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Contents

Foreword

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

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1 Scope

The present document specifies the procedures and the SBc Application Part (SBc-AP) messages used on the SBc-AP interface between the Mobility Management Entity (MME) and the Cell Broadcast Centre (CBC).

The present document supports the following functions.

- Warning Message Transmission function in the EPS.

2 References

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

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

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

[2] IETF RFC 2460 (December 1998): "Internet Protocol, Version 6 (IPv6) Specification".

[3] IETF RFC 791 (September 1981): "Internet Protocol".

[4] IETF RFC 4960 (September 2007): "Stream Control Transmission Protocol".

[5] Void

[6] Void

[7] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)"

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

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

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

[11] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[12] Void

[13] 3GPP TS 22.268: "Public Warning System (PWS) requirements".

[14] 3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)".

[15] Void

[16] 3GPP TS 23.007: "Restoration procedures".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

Elementary Procedure: SBc-AP consists of Elementary Procedures (EPs). An Elementary Procedure is a unit of interaction between MME and CBC. These Elementary Procedures are defined separately and are intended to be used to build up complete sequences in a flexible manner. If the independence between some EPs is restricted, it is described under the relevant EP description. Unless otherwise stated by the restrictions, the EPs may be invoked independently of each other as stand alone procedures, which can be active in parallel. Examples on using several SBc-APs together with each other and EPs from other interfaces can be found in reference [FFS].

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

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

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

Successful:

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

Unsuccessful:

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

Successful and Unsuccessful:

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

Class 2 EPs are considered always successful.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

CMAS	Commercial Mobile Alert System
CBC	Cell Broadcast Center
CBS	Cell Broadcast Service
EPC	Evolved Packet Core
EPS	Evolved Packet System
ETWS	Earthquake and Tsunami Warning System
MME	Mobility Management Entity
PWS	Public Warning System
SCTP	Stream Control Transmission Protocol

4 SBc description

4.1 Transport

4.1.1 General

This subclause specifies the standards for signalling transport to be used across SBc-AP interface. SBc-AP interface is a logical interface between the MME and the CBC. All the SBc-AP messages described in the present document require an SCTP association between the MME and the CBC.

4.1.2 Network layer

The MME and the CBC shall support IPv6 (see IETF RFC 2460 [2]) and/or IPv4 (see IETF RFC 791 [3]).

The IP layer of SBc-AP only supports point-to-point transmission for delivering SBc-AP messages.

4.1.3 Transport layer

SCTP (see IETF RFC 4960 [4]) shall be supported as the transport layer of SBc-AP messages.

Semi-permanent SCTP associations shall be established between MME and CBC, i.e. the SCTP associations shall remain up under normal circumstances.

Local multi-homing should be supported. Remote multi-homing shall be supported.

Multiple local SCTP endpoints may be supported. Multiple remote SCTP endpoints shall be supported. When multiple local or remote SCTP endpoints are configured, several simultaneous SCTP associations shall be supported between MME and CBC.

Checksum calculation for SCTP shall be supported as specified in RFC 4960 [4].

The CBC shall establish the SCTP association.

The registered port number for SBc-AP is 29168.

The registered payload protocol identifier for SBc-AP is 24.

4.1.4 Services expected from signalling transport

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

4.2. SBc-AP functions

4.2.1 Function of SBc-AP

SBc-AP has the following function:

- Warning Message Transmission function:
  This functionality provides the means to start, overwrite and stop the broadcasting of warning message in support of the Public Warning System (PWS) messages as defined in 3GPP TS 22.268 [13] which include Commercial Mobile Warning System (CMAS) and Earthquake and Tsunami (ETWS) messages.

4.3 SBc-AP procedure

4.3.1 General

This sub-clause describes the parameters and detailed behaviors of different procedures.

4.3.2 List of SBc-AP elementary procedure

Table 4.3.2-1 lists the SBc-AP Elementary Procedures defined as class 1 procedures.

Table 4.3.2-1: SBc-AP class 1 elementary procedures

Elementary Procedure	Initiating Message	Successful Outcome	Unsuccessful Outcome
		Response message	Response message
Write-Replace Warning procedure	WRITE-REPLACE WARNING REQUEST	WRITE-REPLACE WARNING RESPONSE	
Stop Warning Procedure	STOP WARNING REQUEST	STOP WARNING RESPONSE	

Table 4.3.2-2 lists the SBc-AP Elementary Procedures defined as class 2 procedures.

Table 4.3.2-2: SBc-AP class 2 elementary procedures

Elementary Procedure	Initiating Message
Error Indication procedure	ERROR INDICATION
Write Replace Warning Indication procedure	WRITE REPLACE WARNING INDICATION
Stop Warning Indication procedure	STOP WARNING INDICATION
PWS Restart Indication	PWS RESTART INDICATION
PWS Failure Indication	PWS FAILURE INDICATION

4.3.3 Write Replace Warning Procedure

4.3.3.1 General

The purpose of Write-Replace Warning procedure is to start, overwrite the broadcasting of warning message, as defined in 3GPP TS 23.041 [14].

4.3.3.2 Successful Operation

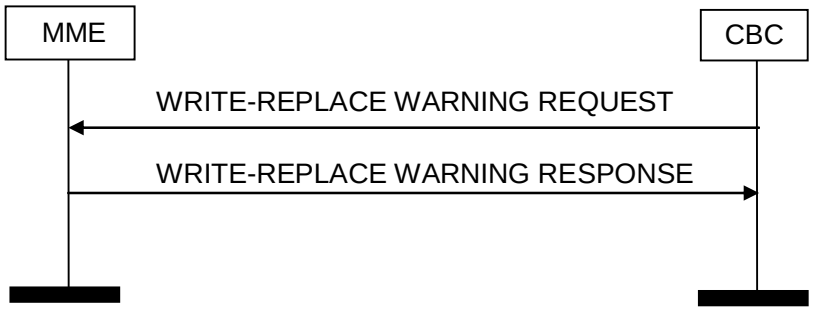

Figure 4.3.3.2-1: Write-Replace Warning procedure. Successful operation.

The CBC initiates the procedure by sending a WRITE-REPLACE WARNING REQUEST message to the MME.

Upon reception of WRITE-REPLACE WARNING REQUEST message, the MME shall forward the message towards the eNBs which belong to the tracking area indicated in *List of TAIs* IE, if this list is present.

If a *Global eNB ID* IE is present in the WRITE-REPLACE WARNING REQUEST message, the MME shall forward the message only towards the eNB identified by the *Global eNB ID* if this IE is supported by the MME. If the *Global eNB ID* IE is not supported by the MME, the MME shall forward the WRITE-REPLACE WARNING REQUEST message using the *List of TAIs* IE, if this list is present, otherwise the MME shall send the message towards all connected (H)eNBs. An MME and a CBC which support the PWS Restoration procedures as specified in 3GPP TS 23.007 [16] subclause 15A.1 shall support the *Global eNB ID* IE.

If neither the *List of TAIs* IE, nor the *Global eNB ID* IE (if this is supported) are present in WRITE-REPLACE WARNING REQUEST message, the MME shall forward the message towards all connected eNBs.

The MME shall return a WRITE-REPLACE WARNING RESPONSE to the CBC immediately after the reception of the WRITE-REPLACE WARNING REQUEST message without waiting responses from eNBs.

The MME shall set the cause IE to ‘Message accepted’ in the WRITE-REPLACE WARNING RESPONSE message.

4.3.3.3 Unsuccessful Operation

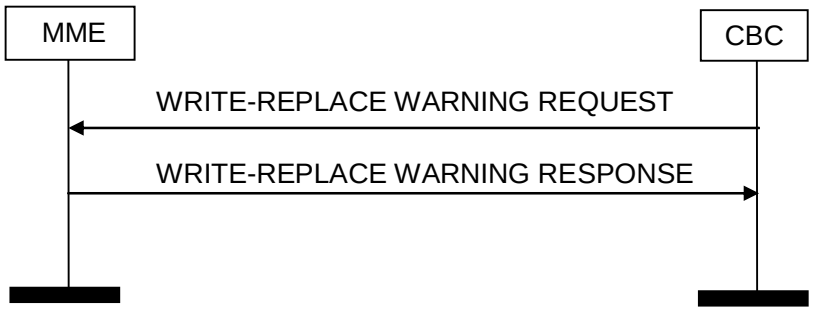

Figure 4.3.3.3-1: Write-Replace Warning procedure. Unsuccessful operation.

The CBC initiates the procedure by sending a WRITE-REPLACE WARNING REQUEST message to the MME.

If MME cannot process the received WRITE-REPLACE WARNING REQUEST message, the MME shall return a WRITE-REPLACE WARNING RESPONSE message towards the CBC and the MME shall not forward the message towards the eNBs belonged to the tracking area as indicated in *List of TAIs* IE.

The MME shall indicate a reason of failure in the cause IE.

NOTE: An Unsuccessful Operation is reported as a Successful Outcome in the Response message. See subclause 3.1.

4.3.3A Stop Warning Procedure

4.3.3A.1 General

The purpose of Stop Warning Procedure is to stop the broadcasting of warning message.

