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Modal verbs terminology

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Foreword

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

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

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 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
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In the present document, modal verbs have the following meanings:

- shall** indicates a mandatory requirement to do something
- shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

- should** indicates a recommendation to do something
- should not** indicates a recommendation not to do something
- may** indicates permission to do something
- need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

- can** indicates that something is possible
- cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

- will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present document contains the coding of information necessary for support of supplementary service operation on the mobile radio interface layer 3.

Clause 2 gives the functional definitions and contents of messages for call independent supplementary service operations. Messages necessary for support of call related supplementary service operations are defined in TS 24.008.

Clause 3 gives the general format and coding for messages used for call independent supplementary service and the format and coding of information elements used for both call related and call independent supplementary service operations.

Clause 4 gives the specification of the call related and call independent supplementary service operations.

1.1 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: "3G Vocabulary".
- [2] 3GPP TS 22.024: "Description of Charge Advice Information (CAI)".
- [3] 3GPP TS 44.006: "Mobile Station - Base Station System (MS - BSS) interface Data Link (DL) layer specification".
- [4] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".
- [5] 3GPP TS 24.008: "Mobile radio interface layer 3 specification".
- [6] 3GPP TS 24.010: "Mobile radio interface layer 3; Supplementary services specification; General aspects".
- [7] 3GPP TS 24.080: "Mobile radio interface layer 3 supplementary services specification; Formats and coding".
- [8] 3GPP TS 24.090: "Unstructured supplementary services operation - Stage 3".
- [9] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".
- [10] 3GPPTS 29.011: "Signalling interworking for supplementary services".
- [11] ITU-T Recommendation X.680: "Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation".
- [11b] ITU-T Recommendation X.681: "Information technology – Abstract Syntax Notation One (ASN.1): Information object specification".
- [12] ITU-T Recommendation X.690: "Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)".
- [13] ITU-T Recommendation X.880: "Data networks and open system communication - Open System Interconnection - Service definitions - Remote operations: Concepts, model and notation".

- [14] 3GPP TS 49.031: "Location Services (LCS); Base Station Application Part LCS Extension (BSSAP-LE)".
- [15] 3GPP TS 24.171: "NAS Signalling for Control Plane LCS in Evolved Packet System".
- [16] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS)".
- [17] 3GPP TS 37.355: "LTE Positioning Protocol (LPP)".
- [18] RFC 3339: "Date and Time on the Internet: Timestamps".
- [19] 3GPP TS 24.571: "Control plane Location Services (LCS) procedures; Stage 3".

1.2 Abbreviations

Abbreviations used in the present document are listed in TR 21.905 [1] and below. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

GAD	Geographical Area Description
LDR	Location Deferred Request

2 Message functional definitions and contents

2.1 General

This clause defines the structure of the messages of the layer 3 protocol defined in TS 24.080. These messages are standard L3 messages as defined in TS 24.007.

Each definition includes:

- a) a brief description of the message;
- b) a table listing the information elements in the order of their appearance in the message. In a sequence of consecutive IEs with half octet length, the first IE occupies bits 1 to 4 of octet N, the second bits 5 to 8 of octet N, the third bits 1 to 4 of octet N+1 etc..

For each IE the table indicates:

- 1) the information element identifier, in hexadecimal notation, if the IE has format T, TV or TLV. If the IEI has half octet length, it is specified by a notation representing the IEI as a hexadecimal digit followed by a "-" (example: B-);
 - 2) the name of the IE (which gives an idea of the semantics of the element), which is used in this and other specifications as a reference to the IE within the message;
 - 3) the name of the type of the IE (which indicates the coding of the value part of the IE), and a reference to a description of the value part of the IE;
 - 4) the presence requirement indication (M, C or O) for the IE, as defined in TS 24.007;
 - 5) the format of the IE (T, V, TV, LV, TLV) as defined in TS 24.007;
 - 6) the length of the IE (or permissible range of lengths), in octets, in the message, where "?" means that the maximum length of the IE is only constrained by the link layer protocol, and in the case of the facility IE by possible further considerations specified in TS 24.010. This indication is non-normative.
- c) Clauses specifying conditions for IEs with presence requirement C or O in the relevant message. Together with other conditions specified in TS 24.080, TS 24.010 or TS 24.08x and 24.09x-series this defines when the IE shall be included or not, what non-presence of such IEs means, and (for IEs with presence requirement C) the static conditions for presence and/or non-presence of the IEs (see TS 24.007).

2.2 Messages for supplementary services control

Table 2.1 summarizes the messages for call independent supplementary services control (see TS 24.010 for a detailed description of call independent supplementary service messages).

Table 2.1: Messages for call independent supplementary service control

Messages for supplementary service control	Reference
FACILITY	2.3
REGISTER	2.4
RELEASE COMPLETE	2.5

2.3 Facility

This message is sent by the mobile station or the network to request or acknowledge a supplementary service. It is used when information is to be conveyed and the transaction already exists, but is not to be released. The supplementary service to be invoked, and its associated parameters, are specified in the Facility information element (see table 2.2).

Table 2.2: FACILITY message content

IEI	Information element	Type / Reference	Presence	Format	Length
	Supplementary service protocol discriminator	Protocol discriminator 3.2	M	V	1/2
	Transaction identifier	Transaction identifier 3.3	M	V	1/2
	Facility message type	Message type 3.4	M	V	1
	Facility	Facility 3.6	M	LV	2-?

2.4 Register

2.4.1 Register (network to MS direction)

This message is sent by the network to the mobile station to assign a new transaction identifier for call independent supplementary service control and to request or acknowledge a supplementary service (see table 2.3).

Table 2.3: REGISTER message content (network to MS direction)

IEI	Information element	Type / Reference	Presence	Format	Length
	Supplementary service protocol discriminator	Protocol discriminator 3.2	M	V	1/2
	Transaction identifier	Transaction identifier 3.3	M	V	1/2
	Register message type	Message type 3.4	M	V	1
1C	Facility	Facility 3.6	M	TLV	2-?

2.4.2 Register (MS to network direction)

This message is sent by the mobile station to the network to assign a new transaction identifier for call independent supplementary service control and to request or acknowledge a supplementary service (see table 2.4).

Table 2.4: REGISTER message content (MS to network direction)

IEI	Information element	Type / Reference	Presence	Format	Length
	Supplementary service protocol discriminator	Protocol discriminator 3.2	M	V	1/2
	Transaction identifier	Transaction identifier 3.3	M	V	1/2
	Register message type	Message type 3.4	M	V	1
1C	Facility	Facility 3.6	M	TLV	2-?
7F	SS version	SS version indicator 3.7.2	O	TLV	3

2.4.2.1 SS version

This information element shall be included if the supplementary service operation being invoked is implemented according to the phase 2 or higher protocol version.

2.5 Release complete

This message is sent by the mobile station or the network to release a transaction used for call independent supplementary service control. It may also request or acknowledge a supplementary service (see table 2.5).

Table 2.5: RELEASE COMPLETE message content

IEI	Information element	Type / Reference	Presence	Format	Length
	Supplementary service protocol discriminator	Protocol discriminator 3.2	M	V	1/2
	Transaction identifier	Transaction identifier 3.3	M	V	1/2
	Release Complete message type	Message type 3.4	M	V	1
08	Cause	Cause TS 24.008	O	TLV	4-32
1C	Facility	Facility 3.6	O	TLV	2-?

2.5.1 Cause

This information element shall be included when the functional handling of the Cause IE is specified in the service description or TS 29.011. If the functional handling of the Cause IE is not specified, the receiving entity may ignore the IE.

2.5.2 Facility

This information element shall be included as required by the service description and the procedures defined in TS 24.010.

3 General message format and information elements coding

The figures and text in this clause describe message contents. Within each octet, the bit designated "bit 1" is transmitted first, followed by bits 2, 3, 4, etc. Similarly, the octet shown at the top of each figure is sent first.

3.1 Overview

Within the layer 3 protocol defined in TS 24.080, every message is a standard L3 message as defined in TS 24.007. This means that the message consists of the following parts:

- a) protocol discriminator;
- b) transaction identifier;
- c) message type;
- d) other information elements, as required.

Unless specified otherwise, a particular information element may be present only once in a given message.

When a field extends over more than one octet, the order of bit values progressively decreases as the octet number increases. The least significant bit of the field is represented by the lowest numbered bit of the highest numbered octet of the field.

