOICE *Information Report Periodicity*	C-Periodic			Indicates the frequency with which the SAS shall send broadcast data reports.
>Min				
>>Minutes	M		INTEGER (1..60, ...)	
>Hour				
>>Hours	M		INTEGER (1..24, ...)	

Table 57

Condition	Explanation
Periodic	This IE shall be present if the *Information Report Characteristics Type* IE indicates 'periodic'

9.2.2.22 Information Type

The Information Type indicates which kind of information the SAS shall provide.

Table 58

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Information Type*	~~M~~			
>Implicit				
>>Method Type	M		9.2.2.25	
>Explicit				
>>**Explicit Information**		*1..<maxnoofExpInfo>*		
>>>CHOICE *Explicit Information Item*	M			
>>>>*Almanac and Satellite Health*			NULL	
>>>>*UTC Model*				
>>>>>Transmission TOW Indicator	M		9.2.2.29	
>>>>*Ionospheric Model*				
>>>>>Transmission TOW Indicator	M		9.2.2.29	
>>>>*Navigation Model*				
>>>>>Transmission TOW Indicator	M		9.2.2.29	
>>>>>**Nav. Model Additional Data**		*0..1*		
>>>>>>GPS Week	M		INTEGER~~nte ger~~ (0..1023)	
>>>>>>GPS_Toe	M		INTEGER~~nte ger~~ (0..167)	GPS time of ephemeris in hours of the latest ephemeris set
>>>>>>T-Toe limit	M		Integer (0..10)	ephemeris age tolerance in hours
>>>>>>**Satellite related data**		*0..<maxSat>*		
>>>>>>>SatID	M		INTEGER~~nte ger~~ (0..63)	
>>>>>>>IODE	M		INTEGER~~nte ger~~ (0..255~~39~~)	Issue of Data Ephemeris for SatID
>>>>*DGPS Corrections*			NULL	
>>>>*Reference Time*			NULL	
>>>>*Acquisition Assistance*			NULL	
>>>>*Real Time Integrity*			NULL	
>>>>*Almanac and Satellite Health SIB*				
>>>>>Transmission TOW Indicator	M		9.2.2.29	

Table 59

Range Bound	Explanation
maxnoofExpInfo	Maximum number of Explicit Information supported in one Information Exchange.
MaxSat	Maximum number of satellites for which data is included in this IE.

9.2.2.23 Message Structure

The *Message Structure* IE gives information for each level with assigned criticality in an hierachical message structure from top level down to the lowest level above the reported level for the occured error (reported in the *Information Element Criticality Diagnostics* IE).

Table 60

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message structure		*1..<maxnoo flevels>*		The first repetition of the *Message Structure* IE corresponds to the top level of the message. The last repetition of the *Message Structure* IE corresponds to the level above the reported level for the occured error of the message.	GLOBAL	ignore
>IE ID	M		INTEGER (0..65535)	The IE ID of this level's IE containing the not understood or missing IE.	-	
>Repetition Number	O		INTEGER (1..256)	The *Repetition Number* IE gives, if applicable, the number of occurrences of this level's reported IE up to and including the occurrence containing the not understood or missing IE. Note: All the counted occurrences of the reported IE must have the same topdown hierachical message structure of IEs with assigned criticality above them.	-	

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Message structure		*1..<maxnooflevels>*		The first repetition of the *Message Structure* IE corresponds to the top level of the message. The last repetition of the *Message Structure* IE corresponds to the level above the reported level for the occurred error of the message.
>IE ID	M		INTEGER (0..65535)	The IE ID of this level's IE containing the not understood or missing IE.
>Repetition Number	O		INTEGER (1..256)	The *Repetition Number* IE gives, if applicable, the number of occurrences of this level's reported IE up to and including the occurrence containing the not understood or missing IE. Note: All the counted occurrences of the reported IE must have the same top-down hierarchical message structure of IEs with assigned criticality above them.

Table 61

Range bound	Explanation
maxnooflevels	Maximum no. of message levels to report. The value for maxnooflevels is 256.

9.2.2.24 Message Type

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

Table 62

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Procedure Code	M		~~ENUMERATED (Position Calculation, Information Exchange Initiation, Information Reporting, Information Exchange Termination, Information Exchange Failure, Error Indication, ...)~~INTEGER(0..255)	"1" = Position Calculation "2" = Information Exchange Initiation "3" = Information Reporting "4" = Information Exchange Termination, "5" = Information Exchange Failure "6" = Error Indication,
Type of Message	M		ENUMERATED (Initiating Message, Successful Outcome, Unsuccessful Outcome, Outcome)	

9.2.2.25 Method Type

Table 63

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Method Type			ENUMERATED (UE_Assisted, UE_Based)	

9.2.2.26 Requested Data Value

The Requested Data Value contains the relevant data concerning the ongoing information exchange.

Table 64

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
GPS Almanac and Satellite Health	O		9.2.2.9	
GPS UTC Model	O		9.2.2.17	
GPS Ionospheric Model	O		9.2.2.11	
GPS Navigation Model	O		9.2.2.13	
DGPS Corrections	O		9.2.2.5	
GPS Reference Time	O		9.2.2.15	
GPS Acquisition Assistance	O		9.2.2.8	
GPS Real Time Integrity	O		9.2.2.14	
Almanac and Satellite Health SIB	O		9.2.2.1	
GPS Transmission TOW	O		9.2.2.16	

9.2.2.27 Requested Data Value Information

The *Requested Data Value Information* IE provides information on whether or not the Requested Data Value is available in the message and also the Requested Data Value itself if available.

In case of "Periodic" and "On Modification" reporting, "Information Not Available" shall be used when at least one part of the requested information was not available at the moment of initiating the Information Reporting procedure.

Table 65

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description	Criticality	Assigned Criticality
CHOICE *Information Availability Indicator*	M				–	
>***Information Available***					–	
>>Requested Data Value	M		9.2.2.26		–	
>*Information not Available*			NULL		–	

9.2.2.28 Transaction ID

The Transaction ID is used to associate all the messages belonging to the same procedure. Messages belonging to the same procedure shall use the same Transaction ID.

The Transaction ID is determined by the initiating peer of a procedure.

The Transaction ID shall uniquely identify a procedure among all ongoing parallel procedures using the same procedure code, and initiated by the same protocol peer.

Table 66

~~IE/Group Name~~	~~Presence~~	~~Range~~	~~IE Type and Reference~~	~~Semantics Description~~
~~Transaction ID~~			~~CHOICE INTEGER (0..127) or INTEGER (0..32767)~~	~~The Transaction ID shall be interpreted for its integer value, not for the type of encoding ("short" or "long").~~

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Transaction ID Length*				The Transaction ID shall be interpreted for its integer value, not for the type of encoding ("short" or "long").
>Short				
>>Transaction ID Value	M		INTEGER (0..127)	
>Long				
>>Transaction ID Value	M		INTEGER (0..32767)	

9.2.2.29 Transmission TOW Indicator

Table 67

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Transmission TOW Indicator			ENUMERATED (requested, not requested)	

9.2.2.30 Uncertainty Ellipse

This IE contains the uncertainty ellipse of a geographical area.

Table 68

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Uncertainty semi-major	M		INTEGER (0..127)	The uncertainty "r" is derived from the "uncertainty code" k by $r = 10x(1.1^{k}-1)$
Uncertainty semi-minor	M		INTEGER (0..127)	The uncertainty "r" is derived from the "uncertainty code" k by $r = 10x(1.1^{k}-1)$
Orientation of major axis	M		INTEGER (0..89)	The relation between the IE value (N) and the angle (a) in degrees it describes is $2N \leq a < 2(N+1)$

9.2.2.31 Cell-ID Measured Results Info List

This IE contains the Cell-ID measurements of signals associated with one or more cells.

Table 69

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Cell-ID Measured Results Info		*1..< maxNoOfMeasNCell >*		
>UC-ID	M		9.2.2.37	The identifier of the measured cell.
>UTRAN Access Point Position with Altitude	M		9.2.2.36	Exact geographical position of the base station antenna.
>Geographical Area	O		9.2.2.6	
>**Round Trip Time Info**		*0..1*		FDD only
>>UE Rx-Tx Time Difference Type 2	M		INTEGER (0..8191)	According to mapping in [13].
>>UE Positioning Measurement Quality	M		9.2.2.35	Quality of the UE Rx-Tx time difference measurement.
>>Round Trip Time	M		INTEGER (0..32766~~7~~)	According to mapping in [13].
>Rx Timing Deviation Info		*0..1*		3.84Mcps TDD only
>>Rx Timing Deviation	M		INTEGER (0..8191)	According to mapping in [14].
>>Timing Advance	M		INTEGER (0..63)	According to [4].
>Rx Timing Deviation LCR Info		*0..1*		1.28Mcps TDD only
>>Rx Timing Deviation LCR	M		INTEGER (0..511)	According to mapping in [14].
>>Timing Advance LCR	M		INTEGER (0..2047)	According to mapping in [14].
>Pathloss	O		INTEGER (46..158, ...)	Unit: dB downlink pathloss as defined in [4] subclause 10.3.7.3

Table 70

Range bound	Explanation
MaxNoOfMeasNCell	Maximum number of neighbour cells on which information can be reported. The value of MaxNoOfMeasNCell is 32.

9.2.2.32 OTDOA Measured Results Info List

This IE contains the OTDOA measurements of signals sent from the reference and neighbour cells.

Table 71

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
OTDOA Measured Results Info		*1..< MaxnoofMeasNCell >*		
>UC-ID	M		9.2.2.37	The identifier of the neighbour cell.
>**UE SFN-SFN Observed Time Difference Type 2 Info**		*1*		
>>SFN-SFN Observed Time Difference Type 2	M		INTEGER (0..40961, ...)	Gives the observed timing of the neighbour cell relative to the reference cell.
>>UE Positioning Measurement Quality	M		9.2.2.35	Quality of the observed time difference measurement.
>>Measurement Delay	M		INTEGER (0..65535, ...)	The interval of time, in units of 10ms frames, spanning the following two events: 1) Time of applicability of the SFN-SFN Value or TUTRAN-GPS/SFN relationship provided for the corresponding neighbour cell in 9.2.2.33. 2) The point in time when this corresponding SFN-SFN observed time difference measurement was captured by the UE.

Table 72

Range bound	Explanation
MaxNoOfMeasNCell	Maximum number of neighbouring cells on which information can be reported. The value of MaxNoOfMeasNCell is 32.

9.2.2.33 OTDOA Neighbour Cell Info

Table 73

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
UC-ID	M		9.2.2.37	The identifier of the neighbour cell.
UTRAN Access Point Position with Altitude	M		9.2.2.36	Exact geographical position of the base station antenna.
CHOICE *Relative Timing Difference Info*	M			
>SFN-SFN Measurement Value Information				
>>SFN-SFN Value	M		INTEGER (0..614399)	
>>SFN-SFN Quality	O		INTEGER (0..255)	Indicates the standard deviation (std) of the SFN-SFN otd (observed time difference) measurements in 1/16 chip. SFN-SFN Quality = $\sqrt{E[(x-\mu)^2]}$ = std of reported SFN-SFN Value, where x is the reported SFN-SFN Value and $\mu = E[x]$ is the expectation value of x.
>>SFN-SFN Drift Rate	M		INTEGER (-100..+100)	Indicates the SFN-SFN drift rate in 1/256 chip per second. A positive value indicates that the Reference cell clock is running at a greater frequency than the measured neighbouring cell.
>>SFN-SFN Drift Rate Quality	O		INTEGER (0..100)	Indicates the standard deviation (std) of the SFN-SFN drift rate measurements in 1/256 chip per second. SFN-SFN Drift Rate Quality = $\sqrt{E[(x-\mu)^2]}$ = std of reported SFN-SFN Drift Rate, where x is the reported SFN-SFN Drift Rate and $\mu = E[x]$ is the expectation value of x.
>$T_{UTRAN-GPS}$ Measurement Value Information				
>>SFN	M		INTEGER (0..4095)	SFN during which the $T_{UTRAN-GPS}$ measurement was performed
>>$T_{UTRAN-GPS}$		*1*		Indicates the UTRAN GPS Timing of Cell Frame for LCS.
>>>MS	M		INTEGER (0..16383)	Most significant part
>>>LS	M		INTEGER (0..4294967295)	Least significant part
>>$T_{UTRAN-GPS}$ Quality	O		INTEGER (0..255)	Indicates the standard deviation (std) of the $T_{UTRAN-GPS}$ measurements in 1/16 chip. $T_{UTRAN-GPS}$ Quality = $\sqrt{E[(x-\mu)^2]}$ = std of reported $T_{UTRAN-GPS}$ Value, where x is the reported $T_{UTRAN-GPS}$ Value and $\mu = E[x]$ is the expectation value of x.
>>$T_{UTRAN-GPS}$ Drift Rate	M		INTEGER (-50..+50)	Indicates the $T_{UTRAN-GPS}$ drift rate in 1/256 chip per second. A positive value indicates that

				the UTRAN clock is running at a lower frequency than GPS clock.
>>$T_{UTRAN-GPS}$ Drift Rate Quality	O		INTEGER (0..50)	Indicates the standard deviation (std) of the $T_{UTRAN-GPS}$ drift rate measurements in 1/256 chip per second. $T_{UTRAN-GPS}$ Drift Rate Quality = $\sqrt{E[(x-\mu)^2]}$ = std of reported $T_{UTRAN-GPS}$ Drift Rate, where x is the reported $T_{UTRAN-GPS}$ Drift Rate and $\mu = E[x]$ is the expectation value of x.