4.3.3A.2 Successful Operation

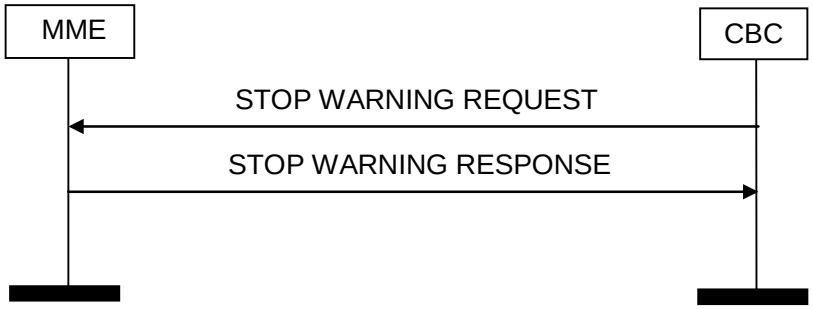

Figure 4.3.3A.2-1: Stop Warning Procedure, Successful Operation.

The CBC initiates the Stop Warning Procedure by sending a STOP WARNING REQUEST message to the MME.

Upon reception of STOP WARNING REQUEST message, the MME shall forward the message towards the eNBs belonged to the tracking area as indicated in *List of TAIs* IE.

If none of *List of TAIs* IE is present in STOP WARNING REQUEST message, the MME shall forward the message towards all connected eNBs.

The MME shall return a STOP WARNING RESPONSE to the CBC immediately after the reception of the STOP WARNING REQUEST message without waiting responses from eNBs.

The MME shall set the cause IE to 'Message accepted' in the STOP WARNING RESPONSE message.

4.3.3A.3 Unsuccessful Operation

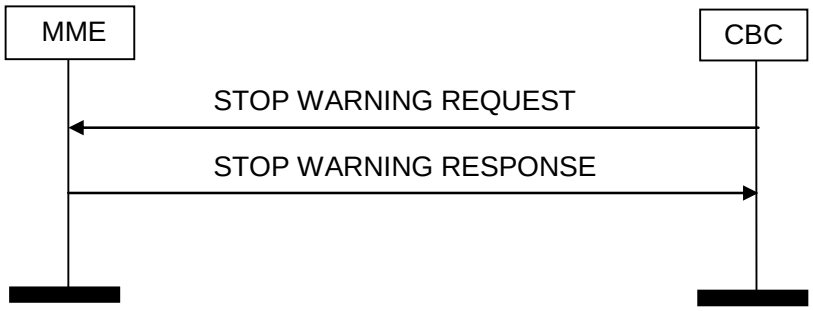

Figure 4.3.3A.3-1: Stop Warning procedure, Unsuccessful operation.

The CBC initiates the Stop Warning Procedure by sending a STOP WARNING REQUEST message to the MME.

If MME cannot process the received STOP WARNING REQUEST message, the MME shall return a STOP WARNING RESPONSE message towards the CBC and the MME shall not forward the message towards the eNBs belonged to the tracking area as indicated in *List of TAIs* IE.

The MME shall indicate a reason of failure in the cause IE.

NOTE: An Unsuccessful Operation is reported as a Successful Outcome in the Response message. See subclause 3.1.

4.3.3B Error Indication

4.3.3B.1 General

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

4.3.3B.2 Successful Operation

Figure 4.3.3B.2-1: Error Indication procedure, CBC originated. Successful operation.

Figure 4.3.3B.2-2: Error Indication procedure, MME originated. Successful operation.

When the conditions defined in subclause 4.5 are fulfilled, the Error Indication procedure is initiated by an ERROR INDICATION message sent from the receiving node.

The ERROR INDICATION message shall contain at least either the *Cause* IE or the *Criticality Diagnostics* as indicated in subclause 4.5.

4.3.3B.3 Abnormal Conditions

Not applicable.

4.3.3C Write Replace Warning Indication

4.3.3C.1 General

If supported by the MME, the Write-Replace-Warning-Indication message(s) shall be sent by the MME to report to the CBC the Broadcast Scheduled Area List if the Send Write-Replace-Warning-Indication parameter was present in the corresponding Write-Replace-Warning-Request. The Broadcast Scheduled Area List shall contain the Broadcast Completed Area List the MME has received from the eNodeB(s) [7].

4.3.3C.2 Successful Operation

Figure 4.3.3C.2-1: Write Replace Warning Indication procedure, MME originated. Successful operation.

The MME initiates the Write Replace Warning Indication procedure by sending a WRITE REPLACE WARNING INDICATION message(s) to the CBC after it has previously received a Broadcast Completed Area List from eNodeB(s) in a WRITE-REPLACE WARNING MESSAGE [7]. The MME may aggregate Broadcast Completed Area Lists it receives from the eNodeBs.

4.3.3C.3 Abnormal Conditions

Not applicable.

4.3.3D Stop Warning Indication

4.3.3D.1 General

If supported by the MME, the Stop Warning Indication message(s) shall be sent by the MME to report to the CBC the Broadcast Cancelled Area List if the Send Stop Warning Indication parameter was present in the corresponding Stop Warning Request. The Broadcast Cancelled Area List shall contain the Broadcast Cancelled Area List the MME has received from the eNodeB(s) [7].

4.3.3D.2 Successful Operation

Figure 4.3.3D.2-1: Stop Warning Indication procedure, MME originated. Successful operation.

The MME initiates the Stop Warning Indication procedure by sending a STOP WARNING INDICATION message to the CBC after it has previously received a Broadcast Cancelled Area List from an eNodeB. The MME may aggregate Broadcast Cancelled Area Lists it receives from the eNodeBs.

4.3.3D.3 Abnormal Conditions

Not applicable.

4.3.3E PWS Restart Indication

4.3.3E.1 General

The PWS Restart Indication is sent by the MME to the CBC upon receipt of a PWS Restart Indication from an (H)eNB, to indicate that the PWS service is restarted in one or more or all cells served by an (H)eNB, i.e. the service has become operational and no warning message data is available for these cell(s). The CBC shall reload the cells if required.

4.3.3E.2 Successful Operation

Figure 4.3.3E.2-1: PWS Restart Indication, Successful Operation.

The MME initiates the PWS Restart Indication procedure by sending a PWS RESTART INDICATION message to the CBC upon receiving a PWS Restart Indication message from an (H)eNB (see TS 36.413 [7]).

The MME shall copy the following parameters from the PWS Restart Indication received from the (H)eNB into the corresponding parameters in the PWS-RESTART-INDICATION towards the CBC:

- Global eNB ID of the (H)eNB;
- Reloaded E-CGI List into the Restarted-Cell-List;
- Tracking Area ID List;
- Emergency Area ID List (if received from the (H)eNB, i.e. if the restarted cell(s) are configured with Emergency Area ID(s)).

Upon receipt of a PWS Restart Indication message, the CBC shall consider that the PWS service is restarted in the reported cell(s), i.e. the service is operational and no warning messages are being broadcast in these cell(s). The CBC shall then reload the warning message data to the (H)eNB for these cells, if any.

The CBC shall consider a PWS Restart Indication message received shortly after a preceding one for the same cell identity as a duplicate restart indication for that cell which it shall ignore.

NOTE: The CBC can receive the same PWS Restart Indication message via two MMEs of the MME pool for redundancy reasons (see subclause 15A.1 of 3GPP TS 23.007 [16]).

The CBC shall reload the warning message data (with the same Message Identifier and Serial Number) to the (H)eNB by initiating Write Replace Warning procedure(s) as specified in subclause 4.3.3.2 with the following additions:

- the CBC should set the *Warning Area List* IE in the Write-Replace Warning Request message to the identities of the cell(s) received in the Restarted-Cell-List which are relevant to the warning message data being reloaded;
- the CBC shall copy the Global eNB ID into the Write-Replace Warning Request message; and
- the CBC may update the Number of Broadcast Requested, if necessary.

4.3.3E.3 Abnormal Conditions

Not applicable.

4.3.3F PWS Failure Indication

4.3.3F.1 General

The PWS Failure Indication is sent by the MME to the CBC upon receipt of a PWS Failure Indication from an (H)eNB, to indicate that ongoing PWS operation in one or more or all cells served by an (H)eNB has failed.

4.3.3F.2 Successful Operation

Figure 4.3.3F.2-1: PWS Failure Indication, Successful Operation.

The MME initiates the PWS Failure Indication procedure by sending a PWS FAILURE INDICATION message to the CBC upon receiving a PWS Failure Indication message from an (H)eNB (see TS 36.413 [7]).

The MME shall copy the following parameters from the PWS Failure Indication received from the (H)eNB into the corresponding parameters in the PWS-FAILURE-INDICATION towards the CBC:

- Global eNB ID of the (H)eNB;
- E-CGI List Failed for PWS into the Failed-Cell-List;

4.3.3F.3 Abnormal Conditions

Not applicable.

4.3.4 Message functional definition and content

4.3.4.1 Message contents

4.3.4.1.1 Presence

All information elements in the message descriptions below are marked mandatory, optional or conditional according to table 4.3.4.1.1-1.

Table 4.3.4.1.1-1: Meaning of abbreviations used in SBc-AP 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.

4.3.4.1.2 Criticality

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

Table 4.3.4.1.2-1: Meaning of content within "Criticality" column

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

4.3.4.1.3 Range

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

4.3.4.1.4 Assigned Criticality

This column provides the actual criticality information as defined in subclause 4.5.3.2, if applicable.