3.2 Protocol discriminator

The Protocol Discriminator (PD) and its use are defined in TS 24.007. TS 24.080 defines the protocols relating to the PD values:

- 1 0 1 1 supplementary services (call independent).

3.3 Transaction identifier

For general rules, format and coding of transaction identifier values, see TS 24.008.

3.4 Message type

The message type IE and its use are defined in TS 24.007. Table 3.1 defines the value part of the message type IE used in the supplementary service protocol.

Table 3.1: Message types

8	7	6	5	4	3	2	1		Message types
x	x	1	0	.	.	.	.		Clearing messages: - RELEASE COMPLETE
				1	0	1	0		
x	x	1	1	.	.	.	.		Miscellaneous message group: - FACILITY - REGISTER
				1	0	1	0		
				1	0	1	1		

For messages transmitted via CS domain the following applies:

- When the radio connection started with a core network node of earlier than R99, bit 8 shall be set to 0 and bit 7 is reserved for the send sequence number in messages sent from the mobile station. In messages sent from the network, bits 7 and 8 are coded with a "0". See 3GPP TS 24.007 [4].

- When the radio connection started with a core network node of R'99 or later, bits 7 and 8 are reserved for the send sequence number in messages sent from the mobile station. In messages sent from the network, bits 7 and 8 are coded with a "0". See 3GPP TS 24.007 [4].

For messages transmitted via PS domain the following applies:

- No sequence number shall be used. Bits 7 and 8 shall be coded with a "0". See 3GPP TS 24.007 [4]. If a sequence number is received on the network side it shall be ignored.

3.5 Other information elements

These information elements are coded according to the general coding rules as defined in TS 24.008.

Table 3.2 contains the code-points allocated to the information elements used in messages defined in this specification. All IEs are defined in TS 24.008, but the content of the Facility and SS version indicator IEs are defined within this specification.

Table 3.2: Information elements specific to call independent supplementary service control

8 7 6 5 4 3 2 1		Reference (IE content)
0	Type 3 and 4 information elements	
0 0 0 1 0 0 0	Cause	TS 24.008
0 0 1 1 1 0 0	Facility	3.6
1 1 1 1 1 1 1	SS version indicator	3.8.2

3.6 Facility information element

The purpose of the Facility information element is to indicate the invocation and operation of supplementary services, identified by the corresponding operation code within the Facility information element.

The Facility information element is coded as shown in figure 3.1 and tables 3.3 to 3.17.

The Facility is a type 4 information element with no upper length limit except that given by the maximum number of octets in a L3 message, see 3GPP TS 44.006.

8	7	6	5	4	3	2	1	
0	0	0	1	1	1	0	0	octet 1
Facility IEI								
Length of Facility contents								octet 2
Component(s) (note)								octet 3 etc.
NOTE: One or more components may be included depending on specific service requirements.								

Figure 3.1: Facility information element

3.6.1 Component (octet 3 etc.)

This clause provides the formats and encoding of components in the Facility information element. Formats and encoding methods make use of and is a subset of ITU-T Rec. Q.773 (Transaction Capabilities formats and Encoding) and T/S 43/BB. The used part of ITU-T Rec. Q.773 respectively T/S 43/BB is almost the same as the Component Portion of TC messages. The only difference is that returnResultNotLast is not used.

This clause is further based on:

- ITU-T Rec. X.680 (Abstract Syntax Notation One (ASN.1): Specification of Basic Notation);
- ITU-T Rec. X.690 (Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER));

and is consistent with these ITU-T Recommendations.

The parameters in tables 3.3 to 3.6 may be one of the following:

- a Sequence of Parameters;
- a Set of Parameters;
- a specific Parameter with its own tag (i.e. not part of a Sequence or Set);
- nothing at all (i.e. absent).

NOTE: Concerning the general rules for encoding (structure of encoding, identifier octets, length octets, etc.) see ITU-T Rec. X.690. For these general rules the same exceptions apply as stated in TS 29.002. This holds also for tables 3.3 to 3.6.

Table 3.3: Invoke component

Invoke component	Reference	Mandatory indication
Component type tag	3.6.2	M
Component length	X.690	
Invoke ID tag	3.6.3	
Invoke ID length	X.690	M
Invoke ID	3.6.3	
Linked ID tag	3.6.3	
Linked ID length	X.690	O
Linked ID	3.6.3	
Operation Code tag	3.6.4	
Operation Code length	X.690	M
Operation Code	3.6.4	
Parameters	4	O

Table 3.4: Return Result component

Return Result component	Reference	Mandatory indication
Component type tag	3.6.2	M
Component length	X.690	
Invoke ID tag	3.6.3	
Invoke ID length	X.690	M
Invoke ID	3.6.3	
Sequence tag	3.6.5	O (note)
Sequence length	X.690	
Operation Code tag	3.6.4	
Operation Code length	X.690	O (note)
Operation Code	3.6.4	
Parameters	4	O (note)

NOTE: Omitted if the Return Result component does not include any parameters.

Table 3.5: Return Error component

Return Error component	Reference	Mandatory indication
Component type tag	3.6.2	M
Component length	X.690	
Invoke ID tag	3.6.3	
Invoke ID length	X.690	M
Invoke ID	3.6.3	
Error Code tag	3.6.6	
Error Code length	X.690	M
Error Code	3.6.6	
Parameters	4	O

Table 3.6: Reject component

Reject component	Reference	Mandatory indication
Component type tag	3.6.2	M
Component length	X.690	
Invoke ID tag (note)	3.6.3	
Invoke ID length	X.690	M
Invoke ID	3.6.3	
Problem Code tag	3.6.7	
Problem Code length	X.690	M
Problem Code	3.6.7	

NOTE: If the Invoke ID is not available, Universal Null (table 3.9) with length = 0 shall be used.

3.6.2 Component type tag

The Component type tag is coded context-specific, constructor as indicated in table 3.7.

Table 3.7: Coding of Component type tag

Component type tag	8	7	6	5	4	3	2	1
Invoke	1	0	1	0	0	0	0	1
Return Result	1	0	1	0	0	0	1	0
Return Error	1	0	1	0	0	0	1	1
Reject	1	0	1	0	0	1	0	0

3.6.3 Component ID tag

The term Component ID refers to the Invoke ID or the Linked ID. The Component ID tag is coded as shown in table 3.8.

Table 3.8: Coding of Component ID tag

Component ID tag	8	7	6	5	4	3	2	1
Invoke ID	0	0	0	0	0	0	1	0
Linked ID (note)	1	0	0	0	0	0	0	0

NOTE: This tag differs from the Invoke ID tag, which is coded as a Universal INTEGER, in order to distinguish it from the following tag (Operation Code) which is also coded as a Universal INTEGER.

The length of a Component ID is 1 octet.

An Invoke Component has one or two Component IDs: an Invoke ID, and if it is desired to associate the Invoke with a previous Invoke, then the Linked ID is provided in addition to the Invoke ID.

Return Result and Return Error Components have one Component ID, called an Invoke ID which is the reflection of the Invoke ID of the Invoke Component to which they are responding.

The Reject Component uses as its Invoke ID, the Invoke ID in the Component being rejected. If this ID is unavailable (e.g. due to mutilation of the message not detected by lower layers), then the Invoke ID tag is replaced with a universal NULL tag as shown in table 3.9. Universal NULL has always length = 0.

Any kind of component, except a reject component, may be rejected.

Table 3.9: Coding of NULL tag

	8	7	6	5	4	3	2	1
NULL tag	0	0	0	0	0	1	0	1

If an Invoke containing both Invoke and Linked IDs is being rejected, only the Invoke ID is used in the Reject Component.

3.6.4 Operation Code

Each Operation is assigned an Operation Code to identify it. An Operation Code follows an Operation Code tag and Operation Code length. The Operation Code tag is coded as shown in table 3.10.

Table 3.10: Coding of Operation Code tag

	8	7	6	5	4	3	2	1
Operation Code tag	0	0	0	0	0	0	1	0

The Operation Codes for the different Operations are defined in clause 4.5.

3.6.5 Sequence and Set tags

When there is more than one parameter in a Component (applicable to all Component types), they follow the Sequence or Set tag, which are coded universal, constructor as shown in table 3.11.

Table 3.11: Coding of Sequence and set tags

Sequence and set tags	8	7	6	5	4	3	2	1
Sequence tag	0	0	1	1	0	0	0	0
Set tag	0	0	1	1	0	0	0	1

3.6.6 Error Code

Each Error is assigned a value (Error Code) to identify it.