9.2.2.34 OTDOA Reference Cell Info

Table 74

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
UC-ID	M		9.2.2.37	The identifier of the reference cell.
UTRAN Access Point Position with Altitude	M		9.2.2.36	Exact geographical position of the base station antenna.
$T_{UTRAN-GPS}$ Measurement Value Information		*0..1*		
>SFN	M		INTEGER (0..4095)	SFN during which the $T_{UTRAN-GPS}$ measurement was performed
>$T_{UTRAN-GPS}$		*1*		Indicates the UTRAN GPS Timing of Cell Frame for LCS.
>>MS	M		INTEGER (0..16383)	Most significant part
>>LS	M		INTEGER (0..4294967295)	Least significant part
>$T_{UTRAN-GPS}$ Quality	O		INTEGER (0..255)	Indicates the standard deviation (std) of the $T_{UTRAN-GPS}$ measurements in 1/16 chip. $T_{UTRAN-GPS}$ Quality = $\sqrt{E[(x-\mu)^2]}$ = std of reported $T_{UTRAN-GPS}$ Value, where x is the reported $T_{UTRAN-GPS}$ Value and $\mu = E[x]$ is the expectation value of x.
>$T_{UTRAN-GPS}$ Drift Rate	M		INTEGER (-50..+50)	Indicates the $T_{UTRAN-GPS}$ drift rate in 1/256 chip per second. A positive value indicates that the UTRAN clock is running at a lower frequency than GPS clock.
>$T_{UTRAN-GPS}$ Drift Rate Quality	O		INTEGER (0..50)	Indicates the standard deviation (std) of the $T_{UTRAN-GPS}$ drift rate measurements in 1/256 chip per second. $T_{UTRAN-GPS}$ Drift Rate Quality = $\sqrt{E[(x-\mu)^2]}$ = std of reported $T_{UTRAN-GPS}$ Drift Rate, where x is the reported $T_{UTRAN-GPS}$ Drift Rate and $\mu = E[x]$ is the expectation value of x.

9.2.2.35 UE Positioning Measurement Quality

Table 75

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Std Resolution	M		BIT STRING (2)	Std Resolution field includes the resolution used in Std of Measurements field. Encoding on two bits as follows: '00' 10 meters '01' 20 meters '10' 30 meters '11' Reserved
Number of Measurements	M		BIT STRING (3)	The 'Number of Measurements' field indicates how many measurements have been used in the UE to determine the sample standard deviation of the measurements. Following 3 bit encoding is used: '001' 5-9 '010' 10-14 '011' 15-24 '100' 25-34 '101' 35-44 '110' 45-54 '111' 55 or more Special case: '000':In this case the field 'Std of Measurements' contains the std of the reported measurement value = $\sqrt{E[(x-\mu)^2]}$, where x is the reported value and μ = E[x] is the expectation value (i.e. the true value) of x. This std can be used irrespective of the number of measurements and reporting of the number of measurements is not needed. Also other measurements such as Ec/No or Rx levels can be utilised in this case to evaluate the 'Std of Measurements' reported in this IE.
Std of Measurements	M		BIT STRING (5)	Std of Measurements field includes sample standard deviation of measurements (when number of measurements is reported in 'Number of Measurements' field) or standard deviation of the reported measurement value = $\sqrt{E[(x-\mu)^2]}$, where x is the reported value and μ = E[x] is the expectation value (i.e. the true value) of x (when '000' is given in 'Number of Measurements' field). Following linear 5 bit encoding is used: '00000' 0 - (R*1-1) meters '00001' R*1 – (R*2-1) meters

				'00010' R*2 – (R*3-1) meters … '11111' R*31 meters or more where R is the resolution defined by Std Resolution field. E.g. R=20 m corresponds to 0-19 m, 20-39 m,…,620+ m.

9.2.2.36 UTRAN Access Point Position with Altitude

The UTRAN Access Point Position with Altitude indicates the exact geographical position of the base station antenna. The altitude shall be included when available.

Table 76

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Geographical Coordinates	M		9.2.2.7	
Altitude and direction	O		9.2.2.2	

9.2.2.37 UTRAN Cell Identifier (UC-ID)

The UC-ID (UTRAN Cell identifier) is the identifier of a cell in one UTRAN.

Table 77

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
RNC-ID	M		INTEGER (0..4095)	The identifier of one RNC in UTRAN.
C-ID	M		INTEGER (0..65535)	The identifier of a cell in one RNS.

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

9.3.0 General

PCAP ASN.1 definition conforms with [7], [8], and [9].

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

Clause 9.3 presents the Abstract Syntax of PCAP protocol with ASN.1. In case there is contradiction between the ASN.1 definition in this clause and the tabular format in clauses 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
```

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

PCAP-PDU-Descriptions  {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
umts-Access (20) modules (3) pcap(4) version1 (1) pcap-PDU-Descriptions (0)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    ProcedureCode,
    TransactionID
FROM PCAP-CommonDataTypes

    PositionCalculationRequest,
    PositionCalculationResponse,
    PositionCalculationFailure,
    InformationExchangeInitiationRequest,
    InformationExchangeInitiationResponse,
    InformationExchangeInitiationFailure,
    InformationReport,
    InformationExchangeTerminationRequest,
    InformationExchangeFailureIndication,
    ErrorIndication,
    PrivateMessage
FROM PCAP-PDU-Contents

    id-PositionCalculation,
    id-InformationExchangeInitiation,
    id-InformationReporting,
    id-InformationExchangeTermination,
    id-InformationExchangeFailure,
    id-ErrorIndication,
    id-privateMessage
FROM PCAP-Constants;

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

PCAP-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 definitions
--
-- **************************************************************

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


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

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

UnsuccessfulOutcome ::= SEQUENCE {
    procedureCode   PCAP-ELEMENTARY-PROCEDURE.&procedureCode        ({PCAP-ELEMENTARY-PROCEDURES}),
    criticality     PCAP-ELEMENTARY-PROCEDURE.&criticality          ({PCAP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    transactionID   TransactionID,
    value           PCAP-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome  ({PCAP-ELEMENTARY-PROCEDURES}{@procedureCode})
}
```

```
Outcome ::= SEQUENCE {
    procedureCode   PCAP-ELEMENTARY-PROCEDURE.&procedureCode     ({PCAP-ELEMENTARY-PROCEDURES}),
    criticality     PCAP-ELEMENTARY-PROCEDURE.&criticality       ({PCAP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    transactionID   TransactionID,
    value           PCAP-ELEMENTARY-PROCEDURE.&Outcome           ({PCAP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

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

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

PCAP-ELEMENTARY-PROCEDURES-CLASS-1 PCAP-ELEMENTARY-PROCEDURE ::= {
    positionCalculation         |
    informationExchangeInitiation,
    ...
}


PCAP-ELEMENTARY-PROCEDURES-CLASS-2 PCAP-ELEMENTARY-PROCEDURE ::= {
    informationReporting            |
    informationExchangeTermination  |
    informationExchangeFailure      |
    errorIndication                 |
    privateMessage,
    ...
}


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

positionCalculation PCAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PositionCalculationRequest
    SUCCESSFUL OUTCOME      PositionCalculationResponse
    UNSUCCESSFUL OUTCOME    PositionCalculationFailure
    PROCEDURE CODE          id-PositionCalculation
    CRITICALITY             ignorereject
}
```

```
informationExchangeInitiation PCAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      InformationExchangeInitiationRequest
    SUCCESSFUL OUTCOME      InformationExchangeInitiationResponse
    UNSUCCESSFUL OUTCOME    InformationExchangeInitiationFailure
    PROCEDURE CODE          id-InformationExchangeInitiation
    CRITICALITY             reject
}


informationReporting PCAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      InformationReport
    PROCEDURE CODE          id-InformationReporting
    CRITICALITY             ignore
}


informationExchangeTermination PCAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      InformationExchangeTerminationRequest
    PROCEDURE CODE          id-InformationExchangeTermination
    CRITICALITY             ignore
}


informationExchangeFailure PCAP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      InformationExchangeFailureIndication
    PROCEDURE CODE          id-InformationExchangeFailure
    CRITICALITY             ignore
}


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

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


END
```

9.3.3 PDU Definitions

```
-- **************************************************************
--
-- PDU definitions for PCAP.
--
```

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

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

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Cause,
    CriticalityDiagnostics,
    GPS-UTRAN-TRU,
    InformationExchangeID,
    InformationReportCharacteristics,
    InformationType,
    MeasuredResultsList,
    RequestedDataValue,
    RequestedDataValueInformation,
    UE-PositionEstimate,
    CellId-MeasuredResultsSets,
    OTDOA-MeasurementGroup
FROM PCAP-IEs

    TransactionID
FROM PCAP-CommonDataTypes

    PrivateIE-Container{},
    ProtocolExtensionContainer{},
    ProtocolIE-ContainerList{},
    ProtocolIE-Container{},
    PrivateIE-Container{},
    PCAP-PRIVATE-IES,
    PCAP-PROTOCOL-EXTENSION,
    PCAP-PROTOCOL-IES
FROM PCAP-Containers

    id-Cause,
    id-CriticalityDiagnostics,
    id-GPS-UTRAN-TRU,
    id-InformationExchangeID,
    id-InformationExchangeObjectType-InfEx-Rprt,
    id-InformationExchangeObjectType-InfEx-Rqst,
    id-InformationExchangeObjectType-InfEx-Rsp,
    id-InformationReportCharacteristics,
```

```
    id-InformationType,
    id-MeasuredResultsList,
    id-RequestedDataValue,
    id-RequestedDataValueInformation,
    id-TransactionID,
    id-UE-PositionEstimate,
    id-CellId-MeasuredResultsSets,
    id-OTDOA-MeasurementGroup
FROM PCAP-Constants;


-- **************************************************************
--
-- POSITION CALCULATION REQUEST
--
-- **************************************************************

PositionCalculationRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {PositionCalculationRequestIEs} },
    protocolExtensions  ProtocolExtensionContainer { {PositionCalculationRequestExtensions} }   OPTIONAL,
    ...
}

PositionCalculationRequestIEs PCAP-PROTOCOL-IES ::= {
    { ID id-UE-PositionEstimate      CRITICALITY reject  TYPE UE-PositionEstimate      PRESENCE mandatory } |
    { ID id-MeasuredResultsList      CRITICALITY reject  TYPE MeasuredResultsList      PRESENCE optionalmandatory },
    ...
}

PositionCalculationRequestExtensions PCAP-PROTOCOL-EXTENSION ::= {
    { ID id-CellId-MeasuredResultsSets      CRITICALITY reject  EXTENSION CellId-MeasuredResultsSets    PRESENCE optional } |
    { ID id-OTDOA-MeasurementGroup          CRITICALITY reject  EXTENSION OTDOA-MeasurementGroup        PRESENCE optional },
    ...
}

-- **************************************************************
--
-- POSITION CALCULATION RESPONSE
--
-- **************************************************************

PositionCalculationResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {PositionCalculationResponseIEs} },
    protocolExtensions  ProtocolExtensionContainer { {PositionCalculationResponseExtensions} }  OPTIONAL,
    ...
}

PositionCalculationResponseIEs PCAP-PROTOCOL-IES ::= {
    { ID id-UE-PositionEstimate         CRITICALITY ignore  TYPE UE-PositionEstimate        PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional },
    ...
}
```

```
PositionCalculationResponseExtensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- POSITION CALCULATION FAILURE
--
-- **************************************************************

PositionCalculationFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {PositionCalculationFailureIEs} },
    protocolExtensions  ProtocolExtensionContainer { {PositionCalculationFailureExtensions} }   OPTIONAL,
    ...
}

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

PositionCalculationFailureExtensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- INFORMATION EXCHANGE INITIATION REQUEST
--
-- **************************************************************

InformationExchangeInitiationRequest ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container    {{InformationExchangeInitiationRequest-IEs}},
    protocolExtensions      ProtocolExtensionContainer  {{InformationExchangeInitiationRequest-Extensions}}     OPTIONAL,
    ...
}