4.3.4.2 Warning Message Transmission Messages

4.3.4.2.1 WRITE-REPLACE WARNING REQUEST

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

Direction: CBC → MME

Table 4.3.4.2.1-1: WRITE-REPLACE WARNING REQUEST message contents

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		4.3.4.3.1		YES	reject
Message Identifier	M		[7]		YES	reject
Serial Number	M		[7]		YES	reject
List of TAIs	O				YES	reject
>TAI List Item		1 to <maxnoofTAI>				
>>TAI	M		[7]			
Warning Area List	O		[7]		YES	ignore
Repetition Period	M		[7]		YES	reject
Extended Repetition Period	O		[7]		YES	reject
Number of Broadcast Requested	M		[7]		YES	reject
Warning Type	O		[7]		YES	ignore
Warning Security Information	O		[7]		YES	ignore
Data Coding Scheme	O		[7]		YES	ignore
Warning Message Contents	O		[7]		YES	ignore
OMC ID	O		4.3.4.3.4		YES	ignore
Concurrent Warning Message Indicator	O		[7]		YES	reject
Send Write-Replace-Warning-Indication	O		4.3.4.3.5		YES	ignore
Global eNB ID	O		[7]		YES	ignore

Table 4.3.4.2.1-2: RANGE explanation

Range bound	Explanation
maxnoofTAI	Maximum no. of TAI subject for warning message broadcast. Value is 65535.

4.3.4.2.2 WRITE-REPLACE WARNING RESPONSE

This message is sent by the MME to acknowledge the CBC on the start or overwrite request of a warning message.

Direction: MME → CBC

Table 4.3.4.2.2-1: WRITE-REPLACE WARNING RESPONSE message contents

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		4.3.4.3.1		YES	reject
Message Identifier	M		[7]		YES	reject
Serial Number	M		[7]		YES	reject
Cause	M		4.3.4.3.2		YES	reject
Criticality Diagnostics	O		4.3.4.3.3		YES	ignore
Unknown Tracking Area List	O		4.3.4.3.6		YES	ignore

4.3.4.2.3 STOP WARNING REQUEST

This message is sent by the CBC to stop a warning message broadcast.

Direction: CBC → MME

Table 4.3.4.2.3-1: STOP WARNING REQUEST message contents

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		4.3.4.3.1		YES	reject
Message Identifier	M		[7]		YES	reject
Serial Number	M		[7]		YES	reject
List of TAIs	O				YES	reject
>TAI List Item		1 to <maxnoofTAI>				
>>TAI	M		[7]			
Warning Area List	O		[7]		YES	Ignore
OMC ID	O		4.3.4.3.4		YES	ignore
Send Stop Warning Indication	O		4.3.4.3.7		YES	ignore
Stop-All Indicator	O		4.3.4.3.8		YES	reject

Table 4.3.4.2.1-2: RANGE explanation

Range bound	Explanation
maxnoofTAI	Maximum no. of TAI subject for warning message broadcast. Value is 65535.

4.3.4.2.4 STOP WARNING RESPONSE

This message is sent by the MME to acknowledge the CBC on the stop request of a warning message.

Direction: MME → CBC

Table 4.3.4.2.2-1: STOP WARNING RESPONSE message contents

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		4.3.4.3.1		YES	reject
Message Identifier	M		[7]		YES	reject
Serial Number	M		[7]		YES	reject
Cause	M		4.3.4.3.2		YES	reject
Criticality Diagnostics	O		4.3.4.3.3		YES	ignore
Unknown Tracking Area List	O		4.3.4.3.6		YES	ignore

4.3.4.2.5 WRITE REPLACE WARNING INDICATION

This message is sent by the MME to report to the CBC the Broadcast Scheduled Area List(s) the MME has received from the eNodeB(s) as Broadcast Completed Area List in a WRITE-REPLACE WARNING RESPONSE [7]. Multiple responses from eNodeBs may be combined in a Broadcast Scheduled Area List.

The *Broadcast Scheduled Area List* IE is only included in the WRITE-REPLACE WARNING INDICATION when the broadcast is successful in at least one cell within the eNodeBs.

Direction: MME → CBC

Table 4.3.4.2.5-1: WRITE REPLACE WARNING INDICATION message contents

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		4.3.4.3.1		YES	ignore
Message Identifier	M		[7]		YES	reject
Serial Number	M		[7]		YES	reject
Broadcast Scheduled Area List	O		[7]		YES	reject

4.3.4.2.6 STOP WARNING INDICATION

This message is sent by the MME to report to the CBC the Broadcast Cancelled Area List the MME has received from the eNodeB in a KILL RESPONSE [7]. If the MME has received a KILL RESPONSE without a *Broadcast Cancelled Area List* IE, then the eNodeB ID shall be included in the Broadcast Empty Area List instead. Multiple responses from eNodeBs may be aggregated into a combined Broadcast Cancelled Area List.

NOTE: The CBC is able to derive the list of cell IDs that are served by the eNodeB, because the eNodeB ID is contained in the cell ID.The *Broadcast Cancelled Area List* IE is only included in the STOP WARNING INDICATION when the broadcast is successfully stopped in at least one cell within the eNodeBs.

The Broadcast Empty Area *List* IE shall be included in the STOP-WARNING-INDICATION when the MME has received at least one KILL RESPONSE without *Broadcast Cancelled Area List* IE.

Direction: MME → CBC

Table 4.3.4.2.6-1: STOP WARNING INDICATION message contents

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		4.3.4.3.1		YES	ignore
Message Identifier	M		[7]		YES	reject
Serial Number	M		[7]		YES	reject
Broadcast Cancelled Area List	O		[7]		YES	reject
Broadcast Empty Area List	O		4.3.4.3.9		YES	ignore

4.3.4.2.7 PWS RESTART INDICATION

This Indication is sent by the MME to report to the CBC the List of cells that have become available for PWS and have no warning message data.

Direction: MME → CBC

Table 4.3.4.2.7-1: PWS RESTART INDICATION message contents

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		4.3.4.3.1		YES	ignore
Restarted-Cell-List	M		[7]		YES	reject
>Restarted Cell List Item		1 to <maxnoofRestartedCells>				
>>E-CGI	M		[7]			
Global eNB ID	M		[7]		YES	reject
List of TAIs for Restart	M				YES	reject
>TAI for Restart List Item		1 to <maxnoofTRestartTAIs>				
>>TAI	M		[7]			
List of EAIs for Restart	O				YES	reject
>EAI for Restart List Item		1 to <maxnoofRestartEAIs>				
>>Emergency Area ID	M		[7]			

Table 4.3.4.2.7-2: RANGE explanation

Range bound	Explanation
maxnoofRestartedCells	Maximum no. of restarted cells. Value is 256.
maxnoofRestartTAIs	Maximum no. of Tracking Area IDs configured in the restarted cells. Value is 2048.
maxnoofRestartEAIs	Maximum no. of Emergency Area ID configured in the restarted cells. Value is 256.

4.3.4.2.8 PWS FAILURE INDICATION

This Indication is sent by the MME to report to the CBC the List of cells that are no longer available for PWS.

Direction: MME → CBC

Table 4.3.4.2.8-1: PWS FAILURE INDICATION message contents

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		4.3.4.3.1		YES	ignore
Failed-Cell-List	M		[7]		YES	reject
>Failed Cell List Item		1 to <maxnoofFailedCells>				
>>E-CGI	M		[7]			
Global eNB ID	M		[7]		YES	reject

Table 4.3.4.2.8-2: RANGE explanation

Range bound	Explanation
maxnoofFailedCells	Maximum number of failed cells. Value is 256.

4.3.4.2A Management Messages

4.3.4.2A.1 ERROR INDICATION

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

Direction : MME → CBC and CBC → MME

Table 4.3.4.2A.1-1: ERROR INDICATION message contents

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		4.3.4.3.1		YES	ignore
Cause	O		4.3.4.3.2		YES	ignore
Criticality Diagnostics	O		4.3.4.3.3		YES	ignore

4.3.4.3 Information element definition

4.3.4.3.1 Message Type

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

Table 4.3.4.3.1-1: Message Type information element

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Message Type				Assumed max no of messages is 256.
>Procedure Code	M		(Write-Replace Warning, Stop Warning, Write-Replace Warning Indication, Stop Warning Indication, PWS Restart Indication, …)	
>Type of Message	M		CHOICE (Initiating Message, Successful Outcome, Unsuccessful Outcome, PWS Failure Indication, …)	

4.3.4.3.2 Cause

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

Table 4.3.4.3.2-1: Cause information element

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Cause	M		INTEGER (Message accepted, Parameter not recognised, Parameter value invalid, Valid message not identified, Tracking area not valid, Unrecognised message, Missing mandatory element, MME capacity exceeded, MME memory exceeded, Warning broadcast not supported, Warning broadcast not operational, Message reference already used, Unspecified error, Transfer syntax error, Semantic error, Message not compatible with receiver state, Abstract syntax error reject, Abstract syntax error ignore and notify, Abstract syntax error falsely constructed message, …)	

4.3.4.3.3 Criticality Diagnostics

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

Table 4.3.4.3.3-1: Criticality Diagnostics information element

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Procedure Code	O		INTEGER (0..255)	Procedure Code is to be used if Criticality Diagnostics is part of Error Indication procedure, and not within the response message of the same procedure that caused the error
Triggering Message	O		ENUMERATED(initiating message, successful outcome, unsuccessful outcome, outcome)	The Triggering Message is used only if the Criticality Diagnostics is part of Error Indication procedure.
Procedure Criticality	O		ENUMERATED(reject, ignore, notify)	This Procedure Criticality is used for reporting the Criticality of the Triggering message (Procedure).
Information Element Criticality Diagnostics		0 to <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 not be used.
>IE ID	M		INTEGER (0..65535)	The IE ID of the not understood or missing IE
>Type of Error	M		ENUMERATED(not understood, missing, …)	

Table 4.3.4.3.3-2: RANGE explanation

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

4.3.4.3.4 OMC ID

The OMC ID IE indicates the identity of an Operation and Maintenance Centre to which Trace records shall be sent.