An Error Code follows an Error Code tag and Error Code length. The Error Code tag is coded as shown in table 3.12.

Table 3.12: Coding of Error Code tag

	8	7	6	5	4	3	2	1
Error Code tag	0	0	0	0	0	0	1	0

The Error Codes for the different Errors are defined in clause 4.5.

3.6.7 Problem Code

The Problem Code consists of one of the four elements: General Problem, Invoke Problem, Return Result Problem or Return Error Problem. The tags for these elements are coded as shown in table 3.13.

Table 3.13: Coding of Problem tags

Problem tags	8	7	6	5	4	3	2	1
General Problem tag	1	0	0	0	0	0	0	0
Invoke Problem tag	1	0	0	0	0	0	0	1
Return Result Problem tag	1	0	0	0	0	0	1	0
Return Error Problem tag	1	0	0	0	0	0	1	1

The Problem Codes for the different Problems are shown in tables 3.14 to 3.17.

Table 3.14: Coding of General Problem Codes

General Problem Codes	8	7	6	5	4	3	2	1
Unrecognized Component	0	0	0	0	0	0	0	0
Mistyped Component	0	0	0	0	0	0	0	1
Badly Structured Component	0	0	0	0	0	0	1	0

Table 3.15: Coding of Invoke Problem Codes

Invoke Problem Codes	8	7	6	5	4	3	2	1
Duplicate Invoke ID	0	0	0	0	0	0	0	0
Unrecognized Operation	0	0	0	0	0	0	0	1
Mistyped Parameter	0	0	0	0	0	0	1	0
Resource Limitation	0	0	0	0	0	0	1	1
Initiating Release	0	0	0	0	0	1	0	0
Unrecognized Linked ID	0	0	0	0	0	1	0	1
Linked Response Unexpected	0	0	0	0	0	1	1	0
Unexpected Linked Operation	0	0	0	0	0	1	1	1

Table 3.16: Coding of Return Result Problem Codes

Return Result Problem Codes	8	7	6	5	4	3	2	1
Unrecognized Invoke ID	0	0	0	0	0	0	0	0
Return Result Unexpected	0	0	0	0	0	0	0	1
Mistyped Parameter	0	0	0	0	0	0	1	0

Table 3.17: Coding of Return Error Problem Codes

Return Error Problem Codes	8	7	6	5	4	3	2	1
Unrecognized Invoke ID	0	0	0	0	0	0	0	0
Return Error Unexpected	0	0	0	0	0	0	0	1
Unrecognized Error	0	0	0	0	0	0	1	0
Unexpected Error	0	0	0	0	0	0	1	1
Mistyped Parameter	0	0	0	0	0	1	0	0

3.7 Version handling for supplementary services

3.7.1 Supplementary service screening indicator

The purpose of the supplementary service screening indicator is to allow the network to assess the capabilities of the MS in advance of a network initiated SS activity. The SS screening indicator is sent in the mobile station classmark 2 as defined in TS 24.008. The handling of the SS screening indicator is described in TS 24.010.

8	7	6	5	4	3	2	1
(note)	(note)	SS screening indicator		(note)			

NOTE: Values not relevant to supplementary services.

Figure 3.2: Coding of SS screening indicator in mobile station classmark 2

Table 3.18: Coding of SS screening indicator in mobile station classmark 2

SS screening indicator in mobile station classmark 2	6	5
default value of phase 1	0	0
capability of handling of ellipsis notation and phase 2 error handling (note 1)	0	1
for future use (note 2)	1	0
for future use (note 2)	1	1
NOTE 1: Ellipsis notation is described in TS 24.010 and TS 29.002. SS Error handling is described in TS 24.010.		
NOTE 2: The network shall interpret these values the same as "01".		

3.7.2 Supplementary service version indicator

The purpose of the supplementary service version indicator is to allow the network to select the correct version of a protocol for a specific supplementary service. The SS version indicator is included in messages as defined in TS 24.008 and TS 24.080. The coding described in table 3.19 refers to the first octet received in the SS version indicator. Any other octets received shall be ignored. The handling of the SS version indicator is described in TS 24.010.

Table 3.19: Coding of SS version indicator

SS version indicator	8	7	6	5	4	3	2	1
phase 2 service, ellipsis notation, and phase 2 error handling is supported (note 1)	0	0	0	0	0	0	0	0
SS-Protocol version 3 is supported, and phase 2 error handling is supported (note 1)	0	0	0	0	0	0	0	1
all other values are for future use (note 2)								
NOTE 1: Ellipsis notation is described in TS 24.010 and TS 29.002. SS Error handling is described in TS 24.010.								
NOTE 2: The network shall interpret all higher values of the SS version indicator the same as "00000001".								

4 Supplementary services operation specifications

4.1 General

This clause specifies the abstract syntax for the Supplementary Service protocol using the Abstract Syntax Notation One (ASN.1), defined in ITU-T Rec. X.680 and X.681.

The mapping of OPERATION and ERROR to components is defined in clause 3 of this specification.

The encoding rules which are applicable to the defined abstract syntax are the Basic Encoding Rules for Abstract Syntax Notation One, defined in ITU-T Rec. X.690 with the same exceptions as stated in TS 29.002. For each Supplementary Service parameter which has to be transferred by a Supplementary Service message, there is a PDU field (an ASN.1 NamedType) whose ASN.1 identifier has the same name as the corresponding parameter, except for the differences required by the ASN.1 notation (blanks between words are removed, the first letter of the first word is

lower-case and the first letter of the following words are capitalized (e.g. "bearer service" is mapped to "bearerService"). In addition some words may be abbreviated as follows:

- ms mobile subscriber;
- ss supplementary services;
- cug closed user group.

The ASN.1 data type which follows the words "ARGUMENT", "PARAMETER" or "RESULT" (for information objects of class "OPERATION" and "ERROR") is always optional from a syntactic point of view. However, except specific mention, it has to be considered as mandatory from a semantic point of view. When in an invoke component, a mandatory element is missing in any component or inner data structure, a reject component is returned with the problem code "Mistyped Parameter". When an optional element is missing in an invoke component or in an inner data structure while it is required by the context, an error component is returned; the associated type of error is "DataMissing".

In case an element is defined as mandatory in the protocol description (TS 24.080 including imports from TS 29.002), but is not present according to the service description (stage 1 to stage 3), the ASN.1 protocol description takes precedence over the diagrams in the TS 24.08x and 24.09x-series of technical specifications.

When possible operations and errors are imported from TS 29.002 thereby making the MSC transparent to most of the messages sent to or from the MS.

Timer values for operations which require timers are shown as ASN.1 comments.

The extension marker "..." shall be used in the same way as described in TS 29.002 and shall be supported on the radio interface by the MS and the network for all operations defined in this specification including those imported from TS 29.002.

4.2 Operation types

Table 4.1 summarizes the operations defined for supplementary services in this specification and shows which of these operations are call related and call independent. The terms "call related" and "call independent" are defined in 3GPP TS 24.010 [6]. Refer to 3GPP TS 24.171 [15] for operations for E-UTRAN LCS, and 3GPP TS 24.571 [19] for operation for 5G LCS.

Table 4.1: Relevance of supplementary service operations

Operation name	Call related SS	Call independent SS
registerSS	-	+
eraseSS	-	+
activateSS	-	+
deactivateSS	-	+
interrogateSS	-	+
registerPassword	-	+
getPassword	-	+
processUnstructuredSS-Data	+	+
forwardCheckSS-Indication	-	+
processUnstructuredSS-Request	-	+
unstructuredSS-Request	-	+
unstructuredSS-Notify	-	+
forwardChargeAdvice	+	-
notifySS	+	-
forwardCUG-Info	+	-
buildMPTY	+	-
holdMPTY	+	-
retrieveMPTY	+	-
splitMPTY	+	-
explicitCT	+	-
accessRegisterCCEntry	+	-
eraseCCEntry	-	+
callDeflection	+	-
userUserService	+	-
lcs-LocationNotification	-	+
lcs-MOLR	-	+
lcs-AreaEventRequest	-	+
lcs-AreaEventReport	-	+
lcs-AreaEventCancellation	-	+
lcs-PeriodicLocationRequest	-	+
lcs-LocationUpdate	-	+
lcs-PeriodicLocationCancellation	-	+
lcs-PeriodicTriggeredInvoke	-	+
lcs-EventReport	-	+
lcs-CancelDeferredLocation	-	+
lcs-MSCancelDeferredLocation	-	+
lcs-LocationPrivacySetting	-	+

NOTE: The processUnstructuredSS-Data operation may be used call related by a GSM Phase 1 MS.