InformationExchangeInitiationRequest-IEs PCAP-PROTOCOL-IES ::= {
    { ID id-InformationExchangeID                       CRITICALITY reject  TYPE InformationExchangeID                      PRESENCE mandatory }|
    { ID id-InformationExchangeObjectType-InfEx-Rqst    CRITICALITY reject  TYPE InformationExchangeObjectType-InfEx-Rqst   PRESENCE mandatory }|
    -- This IE represents both the Information Exchange Object Type IE and the choice based on the Information Exchange Object Type
    -- as described in the tabular message format in clause 9.1.
    { ID id-InformationType                             CRITICALITY reject  TYPE InformationType                        PRESENCE mandatory }|
    { ID id-InformationReportCharacteristics            CRITICALITY reject  TYPE InformationReportCharacteristics       PRESENCE mandatory }|
    { ID id-GPS-UTRAN-TRU                               CRITICALITY reject  TYPE GPS-UTRAN-TRU                          PRESENCE conditional },
    -- This IE shall be present if the information requested in the Information Type IE contains GPS-related data
    ...
}
```

```
InformationExchangeInitiationRequest-Extensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

InformationExchangeObjectType-InfEx-Rqst ::= CHOICE {
    referencePosition               RefPosition-InfEx-Rqst,
    ...
}

RefPosition-InfEx-Rqst ::= SEQUENCE {
    referencePositionEstimate       UE-PositionEstimate,
    iE-Extensions                   ProtocolExtensionContainer  { { RefPositionItem-InfEx-Rqst-ExtIEs} }     OPTIONAL,
    ...
}

RefPositionItem-InfEx-Rqst-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}



-- **************************************************************
--
-- INFORMATION EXCHANGE INITIATION RESPONSE
--
-- **************************************************************

InformationExchangeInitiationResponse ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container    {{InformationExchangeInitiationResponse-IEs}},
    protocolExtensions      ProtocolExtensionContainer  {{InformationExchangeInitiationResponse-Extensions}}    OPTIONAL,
    ...
}

InformationExchangeInitiationResponse-IEs PCAP-PROTOCOL-IES ::= {
    { ID    id-InformationExchangeID                    CRITICALITY ignore  TYPE InformationExchangeID                  PRESENCE mandatory }|
    { ID    id-InformationExchangeObjectType-InfEx-Rsp  CRITICALITY ignore  TYPE InformationExchangeObjectType-InfEx-Rsp  PRESENCE optional }|
    { ID    id-CriticalityDiagnostics                   CRITICALITY ignore  TYPE CriticalityDiagnostics                 PRESENCE optional },
    ...
}

InformationExchangeInitiationResponse-Extensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

InformationExchangeObjectType-InfEx-Rsp ::= CHOICE {
    referencePosition               RefPosition-InfEx-Rsp,
    ...
}

RefPosition-InfEx-Rsp ::= SEQUENCE {
    requestedDataValue              RequestedDataValue,
    iE-Extensions                   ProtocolExtensionContainer  { { RefPositionItem-InfEx-Rsp-ExtIEs} }   OPTIONAL,
```

```
    ...
}

RefPositionItem-InfEx-Rsp-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- INFORMATION EXCHANGE INITIATION FAILURE
--
-- **************************************************************

InformationExchangeInitiationFailure ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container    {{InformationExchangeInitiationFailure-IEs}},
    protocolExtensions      ProtocolExtensionContainer  {{InformationExchangeInitiationFailure-Extensions}}     OPTIONAL,
    ...
}

InformationExchangeInitiationFailure-IEs PCAP-PROTOCOL-IES ::= {
    { ID    id-InformationExchangeID        CRITICALITY ignore  TYPE InformationExchangeID    PRESENCE mandatory }|
    { ID    id-Cause                        CRITICALITY ignore  TYPE Cause                    PRESENCE mandatory }|
    { ID    id-CriticalityDiagnostics       CRITICALITY ignore  TYPE CriticalityDiagnostics   PRESENCE optional },
    ...
}

InformationExchangeInitiationFailure-Extensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- INFORMATION REPORT
--
-- **************************************************************

InformationReport ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container        {{InformationReport-IEs}},
    protocolExtensions      ProtocolExtensionContainer  {{InformationReport-Extensions}}        OPTIONAL,
    ...
}

InformationReport-IEs PCAP-PROTOCOL-IES ::= {
    { ID    id-InformationExchangeID                        CRITICALITY ignore  TYPE InformationExchangeID                  PRESENCE mandatory }|
    { ID    id-InformationExchangeObjectType-InfEx-Rprt     CRITICALITY ignore  TYPE InformationExchangeObjectType-InfEx-Rprt  PRESENCE mandatory },
    ...
}

InformationReport-Extensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
InformationExchangeObjectType-InfEx-Rprt ::= CHOICE {
    referencePosition               RefPosition-InfEx-Rprt,
    ...
 }

RefPosition-InfEx-Rprt ::= SEQUENCE {
    requestedDataValueInformation   RequestedDataValueInformation,
    iE-Extensions                   ProtocolExtensionContainer  {{ RefPositionItem-InfEx-Rprt-ExtIEs }}    OPTIONAL,
    ...

 }

RefPositionItem-InfEx-Rprt-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- INFORMATION EXCHANGE TERMINATION REQUEST
--
-- **************************************************************

InformationExchangeTerminationRequest ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container        {{InformationExchangeTerminationRequest-IEs}},
    protocolExtensions      ProtocolExtensionContainer  {{InformationExchangeTerminationRequest-Extensions}} OPTIONAL,
    ...
}

InformationExchangeTerminationRequest-IEs PCAP-PROTOCOL-IES ::= {
    { ID    id-InformationExchangeID            CRITICALITY     ignore  TYPE InformationExchangeID        PRESENCE mandatory},
    ...
}

InformationExchangeTerminationRequest-Extensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- INFORMATION EXCHANGE FAILURE INDICATION
--
-- **************************************************************

InformationExchangeFailureIndication ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container        {{InformationExchangeFailureIndication-IEs}},
    protocolExtensions      ProtocolExtensionContainer  {{InformationExchangeFailureIndication-Extensions}}   OPTIONAL,
    ...
}
```

```
InformationExchangeFailureIndication-IEs PCAP-PROTOCOL-IES ::= {
    { ID    id-InformationExchangeID            CRITICALITY ignore          TYPE InformationExchangeID       PRESENCE mandatory   }|
    { ID    id-Cause                            CRITICALITY ignore          TYPE Cause                       PRESENCE mandatory   },
    ...
}

InformationExchangeFailureIndication-Extensions PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


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

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

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

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


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

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

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

END
```

9.3.4 Information Element Definitions

```
-- **************************************************************
--
-- Information Element Definitions
--
-- **************************************************************

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

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    maxNrOfErrors,
    maxSat,
    maxSatAlmanac,
    maxNrOfLevels,
    maxNrOfMeasNCell,
    maxNrOfMeasurements,
    maxNrOfPoints,
    maxNrOfExpInfo,
    maxNrOfSets,
    id-TypeOfError,
    id-MessageStructure
FROM PCAP-Constants

    Criticality,
    ProcedureCode,
    ProtocolIE-ID,
    TransactionID,
    TriggeringMessage
FROM PCAP-CommonDataTypes

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


-- **************************************************************
--
-- Almanac and Satellite Health SIB
--
-- **************************************************************

AlmanacAndSatelliteHealthSIB ::=    SEQUENCE {
```

```
    gpsAlmanacAndSatelliteHealth        GPS-AlmanacAndSatelliteHealth,
    satMask                             BIT STRING (SIZE (1..32)),
    lsbTOW                              BIT STRING (SIZE (8)),
    iE-Extensions                       ProtocolExtensionContainer { { AlmanacAndSatelliteHealthSIB-ExtIEs } }   OPTIONAL,
    ...
}

AlmanacAndSatelliteHealthSIB-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- Cause IE
--
-- **************************************************************

Cause ::= CHOICE {
    radioNetwork            CauseRadioNetwork,
    transport               CauseTransport,
    protocol                CauseProtocol,
    misc                    CauseMisc,
    ...
}
CauseRadioNetwork ::= ENUMERATED {
    invalid-reference-information,
    information-temporarily-not-available,
    information-provision-not-supported-for-the-object,
    position-calculation-error-invalid-GPS-measured-results,
    ...,
    position-calculation-error-invalid-CellID-measured-results,
    position-calculation-error-invalid-OTDOA-measured-results,
    position-calculation-error-AGPS-positioning-method-not-supported,
    position-calculation-error-CellID-positioning-method-not-supported,
    position-calculation-error-OTDOA-positioning-method-not-supported
}

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,
    ...
}

-- **************************************************************
--
-- Cell Id Measured Results Sets
--
-- **************************************************************

CellId-MeasuredResultsSets ::=          SEQUENCE (SIZE (1..maxNrOfMeasurements)) OF
    CellId-MeasuredResultsInfoList

CellId-MeasuredResultsInfoList ::=      SEQUENCE (SIZE (1..maxNrOfMeasNCell)) OF
    CellId-MeasuredResultsInfo

CellId-MeasuredResultsInfo ::=          SEQUENCE {
    uC-ID                               UC-ID,
    uTRANAccessPointPositionAltitude    UTRANAccessPointPositionAltitude,
    ue-PositionEstimate                 UE-PositionEstimate         OPTIONAL,
    roundTripTimeInfo                   RoundTripTimeInfo           OPTIONAL, -- FDD only
    rxTimingDeviationInfo               RxTimingDeviationInfo       OPTIONAL, -- 3.84Mcps TDD only
    rxTimingDeviationLCRInfo            RxTimingDeviationLCRInfo    OPTIONAL, -- 1.28Mcps TDD only
    pathloss                            Pathloss                    OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { CellId-MeasuredResultsInfo-ExtIEs } }    OPTIONAL,
    ...
}

CellId-MeasuredResultsInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

RoundTripTimeInfo ::=                   SEQUENCE {
    ue-RxTxTimeDifferenceType2          UE-RxTxTimeDifferenceType2,
    ue-PositioningMeasQuality           UE-PositioningMeasQuality,
    roundTripTime                       RoundTripTime,
    iE-Extensions                       ProtocolExtensionContainer { { RoundTripTimeInfo-ExtIEs } }    OPTIONAL,
    ...
}

RoundTripTimeInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
UE-RxTxTimeDifferenceType2 ::=          INTEGER (0..8191)

UE-PositioningMeasQuality ::=           SEQUENCE {
    stdResolution                       BIT STRING (SIZE (2)),
    numberOfMeasurements                BIT STRING (SIZE (3)),
    stdOfMeasurements                   BIT STRING (SIZE (5)),
    iE-Extensions                       ProtocolExtensionContainer { { UE-PositioningMeasQuality-ExtIEs } }     OPTIONAL,
    ...
}

UE-PositioningMeasQuality-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

RoundTripTime ::=                       INTEGER (0..3276667)
-- Actual value RoundTripTime = IE value * 0.0625 + 876

UTRANAccessPointPositionAltitude ::=    SEQUENCE {
    geographicalCoordinates             GeographicalCoordinates,
    ga-AltitudeAndDirection             GA-AltitudeAndDirection                                                 OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { UTRANAccessPointPositionAltitude-ExtIEs } }    OPTIONAL,
    ...
}

UTRANAccessPointPositionAltitude-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

RxTimingDeviationInfo ::=               SEQUENCE {
    rxTimingDeviation                   RxTimingDeviation,
    timingAdvance                       TimingAdvance,
    iE-Extensions                       ProtocolExtensionContainer { { RxTimingDeviationInfo-ExtIEs } }    OPTIONAL,
    ...
}

RxTimingDeviationInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

RxTimingDeviationLCRInfo ::=            SEQUENCE {
    rxTimingDeviationLCR                RxTimingDeviationLCR,
    timingAdvanceLCR                    TimingAdvanceLCR,
    iE-Extensions                       ProtocolExtensionContainer { { RxTimingDeviationLCRInfo-ExtIEs } }    OPTIONAL,
    ...
}

RxTimingDeviationLCRInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

RxTimingDeviation ::=                   INTEGER (0..8191)
```

```
RxTimingDeviationLCR ::=                INTEGER (0..511)

TimingAdvance ::=                       INTEGER (0..63)

TimingAdvanceLCR ::=                    INTEGER (0..2047)

Pathloss ::=                            INTEGER (46..158)
-- Unit: dB; as defined in [4] subclause 10.3.7.3


-- **************************************************************
--
-- CriticalityDiagnostics
--
-- **************************************************************

CriticalityDiagnostics ::= SEQUENCE {
    procedureCode               ProcedureCode                                   OPTIONAL,
    triggeringMessage           TriggeringMessage                               OPTIONAL,
    procedureCriticality        Criticality                                     OPTIONAL,
    transactionID               TransactionID                                   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,
        repetitionNumber        CriticalityDiagnosticsRepetitionNumber0                 OPTIONAL,
        messageStructure        MessageStructure                                        OPTIONAL,
        typeOfError             TypeOfError,
        iE-Extensions           ProtocolExtensionContainer { {CriticalityDiagnostics-IE-List-ExtIEs} }  OPTIONAL,
        ...
    }

CriticalityDiagnostics-IE-List-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
{   ID id-MessageStructure      CRITICALITY ignore      EXTENSION MessageStructure      PRESENCE optional }|
{   ID id-TypeOfError           CRITICALITY ignore      EXTENSION TypeOfError           PRESENCE mandatory },
    ...
}

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

CriticalityDiagnosticsRepetitionNumber0 ::= INTEGER (0..255, ...)
RepetitionNumber1 ::= INTEGER (1..256, ...)