Table 4.3.4.3.4-1: OMC ID information element

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
OMC ID	O		OCTET STRING (SIZE (1..20)) Octets are coded according to 3GPP TS 29.002 [11].	

4.3.4.3.5 Send Write-Replace-Warning-Indication

The Send Write-Replace-Warning-Indication IE indicates to the MME that the MME shall send the WRITE-REPLACE WARNING INDICATION to the CBC for the warning message.

Table 4.3.4.3.5-1: Send Write-Replace-Warning-Indication information element

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Send Write-Replace-Warning-Indication	O		ENUMERATED(true)	

4.3.4.3.6 Unknown Tracking Area List

The *Unknown Tracking Area List* IE identifies the Tracking Areas that are unknown to the MME and where the Request cannot be delivered.

This IE shall only be included if the Cause IE indicates *Message accepted*, which means the MME will proceed with the request for Tracking Areas that are known to the MME. The Cause IE indicating *Tracking area not valid* is used when all Tracking Areas in the Request are invalid.

Table 4.3.4.3.5-1: Failure List information element

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Unknown Tracking Area List	O		The Unknown Tracking Area List is of type *List of TAIs*.	

4.3.4.3.7 Send Stop Warning Indication

The Send Stop Warning Indication IE indicates to the MME that the MME shall send the STOP WARNING INDICATION to the CBC for the warning message.

Table 4.3.4.3.7-1: Send Stop-Warning-Indication information element

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Send Stop Warning Indication	O		ENUMERATED(true)	

4.3.4.3.8 Stop-All Indicator

The *Stop-All Indicator* IE indicates that the *Message Identifier* IE and the *Serial Number* IE do not refer to a specific message that needs to be stopped, but that all messages in the area are referred to and to force the cells in the area into their Warning Message Delivery initial state.

Table 4.3.4.3.8-1: Stop-All Indicator information element

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Stop-All Indicator	O		ENUMERATED(true)	

4.3.4.3.9 Broadcast Empty Area List

The *Broadcast Empty Area List* IE contains the eNodeB IDs of the eNodeBs which have responded with a KILL RESPONSE message which did not contain a *Broadcast Cancelled Area List* IE [7].

Table 4.3.4.3.9-1: Broadcast Empty Area List information element

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Broadcast Empty Area List	O		The Broadcast Empty Area List is a list of Global eNB IDs [7]	

4.4 Message and information element abstract syntax

4.4.1 General

SBC-AP ASN.1 definition conforms with [8] and [9].

The ASN.1 definition specifies the structure and content of SBC-AP messages. SBC-AP 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 SBC-AP 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 SBC-AP message that is not constructed as defined above is received, this shall be considered as Abstract Syntax Error, and the message shall be handled as defined for Abstract Syntax error in subclause 4.5.3.6.

4.4.2 Usage of protocol extension mechanism for non-standard use

The protocol extension 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 extension mechanism shall not be used for basic functionality. Such functionality shall be standardised.

4.4.3 Elementary procedure definitions

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

SBC-AP-PDU-Descriptions {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) sbc-AP (3) version1 (1) sbc-AP-PDU-Descriptions (0)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    ProcedureCode
FROM SBC-AP-CommonDataTypes

    Write-Replace-Warning-Request,
```

```
    Write-Replace-Warning-Response,
    Stop-Warning-Request,
    Stop-Warning-Response,
    Error-Indication,
    Write-Replace-Warning-Indication,
    Stop-Warning-Indication,
    PWS-Restart-Indication,
    PWS-Failure-Indication
FROM SBC-AP-PDU-Contents

    id-Write-Replace-Warning,
    id-Stop-Warning,
    id-Error-Indication,
    id-Write-Replace-Warning-Indication,
    id-Stop-Warning-Indication,
    id-PWS-Restart-Indication,
    id-PWS-Failure-Indication
FROM SBC-AP-Constants;

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

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

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

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

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

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

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

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

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

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

SBC-AP-ELEMENTARY-PROCEDURES-CLASS-1 SBC-AP-ELEMENTARY-PROCEDURE ::= {
    write-Replace-Warning       |
    stop-Warning            ,
    ...
}

SBC-AP-ELEMENTARY-PROCEDURES-CLASS-2 SBC-AP-ELEMENTARY-PROCEDURE ::= {
    error-Indication    |
    write-Replace-Warning-Indication    |
    stop-Warning-Indication |
    pws-Restart-Indication |
    pws-Failure-Indication,
    ...
    }

write-Replace-Warning SBC-AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  Write-Replace-Warning-Request
    SUCCESSFUL OUTCOME  Write-Replace-Warning-Response

    PROCEDURE CODE      id-Write-Replace-Warning
    CRITICALITY         reject
}

stop-Warning SBC-AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  Stop-Warning-Request
    SUCCESSFUL OUTCOME  Stop-Warning-Response

    PROCEDURE CODE      id-Stop-Warning
    CRITICALITY         reject
}

error-Indication SBC-AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  Error-Indication
    PROCEDURE CODE      id-Error-Indication
    CRITICALITY         ignore
}

write-Replace-Warning-Indication SBC-AP-ELEMENTARY-PROCEDURE    ::= {
    INITIATING MESSAGE  Write-Replace-Warning-Indication
    PROCEDURE CODE      id-Write-Replace-Warning-Indication
    CRITICALITY         ignore
}

stop-Warning-Indication SBC-AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  Stop-Warning-Indication
    PROCEDURE CODE      id-Stop-Warning-Indication
    CRITICALITY         ignore
}

pws-Restart-Indication SBC-AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  PWS-Restart-Indication
    PROCEDURE CODE      id-PWS-Restart-Indication
    CRITICALITY         ignore
}

pws-Failure-Indication SBC-AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  PWS-Failure-Indication
    PROCEDURE CODE      id-PWS-Failure-Indication
    CRITICALITY         ignore
}

END
```

4.4.4 PDU definitions

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

```
--
-- PDU definitions for SBC-AP.
--
-- ***************************************************************

SBC-AP-PDU-Contents {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) sbc-AP (3) version1 (1) sbc-AP-PDU-Contents (1)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS

    Cause,
    Concurrent-Warning-Message-Indicator,
    Criticality-Diagnostics,
    Data-Coding-Scheme,
    Message-Identifier,
    Serial-Number,
    List-of-TAIs,
    Warning-Area-List,
    Omc-Id,
    Repetition-Period,
    Extended-Repetition-Period,
    Number-of-Broadcasts-Requested,
    Warning-Type,
    Warning-Security-Information,
    Warning-Message-Content,
    Send-Write-Replace-Warning-Indication,
    Broadcast-Scheduled-Area-List,
    Unknown-Tracking-Area-List,
    Send-Stop-Warning-Indication,
    Broadcast-Cancelled-Area-List,
    Stop-All-Indicator,
    Broadcast-Empty-Area-List,
    Restarted-Cell-List,
    Global-ENB-ID,
    List-of-TAIs-Restart,
    List-of-EAIs-Restart,
    Failed-Cell-List
FROM SBC-AP-IEs

    ProtocolExtensionContainer{},
    ProtocolIE-Container{},
    SBC-AP-PROTOCOL-EXTENSION,
    SBC-AP-PROTOCOL-IES
FROM SBC-AP-Containers

    id-Concurrent-Warning-Message-Indicator,
    id-Criticality-Diagnostics,
    id-Cause,
    id-Data-Coding-Scheme,
    id-List-of-TAIs,
    id-Message-Identifier,
    id-Serial-Number,
    id-Number-of-Broadcasts-Requested,
    id-Omc-Id,
    id-Radio-Resource-Loading-List,
    id-Recovery-Indication,
    id-Repetition-Period,
    id-Extended-Repetition-Period,
    id-Warning-Area-List,
    id-Warning-Message-Content,
    id-Warning-Security-Information,
    id-Warning-Type,
    id-Send-Write-Replace-Warning-Indication,
    id-Broadcast-Scheduled-Area-List,
    id-Unknown-Tracking-Area-List,
    id-Send-Stop-Warning-Indication,
    id-Broadcast-Cancelled-Area-List,
```

```
    id-Stop-All-Indicator,
    id-Broadcast-Empty-Area-List,
    id-Global-ENB-ID,
    id-Restarted-Cell-List,
    id-List-of-TAIs-Restart,
    id-List-of-EAIs-Restart,
    id-Failed-Cell-List
FROM SBC-AP-Constants;

-- ************************************************************
--
-- Write-Replace-Warning-Request
--
-- ************************************************************

Write-Replace-Warning-Request ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {Write-Replace-Warning-Request-IEs} },
    protocolExtensions      ProtocolExtensionContainer { {Write-Replace-Warning-Request-Extensions}
} OPTIONAL,
    ...
}

Write-Replace-Warning-Request-IEs SBC-AP-PROTOCOL-IES ::= {
    { ID id-Message-Identifier  CRITICALITY reject  TYPE Message-Identifier     PRESENCE mandatory }
|
    { ID id-Serial-Number   CRITICALITY reject  TYPE Serial-Number      PRESENCE mandatory } |
    { ID id-List-of-TAIs        CRITICALITY reject  TYPE List-of-TAIs       PRESENCE optional } |
    { ID id-Warning-Area-List   CRITICALITY ignore  TYPE Warning-Area-List      PRESENCE optional }
|
    { ID id-Repetition-Period   CRITICALITY reject  TYPE Repetition-Period      PRESENCE mandatory
} |
    { ID id-Extended-Repetition-Period  CRITICALITY reject  TYPE Extended-Repetition-Period
    PRESENCE optional  } |