The following ASN.1 module defines operations by allocating them a local value. For the involved operations the same local values as in MAP are allocated.

```

SS-Operations {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Access (2) modules (3)
    ss-Operations (0) version16 (16)}

DEFINITIONS ::=

BEGIN

EXPORTS

-- exports operations

-- operations defined in this specification
processUnstructuredSS-Data, notifySS, forwardChargeAdvice, forwardCUG-Info, buildMPTY, holdMPTY,
retrieveMPTY, splitMPTY, explicitCT, accessRegisterCCEntry, callDeflection, userUserService,
lcs-LocationNotification, lcs-MOLR, lcs-AreaEventRequest, lcs-AreaEventReport, lcs-
AreaEventCancellation, lcs-PeriodicLocationRequest, lcs-LocationUpdate, lcs-
PeriodicLocationCancellation,
lcs-PeriodicTriggeredInvoke, lcs-EventReport, lcs-CancelDeferredLocation, lcs-
MSCancelDeferredLocation, lcs-LocationPrivacySetting;

IMPORTS

OPERATION FROM
Remote-Operations-Information-Objects {

```

```

    joint-iso-itu-t remote-operations(4)
    informationObjects(5) version1(0)}

-- The MAP operations:
-- registerSS, eraseSS, activateSS, deactivateSS, interrogateSS, registerPassword,
-- getPassword, processUnstructuredSS-Request, unstructuredSS-Request, unstructuredSS-Notify
-- forwardCheckSS-Indication
-- are imported from MAP-Operations in SS-Protocol module.

-- imports SS-data types
NotifySS-Arg,
ForwardChargeAdviceArg,
ForwardCUG-InfoArg,
SS-UserData,
AccessRegisterCCEnterArg,
CallDeflectionArg,
UserUserServiceArg,
LocationNotificationArg,
LocationNotificationRes,
LCS-MOLRArg,
LCS-MOLRRes,
LCS-AreaEventRequestArg,
LCS-AreaEventReportArg,
LCS-AreaEventCancellationArg,
LCS-PeriodicLocationRequestArg,
LCS-PeriodicLocationRequestRes,
LCS-LocationUpdateArg,
LCS-LocationUpdateRes,
LCS-PeriodicLocationCancellationArg,
LCS-PeriodicTriggeredInvokeArg,
LCS-PeriodicTriggeredInvokeRes,
LCS-EventReportArg,
LCS-EventReportRes,
LCS-CancelDeferredLocationArg,
LCS-LocationPrivacySettingArg

FROM SS-DataTypes {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Access (2) modules (3)
    ss-DataTypes (2) version16 (16)}

-- imports MAP-SS-data types
RegisterCC-EntryRes
FROM MAP-SS-DataTypes {
    itu-t identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-SS-DataTypes (14) version20 (20)}

-- imports MAP-errors
illegalSS-Operation, ss-ErrorStatus, ss-NotAvailable, ss-SubscriptionViolation,
ss-Incompatibility, systemFailure, facilityNotSupported, callBarred, unexpectedDataValue,
shortTermDenial, longTermDenial, dataMissing, forwardingViolation, forwardingFailed,
positionMethodFailure, resourceLimitation
FROM MAP-Errors {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Network (1) modules (3)
    map-Errors (10) version20 (20)}

-- imports SS-Errors
resourcesNotAvailable, maxNumberOfMPTY-ParticipantsExceeded, deflectionToServedSubscriber,
invalidDeflectedToNumber, specialServiceCode, rejectedByUser, rejectedByNetwork
FROM SS-Errors {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Access (2) modules (3)
    ss-Errors (1) version16 (16)}
;

-- operations definition

processUnstructuredSS-Data OPERATION ::= { -- Timer T(PUSSD)= 15s to 30s
    ARGUMENT    SS-UserData
    RESULT      SS-UserData
    -- optional
    ERRORS      {
        systemFailure |
        unexpectedDataValue}
    CODE        local:19 }

notifySS OPERATION ::= {
    ARGUMENT    NotifySS-Arg
    CODE        local:16 }

```

```
forwardChargeAdvice OPERATION ::= { -- Timer T(AoC)= 1s to 40s
  ARGUMENT    ForwardChargeAdviceArg
  RETURN RESULT TRUE
  CODE        local:125 }

forwardCUG-Info OPERATION ::= {
  ARGUMENT    ForwardCUG-InfoArg
  CODE        local:120 }

buildMPTY OPERATION ::= { -- Timer T(BuildMPTY)= 5s to 30s
  RETURN RESULT TRUE
  ERRORS {
  illegalSS-Operation |
  ss-ErrorStatus |
  ss-NotAvailable |
  ss-Incompatibility |
  systemFailure |
  resourcesNotAvailable |
  maxNumberOfMPTY-ParticipantsExceeded}
  CODE        local:124 }

holdMPTY OPERATION ::= { -- Timer T(HoldMPTY)= 5s to 30s
  RETURN RESULT TRUE
  ERRORS {
  illegalSS-Operation |
  ss-ErrorStatus |
  ss-Incompatibility |
  facilityNotSupported |
  systemFailure}
  CODE        local:123 }

retrieveMPTY OPERATION ::= { -- Timer T(RetrieveMPTY)= 5s to 30s
  RETURN RESULT TRUE
  ERRORS {
  illegalSS-Operation |
  ss-ErrorStatus |
  ss-Incompatibility |
  facilityNotSupported |
  systemFailure}
  CODE        local:122 }

splitMPTY OPERATION ::= { -- Timer T(SplitMPTY)= 5s to 30s
  RETURN RESULT TRUE
  ERRORS {
  illegalSS-Operation |
  ss-ErrorStatus |
  ss-Incompatibility |
  facilityNotSupported |
  systemFailure}
  CODE        local:121 }

explicitCT OPERATION ::= { -- Timer T(ECT)= 5s to 15s
  RETURN RESULT TRUE
  ERRORS {
  illegalSS-Operation |
  ss-ErrorStatus |
  ss-NotAvailable |
  ss-Incompatibility |
  facilityNotSupported |
  systemFailure |
  resourcesNotAvailable |
  callBarred}
  CODE        local:126 }

accessRegisterCCEntry OPERATION ::= { -- Timer T(AccRegCCEntry)= 30s
  ARGUMENT    AccessRegisterCCEntryArg
  RESULT      RegisterCC-EntryRes
  ERRORS {
  systemFailure |
  dataMissing |
  unexpectedDataValue |
  callBarred |
  illegalSS-Operation |
  ss-ErrorStatus |
  ss-Incompatibility |
  shortTermDenial |
  longTermDenial |
  facilityNotSupported}
```



```
CODE    local:119 }
```

-- the timer value is defined by T308, see also in TS 24.008 for definition of timer T308

```
callDeflection OPERATION ::= { -- Timer T(CD)= 30s
  ARGUMENT    CallDeflectionArg
  RETURN RESULT TRUE
  ERRORS {
    illegalSS-Operation |
    ss-ErrorStatus |
    ss-NotAvailable |
    ss-Incompatibility |
    facilityNotSupported |
    systemFailure |
    resourcesNotAvailable |
    forwardingViolation |
    callBarred |
    deflectionToServedSubscriber |
    invalidDeflectedToNumber |
    specialServiceCode |
    forwardingFailed}
  CODE    local:117 }
```

-- the timer value is defined by T305, see also in TS 24.008 for definition of timer T305
 -- extensionContainer shall not be used with this operation

```
userUserService OPERATION ::= { -- Timer T(UUS3)= 10s
  ARGUMENT    UserUserServiceArg
  RETURN RESULT TRUE
  ERRORS {
    illegalSS-Operation |
    ss-ErrorStatus |
    ss-NotAvailable |
    ss-Incompatibility |
    facilityNotSupported |
    systemFailure |
    resourcesNotAvailable |
    rejectedByNetwork |
    rejectedByUser}
  CODE    local:118 }
```