TypeOfError ::= ENUMERATED {
```

```
    not-understood,
    missing,
    ...
}

-- **************************************************************
--
-- DGPSCorrections
--
-- **************************************************************


DGPSCorrections ::=                 SEQUENCE {
    gps-TOW-sec                         INTEGER (0..604799),
    statusHealth                        DiffCorrectionStatus,
    dgps-CorrectionSatInfoList          DGPS-CorrectionSatInfoList                  OPTIONAL,
    -- not included if satelliteHealth is equal to noData or invalidData
    iE-Extensions                       ProtocolExtensionContainer { { DGPSCorrections-ExtIEs } }   OPTIONAL,
    ...
}

DGPSCorrections-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


DiffCorrectionStatus ::=            ENUMERATED {
                                        udre-1-0, udre-0-75, udre-0-5, udre-0-3,
                                        udre-0-2, udre-0-1, noData, invalidData}

DGPS-CorrectionSatInfoList ::=      SEQUENCE (SIZE (1..maxSat)) OF
                                        DGPS-CorrectionSatInfo

DGPS-CorrectionSatInfo ::=          SEQUENCE {
    satID                               INTEGER (0..63),
    iode                                INTEGER (0..25539),
    udre                                UDRE,
    prc                                 PRC,
    rrc                                 RRC,
    iE-Extensions                       ProtocolExtensionContainer { { DGPS-CorrectionSatInfo-ExtIEs } }     OPTIONAL,
    ...
}

DGPS-CorrectionSatInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

UDRE ::=                            ENUMERATED {
                                        lessThan1,
                                        between1-and-4,
                                        between4-and-8,
```

```
                                        over8}

PRC ::=                             INTEGER (-2047..2047)

RRC ::=                             INTEGER (-127..127)




-- **************************************************************
--
-- UE-PositionEstimate (i.e., Geographical Area)
--
-- **************************************************************

-- UE-PositionEstimate is based on Geographical Area Description in 23.032

UE-PositionEstimate ::= CHOICE {
    point                       GA-Point,
    pointWithUnCertainty        GA-PointWithUnCertainty,
    polygon                     GA-Polygon,
    pointWithUncertaintyEllipse GA-PointWithUnCertaintyEllipse,
    pointWithAltitude           GA-PointWithAltitude,
    pointWithAltitudeAndUncertaintyEllipsoid        GA-PointWithAltitudeAndUncertaintyEllipsoid,
    ellipsoidArc                GA-EllipsoidArc,
    ...
}

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

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

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

GA-EllipsoidArc ::= SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    innerRadius                 INTEGER (0..65535),
    uncertaintyRadius           INTEGER (0..127),
```

```
    offsetAngle                 INTEGER (0..179),
    includedAngle               INTEGER (0..179),
    confidence                  INTEGER (0..10027),
    iE-Extensions               ProtocolExtensionContainer { { GA-EllipsoidArc-ExtIEs} } OPTIONAL,
    ...
}

GA-EllipsoidArc-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-Point ::= SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    iE-Extensions               ProtocolExtensionContainer { {GA-Point-ExtIEs} } OPTIONAL,
    ...
}

GA-Point-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-PointWithAltitude ::= SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    altitudeAndDirection        GA-AltitudeAndDirection,
    iE-Extensions               ProtocolExtensionContainer { { GA-PointWithAltitude-ExtIEs} } OPTIONAL,
    ...
}

GA-PointWithAltitude-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-PointWithAltitudeAndUncertaintyEllipsoid ::= SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    altitudeAndDirection        GA-AltitudeAndDirection,
    uncertaintyEllipse          GA-UncertaintyEllipse,
    uncertaintyAltitude         INTEGER (0..127),
    confidence                  INTEGER (0..10027),
    iE-Extensions               ProtocolExtensionContainer { { GA-PointWithAltitudeAndUncertaintyEllipsoid-ExtIEs} } OPTIONAL,
    ...
}

GA-PointWithAltitudeAndUncertaintyEllipsoid-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-PointWithUnCertainty ::=SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    uncertaintyCode             INTEGER (0..127),
    iE-Extensions               ProtocolExtensionContainer { {GA-PointWithUnCertainty-ExtIEs} } OPTIONAL,
    ... uncertaintyCode         INTEGER (0..127)
}
```

```
GA-PointWithUnCertainty-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-PointWithUnCertaintyEllipse ::= SEQUENCE {
    geographicalCoordinates     GeographicalCoordinates,
    uncertaintyEllipse          GA-UncertaintyEllipse,
    confidence                  INTEGER (0..100),
    iE-Extensions               ProtocolExtensionContainer { { GA-PointWithUnCertaintyEllipse-ExtIEs} } OPTIONAL,
    ...
}

GA-PointWithUnCertaintyEllipse-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-Polygon ::= SEQUENCE (SIZE (1..maxNrOfPoints)) OF
    SEQUENCE {
        geographicalCoordinates     GeographicalCoordinates,
        iE-Extensions               ProtocolExtensionContainer { {GA-Polygon-ExtIEs} } OPTIONAL,
        ...
    }

GA-Polygon-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GA-UncertaintyEllipse ::= SEQUENCE {
    uncertaintySemi-major       INTEGER (0..127),
    uncertaintySemi-minor       INTEGER (0..127),
    orientationOfMajorAxis      INTEGER (0..89),
    ...
}



-- **************************************************************
--
-- GPS-AcquisitionAssistance:
--
-- **************************************************************


GPS-AcquisitionAssistance ::=   SEQUENCE {
    gps-TOW-1msec                       INTEGER (0..604799999),
    satelliteInformationList            AcquisitionSatInfoList,
    iE-Extensions                       ProtocolExtensionContainer { { GPS-AcquisitionAssistance-ExtIEs } }    OPTIONAL,
    ...
}

GPS-AcquisitionAssistance-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
```

```
    ...
}

AcquisitionSatInfoList ::=          SEQUENCE (SIZE (1..maxSat)) OF
                                        AcquisitionSatInfo

AcquisitionSatInfo ::=              SEQUENCE {
    satID                               INTEGER (0..63),
    doppler0thOrder                     INTEGER (-2048..2047),
    extraDopplerInfo                    ExtraDopplerInfo                                OPTIONAL,
    codePhase                           INTEGER (0..1022),
    integerCodePhase                    INTEGER (0..19),
    gps-BitNumber                       INTEGER (0..3),
    codePhaseSearchWindow               CodePhaseSearchWindow,
    azimuthAndElevation                 AzimuthAndElevation                             OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { AcquisitionSatInfo-ExtIEs } }    OPTIONAL,
    ...
}

AcquisitionSatInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

ExtraDopplerInfo ::=                SEQUENCE {
    doppler1stOrder                     INTEGER (-42..21),
    dopplerUncertainty                  DopplerUncertainty,
    iE-Extensions                       ProtocolExtensionContainer { { ExtraDopplerInfo-ExtIEs } }   OPTIONAL,
    ...
}

ExtraDopplerInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

DopplerUncertainty ::=              ENUMERATED {
                                        hz12-5, hz25, hz50, hz100, hz200, ...}

CodePhaseSearchWindow ::=           ENUMERATED {
                                        w1023, w1, w2, w3, w4, w6, w8,
                                        w12, w16, w24, w32, w48, w64,
                                        w96, w128, w192 }

AzimuthAndElevation ::=             SEQUENCE {
    azimuth                             INTEGER (0..31),
    elevation                           INTEGER (0..7),
    iE-Extensions                       ProtocolExtensionContainer { { AzimuthAndElevation-ExtIEs } }   OPTIONAL,
    ...
}
```

```
AzimuthAndElevation-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- GPS Almanac and Satellite Health
--
-- **************************************************************


GPS-AlmanacAndSatelliteHealth ::=   SEQUENCE {
    wn-a                                BIT STRING (SIZE (8)),
    almanacSatInfoList                  AlmanacSatInfoList,
    svGlobalHealth                      BIT STRING (SIZE (364)) OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { GPS-AlmanacAndSatelliteHealth-ExtIEs } }    OPTIONAL,
    ...
}

GPS-AlmanacAndSatelliteHealth-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


AlmanacSatInfoList ::=              SEQUENCE (SIZE (1..maxSatAlmanac)) OF
                                        AlmanacSatInfo

AlmanacSatInfo ::=                  SEQUENCE {
    dataID                              BIT STRING (SIZE (2)),
    satID                               INTEGER (0..63),
    e                                   BIT STRING (SIZE (16)),
    t-oa                                BIT STRING (SIZE (8)),
    deltaI                              BIT STRING (SIZE (16)),
    omegaDot                            BIT STRING (SIZE (16)),
    satHealth                           BIT STRING (SIZE (8)),
    a-Sqrt                              BIT STRING (SIZE (24)),
    omega0                              BIT STRING (SIZE (24)),
    m0                                  BIT STRING (SIZE (24)),
    omega                               BIT STRING (SIZE (24)),
    af0                                 BIT STRING (SIZE (11)),
    af1                                 BIT STRING (SIZE (11)),
    iE-Extensions                       ProtocolExtensionContainer { { AlmanacSatInfo-ExtIEs } }  OPTIONAL,
    ...
}

AlmanacSatInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}


-- **************************************************************
--
-- GPS Clock And Ephemeris Parameters
--
-- **************************************************************

GPS-ClockAndEphemerisParameters ::= SEQUENCE {
    codeOnL2                            BIT STRING (SIZE (2)),
    uraIndex                            BIT STRING (SIZE (4)),
    satHealth                           BIT STRING (SIZE (6)),
    iodc                                BIT STRING (SIZE (10)),
    l2Pflag                             BIT STRING (SIZE (1)),
    sf1Revd                             SubFrame1Reserved,
    t-GD                                BIT STRING (SIZE (8)),
    t-oc                                BIT STRING (SIZE (16)),
    af2                                 BIT STRING (SIZE (8)),
    af1                                 BIT STRING (SIZE (16)),
    af0                                 BIT STRING (SIZE (22)),
    c-rs                                BIT STRING (SIZE (16)),
    delta-n                             BIT STRING (SIZE (16)),
    m0                                  BIT STRING (SIZE (32)),
    c-uc                                BIT STRING (SIZE (16)),
    e                                   BIT STRING (SIZE (32)),
    c-us                                BIT STRING (SIZE (16)),
    a-Sqrt                              BIT STRING (SIZE (32)),
    t-oe                                BIT STRING (SIZE (16)),
    fitInterval                         BIT STRING (SIZE (1)),
    aodo                                BIT STRING (SIZE (5)),
    c-ic                                BIT STRING (SIZE (16)),
    omega0                              BIT STRING (SIZE (32)),
    c-is                                BIT STRING (SIZE (16)),
    i0                                  BIT STRING (SIZE (32)),
    c-rc                                BIT STRING (SIZE (16)),
    omega                               BIT STRING (SIZE (32)),
    omegaDot                            BIT STRING (SIZE (24)),
    iDot                                BIT STRING (SIZE (14)),
    iE-Extensions                       ProtocolExtensionContainer { { GPS-ClockAndEphemerisParameters-ExtIEs } }     OPTIONAL,
    ...
}

GPS-ClockAndEphemerisParameters-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

SubFrame1Reserved ::=               SEQUENCE {
    reserved1                           BIT STRING (SIZE (23)),
    reserved2                           BIT STRING (SIZE (24)),
    reserved3                           BIT STRING (SIZE (24)),
```

```
    reserved4                           BIT STRING (SIZE (16))
}


-- **************************************************************
--
-- GPS Ionospheric Model
--
-- **************************************************************


 GPS-Ionospheric-Model ::=          SEQUENCE {
    alfa0                               BIT STRING (SIZE (8)),
    alfa1                               BIT STRING (SIZE (8)),
    alfa2                               BIT STRING (SIZE (8)),
    alfa3                               BIT STRING (SIZE (8)),
    beta0                               BIT STRING (SIZE (8)),
    beta1                               BIT STRING (SIZE (8)),
    beta2                               BIT STRING (SIZE (8)),
    beta3                               BIT STRING (SIZE (8)),
    iE-Extensions                       ProtocolExtensionContainer { { GPS-Ionospheric-Model-ExtIEs } }    OPTIONAL,
    ...
}

GPS-Ionospheric-Model-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- GPS Measured Results
--
-- **************************************************************

MeasuredResultsList ::=             SEQUENCE (SIZE (0..maxNrOfSets)) OF
    GPS-MeasuredResults