    { ID id-Number-of-Broadcasts-Requested
                    CRITICALITY reject  TYPE Number-of-Broadcasts-Requested PRESENCE mandatory } |
    { ID id-Warning-Type        CRITICALITY ignore  TYPE Warning-Type       PRESENCE optional } |
    { ID id-Warning-Security-Information        CRITICALITY ignore  TYPE Warning-Security-
Information     PRESENCE optional } |
    { ID id-Data-Coding-Scheme  CRITICALITY ignore  TYPE Data-Coding-Scheme     PRESENCE optional }
|
    { ID id-Warning-Message-Content
                    CRITICALITY ignore  TYPE Warning-Message-Content    PRESENCE optional } |
    { ID id-Omc-Id  CRITICALITY ignore TYPE Omc-Id PRESENCE optional } |
    { ID id-Concurrent-Warning-Message-Indicator  CRITICALITY reject TYPE Concurrent-Warning-
Message-Indicator PRESENCE optional }   |
    { ID id-Send-Write-Replace-Warning-Indication   CRITICALITY ignore  TYPE Send-Write-Replace-
Warning-Indication  PRESENCE optional } |
    { ID id-Global-ENB-ID   CRITICALITY ignore  TYPE Global-ENB-ID  PRESENCE optional },
    ...
}

Write-Replace-Warning-Request-Extensions SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ************************************************************
--
-- Write-Replace-Warning-Response
--
-- ************************************************************

Write-Replace-Warning-Response ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {Write-Replace-Warning-Response-IEs} },
    protocolExtensions      ProtocolExtensionContainer { {Write-Replace-Warning-Response-Extensions}
} OPTIONAL,
    ...
}

Write-Replace-Warning-Response-IEs SBC-AP-PROTOCOL-IES ::= {
    { ID id-Message-Identifier  CRITICALITY reject  TYPE Message-Identifier     PRESENCE mandatory }
|
    { ID id-Serial-Number   CRITICALITY reject  TYPE Serial-Number      PRESENCE mandatory } |
    { ID id-Cause               CRITICALITY reject  TYPE Cause                  PRESENCE mandatory }
    |
    { ID id-Criticality-Diagnostics     CRITICALITY ignore  TYPE Criticality-Diagnostics    PRESENCE
optional } |
    { ID id-Unknown-Tracking-Area-List CRITICALITY ignore   TYPE List-of-TAIs   PRESENCE optional },
```

```
    ...
}

Write-Replace-Warning-Response-Extensions SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- Stop-Warning-Request
--
-- **************************************************************

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

Stop-Warning-Request-IEs SBC-AP-PROTOCOL-IES ::= {
    { ID id-Message-Identifier  CRITICALITY reject  TYPE Message-Identifier     PRESENCE mandatory }
|
    { ID id-Serial-Number   CRITICALITY reject  TYPE Serial-Number      PRESENCE mandatory } |
    { ID id-List-of-TAIs        CRITICALITY reject  TYPE List-of-TAIs       PRESENCE optional } |
    { ID id-Warning-Area-List   CRITICALITY ignore  TYPE Warning-Area-List      PRESENCE optional }|
    { ID id-Omc-Id  CRITICALITY ignore TYPE Omc-Id PRESENCE optional } |
    { ID id-Send-Stop-Warning-Indication    CRITICALITY ignore  TYPE Send-Stop-Warning-Indication
    PRESENCE optional } |
    { ID id-Stop-All-Indicator  CRITICALITY reject  TYPE Stop-All-Indicator PRESENCE optional},
...
}

Stop-Warning-Request-Extensions SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- Stop-Warning-Response
--
-- **************************************************************

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

Stop-Warning-Response-IEs SBC-AP-PROTOCOL-IES ::= {
    { ID id-Message-Identifier  CRITICALITY reject  TYPE Message-Identifier     PRESENCE mandatory }
|
    { ID id-Serial-Number   CRITICALITY reject  TYPE Serial-Number      PRESENCE mandatory } |
    { ID id-Cause               CRITICALITY reject  TYPE Cause                  PRESENCE mandatory }
    |
    { ID id-Criticality-Diagnostics     CRITICALITY ignore  TYPE Criticality-Diagnostics    PRESENCE
optional } |
    { ID id-Unknown-Tracking-Area-List CRITICALITY ignore   TYPE List-of-TAIs   PRESENCE optional },
    ...
}

Stop-Warning-Response-Extensions SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- Write-Replace-Warning-Indication
--
-- **************************************************************

Write-Replace-Warning-Indication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {Write-Replace-Warning-Indication-IEs} },
    protocolExtensions      ProtocolExtensionContainer { {Write-Replace-Warning-Indication-
Extensions} } OPTIONAL,
    ...
}
```

```
Write-Replace-Warning-Indication-IEs SBC-AP-PROTOCOL-IES ::= {
    { ID id-Message-Identifier  CRITICALITY reject  TYPE Message-Identifier     PRESENCE mandatory }
|
    { ID id-Serial-Number   CRITICALITY reject  TYPE Serial-Number      PRESENCE mandatory } |
    { ID id-Broadcast-Scheduled-Area-List       CRITICALITY reject  TYPE Broadcast-Scheduled-Area-
List    PRESENCE optional },
    ...
}

Write-Replace-Warning-Indication-Extensions SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- Stop-Warning-Indication
--
-- **************************************************************

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

Stop-Warning-Indication-IEs SBC-AP-PROTOCOL-IES ::= {
    { ID id-Message-Identifier  CRITICALITY reject  TYPE Message-Identifier     PRESENCE mandatory }
|
    { ID id-Serial-Number   CRITICALITY reject  TYPE Serial-Number      PRESENCE mandatory } |
    { ID id-Broadcast-Cancelled-Area-List       CRITICALITY reject  TYPE Broadcast-Cancelled-Area-
List    PRESENCE optional }|
    { ID id-Broadcast-Empty-Area-List   CRITICALITY ignore  TYPE Broadcast-Empty-Area-List  PRESENCE
optional },
    ...
}

Stop-Warning-Indication-Extensions SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- PWS-Restart-Indication
--
-- **************************************************************

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

PWS-Restart-Indication-IEs SBC-AP-PROTOCOL-IES ::= {
    { ID id-Restarted-Cell-List CRITICALITY reject  TYPE Restarted-Cell-List    PRESENCE mandatory
}|
    { ID id-Global-ENB-ID   CRITICALITY reject  TYPE Global-ENB-ID  PRESENCE mandatory } |
    { ID id-List-of-TAIs-Restart    CRITICALITY reject  TYPE List-of-TAIs-Restart   PRESENCE
mandatory } |
    { ID id-List-of-EAIs-Restart    CRITICALITY reject  TYPE List-of-EAIs-Restart   PRESENCE
optional },
    ...
}

PWS-Restart-Indication-Extensions SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- PWS-Failure-Indication
--
-- **************************************************************

PWS-Failure-Indication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {PWS-Failure-Indication-IEs} },
    protocolExtensions  ProtocolExtensionContainer { {PWS-Failure-Indication-Extensions} } OPTIONAL,
```

```
    ...
}

PWS-Failure-Indication-IEs SBC-AP-PROTOCOL-IES ::= {
    { ID id-Failed-Cell-List    CRITICALITY reject  TYPE Failed-Cell-List   PRESENCE mandatory }|
    { ID id-Global-ENB-ID   CRITICALITY reject  TYPE Global-ENB-ID  PRESENCE mandatory },
    ...
}

PWS-Failure-Indication-Extensions SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- ERROR INDICATION ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Error Indication
--
-- **************************************************************

Error-Indication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       {{ErrorIndicationIEs}},
    ...
}

ErrorIndicationIEs SBC-AP-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE
optional    } |
    { ID id-Criticality-Diagnostics     CRITICALITY ignore  TYPE Criticality-Diagnostics
    PRESENCE optional   } ,
    ...
}