-- The timer value for UUS3 is 10s; it is applicable only if UUS3 is activated by FACILITY
 -- message. If UUS service (UUS1, UUS2 or UUS3) is activated by SETUP message, no timers are
 -- needed. In those cases Return Result or Return Error must be received within certain call
 -- control messages, see 3GPP TS 24.087.
 -- extensionContainer shall not be used with this operation.

```
lcs-LocationNotification OPERATION ::= { -- Timer T(LCSN)= 10s to 20s
  ARGUMENT    LocationNotificationArg
  RESULT LocationNotificationRes
  ERRORS {
    systemFailure |
    unexpectedDataValue}
  CODE    local:116 }
```

```
lcs-MOLR OPERATION ::= { -- Timer T(LCSL)= 10s to 300s
  ARGUMENT    LCS-MOLRArg
  RESULT LCS-MOLRRes
  ERRORS {
    systemFailure |
    unexpectedDataValue |
    dataMissing |
    facilityNotSupported |
    ss-SubscriptionViolation |
    positionMethodFailure}
  CODE    local:115 }
```

```
lcs-AreaEventRequest OPERATION ::= { -- Timer T(LCSN)= 10s to 20s
  ARGUMENT    LCS-AreaEventRequestArg
  RETURN RESULT TRUE
  ERRORS {
    systemFailure |
    facilityNotSupported |
    unexpectedDataValue}
  CODE    local:114 }
```

```

lcs-AreaEventReport OPERATION ::= { -- Timer T(LCSL)= 10s to 300s
  ARGUMENT    LCS-AreaEventReportArg
  RETURN RESULT TRUE
  ERRORS {
    systemFailure |
    unexpectedDataValue |
    facilityNotSupported }
  CODE    local:113 }

lcs-AreaEventCancellation OPERATION ::= { -- Timer T(LCSN)= 10s to 20s
  ARGUMENT    LCS-AreaEventCancellationArg
  RETURN RESULT TRUE
  ERRORS {
    systemFailure |
    facilityNotSupported |
    unexpectedDataValue }
  CODE    local:112 }

lcs-PeriodicLocationRequest OPERATION ::= { -- Timer T(LCSN)= 10s to 20s
  ARGUMENT    LCS-PeriodicLocationRequestArg
  RESULT    LCS-PeriodicLocationRequestRes
  ERRORS {
    systemFailure |
    facilityNotSupported |
    unexpectedDataValue |
    dataMissing }
  CODE    local: 111 }

lcs-LocationUpdate OPERATION ::= { -- Timer T(LCSN)= 10s to 20s
  ARGUMENT    LCS-LocationUpdateArg
  RESULT    LCS-LocationUpdateRes
  ERRORS {
    systemFailure |
    unexpectedDataValue }
  CODE    local: 110 }

lcs-PeriodicLocationCancellation OPERATION ::= { -- Timer T(LCSN)= 10s to 20s
  ARGUMENT    LCS-PeriodicLocationCancellationArg
  RETURN RESULT TRUE
  ERRORS {
    systemFailure |
    unexpectedDataValue }
  CODE    local: 109 }

lcs-PeriodicTriggeredInvoke OPERATION ::= { -- Timer T(LCSN)= 10s to 20s
  ARGUMENT    LCS-PeriodicTriggeredInvokeArg
  RESULT    LCS-PeriodicTriggeredInvokeRes
  ERRORS {
    systemFailure |
    facilityNotSupported |
    unexpectedDataValue |
    dataMissing |
    resourceLimitation }
  CODE    local: 108 }

lcs-EventReport OPERATION ::= { -- Timer T(LCSL)= 10s to 300s
  ARGUMENT    LCS-EventReportArg
  RESULT    LCS-EventReportRes
  ERRORS {
    systemFailure |
    facilityNotSupported |
    ss-SubscriptionViolation |
    unexpectedDataValue |
    dataMissing |
    resourceLimitation }
  CODE    local: 107 }

lcs-CancelDeferredLocation OPERATION ::= { -- Timer T(LCSN)= 10s to 20s
  ARGUMENT    LCS-CancelDeferredLocationArg
  RETURN RESULT TRUE
  ERRORS {
    systemFailure |
    unexpectedDataValue }
  CODE    local: 106 }

```

```

lcs-MSCancelDeferredLocation OPERATION ::= { -- Timer T(LCSN)= 10s to 20s
  ARGUMENT    LCS-CancelDeferredLocationArg
  RETURN RESULT TRUE
  ERRORS {
    systemFailure |
    unexpectedDataValue}
  CODE local: 105 }

lcs-LocationPrivacySetting OPERATION ::= { -- Timer T(LCSN)= 10s to 20s
  ARGUMENT    LCS-LocationPrivacySettingArg
  RETURN RESULT TRUE
  ERRORS {
    systemFailure |
    unexpectedDataValue}
  CODE local: 104 }

END

```

4.2.1 Void

4.2.2 Operations description

For each operation this clause provides a brief prose description.

4.2.2.1 registerSS (MS --> network)

This operation is invoked by an MS to register data related to a supplementary service in the network. When no BasicService parameter is provided, the registration applies to all provisioned and applicable basic services.

4.2.2.2 eraseSS (MS --> network)

This operation is invoked by an MS to erase data related to a supplementary service in the network. When no BasicService parameter is provided, the erasure applies to all provisioned and applicable basic services.

4.2.2.3 activateSS (MS --> network)

This operation is invoked by an MS to request the network for a supplementary service activation. When no BasicService parameter is provided, the activation applies to all provisioned and applicable basic services.

4.2.2.4 deactivateSS (MS --> network)

This operation is invoked by an MS to request the network for a supplementary service deactivation. When no BasicService parameter is provided, the deactivation applies to all provisioned and applicable basic services.

4.2.2.5 interrogateSS (MS --> network)

This operation is invoked by an MS to request the network for a supplementary service interrogation. When no BasicService parameter is provided, the interrogation applies to all provisioned and applicable basic services.

4.2.2.6 notifySS (network --> MS)

This operation is invoked by the network to forward a supplementary service notification towards a mobile subscriber.

4.2.2.7 registerPassword (MS --> network)

This operation is invoked by an MS to register a new password related to the management by the subscriber himself of subscription data in the HLR. The operation "Register password" will be successful if the subscriber can provide the old password, the new password and the new password again as results of 3 subsequent operations "Get password".

4.2.2.8 getPassword (network --> MS)

This operation is invoked by the network to request a password from the mobile subscriber. It may be used to allow the registration of a new password or the management of subscription data by the subscriber himself (e.g. modification of call barring activation status).

4.2.2.9 processUnstructuredSS-Data (MS --> network)

This operation is invoked by an MS to relay unstructured information in order to allow end to end SS operation between the MS and the network following specific rules (e.g. embedding of keypad commands). The operation is used in order to provide backward compatibility (see TS 24.090).

4.2.2.10 processUnstructuredSS-Request (MS --> network)

This operation is invoked by an MS to start an unstructured supplementary service data application in the network.

4.2.2.11 unstructuredSS-Request (network --> MS)

This operation is invoked by the network to request unstructured information from the MS in order to perform an unstructured supplementary service data application.

4.2.2.12 unstructuredSS-Notify (network --> MS)

This operation is invoked by the network to give an unstructured supplementary service notification to the mobile user.

4.2.2.13 forwardCheckSSIndication (network --> MS)

This operation is invoked by the network to indicate to the mobile subscriber that the status of supplementary services may not be correct in the network. The procedures for initiating ForwardCheckSSIndication are specified in TS 29.002.

4.2.2.14 forwardChargeAdvice (network --> MS)

This operation is invoked by the network to forward Advice of Charge information to the mobile subscriber.

4.2.2.15 buildMPTY (MS --> network)

This operation is invoked by an MS to request the network to connect calls in a multi party call.

4.2.2.16 holdMPTY (MS --> network)

This operation is invoked by an MS to put the MS-connection to a multi party call (invoked by that MS) on hold.

4.2.2.17 retrieveMPTY (MS --> network)

This operation is invoked by an MS to request retrieval of a multi party call held by that MS.

4.2.2.18 splitMPTY (MS --> network)

This operation is invoked by an MS to request a private communication with one of the remote parties in a multi party call invoked by that MS.

4.2.2.19 forwardCUG-Info (MS --> network)

This operation is used by an MS to explicitly invoke a CUG call.

4.2.2.20 explicitCT (MS --> Network)

This operation is invoked by an MS to request the network to connect the two calls of the subscriber.

4.2.2.21 accessRegisterCCEntry (MS --> Network)

This operation is invoked by an MS to activate a CCBS request in the network.

4.2.2.22 callDeflection (MS --> Network)

This operation is invoked by an MS to request the network to deflect the incoming call to a specified destination.