GPS-MeasuredResults ::=             SEQUENCE {
    gps-TOW-1msec                       INTEGER (0..604799999),
    gps-MeasurementParamList            GPS-MeasurementParamList,
    gps-TOW-rem-usec                    INTEGER (0..999)                                    OPTIONAL,
    gps-MeasurementParamList            GPS-MeasurementParamList,
    iE-Extensions                       ProtocolExtensionContainer { { GPS-MeasuredResults-ExtIEs } }    OPTIONAL,
    ...
}

GPS-MeasuredResults-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
GPS-MeasurementParamList ::=        SEQUENCE (SIZE (1..maxSat)) OF
                                        GPS-MeasurementParam

GPS-MeasurementParam ::=            SEQUENCE {
    satelliteID                         INTEGER (0..63),
    c-N0                                INTEGER (0..63),
    doppler                             INTEGER (-32768..32768),
    wholeGPS-Chips                      INTEGER (0..1022),
    fractionalGPS-Chips                 INTEGER (0..1023),
    multipathIndicator                  MultipathIndicator,
    pseudorangeRMS-Error                INTEGER (0..63),
    iE-Extensions                       ProtocolExtensionContainer { { GPS-MeasurementParam-ExtIEs } }  OPTIONAL,
    ...
}

MultipathIndicator ::=              ENUMERATED {
                                        nm,
                                        low,
                                        medium,
                                        high }


GPS-MeasurementParam-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- GPS Navigation Model
--
-- **************************************************************


GPS-NavigationModel ::=             SEQUENCE {
    navigationModelSatInfoList          NavigationModelSatInfoList
}

NavigationModelSatInfoList ::=      SEQUENCE (SIZE (1..maxSat)) OF
                                        NavigationModelSatInfo

NavigationModelSatInfo ::=          SEQUENCE {
    satID                               INTEGER (0..63),
    satelliteStatus                     SatelliteStatus,
    gps-clockAndEphemerisParms          GPS-ClockAndEphemerisParameters                 OPTIONAL,
    -- This IE is not present if satelliteStatus is es-SN
    iE-Extensions                       ProtocolExtensionContainer { { NavigationModelSatInfo-ExtIEs } }    OPTIONAL,
    ...
}

NavigationModelSatInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
```

```
    ...
}

SatelliteStatus ::=                 ENUMERATED {
                                        ns-NN,
                                        es-SN,
                                        es-NN,
                                        rev2,
                                        revreserved }


-- **************************************************************
--
-- GPS Real Time Integrity
--
-- **************************************************************

GPS-RealTimeIntegrity ::= CHOICE {
    badSatellites       BadSatList,
    noBadSatellites     NoBadSatellites,
    ...
}

BadSatList ::=                      SEQUENCE (SIZE (1..maxSat)) OF
                                        INTEGER (0..63)

NoBadSatellites ::= NULL


-- **************************************************************
--
-- GPS Reference Time
--
-- **************************************************************

GPS-ReferenceTime ::=               SEQUENCE {
    gps-Week                            INTEGER (0..1023),
    gps-TOW-1msec                       INTEGER (0..604799999),
    gps-TOW-rem-usec                    INTEGER (0..999)                                OPTIONAL,
    gps-TOW-AssistList                  GPS-TOW-AssistList                              OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { GPS-ReferenceTime-ExtIEs } }   OPTIONAL,
    ...
}

GPS-ReferenceTime-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

GPS-TOW-AssistList ::=              SEQUENCE (SIZE (1..maxSat)) OF
```

```
                                    GPS-TOW-Assist

GPS-TOW-Assist ::=                  SEQUENCE {
    satID                               INTEGER (0..63),
    tlm-Message                         BIT STRING (SIZE (14)),
    antiSpoof                           BOOLEANENUMERATED {present, notPresent},
    alert                               BOOLEANENUMERATED {present, notPresent},
    tlm-Reserved                        BIT STRING (SIZE (2)),
    iE-Extensions                       ProtocolExtensionContainer { { GPS-TOW-Assist-ExtIEs } }  OPTIONAL,
    ...
}

GPS-TOW-Assist-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- GPS Transmission TOW
--
-- **************************************************************

GPS-Transmission-TOW ::= INTEGER (0..604799)



-- **************************************************************
--
-- GPS UTC Model
--
-- **************************************************************

GPS-UTC-Model ::=                   SEQUENCE {
    a1                                  BIT STRING (SIZE (24)),
    a0                                  BIT STRING (SIZE (32)),
    t-ot                                BIT STRING (SIZE (8)),
    delta-t-LS                          BIT STRING (SIZE (8)),
    wn-t                                BIT STRING (SIZE (8)),
    wn-lsf                              BIT STRING (SIZE (8)),
    dn                                  BIT STRING (SIZE (8)),
    delta-t-LSF                         BIT STRING (SIZE (8)),
    iE-Extensions                       ProtocolExtensionContainer { { GPS-UTCmodel-ExtIEs } }  —OPTIONAL,
    ...
}

GPS-UTCmodel-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
-- **************************************************************
--
-- GPS UTRAN Time Relationship Uncertainty
-- nsec=nanosecond, usec=microsecond, msec=millisecond, sec=second
--
-- **************************************************************

GPS-UTRAN-TRU ::=   ENUMERATED {
                        nsec-50,
                        nsec-500,
                        usec-1,
                        usec-10,
                        msec-1,
                        msec-10,
                        msec-100,
                        unreliable,
                        ...}


-- **************************************************************
--
-- Information Exchange ID
--
-- **************************************************************

InformationExchangeID ::= INTEGER (0..1048575)


-- **************************************************************
--
-- Information Report Characteristics
--
-- **************************************************************

InformationReportCharacteristics ::= SEQUENCE {
    type                    InformationReportCharacteristicsType,
    periodicity             InformationReportPeriodicity        OPTIONAL,
    -- present if type indicates periodic
    ...
}

InformationReportCharacteristicsType ::= ENUMERATED {
    onDemand,
    periodic,
    onModification,
    ...
}


InformationReportPeriodicity ::= CHOICE {
    min             INTEGER (1..60,...),
```

```
-- Unit min, Step 1min
    hour            INTEGER (1..24,...),
-- Unit hour, Step 1hour
    ...
}

-- **************************************************************
--
-- Information Type
--
-- **************************************************************


InformationType ::= CHOICE {
    implicitInformation         MethodType,
    explicitInformation         ExplicitInformationList,
    ...
}


ExplicitInformationList ::= SEQUENCE (SIZE (1..maxNrOfExpInfo)) OF ExplicitInformation

ExplicitInformation ::= CHOICE {
    almanacAndSatelliteHealth       AlmanacAndSatelliteHealth,
    utcModel                        UtcModel,
    ionosphericModel                IonosphericModel,
    navigationModel                 NavigationModel,
    dgpsCorrections                 DgpsCorrections,
    referenceTime                   ReferenceTime,
    acquisitionAssistance           AcquisitionAssistance,
    realTimeIntegrity               RealTimeIntegrity,
    almanacAndSatelliteHealthSIB    AlmanacAndSatelliteHealthSIB-InfoType,
    ...
}

AlmanacAndSatelliteHealth ::= NULL

UtcModel ::= SEQUENCE {
    transmissionTOWIndicator    TransmissionTOWIndicator,
    iE-Extensions               ProtocolExtensionContainer { { UtcModel-ExtIEs } } OPTIONAL,
    ...
}

UtcModel-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

IonosphericModel ::= SEQUENCE {
    transmissionTOWIndicator    TransmissionTOWIndicator,
    iE-Extensions               ProtocolExtensionContainer { { IonosphericModel-ExtIEs } } OPTIONAL,
    ...
}
```

```
IonosphericModel-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

NavigationModel ::= SEQUENCE {
    transmissionTOWIndicator        TransmissionTOWIndicator,
    navModelAdditionalData              NavModelAdditionalData          OPTIONAL,
    iE-Extensions               ProtocolExtensionContainer { { NavigationModel-ExtIEs } }   OPTIONAL,
    ...
}

NavigationModel-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


NavModelAdditionalData ::= SEQUENCE {
    gps-Week                        INTEGER (0..1023),
    gps-TOE                         INTEGER (0..167),
    t-TOE-limit                     INTEGER (0..10),
    satRelatedDataList              SatelliteRelatedDataList,
    iE-Extensions               ProtocolExtensionContainer { { NavModelAdditionalData-ExtIEs } } OPTIONAL,
    ...
}

NavModelAdditionalData-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

SatelliteRelatedDataList ::= SEQUENCE (SIZE (0..maxSat)) OF SatelliteRelatedData

SatelliteRelatedData ::= SEQUENCE {
    satID                           INTEGER (0..63),
    iode                            INTEGER (0..25539),
    iE-Extensions               ProtocolExtensionContainer { { SatelliteRelatedData-ExtIEs } } OPTIONAL,
    ...
}

SatelliteRelatedData-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

DgpsCorrections ::= NULL

ReferenceTime ::= NULL

AcquisitionAssistance ::= NULL

RealTimeIntegrity ::= NULL

AlmanacAndSatelliteHealthSIB-InfoType ::= SEQUENCE {
```

```
    transmissionTOWIndicator    TransmissionTOWIndicator,
    iE-Extensions               ProtocolExtensionContainer { { AlmanacAndSatelliteHealthSIB-InfoType-ExtIEs } } OPTIONAL,
    ...
}

AlmanacAndSatelliteHealthSIB-InfoType-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


TransmissionTOWIndicator ::= ENUMERATED {
    requested,
    not-Requested
}

-- **************************************************************
--
-- Message Structure
--
-- **************************************************************

MessageStructure ::= SEQUENCE (SIZE (1..maxNrOfLevels)) OF
    SEQUENCE {
        iE-ID                   ProtocolIE-ID,
        repetitionNumber        MessageStructureRepetitionNumber1                   OPTIONAL,
        iE-Extensions           ProtocolExtensionContainer { {MessageStructure-ExtIEs} }    OPTIONAL,
        ...
    }

MessageStructureRepetition ::= INTEGER (1..256)

MessageStructure-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- Method Type
--
-- **************************************************************