END
```

4.4.5 Information element definitions

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


SBC-AP-IEs {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) sbc-AP (3) version1 (1) sbc-AP-IEs (2)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    maxNrOfErrors,
    maxNrOfTAIs,
    maxnoofTAIforWarning,
    maxnoofCellID,
    maxnoofEmergencyAreaID,

    id-TypeOfError,
    maxnoofCellinEAI,
    maxnoofCellinTAI,
    maxnoofeNBIds,
    maxnoofRestartTAIs,
    maxnoofRestartEAIs,
    maxnoofRestartedCells,
    maxnoofFailedCells

FROM SBC-AP-Constants
```

```
    Criticality,
    ProcedureCode,
    TriggeringMessage,
    ProtocolIE-ID
FROM SBC-AP-CommonDataTypes

    ProtocolExtensionContainer{},

    SBC-AP-PROTOCOL-EXTENSION
FROM SBC-AP-Containers;


-- A

-- B

Broadcast-Scheduled-Area-List ::= SEQUENCE {
    cellId-Broadcast-List           CellId-Broadcast-List           OPTIONAL,
    tAI-Broadcast-List              TAI-Broadcast-List              OPTIONAL,
    emergencyAreaID-Broadcast-List  EmergencyAreaID-Broadcast-List  OPTIONAL,
    iE-Extensions              ProtocolExtensionContainer {{Broadcast-Scheduled-Area-List-ExtIEs}}
OPTIONAL,
    ...
}

Broadcast-Scheduled-Area-List-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

Broadcast-Cancelled-Area-List ::= SEQUENCE {
    cellID-Cancelled-List           CellID-Cancelled-List           OPTIONAL,
    tAI-Cancelled-List              TAI-Cancelled-List              OPTIONAL,
    emergencyAreaID-Cancelled-List  EmergencyAreaID-Cancelled-List  OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer {{Broadcast-Cancelled-Area-List-ExtIEs}}
OPTIONAL,
    ...
}

Broadcast-Cancelled-Area-List-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

Broadcast-Empty-Area-List   ::= SEQUENCE (SIZE (1.. maxnoofeNBIds)) OF Global-ENB-ID


-- C

CancelledCellinEAI ::= SEQUENCE (SIZE(1..maxnoofCellinEAI)) OF CancelledCellinEAI-Item

CancelledCellinEAI-Item ::= SEQUENCE {
    eCGI                    EUTRAN-CGI,
    numberOfBroadcasts      NumberOfBroadcasts,
    iE-Extensions           ProtocolExtensionContainer { {CancelledCellinEAI-Item-ExtIEs} }
OPTIONAL,
    ...
}

CancelledCellinEAI-Item-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}
CancelledCellinTAI ::= SEQUENCE (SIZE(1..maxnoofCellinTAI)) OF CancelledCellinTAI-Item

CancelledCellinTAI-Item ::= SEQUENCE{
    eCGI                EUTRAN-CGI,
    numberOfBroadcasts  NumberOfBroadcasts,
    iE-Extensions       ProtocolExtensionContainer { {CancelledCellinTAI-Item-ExtIEs} } OPTIONAL,
    ...
}

CancelledCellinTAI-Item-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

Cause                   ::= INTEGER {
    message-accepted                                (0),
    parameter-not-recognised                        (1),
    parameter-value-invalid                         (2),
    valid-message-not-identified                    (3),
```

```
    tracking-area-not-valid                             (4),
    unrecognised-message                                (5),
    missing-mandatory-element                           (6),
    mME-capacity-exceeded                               (7),
    mME-memory-exceeded                                 (8),
    warning-broadcast-not-supported                     (9),
    warning-broadcast-not-operational                   (10),
    message-reference-already-used                      (11),
    unspecifed-error                                    (12),
    transfer-syntax-error                               (13),
    semantic-error                                      (14),
    message-not-compatible-with-receiver-state          (15),
    abstract-syntax-error-reject                        (16),
    abstract-syntax-error-ignore-and-notify             (17),
    abstract-syntax-error-falsely-constructed-message   (18)
} (0..255)

CellId-Broadcast-List ::= SEQUENCE (SIZE(1..maxnoofCellID)) OF CellId-Broadcast-List-Item

CellId-Broadcast-List-Item ::= SEQUENCE {
    eCGI                EUTRAN-CGI,
    iE-Extensions       ProtocolExtensionContainer { {CellId-Broadcast-List-Item-ExtIEs} } OPTIONAL,
    ...
}

CellId-Broadcast-List-Item-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

CellID-Cancelled-List ::= SEQUENCE (SIZE(1..maxnoofCellID)) OF CellID-Cancelled-Item

CellID-Cancelled-Item ::= SEQUENCE {
    eCGI                EUTRAN-CGI,
    numberOfBroadcasts  NumberOfBroadcasts,
    iE-Extensions       ProtocolExtensionContainer { {CellID-Cancelled-Item-ExtIEs} } OPTIONAL,
    ...
}

CellID-Cancelled-Item-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

Concurrent-Warning-Message-Indicator ::= ENUMERATED {true}

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

CriticalityDiagnostics-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

CriticalityDiagnostics-IE-Item-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}



-- D

Data-Coding-Scheme          ::= BIT STRING (SIZE (8))
```

```
-- E

ECGIList                    ::= SEQUENCE (SIZE(1..maxnoofCellID)) OF EUTRAN-CGI

Emergency-Area-ID-List      ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF Emergency-Area-ID

Emergency-Area-ID           ::= OCTET STRING (SIZE (3))

EmergencyAreaID-Broadcast-List ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaID-
Broadcast-List-Item

EmergencyAreaID-Broadcast-List-Item ::= SEQUENCE {
    emergencyAreaID         Emergency-Area-ID,
    scheduledCellinEAI      ScheduledCellinEAI,
    iE-Extensions           ProtocolExtensionContainer { {EmergencyAreaID-Broadcast-List-Item-
ExtIEs} } OPTIONAL,
    ...
}

EmergencyAreaID-Broadcast-List-Item-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

EmergencyAreaID-Cancelled-List ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaID-
Cancelled-Item

EmergencyAreaID-Cancelled-Item ::= SEQUENCE {
    emergencyAreaID         Emergency-Area-ID,
    cancelledCellinEAI      CancelledCellinEAI,
    iE-Extensions           ProtocolExtensionContainer { {EmergencyAreaID-Cancelled-Item-ExtIEs} }
OPTIONAL,
    ...
}

EmergencyAreaID-Cancelled-Item-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

EUTRAN-CGI ::= SEQUENCE {
    pLMNidentity            PLMNidentity,
    cell-ID                 CellIdentity,
    iE-Extensions           ProtocolExtensionContainer { {EUTRAN-CGI-ExtIEs} } OPTIONAL,
    ...
}

EUTRAN-CGI-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

Extended-Repetition-Period ::= INTEGER (4096..131071)

ENB-ID ::= CHOICE {
    macroENB-ID         BIT STRING (SIZE(20)),
    homeENB-ID          BIT STRING (SIZE(28)),
    ...
}


-- F

Failed-Cell-List            ::= SEQUENCE (SIZE(1..maxnoofFailedCells)) OF EUTRAN-CGI

-- G

Global-ENB-ID ::= SEQUENCE {
    pLMNidentity            PLMNidentity,
    eNB-ID                  ENB-ID,
    iE-Extensions           ProtocolExtensionContainer { {GlobalENB-ID-ExtIEs} }        OPTIONAL,
    ...
}

GlobalENB-ID-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- H
```

```
-- I

-- J

-- K

-- L

List-of-TAIs            ::= SEQUENCE (SIZE (1..maxNrOfTAIs)) OF
    SEQUENCE {
    tai                 TAI
}

List-of-TAIs-Restart    ::= SEQUENCE (SIZE (1..maxnoofRestartTAIs)) OF
    SEQUENCE {
    tai                 TAI
}


List-of-EAIs-Restart    ::= SEQUENCE (SIZE(1..maxnoofRestartEAIs)) OF Emergency-Area-ID


-- M

Message-Identifier ::= BIT STRING (SIZE (16))

-- N

Number-of-Broadcasts-Requested      ::= INTEGER (0..65535)

-- For Number-of-Broadcasts-Requested = 0 and Repetition-Period = 0, then eNB action is no broadcast
--  for ETWS Secondary and CMAS.
--
-- For Number-of-Broadcasts-Requested = 1 and Repetition-Period = 0, then eNB action is broadcast
-- only once for ETWS and CMAS.
--
-- For Number-of-Broadcasts-Requested = 0 and Repetition-Period > 0, then eNB action is no broadcast
-- for the ETWS Secondary, and broadcast until further notice for the CMAS.
--
-- For Number-of-Broadcasts-Requested > 0 and Repetition-Period > 0, then eNB action is normal
-- broadcast.
-- All other combinations of Number-of-Broadcasts-Requested and Repetition-Period are considered
-- invalid.

NumberOfBroadcasts ::= INTEGER (0..65535)

-- O
Omc-Id                      ::= OCTET STRING (SIZE (1..20))


-- P
PLMNidentity                ::= TBCD-STRING

-- Q

-- R

Repetition-Period           ::= INTEGER (0..4096)
-- 1 to 4096: Each unit represents a repetition of one second to a maximum of
-- once per 4096 seconds (~1 hour).
-- 0: no repetition
-- A CBC compliant to this version or later of this specification shall not send a repetition period
-- greater than 4095.
-- For backwards compatibility with a CBC compliant to an earlier version of this specification the
-- maximum value of the repetition period defined in ASN.1 remains at 4096.
-- If the value of the Repetition Period IE received in the WRITE-REPLACE WARNING REQUEST message is
-- set to 4096, the MME shall set the Repetition Period IE to the maximum value 4095 supported on
-- the S1-MME interface as defined in [7] before forwarding to the selected eNBs.

Restarted-Cell-List         ::= SEQUENCE (SIZE(1.. maxnoofRestartedCells)) OF EUTRAN-CGI

-- S

ScheduledCellinEAI ::= SEQUENCE (SIZE(1..maxnoofCellinEAI)) OF ScheduledCellinEAI-Item

ScheduledCellinEAI-Item ::= SEQUENCE {
    eCGI                    EUTRAN-CGI,
```

```
    iE-Extensions           ProtocolExtensionContainer { {ScheduledCellinEAI-Item-ExtIEs} }
OPTIONAL,
    ...
}

ScheduledCellinEAI-Item-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

ScheduledCellinTAI ::= SEQUENCE (SIZE(1..maxnoofCellinTAI)) OF ScheduledCellinTAI-Item

ScheduledCellinTAI-Item ::= SEQUENCE{
    eCGI                EUTRAN-CGI,
    iE-Extensions       ProtocolExtensionContainer { {ScheduledCellinTAI-Item-ExtIEs} } OPTIONAL,
    ...
}

ScheduledCellinTAI-Item-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

Send-Write-Replace-Warning-Indication ::= ENUMERATED {true}

Send-Stop-Warning-Indication ::= ENUMERATED {true}

Serial-Number               ::= BIT STRING (SIZE (16))

Stop-All-Indicator ::= ENUMERATED {true}

-- T

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

TAI-Broadcast-List ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAI-Broadcast-List-Item

TAI-Broadcast-List-Item ::= SEQUENCE {
    tAI                 TAI,
    scheduledCellinTAI  ScheduledCellinTAI,
    iE-Extensions       ProtocolExtensionContainer { {TAI-Broadcast-List-Item-ExtIEs} } OPTIONAL,
    ...
}

TAI-Broadcast-List-Item-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAI-Cancelled-List ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAI-Cancelled-List-Item

TAI-Cancelled-List-Item ::= SEQUENCE {
    tAI                 TAI,
    cancelledCellinTAI  CancelledCellinTAI,
    iE-Extensions       ProtocolExtensionContainer { {TAI-Cancelled-List-Item-ExtIEs} } OPTIONAL,
    ...
}

TAI-Cancelled-List-Item-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAI-List-for-Warning    ::= SEQUENCE (SIZE(1.. maxnoofTAIforWarning)) OF TAI

TAI ::= SEQUENCE {
    pLMNidentity            PLMNidentity,
    tAC                     TAC,
    iE-Extensions           ProtocolExtensionContainer { {TAI-ExtIEs} } OPTIONAL
}

TAI-ExtIEs SBC-AP-PROTOCOL-EXTENSION ::= {
    ...
}

TBCD-STRING ::= OCTET STRING (SIZE (3))

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