4.2.2.23 userUserService (MS --> Network, Network --> MS)

This operation is invoked by an MS to request the network to allow an MS to send/receive information to/from another subscriber in association with a call.

4.2.2.24 lcs-LocationNotification (network --> MS)

This operation is invoked by the network to request a verification from the mobile subscriber for the attempted location request or to notify the subscriber about authorized location request.

Refer to 3GPP TS 24.171 [15] for lcs-LocationNotification operations for E-UTRAN LCS.

Refer to 3GPP TS 24.571 [19] for lcs-LocationNotification operations for 5G LCS.

4.2.2.25 lcs-MOLR (MS --> Network)

This operation is invoked by an MS to request the network to start location procedure, which is used to provide the MS location estimate, location assistance data or deciphering keys for broadcast assistance data.

Refer to 3GPP TS 24.171 [15] for lcs-MOLR operations for E-UTRAN LCS.

Refer to 3GPP TS 24.571 [19] for lcs-MOLR operations for 5G LCS.

4.2.2.26 lcs-AreaEventRequest (network --> MS)

This operation is invoked by the network to request a mobile to start the deferred MT-LR Area Event procedure.

4.2.2.27 lcs-AreaEventReport (MS --> network)

This operation is invoked by an MS to respond that the requested Area Event has occurred.

4.2.2.28 lcs-AreaEventCancellation (network --> MS)

This operation is invoked by the network to request a mobile to cancel the deferred MT-LR Area Event procedure.

4.2.2.29 lcs-PeriodicLocationRequest (network --> MS)

This operation is invoked by the network to request a mobile to start periodic reporting procedure.

4.2.2.30 lcs-LocationUpdate (network --> MS)

This operation is invoked by the network to notify the mobile about the delivery of location estimates to an external LCS Client, or to deliver a location estimate to the mobile in a periodic location procedure.

4.2.2.31 lcs-PeriodicLocationCancellation (network --> MS)

This operation is invoked by the network to request a mobile to cancel the periodic or triggered reporting procedure. This operation is applicable to EPS.

4.2.2.32 lcs-PeriodicTriggeredInvoke (network --> MS)

This operation is invoked by the network to request a mobile to start a periodic and triggered reporting procedure. This operation is applicable to EPS and 5GS.

4.2.2.33 lcs-EventReport (MS --> Network)

This operation is invoked by an MS to report a periodic or triggered location related event to the network or to cancel location related event reporting. This operation is applicable to 5GS.

4.2.2.34 lcs-CancelDeferredLocation (network --> MS)

This operation is invoked by the network to request a mobile to cancel a periodic or triggered reporting procedure. This operation is applicable to 5GS.

4.2.2.35 lcs-MSCancelDeferredLocation (MS -->network)

This operation is invoked by an MS to request the network to cancel a periodic or triggered reporting procedure. This operation is applicable to 5GS.

4.2.2.36 lcs-LocationPrivacySetting (MS --> network)

This operation is invoked by an MS to request network to update its Location Privacy Indication information. This operation is applicable to 5GS.

4.3 Errors

4.3.1 Errors ASN.1 specification

The following ASN.1 module provides an ASN.1 specification of errors. Errors from MAP are imported in the SS-Protocol module in clause 4.5. The module defines errors by allocating them a local value. For the involved errors the same local values as in MAP are allocated.

```

SS-Errors {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Access (2) modules (3)
    ss-Errors (1) version16 (16)}

DEFINITIONS ::=

BEGIN

IMPORTS

ERROR FROM
Remote-Operations-Information-Objects {joint-iso-itu-t remote-operations(4)
    informationObjects(5) version1(0)};

-- The MAP errors
-- unknownSubscriber, bearerServiceNotProvisioned, teleserviceNotProvisioned,
-- illegalSS-Operation, ss-ErrorStatus, ss-NotAvailable, ss-SubscriptionViolation,
-- ss-Incompatibility, systemFailure, dataMissing, unexpectedDataValue, facilityNotSupported,
-- pw-RegistrationFailure, negativePW-Check, callBarred, numberOfPW-AttemptsViolation,
-- absentSubscriber, illegalSubscriber, illegalEquipment, ussd-Busy, unknownAlphabet,
-- forwardingViolation, forwardingFailed, resourceLimitation
-- are imported from MAP-Errors in SS-Protocol module.

-- errors definition
resourcesNotAvailable ERROR ::= {
    CODE    local:127 }
maxNumberOfPTY-ParticipantsExceeded ERROR ::= {
    CODE    local:126 }
invalidDeflectedToNumber ERROR ::= {
    CODE    local:125 }
specialServiceCode ERROR ::= {

```

```

        CODE    local:124 }
deflectionToServedSubscriber ERROR ::= {
    CODE    local:123 }
rejectedByNetwork ERROR ::= {
    CODE    local:122 }
rejectedByUser ERROR ::= {
    CODE    local:121 }

END

```

4.3.2 Errors description

For each error this clause provides a brief prose description.

4.3.2.1 unknownSubscriber

This error is returned by the network when it is requested to perform an operation concerning an unknown subscriber.

4.3.2.2 bearerServiceNotProvisioned

This error is returned by the network when it is requested to perform an operation on a supplementary service and not even a subset of the requested bearer service group has been subscribed to.

4.3.2.3 teleServiceNotProvisioned

This error is returned by the network when it is requested to perform an operation on a supplementary service and not even a subset of the requested teleservice group has been subscribed to.

4.3.2.4 illegalSS-Operation

This error is returned by the network when it is requested to perform an illegal operation which is defined as not applicable for the relevant supplementary service(s) (e.g. registration request for a service which must be registered by the administration). For the definition of the allowed operations for the individual supplementary services, see TS 24.08x and 24.09x-series of technical specifications.

4.3.2.5 ss-ErrorStatus

This error is returned by the network when it is requested to perform an operation which is not compatible with the current status of the relevant supplementary service. The current status may be given as additional information by use of the SS-parameter.

4.3.2.6 ss-NotAvailable

This error is returned by the network when it is requested to perform an operation on a supplementary service which is not available in the current location area.

4.3.2.7 ss-SubscriptionViolation

This error is returned by the network when it is requested to perform an operation on a supplementary service, transgressing the subscription restrictions. The nature of the restriction or the transgressed options may be sent as parameters.

4.3.2.8 ss-Incompatibility

This error is returned by the network when it is requested for a supplementary service operation incompatible with the status of an other supplementary service or with the teleservice or bearer service for which the operation is requested. This error shall only be used if the operation is not compatible for even a subset of the teleservice group or bearer service group specified in the request. The identity and status of the conflicting service may also be indicated. The additional information may contain the SS-code parameter, the Basic Service Group parameter and the SS-status parameter.

4.3.2.9 systemFailure

This error is returned by the network, when it cannot perform an operation because of a failure in the network.

4.3.2.10 dataMissing

This error is returned by the network when an optional parameter is missing in an invoke component or an inner data structure, while it is required by the context of the request.

4.3.2.11 unexpectedDataValue

This error is returned by the network when it receives a parameter with an unexpected value, without type violation.

4.3.2.12 passwordRegistrationFailure

This error is returned when a password registration procedure fails because of abnormal subscriber inputs. A more specific diagnostic may be passed as error parameter and indicates situations such as:

- invalid password format;
- new passwords mismatch.

4.3.2.13 negativePasswordCheck

This error is returned to indicate the negative result of a password check because the subscriber has not provided the required password or has provided a password which does not match the valid one.

4.3.2.14 facilityNotSupported

This error is returned by the network receiving a request about a facility which is not supported in the PLMN.

4.3.2.15 resourcesNotAvailable

This error is returned by the network to the MS if temporarily there are no resources to support e.g. a multi party call available in the network.

4.3.2.16 maxNumberOfMPTY-ParticipantsExceeded

This error is returned by the network to the MS if the request must be rejected because the number of subscribers to join a multi party call would exceed the maximum value.

4.3.2.17 callBarred

This error is returned by the network to the MS when call independent subscriber control procedures are barred by the operator. The parameter "operator barring" shall be included.

4.3.2.18 numberOfPW-AttemptsViolation

This error is returned by the network to the MS when the maximum number of wrong password attempts is exceeded.

4.3.2.19 absentSubscriber

This error is returned when the subscriber has activated the detach service or the system detects the absence condition. This error is not used on the radio interface but only between network entities.