MethodType ::= ENUMERATED {
    ue-assisted,
    ue-based,
    ...
}


-- **************************************************************
--
-- OTDOA Measurement Group
```

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

OTDOA-MeasurementGroup ::=          SEQUENCE {
    otdoa-ReferenceCellInfo             OTDOA-ReferenceCellInfo,
    otdoa-NeighbourCellInfoList         OTDOA-NeighbourCellInfoList,
    otdoa-MeasuredResultsSets           OTDOA-MeasuredResultsSets,
    iE-Extensions                       ProtocolExtensionContainer { { OTDOA-MeasurementGroup-ExtIEs } }     OPTIONAL,
    ...
}

OTDOA-MeasurementGroup-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

OTDOA-ReferenceCellInfo ::=             SEQUENCE {
    uC-ID                               UC-ID,
    uTRANAccessPointPositionAltitude    UTRANAccessPointPositionAltitude,
    tUTRANGPSMeasurementValueInfo       TUTRANGPSMeasurementValueInfo                                        OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { OTDOA-ReferenceCellInfo-ExtIEs } }    OPTIONAL,
    ...
}

OTDOA-ReferenceCellInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

OTDOA-NeighbourCellInfoList ::=         SEQUENCE (SIZE (1..maxNrOfMeasNCell)) OF
    OTDOA-NeighbourCellInfo

OTDOA-NeighbourCellInfo ::=             SEQUENCE {
    uC-ID                               UC-ID,
    uTRANAccessPointPositionAltitude    UTRANAccessPointPositionAltitude,
    relativeTimingDifferenceInfo        RelativeTimingDifferenceInfo,
    iE-Extensions                       ProtocolExtensionContainer { { OTDOA-NeighbourCellInfo-ExtIEs } }    OPTIONAL,
    ...
}

OTDOA-NeighbourCellInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

OTDOA-MeasuredResultsSets ::=           SEQUENCE (SIZE (1..maxNrOfMeasurements)) OF
    OTDOA-MeasuredResultsInfoList

OTDOA-MeasuredResultsInfoList ::=       SEQUENCE (SIZE (1..maxNrOfMeasNCell)) OF
    OTDOA-MeasuredResultsInfo

OTDOA-MeasuredResultsInfo ::=           SEQUENCE {
    uC-ID                               UC-ID,
    ue-SFNSFNTimeDifferenceType2Info    UE-SFNSFNTimeDifferenceType2Info,
    iE-Extensions                       ProtocolExtensionContainer { { OTDOA-MeasuredResultsInfo-ExtIEs } }     OPTIONAL,
```

```
    ...
}

OTDOA-MeasuredResultsInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

UE-SFNSFNTimeDifferenceType2Info ::=    SEQUENCE {
    ue-SFNSFNTimeDifferenceType2        INTEGER (0..40961),
    ue-PositioningMeasQuality           UE-PositioningMeasQuality,
    measurementDelay                    INTEGER (0..65535),
    iE-Extensions                       ProtocolExtensionContainer { { UE-SFNSFNTimeDifferenceInfo-ExtIEs } }    OPTIONAL,
    ...
}

UE-SFNSFNTimeDifferenceInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

UC-ID ::=                               SEQUENCE {
    rNC-ID                              INTEGER (0..4095),
    c-ID                                INTEGER (0..65535),
    iE-Extensions                       ProtocolExtensionContainer { { UC-ID-ExtIEs } }     OPTIONAL,
    ...
}

UC-ID-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

RelativeTimingDifferenceInfo ::= CHOICE {
    sFNSFNMeasurementValueInfo          SFNSFNMeasurementValueInfo,
    tUTRANGPSMeasurementValueInfo       TUTRANGPSMeasurementValueInfo,
    ...
}

SFNSFNMeasurementValueInfo ::=          SEQUENCE {
    sFNSFNValue                         SFNSFNValue,
    sFNSFNQuality                       SFNSFNQuality                                       OPTIONAL,
    sFNSFNDriftRate                     SFNSFNDriftRate,
    sFNSFNDriftRateQuality              SFNSFNDriftRateQuality                              OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { SFNSFNMeasurementValueInfo-ExtIEs } }    OPTIONAL,
    ...
}

SFNSFNMeasurementValueInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

SFNSFNValue ::=                         INTEGER (0..614399)

SFNSFNQuality ::=                       INTEGER (0..255)
```

```
-- Unit chip, Step 1/16 chip, Range 0.. 255/16 chip

SFNSFNDriftRate ::=                     INTEGER (-100..100)
-- Unit chip/s, Step 1/256 chip/s, Range -100/256..+100/256 chip/s

SFNSFNDriftRateQuality ::=              INTEGER (0..100)
-- Unit chip/s, Step 1/256 chip/s, Range 0..100/256 chip/s

TUTRANGPSMeasurementValueInfo ::= SEQUENCE {
    sFN                                 SFN,
    tUTRANGPS                           TUTRANGPS,
    tUTRANGPSQuality                    TUTRANGPSQuality                                    OPTIONAL,
    tUTRANGPSDriftRate                  TUTRANGPSDriftRate,
    tUTRANGPSDriftRateQuality           TUTRANGPSDriftRateQuality                           OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { TUTRANGPSMeasurementValueInfo-ExtIEs } }   OPTIONAL,
    ...
}

TUTRANGPSMeasurementValueInfo-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

SFN ::=                                 INTEGER (0..4095)

TUTRANGPS ::=                           SEQUENCE {
    ms-part                             INTEGER (0..16383),
    ls-part                             INTEGER (0..4294967295)
}

TUTRANGPSQuality ::=                    INTEGER (0..255)
-- Unit chip, Step 1/16 chip, Range 0.. 255/16 chip

TUTRANGPSDriftRate ::=                  INTEGER (-50..50)
-- Unit chip/s, Step 1/256 chip/s, Range -50/256..+50/256 chip/s

TUTRANGPSDriftRateQuality ::=           INTEGER (0..50)
-- Unit chip/s, Step 1/256 chip/s, Range 0..50/256 chip/s


-- **************************************************************
--
-- Requested Data Value
--
-- **************************************************************

RequestedDataValue ::= SEQUENCE {
    gpsAlmanacAndSatelliteHealth        GPS-AlmanacAndSatelliteHealth           OPTIONAL,
    gps-UTC-Model                       GPS-UTC-Model                           OPTIONAL,
    gps-Ionospheric-Model               GPS-Ionospheric-Model                   OPTIONAL,
    gps-NavigationModel                 GPS-NavigationModel                     OPTIONAL,
    dgpsCorrections                     DGPSCorrections                         OPTIONAL,
    referenceTime                       GPS-ReferenceTime                       OPTIONAL,
```

```
    gps-AcquisitionAssistance           GPS-AcquisitionAssistance                       OPTIONAL,
    gps-RealTime-Integrity              GPS-RealTimeIntegrity                           OPTIONAL,
    almanacAndSatelliteHealthSIB        AlmanacAndSatelliteHealthSIB                    OPTIONAL,
    gps-Transmission-TOW                GPS-Transmission-TOW                            OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { { RequestedDataValue-ExtIEs} }   OPTIONAL,
    ...
}

--at least one of the above IEs shall be present in the requested data value

RequestedDataValue-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- Requested Data Value Information
--
-- **************************************************************

RequestedDataValueInformation ::= CHOICE {
    informationAvailable        InformationAvailable,
    informationNotAvailable     InformationNotAvailable
}

InformationAvailable::= SEQUENCE {
    requestedDataValue      RequestedDataValue,
    iE-Extensions           ProtocolExtensionContainer { { InformationAvailable-ExtIEs} }    OPTIONAL,
    ...
}

InformationAvailable-ExtIEs PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

InformationNotAvailable ::= NULL


END
```

9.3.5 Common Definitions

```
-- **************************************************************
--
-- Common definitions
--
-- **************************************************************

PCAP-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
```

```
umts-Access (20) modules (3) pcap(4) version1 (1) pcap-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)

TransactionID       ::= CHOICE {
    shortTID            INTEGER (0..127),
    longTID             INTEGER (0..32767)
}

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

END
```

9.3.6 Constant Definitions

```
-- **************************************************************
--
-- Constant definitions
```

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

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

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    ProcedureCode,
    ProtocolIE-ID
FROM PCAP-CommonDataTypes;


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

id-PositionCalculation              ProcedureCode ::= 1
id-InformationExchangeInitiation    ProcedureCode ::= 2
id-InformationReporting             ProcedureCode ::= 3
id-InformationExchangeTermination   ProcedureCode ::= 4
id-InformationExchangeFailure       ProcedureCode ::= 5
id-ErrorIndication                  ProcedureCode ::= 6
id-privateMessage                   ProcedureCode ::= 7



-- **************************************************************
--
-- Lists
--
-- **************************************************************

maxNrOfErrors                       INTEGER ::= 256
maxSat                              INTEGER ::= 16
maxSatAlmanac                       INTEGER ::= 32
maxNrOfLevels                       INTEGER ::= 256
maxNrOfPoints                       INTEGER ::= 15
maxNrOfExpInfo                      INTEGER ::= 32
maxNrOfMeasNCell                    INTEGER ::= 32
maxNrOfMeasurements                 INTEGER ::= 16
maxNrOfSets                         INTEGER ::= 3

-- **************************************************************
--
-- IEs
```

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

id-Cause                                        ProtocolIE-ID ::= 1
id-CriticalityDiagnostics                       ProtocolIE-ID ::= 2
id-GPS-UTRAN-TRU                                ProtocolIE-ID ::= 3
id-InformationExchangeID                        ProtocolIE-ID ::= 4
id-InformationExchangeObjectType-InfEx-Rprt     ProtocolIE-ID ::= 5
id-InformationExchangeObjectType-InfEx-Rqst     ProtocolIE-ID ::= 6
id-InformationExchangeObjectType-InfEx-Rsp      ProtocolIE-ID ::= 7
id-InformationReportCharacteristics             ProtocolIE-ID ::= 8
id-InformationType                              ProtocolIE-ID ::= 9
id-MeasuredResultsList                          ProtocolIE-ID ::= 10
id-MessageStructure                             ProtocolIE-ID ::= 19
id-MethodType                                   ProtocolIE-ID ::= 11
id-RefPosition-InfEx-Rqst                       ProtocolIE-ID ::= 12
id-RefPosition-InfEx-Rsp                        ProtocolIE-ID ::= 13
id-RefPosition-Inf-Rprt                         ProtocolIE-ID ::= 14
id-RequestedDataValue                           ProtocolIE-ID ::= 15
id-RequestedDataValueInformation                ProtocolIE-ID ::= 16
id-TransactionID                                ProtocolIE-ID ::= 17
id-UE-PositionEstimate                          ProtocolIE-ID ::= 18
id-CellId-MeasuredResultsSets                   ProtocolIE-ID ::= 20
id-TypeOfError                                  ProtocolIE-ID ::= 21
id-OTDOA-MeasurementGroup                       ProtocolIE-ID ::= 22

END
```

9.3.7 Container Definitions

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

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

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

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

-- **************************************************************
--
-- Class Definition for Protocol IEs
--
-- **************************************************************

PCAP-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
--
-- **************************************************************

PCAP-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
--
```

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

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

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

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

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

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

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

ProtocolExtensionField {PCAP-PROTOCOL-EXTENSION : ExtensionSetParam} ::= SEQUENCE {
```

```
    id                  PCAP-PROTOCOL-EXTENSION.&id             ({ExtensionSetParam}),
    criticality         PCAP-PROTOCOL-EXTENSION.&criticality    ({ExtensionSetParam}{@id}),
    extensionValue      PCAP-PROTOCOL-EXTENSION.&Extension      ({ExtensionSetParam}{@id})
}

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

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

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

END
```

9.4 Message Transfer Syntax

PCAP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax, as specified in [9].

The following encoding rules apply in addition to what has been specified in X.691 [9]:

When a bitstring value is placed in a bit-field as specified in 15.6 to 15.11 in [9], the leading bit of the bitstring value shall be placed in the leading bit of the bit-field, and the trailing bit of the bitstring value shall be placed in the trailing bit of the bit-field.

NOTE - When using the "bstring" notation, the leading bit of the bitstring value is on the left, and the trailing bit of the bitstring value is on the right. The term ‘leading bit’ is to be interpreted as equal to the term ‘first bit’ defined in [7].

/* partly omitted */

Annex A (informative): Guidelines for Usage of the Criticality Diagnostics IE

A.1 EXAMPLE MESSAGE Layout

Assume the following message format:

Table A.1

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M				YES	Reject
Transaction ID	M				–	
A	M				YES	reject
B	M				YES	reject
>E		*1..<maxE>*			EACH	ignore
>>F		*1..<maxF>*			-	
>>>G		*0..3, ...*			EACH	ignore
>>H		*1..<maxH>*			EACH	ignore
>>>G		*0..3, ...*			EACH	ignore and notify
>>G	M				YES	reject
>>J		*1..<maxJ>*			-	
>>>G		*0..3, ...*			EACH	reject
C	M				YES	reject
>K		*1..<maxK>*			EACH	ignore and notify
>>L		*1..<maxL>*			-	
>>>M	O				-	
D	M				YES	reject

NOTE: The IEs F, J, and L do not have assigned criticality. The IEs F, J, and L are consequently realised as the ASN.1 type SEQUENCE OF of "ordinary" ASN.1 type, e.g. INTEGER. On the other hand, the repeatable IEs with assigned criticality are realised as the ASN.1 type SEQUENCE OF of an IE object, e.g. ProtocolIE-Single-Container.

For the corresponding ASN.1 layout, see clause A.4.

A.2 Example on a Received EXAMPLE MESSAGE

Assume further more that a received message based on the above tabular format is according to figure A.1.

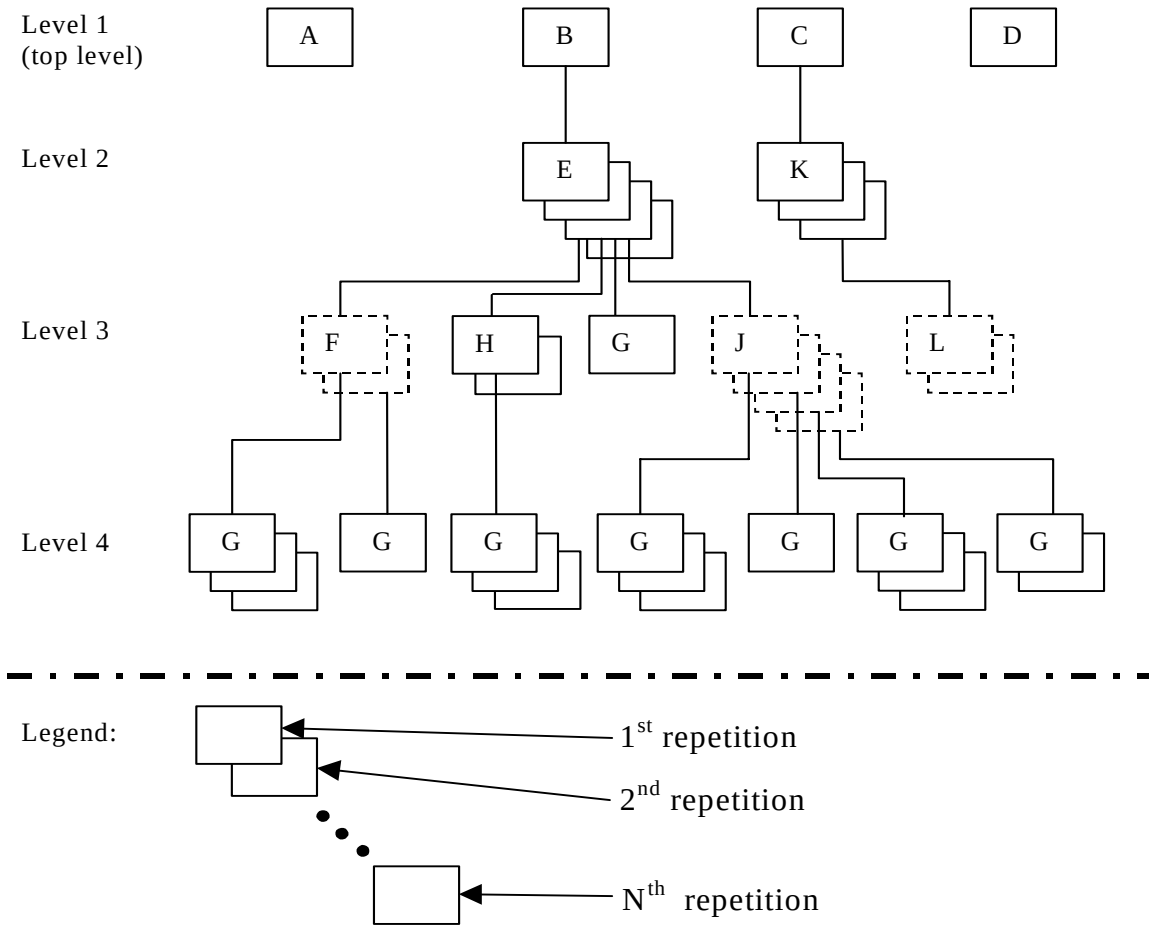

Figure A.1: Example of content of a received ~~NBA~~PCAP message based on the EXAMPLE MESSAGE