```
-- U

Unknown-Tracking-Area-List      ::= SEQUENCE (SIZE(1.. maxNrOfTAIs)) OF TAI

-- V

-- W

Warning-Area-List               ::= CHOICE {
    cell-ID-List                ECGIList,
    tracking-Area-List-for-Warning                  TAI-List-for-Warning,
    emergency-Area-ID-List      Emergency-Area-ID-List,
    ...
}

Warning-Message-Content         ::= OCTET STRING (SIZE (1..9600))
Warning-Security-Information    ::= OCTET STRING (SIZE (50))
Warning-Type                    ::=  OCTET STRING (SIZE (2))

-- X

-- Y

END
```

4.4.6 Common definitions

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

SBC-AP-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) sbc-AP (3) version1 (1) sbc-AP-CommonDataTypes (3)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

Criticality     ::= ENUMERATED { reject, ignore, notify }

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

ProcedureCode       ::= INTEGER (0..255)

ProtocolExtensionID ::= INTEGER (0..65535)

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

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

END
```

4.4.7 Constant definitions

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

SBC-AP-Constants {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) sbc-AP (3) version1 (1) sbc-AP-Constants (4)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

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

id-Write-Replace-Warning            INTEGER ::= 0
id-Stop-Warning                     INTEGER ::= 1
id-Error-Indication                 INTEGER ::= 2
id-Write-Replace-Warning-Indication INTEGER ::= 3
id-Stop-Warning-Indication          INTEGER ::= 4
id-PWS-Restart-Indication           INTEGER ::= 5
id-PWS-Failure-Indication           INTEGER ::= 6

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

id-Broadcast-Message-Content        INTEGER ::= 0
id-Cause                INTEGER ::= 1
id-Criticality-Diagnostics  INTEGER ::=2
id-Data-Coding-Scheme           INTEGER ::= 3
id-Failure-List             INTEGER ::= 4
id-Message-Identifier           INTEGER ::= 5
id-Number-of-Broadcasts-Completed-List  INTEGER ::= 6
id-Number-of-Broadcasts-Requested       INTEGER ::= 7
id-Radio-Resource-Loading-List      INTEGER ::= 8
id-Recovery-Indication          INTEGER ::= 9
id-Repetition-Period            INTEGER ::= 10
id-Serial-Number            INTEGER ::= 11
id-Service-Areas-List           INTEGER ::= 12
id-TypeOfError                  INTEGER ::= 13
id-List-of-TAIs                 INTEGER ::= 14
id-Warning-Area-List            INTEGER ::= 15
id-Warning-Message-Content      INTEGER ::= 16
id-Warning-Security-Information     INTEGER ::= 17
id-Warning-Type                  INTEGER ::= 18
id-Omc-Id                        INTEGER ::= 19
id-Concurrent-Warning-Message-Indicator INTEGER ::= 20
id-Extended-Repetition-Period    INTEGER ::= 21
id-Unknown-Tracking-Area-List    INTEGER ::= 22
id-Broadcast-Scheduled-Area-List INTEGER ::= 23
id-Send-Write-Replace-Warning-Indication INTEGER ::= 24
id-Broadcast-Cancelled-Area-List        INTEGER ::= 25
id-Send-Stop-Warning-Indication         INTEGER ::= 26
id-Stop-All-Indicator            INTEGER ::= 27
id-Global-ENB-ID                        INTEGER ::= 28
id-Broadcast-Empty-Area-List            INTEGER ::= 29
id-Restarted-Cell-List          INTEGER ::= 30
id-List-of-TAIs-Restart         INTEGER ::= 31
id-List-of-EAIs-Restart         INTEGER ::= 32
id-Failed-Cell-List             INTEGER ::= 33


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

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

maxNrOfErrors               INTEGER ::= 256
maxnoofCellID               INTEGER ::= 65535
maxnoofCellinEAI            INTEGER ::= 65535
maxnoofCellinTAI            INTEGER ::= 65535
maxNrOfTAIs                 INTEGER ::= 65535
maxnoofEmergencyAreaID      INTEGER ::= 65535
maxnoofTAIforWarning        INTEGER ::= 65535

maxProtocolExtensions           INTEGER ::= 65535
maxProtocolIEs              INTEGER ::= 65535
maxnoofeNBIds               INTEGER ::= 256
maxnoofRestartedCells       INTEGER ::= 256
maxnoofRestartTAIs          INTEGER ::= 2048
```

```
maxnoofRestartEAIs          INTEGER ::= 256
maxnoofFailedCells          INTEGER ::= 256

END
```

4.4.8 Container Definitions

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

SBC-AP-Containers {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) sbc-AP (3) version1 (1) sbc-AP-Containers (5)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    Presence,
    ProtocolExtensionID,
    ProtocolIE-ID
FROM SBC-AP-CommonDataTypes

    maxProtocolExtensions,
    maxProtocolIEs
FROM SBC-AP-Constants;

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

SBC-AP-PROTOCOL-IES ::= CLASS {
    &id             ProtocolIE-ID       UNIQUE,
    &criticality            Criticality     DEFAULT ignore,
    &Value,
    &presence           Presence
}
WITH SYNTAX {
    ID              &id
    CRITICALITY         &criticality
    TYPE                &Value
    PRESENCE            &presence
}

-- **************************************************************
--
-- Class Definition for Protocol Extensions
--
-- **************************************************************

SBC-AP-PROTOCOL-EXTENSION ::= CLASS {
    &id             ProtocolExtensionID     UNIQUE,
    &criticality            Criticality     DEFAULT ignore,
    &Extension,
    &presence       Presence
}
WITH SYNTAX {
    ID              &id
    CRITICALITY         &criticality
    EXTENSION           &Extension
    PRESENCE            &presence
}

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

```
--
-- Container for Protocol IEs
--
-- ************************************************************