4.3.2.20 illegalSubscriber

This error is returned when illegality of the access has been established by use of authentication procedure. This error is not used on the radio interface but only between network entities.

4.3.2.21 illegalEquipment

This error is returned when the IMEI check procedure has shown that the IMEI is prohibited listed or not permitted listed. This error is not used on the radio interface but only between network entities.

4.3.2.22 ussd-Busy

This error is returned by the MS to the network when the MS is not able to process the unstructured supplementary service data operation due to an on-going MMI input of the user or an already existing call independent supplementary service transaction.

4.3.2.23 unknownAlphabet

This error is returned by the MS or the network when the alphabet/language used for the unstructured supplementary service data operation is not known by the network or the MS.

4.3.2.24 invalidDeflectedToNumber

This error is returned if the requested deflected-to number is invalid.

4.3.2.25 specialServiceCode

This error is returned if diversion to a special service code was requested.

4.3.2.26 deflectionToServedSubscriber

This error is returned if a diversion to the served subscriber's number was requested.

4.3.2.27 rejectedByNetwork

This error is returned by the network when the network rejects User-to-User Signalling service request.

4.3.2.28 rejectedByUser

This error is returned by the remote party when the remote party rejects User-to-User Signalling service request.

4.3.2.29 positionMethodFailure

This error is returned by the network when the network is unable to obtain any of the location information requested or none of the information obtained satisfies the requested LCS QoS or if requested LCS assistance data could not be transferred or requested deciphering keys for broadcast assistance data could not be returned.

4.3.2.30 resourceLimitation

This error is returned when a requested operation cannot be performed due to insufficient resources.

4.4 Data types and identifiers

4.4.1 General

The data types used in the SS protocol specifications are described in the ASN.1 module provided in clause 4.4.2, while clause 4.4.3 provides an overview of the identifiers used in SS ASN.1 specifications.

Named values have been defined in the following module for the upper boundaries of the value ranges associated to several sub-type specifications.

4.4.2 ASN.1 data types

This clause provides an ASN.1 module defining the abstract data types in operations and errors specification. Only data types which are specific for this specification are defined. All other data types are imported from MAP together with the import of operations and errors.

```

SS-DataTypes {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Access (2) modules (3)
    ss-DataTypes (2) version16 (16)}

DEFINITIONS

IMPLICIT TAGS ::=

BEGIN

-- exports all data types defined in this module

IMPORTS

SS-Code
FROM MAP-SS-Code {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Network (1) modules (3)
    map-SS-Code (15) version20 (20)}

-- imports MAP-SS-DataTypes
SS-Status, USSD-DataCodingScheme, USSD-String, CCBS-Feature
-- USSD-DataCodingScheme, USSD-String were introduced because of CNAP.
FROM MAP-SS-DataTypes {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Network (1) modules (3)
    map-SS-DataTypes (14) version20 (20)}

CUG-Index,
NotificationToMSUser
FROM MAP-MS-DataTypes {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Network (1) modules (3)
    map-MS-DataTypes (11) version20 (20)}

maxSignalInfoLength,
ISDN-AddressString,
ISDN-SubaddressString,
AlertingPattern,
LCSClientExternalID,
AddressString,
LCSServiceTypeID,
AgeOfLocationInformation,
GSN-Address
FROM MAP-CommonDataTypes {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Network (1) modules (3)
    map-CommonDataTypes (18) version20 (20)}

LocationType,
DeferredLocationEventType,
LCSClientName,
LCS-QoS,
Horizontal-Accuracy,
ResponseTime,
Ext-GeographicalInformation,
VelocityEstimate,
SupportedGADShapes,
Add-GeographicalInformation,
LCSRequestorID,
LCS-ReferenceNumber,
LCSCodeword,
AreaEventInfo,
ReportingPLMNList,
PeriodicLDRInfo,
SequenceNumber,
OccurrenceInfo,
IntervalTime

FROM MAP-LCS-DataTypes {
    itu-t identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-LCS-DataTypes (25) version20 (20)}

;

```

```
-- data types definition

SS-UserData ::= IA5String (SIZE (1.. maxSignalInfoLength))

NotifySS-Arg ::= SEQUENCE{
    ss-Code      [1] SS-Code OPTIONAL,
    ss-Status    [4] SS-Status OPTIONAL,
    ss-Notification [5] SS-Notification OPTIONAL,
    callIsWaiting-Indicator [14] NULL OPTIONAL,
    callOnHold-Indicator [15] CallOnHold-Indicator OPTIONAL,
    mpty-Indicator [16] NULL OPTIONAL,
    cug-Index     [17] CUG-Index OPTIONAL,
    clirSuppressionRejected [18] NULL OPTIONAL,
    ... ,
    ect-Indicator [19] ECT-Indicator OPTIONAL,
    nameIndicator [20] NameIndicator OPTIONAL,
    ccbs-Feature  [21] CCBS-Feature OPTIONAL,
    alertingPattern [22] AlertingPattern OPTIONAL,
    multicall-Indicator [23] Multicall-Indicator OPTIONAL}

-- The nameIndicator is defined because of CNAP.

Multicall-Indicator ::= ENUMERATED {
    nbr-SNexceeded (0),
    nbr-Userexceeded (1)}

ForwardChargeAdviceArg ::= SEQUENCE{
    ss-Code      [0] SS-Code,
    chargingInformation [1] ChargingInformation,
    ...}

SS-Notification ::= OCTET STRING (SIZE (1))

-- Bit 8 7 6 5 4 00000 (Unused)

-- Bit 3 Call is forwarded indication to A-subscriber
-- (calling subscriber)
-- 0 No information content
-- 1 Outgoing call has been forwarded to C

-- Bit 2 Call is forwarded indication to B-subscriber
-- (forwarding subscriber)
-- 0 No information content
-- 1 Incoming call has been forwarded to C

-- Bit 1 Call is forwarded indication to C-subscriber
-- (forwarded-to subscriber)
-- 0 No information content
-- 1 Incoming call is a forwarded call

ChargingInformation ::= SEQUENCE{
    e1 [1] E1 OPTIONAL,
    e2 [2] E2 OPTIONAL,
    e3 [3] E3 OPTIONAL,
    e4 [4] E4 OPTIONAL,
    e5 [5] E5 OPTIONAL,
    e6 [6] E6 OPTIONAL,
    e7 [7] E7 OPTIONAL,
    ...}

E1 ::= INTEGER (0..max10TimesUnitsPerTime)
max10TimesUnitsPerTime INTEGER ::= 8191

E2 ::= INTEGER (0..max10TimesTimeInterval)
max10TimesTimeInterval INTEGER ::= 8191

E3 ::= INTEGER (0..max100TimesScalingFactor)
max100TimesScalingFactor INTEGER ::= 8191

E4 ::= INTEGER (0..max10TimesIncrement)
max10TimesIncrement INTEGER ::= 8191

E5 ::= INTEGER (0..max10TimesIncrementPerDataInterval)
max10TimesIncrementPerDataInterval INTEGER ::= 8191

E6 ::= INTEGER (0..maxNumberOfSegmentsPerDataInterval)
maxNumberOfSegmentsPerDataInterval INTEGER ::= 8191
```

```

E7 ::= INTEGER (0..max10TimesInitialTime)
max10TimesInitialTime INTEGER ::= 8191

CallOnHold-Indicator ::= ENUMERATED {
    callRetrieved (0),
    callOnHold (1)}

ForwardCUG-InfoArg ::= SEQUENCE {
    cug-Index [0] CUG-Index OPTIONAL,
    suppressPrefCUG [1] NULL OPTIONAL,
    suppressOA [2] NULL OPTIONAL,
    ...}

ECT-Indicator ::= SEQUENCE {
    ect-CallState [0] ECT-CallState,
    rdn [1] RDN OPTIONAL,
    ...}

ECT-CallState ::= ENUMERATED {
    alerting (0),
    active (1)}

NameIndicator ::= SEQUENCE {
    callingName [0] Name OPTIONAL,
    ...}

Name ::= CHOICE {
    namePresentationAllowed [0] NameSet,
    presentationRestricted [1] NULL,
    nameUnavailable [2] NULL,
    namePresentationRestricted [3] NameSet}

NameSet ::= SEQUENCE {
    dataCodingScheme [0] USSD-DataCodingScheme,
    lengthInCharacters [1] INTEGER,
    nameString [2] USSD-String,
    ...}

-- NameIndicator, Name and NameSet are defined because of CNAP.
-- The USSD-DataCodingScheme shall indicate use of the default alphabet through the
-- following encoding:
-- bit 7 6 5 4 3 2 1 0
-- | 0 0 0 0 | 1 1 1 1|

RDN ::= CHOICE {
    presentationAllowedAddress [0] RemotePartyNumber,
    presentationRestricted [1] NULL,
    numberNotAvailableDueToInterworking [2] NULL,
    presentationRestrictedAddress [3] RemotePartyNumber}

RemotePartyNumber ::= SEQUENCE {
    partyNumber [0] ISDN-AddressString,
    partyNumberSubaddress [1] ISDN-SubaddressString OPTIONAL,
    ...}

AccessRegisterCCEntArg ::= SEQUENCE {
    ...}

CallDeflectionArg ::= SEQUENCE {
    deflectedToNumber [0] AddressString,
    deflectedToSubaddress [1] ISDN-SubaddressString OPTIONAL,
    ...}

UserUserServiceArg ::= SEQUENCE {
    uUS-Service [0] UUS-Service,
    uUS-Required [1] BOOLEAN,
    ... }

UUS-Service ::= ENUMERATED {
    uUS1 (1),
    uUS2 (2),
    uUS3 (3),
    ... }

-- exception handling:
-- In case of UUS-Service with any other value, indicated as "UUS required",
-- but not understood by the MS, the call will be cleared.