A.3 Content of Criticality Diagnostics

A.3.1 Example 1

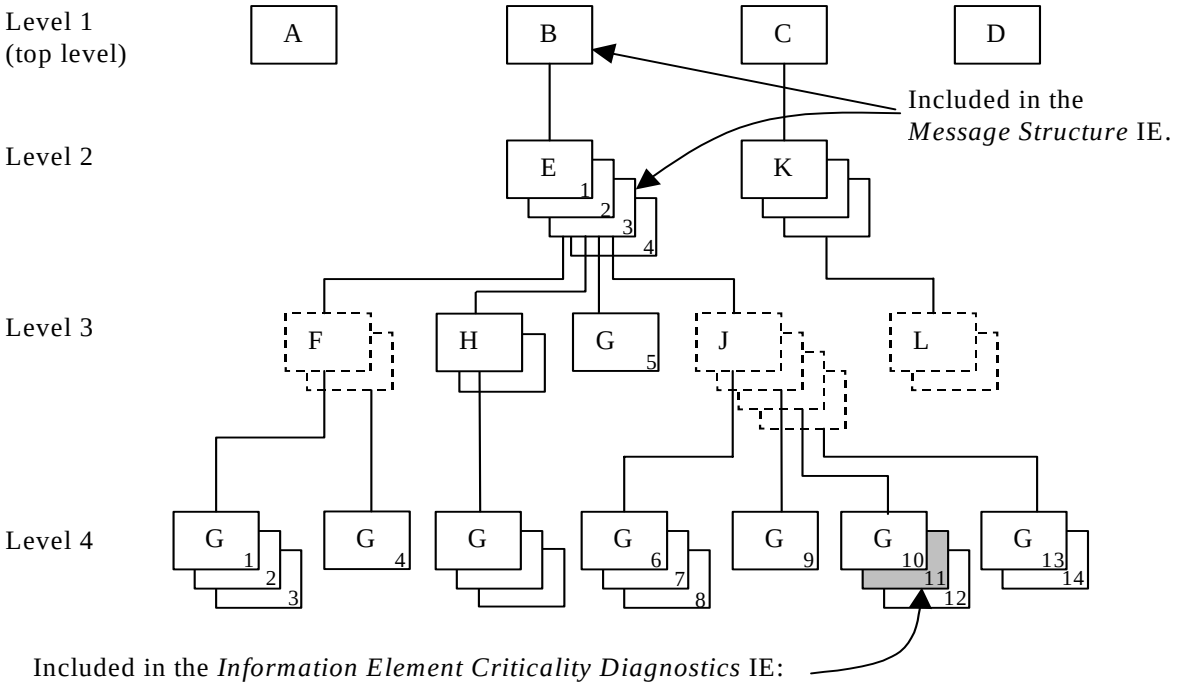

Figure A.2: Example of a received ~~NBA~~PCAP message containing a not comprehended IE

If there is an error within the instance marked as grey in the IE G in the IE J shown in the figure A.2, this will be reported within the *Information Element Criticality Diagnostics* IE within the *Criticality Diagnostics* IEas in table A.2.

Table A.2

IE name	Value	Comment
IE Criticality	Reject	Criticality for IE on the reported level, i.e. level 4.
IE ID	id-G	IE ID from the reported level, i.e. level 4.
Repetition Number	11	Repetition number on the reported level, i.e. level 4. (Since the IE E (level 2) is the lowest level included in the *Message Structure* IE this is the eleventh occurrence of IE G within the IE E (level 2).
Type of Error	not understood	
Message Structure, *first repetition*		
>IE ID	id-B	IE ID from level 1.
Message Structure, *second repetition*		
>IE ID	id-E	IE ID from the lowest level above the reported level, i.e. level 2.
>Repetition Number	3	Repetition number from the lowest level above the reported level, i.e. level 2.

NOTE 1: The IE J on level 3 cannot be included in the *Message Structure* IE since they have no criticality of their own.

NOTE 2: The repetition number of the reported IE indicates the number of repetitions of IE G received up to the detected erroneous repetition, counting all occurrences of the IE G below the same instance of the previous level with assigned criticality (instance 3 of IE E on level 2).

A.3.2 Example 2

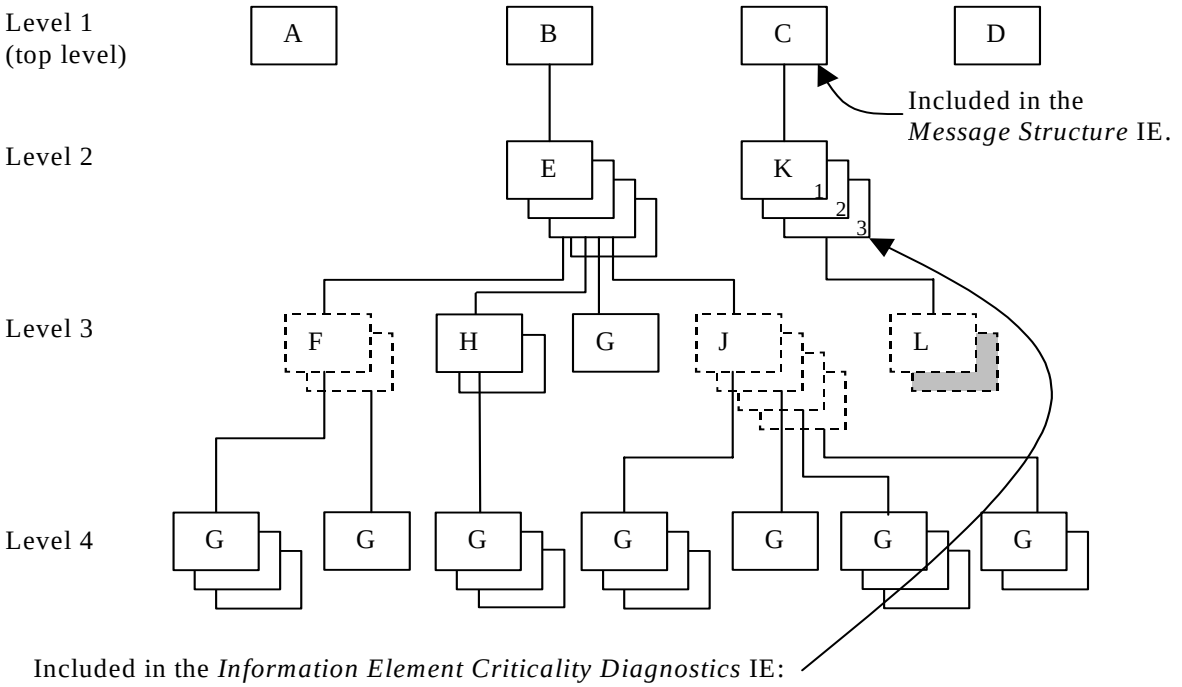

Figure A.3: Example of a received ~~NBA~~PCAP message containing a not comprehended IE

If there is an error within the second instance (marked as grey) in the sequence (IE L in the tabular format) on level 3 below IE K in the structure shown in the figure A.3, this will be reported within the *Information Element Criticality Diagnostics* IE within the *Criticality Diagnostics* IEas in table A.3.

Table A.3

IE name	Value	Comment
IE Criticality	ignore and notify	Criticality for IE on the reported level, i.e. level 2.
IE ID	id-K	IE ID from the reported level, i.e. level 2.
Repetition Number	3	Repetition number on the reported level, i.e. level 2.
Type of Error	not understood	
Message Structure, *first repetition*		
>IE ID	id-C	IE ID from the lowest level above the reported level, i.e. level 1.

NOTE: The IE L on level 3 cannot be reported individually included in the *Message Structure* IE since it has no criticality of its own.

A.3.3 Example 3

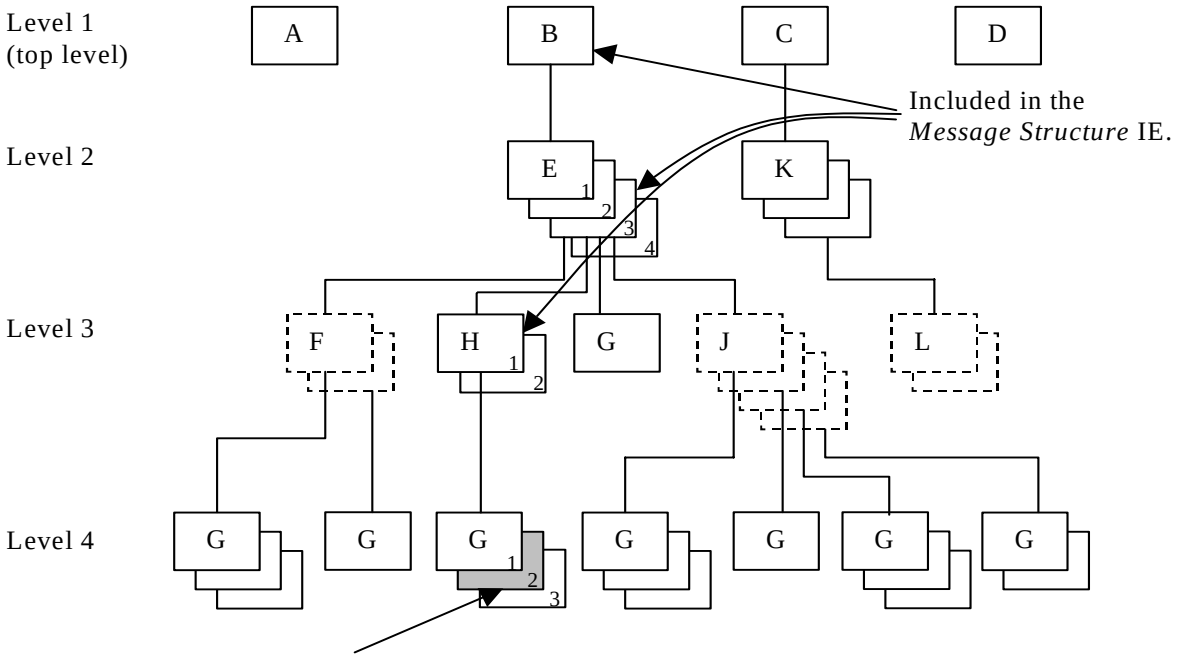

Figure A.4: Example of a received ~~NBA~~PCAP message containing a not comprehended IE

If there is an error within the instance marked as grey in the IE G in the IE H shown in the figure A.4, this will be reported within the *Information Element Criticality Diagnostics* IE within the *Criticality Diagnostics* IEas in table A.4.

Table A.4

IE name	Value	Comment
IE Criticality	ignore and notify	Criticality for IE on the reported level, i.e. level 4.
IE ID	id-G	IE ID from the reported level, i.e. level 4.
Repetition Number	2	Repetition number on the reported level, i.e. level 4.
Type of Error	not understood	
Message Structure, *first repetition*		
>IE ID	id-B	IE ID from level 1.
Message Structure, *second repetition*		
>IE ID	id-E	IE ID from level 2.
>Repetition Number	3	Repetition number from level 2.
Message Structure, *third repetition*		
>IE ID	id-H	IE ID from the lowest level above the reported level, i.e. level 3.
>Repetition Number	1	Repetition number from the lowest level above the reported level, i.e. level 3.

NOTE: The repetition number of level 4 indicates the number of repetitions of IE G received up to the detected erroneous repetition, counted below the same instance of the previous level with assigned criticality (instance 1 of IE H on level 3).