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

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

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

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

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

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

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


END
```

4.4.9 Message transfer syntax

SBC-AP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax as specified in ref. [10].

4.5 Handling of unknown, unforeseen or erroneous protocol data

4.5.1 General

Protocol Error cases can be divided into three classes:

- Transfer Syntax Error;
- Abstract Syntax Error;
- Logical Error.

Protocol errors can occur in the following functions within a receiving node:

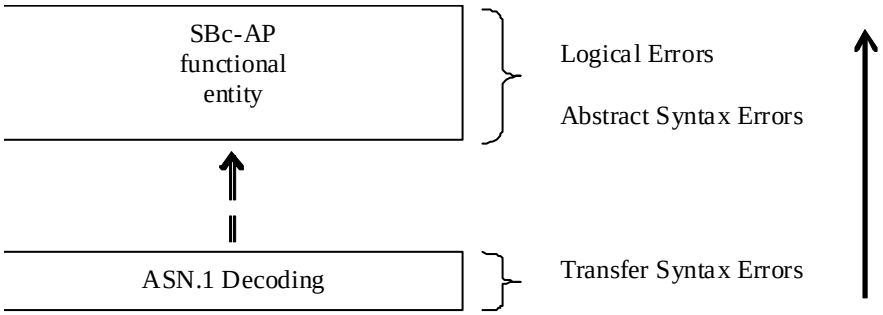

Figure 4.5.1-1: Protocol Errors in SBc-AP

The information stated in subclauses 4.5.2, 4.5.3 and 4.5.4, to be included in the message used when reporting an error, is what at minimum shall be included. Other optional information elements within the message may also be included, if available. This is also valid for the case when the reporting is done with a response message.

4.5.2 Transfer Syntax Error

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

4.5.3 Abstract Syntax Error

4.5.3.1 General

An Abstract Syntax Error occurs when the receiving functional SBc-AP entity:

1. receives IEs or IE groups that cannot be understood (unknown IE id);
2. receives IEs for which the logical range is violated (e.g.: ASN.1 definition: 0 to 15, the logical range is 0 to 10 (values 11 to 15 are undefined), and 12 will be received; this case will be handled as an abstract syntax error using criticality information sent by the originator of the message);
3. does not receive IEs or IE groups but according to the specified presence of the concerning object, the IEs or IE groups should have been present in the received message;

4. receives IEs or IE groups that are defined to be part of that message in wrong order or with too many occurrences of the same IE or IE group;

5. receives IEs or IE groups but according to the conditional presence of the concerning object and the specified condition, the IEs or IE groups should not have been present in the received message.

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

If an Abstract Syntax Error occurs, the receiver shall read the remaining message and shall then for each detected Abstract Syntax Error act according to the Criticality Information and Presence Information for the IE/IE group due to which Abstract Syntax Error occurred in accordance with subclauses 4.5.3.4 and 4.5.3.5. The handling of cases 4 and 5 is specified in subclause 4.5.3.6.

4.5.3.2 Criticality information

In the SBc-AP messages there is criticality information set for individual IEs and/or IE groups. This criticality information instructs the receiver how to act when receiving an IE or an IE group that is not comprehended i.e. the entire item (IE or IE group) which is not (fully or partially) comprehended shall be treated in accordance with its own criticality information as specified in subclause 4.5.3.4.

In addition, the criticality information is used in case of the missing IE/IE group abstract syntax error (see subclause 4.5.3.5).

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

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

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

1. IE or IE group: When one new or modified IE or IE group is implemented for one EP from a standard version, then other new or modified IEs or IE groups specified for that EP in that standard version shall be considered comprehended by the receiving entity (some may still remain unsupported).

2. EP: The comprehension of different EPs within a standard version or between different standard versions is not mandated. Any EP that is not supported may be considered not comprehended, even if another EP from that standard version is comprehended, and action based on criticality shall be applied.

4.5.3.3 Presence information

For many IEs/IE groups which are optional according to the ASN.1 transfer syntax, SBc-AP specifies separately if the presence of these IEs/IE groups is optional or mandatory with respect to MME/CBC application.

The presence field of the indicated classes supports three values:

1. Optional;
2. Conditional;
3. Mandatory.

If an IE/IE group is not included in a received message and the presence of the IE/IE group is mandatory or the presence is conditional and the condition is true according to the version of the specification used by the receiver, an abstract syntax error occurs due to a missing IE/IE group.

4.5.3.4 Not comprehended IE/IE group

4.5.3.4.1 Procedure code

The receiving node shall treat the different types of received criticality information of the *Procedure Code* according to the following:

Reject IE:

- If a message is received with a *Procedure Code* marked with "*Reject IE*" which the receiving node does not comprehend, the receiving node shall reject the procedure using the Error Indication procedure.

Ignore IE and Notify Sender:

- If a message is received with a *Procedure Code* marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the procedure and initiate the Error Indication procedure.

Ignore IE:

- If a message is received with a *Procedure Code* marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the procedure.

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

4.5.3.4.2 Type of Message

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

4.5.3.4.3 IEs other than the Procedure Code and Type of Message

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

Reject IE:

- If a message *initiating* a procedure is received containing one or more IEs/IE groups marked with "*Reject IE*" which the receiving node does not comprehend; none of the functional requests of the message shall be executed. The receiving node shall reject the procedure and report the rejection of one or more IEs/IE groups using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- If a message *initiating* a procedure that does not have a message to report unsuccessful outcome is received containing one or more IEs/IE groups marked with "*Reject IE*" which the receiving node does not comprehend, the receiving node shall terminate the procedure and initiate the Error Indication procedure.

- If a *response* message is received containing one or more IEs marked with "*Reject IE*" which the receiving node does no comprehend, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

Ignore IE and Notify Sender:

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

- if a message *initiating* a procedure that does not have a message to report the outcome of the procedure is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups, and initiate the Error Indication procedure to report that one or more IEs/IE groups have been ignored.

- If a *response* message is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IE/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups and initiate the Error Indication procedure.

Ignore IE:

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

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

When reporting not comprehended IEs/IE groups marked with "*Reject IE*" or "*Ignore IE and Notify Sender*" using a response message defined for the procedure, the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

When reporting not comprehended IEs/IE groups marked with "*Reject IE*" or "*Ignore IE and Notify Sender*" using the Error Indication procedure, the *Procedure Code* IE, the *Triggering Message* IE, *Procedure Criticality* IE, and the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

4.5.3.5 Missing IE or IE group

The receiving node shall treat the missing IE/IE group according to the criticality information for the missing IE/IE group in the received message specified in the version of the present document used by the receiver:

Reject IE:

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

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

- if a received *response* message is missing one or more IEs/IE groups with specified criticality "*Reject IE*, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

Ignore IE and Notify Sender:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and report in the response message of the procedure that one or more IEs/IE groups were missing. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the response message, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- if a received message *initiating* a procedure that does not have a message to report the outcome of the procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and initiate the Error Indication procedure to report that one or more IEs/IE groups were missing.

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

Ignore IE:

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

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

When reporting missing IEs/IE groups with specified criticality "*Reject IE*" or "*Ignore IE and Notify Sender*" using a response message defined for the procedure, the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

When reporting missing IEs/IE groups with specified criticality "*Reject IE*" or "*Ignore IE and Notify Sender*" using the Error Indication procedure, the *Procedure Code* IE, the *Triggering Message* IE, *Procedure Criticality* IE, and the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

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

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

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

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

- If a *response* message is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

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

4.5.4 Logical Error

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

Class 1:

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

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

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

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

Class 2:

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

4.5.5 Exceptions

The error handling for all the cases described hereafter shall take precedence over any other error handling described in the other subclauses of clause 4.5.

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

Annex A (informative): Change history:

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2008-12	CT#42	CP-080972			V1.0.2 approved in CT#42	1.0.2	8.0.0
2009-03	CT#43	CP-090101	0001	3	General clean-up to make an alignment with RAN specifications	8.0.0	8.1.0
		CP-090022	0002	-	General clean-up to make an alignment with RAN specifications		
2009-09	CT#45	CP-090543	0003	1	Correct ASN.1 misalignment between S1AP and SB-AP	8.1.0	8.2.0
			0004	1	Fix the ASN.1 Object Identifiers (OID) descriptions for SBc-AP		
			0005	1	Update port number and payload protocol identifier for SBc-AP		
			0006	-	Fix incorrect IETF reference		
2009-12	CT#46	CP-090780	0008	1	Missing OMC-ID and other corrections	8.2.0	8.3.0
			0009	-	Correction of Warning Message Transmission procedure		
2009-12	CT#46	CP-090799	0007	4	Enhancements to Warning Notifications to support PWS/CMAS Requirements	8.3.0	9.0.0
2010-06	CT#48	CP-100288	0011	2	Number of Broadcasts	9.0.0	9.1.0
2010-09	CT#49	CP-100446	0013	-	Correction of the SCTP Payload Protocol value for the SBc-AP	9.1.0	9.2.0
2010-12	CT#50	CP-100708	0014	3	Correct WRITE-REPLACE-WARNING REQUEST misalignment between S1AP and SBc-AP	9.2.0	9.3.0
2011-03	CT#51	CP-110080	0015	2	SBc-AP Error Indication	9.3.0	10.0.0
2011-09	CT#53	CP-110579	0016	-	Error Indication procedure	10.0.0	11.0.0
2011-12	CT#54	CP-110797	0018	-	Error Indication	11.0.0	11.1.0
		CP-110783	0020	-	Extended Repetition Period		
2012-03	CT#55	CP-120021	0024	-	Correction to Assigned Criticality	11.1.0	11.2.0
2012-06	CT#56	CP-120246	0025	-	Corrections to ASN.1 code	11.2.0	11.3.0
2012-09	CT#57	CP-120460	0026	-	Correction to ASN1 syntax	11.3.0	11.4.0
		CP-120460	0027	-	Editorial updates of references		
		CP-120463	0031	-	ETWS Secondary Notification		
2012-12	CT#58	CP-120886	0029	4	Report to CBC on Warning Message Delivery	11.4.0	12.0.0
		CP-120886	0030	4	Failure List in WRITE-REPLACE RESPONSE and STOP WARNING RESONSE		

2013-03	CT#59	CP-130031	0034	-	Corrections to ASN.1 encoding	12.0.0	12.1.0
2013-06	CT#60	CP-130308	0036	-	Editorial Corrections	12.1.0	12.2.0
2013-09	CT#61	CP-130455	0033	1	Report to CBC on Stop Warning Message Delivery	12.2.0	12.3.0
			0038	1	Stop-all Warning Messages		
2013-09					The header 4.3.4.3.8 style corrected	12.3.0	12.3.1
2013-12	CT#62	CP-130622	0044	2	eNodeB ID List	12.3.1	12.4.0
			0045	1	Correction of references to clauses		
			0048	1	Unsuccessful Outcome		
2014-03	CT#63	CP-140154	0042	7	PWS Restart Indication	12.4.0	12.5.0
2014-06	CT#64	CP-140255	0050	2	Routing of PWS messages to HeNBs	12.5.0	12.6.0
2014-12	CT#66	CP-140782	0051	-	Warning Area List in Write-Replace Warning Request during PWS restoration	12.6.0	12.7.0
			0052	1	Serial Number in Write-Replace Warning Request during PWS restoration		
			0054	-	Message Type for PWS Restart Indication		
2015-03	CT#67	CP-150029	0055	1	Incorrect reference in STOP WARNING REQUEST	12.7.0	12.8.0
2015-06	CT#68	CP-150262	0056	1	Criticality of the Cause IE in Write-Replace Warning Response and Stop Warning Response	12.8.0	13.0.0
2015-09	CT#69	CP-150438	0057	1	Inconsistent Criticality information	13.0.0	13.1.0
2015-12	CT#70	CP-150741	0065	-	ASN.1 Corrections	13.1.0	13.2.0
			0058	2	Failure Indication	13.1.0	13.2.0
			0059	3	Style fixes and resolution of editor's note	13.1.0	13.2.0
2017-09	CT#77	CP-172012	0067	1	Restarted Cell List in PWS RESTART INDICATION	13.2.0	13.3.0

History

Document history		
V13.2.0	March 2016	Publication
V13.3.0	October 2017	Publication