A.3.4 Example 4

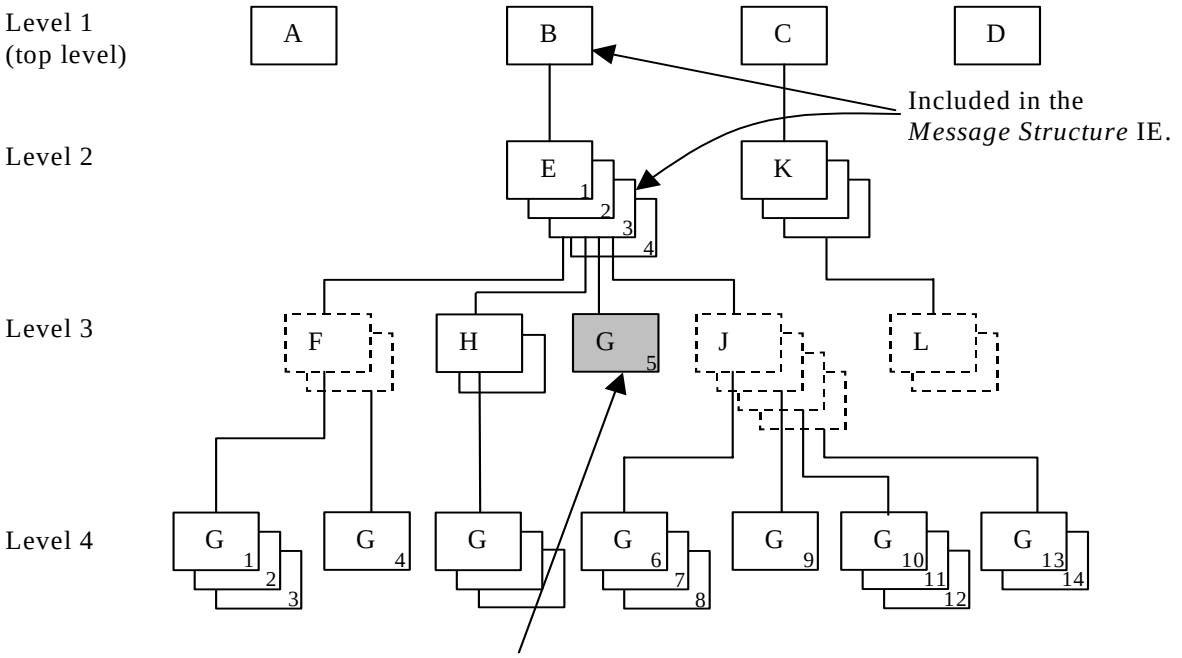

Figure A.5: Example of a received ~~NBA~~PCAP message containing a not comprehended IE

If there is an error within the instance marked as grey in the IE G in the IE E shown in the figure A.5, this will be reported within the *Information Element Criticality Diagnostics* IE within the *Criticality Diagnostics* IE, as in table A.5.

Table A.5

IE name	Value	Comment
IE Criticality	Reject	Criticality for IE on the reported level, i.e. level 3.
IE ID	id-G	IE ID from the reported level, i.e. level 3.
Repetition Number	5	Repetition number on the reported level, i.e. level 3. (Since the IE E (level 2) is the lowest level included in the *Message Structure* IE this is the fifth occurrence of IE G within the IE E (level 2).
Type of Error	not understood	
Message Structure, *first repetition*		
>IE ID	id-B	IE ID from level 1.
Message Structure, *second repetition*		
>IE ID	id-E	IE ID from the lowest level above the reported level, i.e. level 2.
>Repetition Number	3	Repetition number from the lowest level above the reported level, i.e. level 2.

NOTE: The repetition number of the reported IE indicates the number of repetitions of IE G received up to the detected erroneous repetition, counting all occurrences of the IE G below the same instance of the previous level with assigned criticality (instance 3 of IE E on level 2).

A.3.5 Example 5

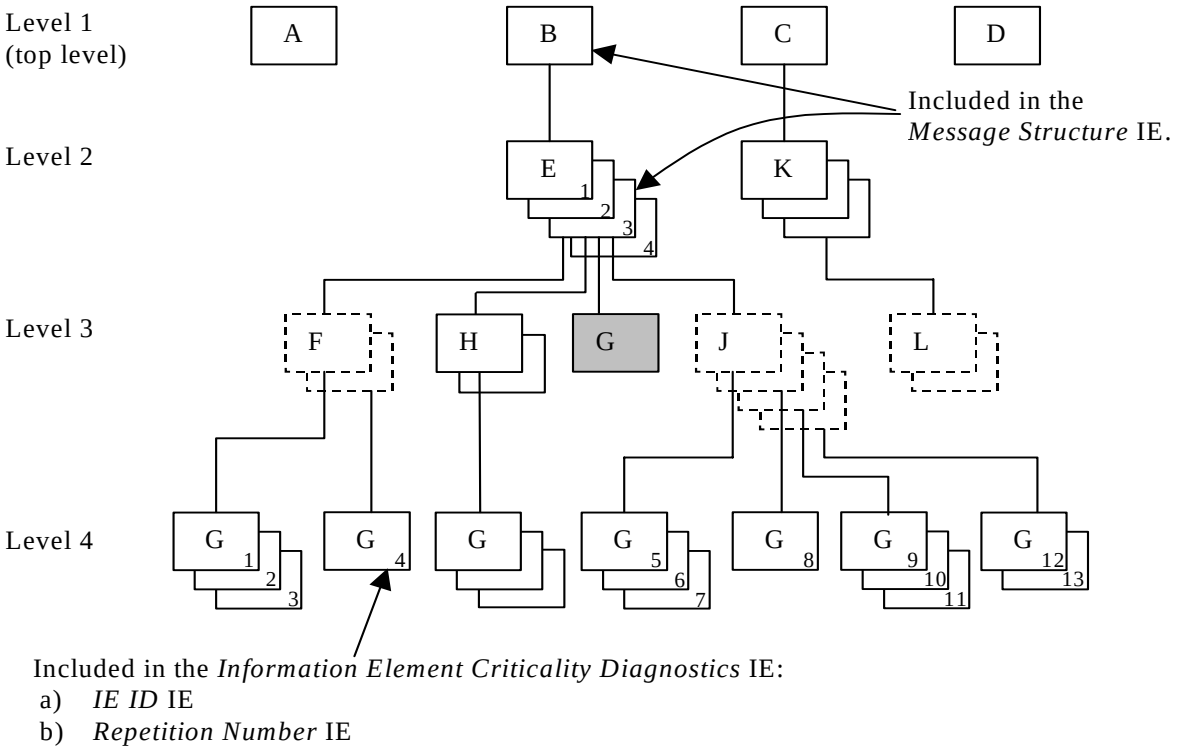

Figure A.6: Example of a received ~~NBA~~PCAP message with a missing IE

If the instance marked as grey in the IE G in the IE E shown in the figure A.6, is missing this will be reported within the *Information Element Criticality Diagnostics* IE within the *Criticality Diagnostics* IE, as in table A.6.

Table A.6

IE name	Value	Comment
IE Criticality	reject	Criticality for IE on the reported level, i.e. level 3.
IE ID	id-G	IE ID from the reported level, i.e. level 3.
Repetition Number	4	Repetition number up to the missing IE on the reported level, i.e. level 3. (Since the IE E (level 2) is the lowest level included in the *Message Structure* IE there have been four occurrences of IE G within the IE E (level 2) up to the missing occurrence.
Type of Error	missing	
Message Structure, *first repetition*		
>IE ID	id-B	IE ID from level 1.
Message Structure, *second repetition*		
>IE ID	id-E	IE ID from the lowest level above the reported level, i.e. level 2.
>Repetition Number	3	Repetition number from the lowest level above the reported level, i.e. level 2.

NOTE: The repetition number of the reported IE indicates the number of repetitions of IE G received up to but not including the missing occurrence, counting all occurrences of the IE G below the same instance of the previous level with assigned criticality (instance 3 of IE E on level 2).

A.4 ASN.1 of EXAMPLE MESSAGE

```
ExampleMessage ::= SEQUENCE {
    ProtocolIEs         ProtocolIE-Container        {{ExampleMessage-IEs}},
    ProtocolExtensions  ProtocolExtensionContainer  {{ExampleMessage-Extensions}}   OPTIONAL,
    ...
}

ExampleMessage-IEs NBAPCAP-PROTOCOL-IES ::= {
    { ID id-A   CRITICALITY reject  TYPE A  PRESENCE mandatory} |
    { ID id-B   CRITICALITY reject  TYPE B  PRESENCE mandatory} |
    { ID id-C   CRITICALITY reject  TYPE C  PRESENCE mandatory} |
    { ID id-D   CRITICALITY reject  TYPE D  PRESENCE mandatory} ,
    ...
}

B ::= SEQUENCE {
    e               E-List,
    iE-Extensions   ProtocolExtensionContainer { {B-ExtIEs} }   OPTIONAL,
    ...
}

B-ExtIEs NBAPCAP-PROTOCOL-EXTENSION ::= {
    ...
}

E-List ::= SEQUENCE (SIZE (1..maxE)) OF ProtocolIE-Single-Container { {E-IEs} }

E-IEs NBAPCAP-PROTOCOL-IES ::= {
    { ID id-E   CRITICALITY ignore  TYPE E  PRESENCE mandatory  }
}

E ::= SEQUENCE {
    f               F-List,
    h               H-List,
    g               G-List1,
    j               J-List,
    iE-Extensions   ProtocolExtensionContainer { {E-ExtIEs} }   OPTIONAL,
    ...
}

E-ExtIEs NBAPCAP-PROTOCOL-EXTENSION ::= {
    ...
}

F-List ::= SEQUENCE (SIZE (1..maxF)) OF F

F ::= SEQUENCE {
    g               G-List2 OPTIONAL,
    iE-Extensions   ProtocolExtensionContainer { {F-ExtIEs} }   OPTIONAL,
    ...
}

F-ExtIEs    NBAPCAP-PROTOCOL-EXTENSION ::= {
    ...
}

G-List2 ::= SEQUENCE (SIZE (1..3, ...)) OF ProtocolIE-Single-Container { {G2-IEs} }

G2-IEs NBAPCAP-PROTOCOL-IES ::= {
    { ID id-G   CRITICALITY ignore  TYPE G  PRESENCE mandatory  }
}

H-List ::= SEQUENCE (SIZE (1..maxH)) OF ProtocolIE-Single-Container { {H-IEs} }

H-IEs NBAPCAP-PROTOCOL-IES ::= {
    { ID id-H   CRITICALITY ignore  TYPE H  PRESENCE mandatory  }
}

H ::= SEQUENCE {
    g               G-List3 OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { {H-ExtIEs} } OPTIONAL,
    ...
}

H-ExtIEs NBAPCAP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}

G-List3 ::= SEQUENCE (SIZE (1..3, ...)) OF ProtocolIE-Single-Container { {G3-IEs} }

G3-IEs ~~NBA~~PCAP-PROTOCOL-IES ::= {
    { ID id-G   CRITICALITY notify  TYPE G  PRESENCE mandatory  }
}

G-List1 ::= ProtocolIE-Single-Container { {G1-IEs} }

G1-IEs ~~NBA~~PCAP-PROTOCOL-IES ::= {
    { ID id-G   CRITICALITY reject  TYPE G  PRESENCE mandatory  }
}

J-List ::= SEQUENCE (SIZE (1..maxJ)) OF J

J ::= SEQUENCE {
    g               G-List4 OPTIONAL,
    iE-Extensions   ProtocolExtensionContainer { {J-ExtIEs} }   OPTIONAL,
    ...
}

J-ExtIEs    ~~NBA~~PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

G-List4 ::= SEQUENCE (SIZE (1..3, ...)) OF ProtocolIE-Single-Container { {G4-IEs} }

G4-IEs ~~NBA~~PCAP-PROTOCOL-IES ::= {
    { ID id-G   CRITICALITY reject  TYPE G  PRESENCE mandatory  }
}

C ::= SEQUENCE {
    k               K-List,
    iE-Extensions   ProtocolExtensionContainer { {C-ExtIEs} }   OPTIONAL,
    ...
}

C-ExtIEs ~~NBA~~PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

K-List ::= SEQUENCE (SIZE (1..maxK)) OF ProtocolIE-Single-Container { {K-IEs} }

K-IEs ~~NBA~~PCAP-PROTOCOL-IES ::= {
    { ID id-K   CRITICALITY notify  TYPE K  PRESENCE mandatory  }
}

K ::= SEQUENCE {
    l               L-List,
    iE-Extensions   ProtocolExtensionContainer { {K-ExtIEs} }   OPTIONAL,
    ...
}

K-ExtIEs ~~NBA~~PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

L-List ::= SEQUENCE (SIZE (1..maxL)) OF L

L ::= SEQUENCE {
    m               M   OPTIONAL,
    iE-Extensions   ProtocolExtensionContainer { {L-ExtIEs} }   OPTIONAL,
    ...
}

L-ExtIEs ~~NBA~~PCAP-PROTOCOL-EXTENSION ::= {
    ...
}

ExampleMessage-Extensions ~~NBA~~PCAP-PROTOCOL-EXTENSION ::= {
    ...
}
```