```

```

LocationNotificationArg ::= SEQUENCE {
    notificationType [0] NotificationToMSUser,
    locationType [1] LocationType,
    lcsClientExternalID [2] LCSCClientExternalID OPTIONAL,
    lcsClientName [3] LCSCClientName OPTIONAL,
    ... ,
    lcsRequestorID [4] LCSRequestorID OPTIONAL,
    lcsCodeword [5] LCSCodeword OPTIONAL,
    lcsServiceTypeID [6] LCSServiceTypeID OPTIONAL,
    deferredLocationExt [7] DeferredLocationExt OPTIONAL }

-- The notificationType may only be set to notifyLocationAllowed,
-- notifyAndVerify-LocationAllowedIfNoResponse,
-- or notifyAndVerify-LocationNotAllowedIfNoResponse.
-- The locationEstimateType field of the locationType may only be set to
-- currentLocation, currentOrLastKnownLocation,
-- notificationVerificationOnly, or activateDeferredLocation.
-- The deferredLocationEventType field of the locationType may only be set to
-- enteringIntoArea, and/or leavingFromArea, and/or beingInsideArea,
-- and/or periodicLDR.
-- For LCS location notification of MT-LR for current location, the
-- locationEstimateType field of the locationType shall be set to currentLocation.
-- For LCS location notification of MT-LR for current or last known location, the
-- locationEstimateType field of the locationType shall be set to currentOrLastKnownLocation.
-- For the LCS location notification for the LDR of MS available event,
-- the locationEstimateType field of the locationType shall be set to currentLocation.
-- For LCS location notification for the LDR of change of area event,
-- the locationEstimateType field of the locationType shall be set to
-- activateDeferredLocation, and the deferredLocationEventType shall be
-- set to enteringIntoArea, and/or leavingFromArea, and/or beingInsideArea.
-- For the post positioning LCS location notification, the locationEstimateType
-- field of the locationType shall be set to notificationVerificationOnly.
-- For LCS location notification for the LDR of periodic location event,
-- the locationEstimateType field of the locationType shall be set to
-- activateDeferredLocation, and the
-- deferredLocationEventType shall be set to periodicLDR.
-- For LCS location notification for the LDR of the motion event,
-- the locationEstimateType field of the locationType shall be set to
-- activateDeferredLocation, the deferredLocationEventType shall be omitted
-- and the deferredLocationExt shall be set to motionEvent.

-- exception handling:
-- At reception of an unrecognised notificationType value the receiver shall reject the
-- operation with a return error cause of unexpected data value.
-- At reception of an unrecognised locationType value the receiver shall reject the
-- operation with a return error cause of unexpected data value.
-- At reception of an unallowed notificationType value the receiver shall either ignore the
-- received operation or reject the operation with a return error cause of unexpected
-- data value.
-- At reception of an unallowed locationType value the receiver shall either ignore the
-- received operation or reject the operation with a return error cause of unexpected
-- data value.

DeferredLocationExt ::= BIT STRING {
    motionEvent (0) } (SIZE (1..16))
-- A bit set to one indicates that the corresponding deferred location type is present.
-- A bit set to zero indicates that the corresponding deferred location type is absent.

LocationNotificationRes ::= SEQUENCE {
    verificationResponse [0] VerificationResponse OPTIONAL,
    locationPrivacyIndication [1] LCS-LocationPrivacyIndication OPTIONAL,
    validTimePeriod [2] LCS-ValidTimePeriod OPTIONAL,
    ... }
-- Parameters locationPrivacyIndication or validTimePeriod may be included by a UE for 5GS
-- access. Parameter validTimePeriod only may be included if parameter locatonPrivacyIndication
-- is included.

VerificationResponse ::= ENUMERATED {
    permissionDenied (0),
    permissionGranted (1),
    ... }

-- exception handling:
-- an unrecognized value shall be treated the same as value 0 (permissionDenied)

LCS-MOLRArg ::= SEQUENCE {

```

```

molr-Type [0] MOLR-Type,
locationMethod [1] LocationMethod OPTIONAL,
lcs-QoS [2] LCS-QoS OPTIONAL,
lcsClientExternalID [3] LCSClientExternalID OPTIONAL,
mlc-Number [4] ISDN-AddressString OPTIONAL,
gpsAssistanceData [5] GPSAssistanceData OPTIONAL,
...,
supportedGADShapes [6] SupportedGADShapes OPTIONAL,
lcsServiceTypeID [7] LCSServiceTypeID OPTIONAL,
ageOfLocationInfo [8] AgeOfLocationInformation OPTIONAL,
locationType [9] LocationType OPTIONAL,
pseudonymIndicator [10] NULL OPTIONAL,
h-gmlc-address [11] GSN-Address OPTIONAL,
locationEstimate [12] Ext-GeographicalInformation OPTIONAL,
velocityEstimate [13] VelocityEstimate OPTIONAL,
referenceNumber [14] LCS-ReferenceNumber OPTIONAL,
periodicLDRInfo [15] PeriodicLDRInfo OPTIONAL,
locationUpdateRequest [16] NULL OPTIONAL,
sequenceNumber [17] SequenceNumber OPTIONAL,
terminationCause [18] TerminationCause OPTIONAL,
mo-lrShortCircuit [19] NULL OPTIONAL,
ganssAssistanceData [20] GANSSAssistanceData OPTIONAL,
multiplePositioningProtocolPDUs [21] MultiplePositioningProtocolPDUs OPTIONAL,
locationInfo [22] LocationInfo OPTIONAL,
scheduledLocTime [23] DateTime OPTIONAL }
-- The parameter locationMethod shall be included if and only if the molr-Type is set to value
-- deCipheringKeys or assistanceData.
-- The parameter gpsAssistanceData shall be included if and only if the molr-Type is set to value
-- assistanceData and locationMethod is set to value assistedGPS or assistedGPSandGANSS.
-- The parameter ganssAssistanceData shall be included if and only if the molr-Type is set to value
-- assistanceData and locationMethod is set to value assistedGANSS or assistedGPSandGANSS.
-- supportedGADShapes shall not be included for deferred MO-LR initiation or deferred MO-LR or MT-LR
-- responses
-- multiplePositioningProtocolPDUs may only be included for E-UTRAN access for an EPC-MO-LR.
-- locationMethod shall not be included for E-UTRAN and 5G access.
-- gpsAssistanceData shall not be included for E-UTRAN access.
-- velocityEstimate shall not be included for E-UTRAN access.
-- periodicLDRInfo shall not be included for E-UTRAN access.
-- locationUpdateRequest shall not be included for E-UTRAN access.
-- sequenceNumber shall not be included for E-UTRAN access.
-- mo-lrShortCircuit shall not be included for E-UTRAN access.
-- ganssAssistanceData shall not be included for E-UTRAN access.
-- locationInfo shall be included if available for E-UTRAN access for a periodic and triggered
-- event report.
-- Only mlc-number could be used to represent the address of H-GMLC of the UE, h-gmlc-address shall
not be used for this purpose.

```

```

MOLR-Type ::= ENUMERATED {
  locationEstimate (0),
  assistanceData (1),
  deCipheringKeys (2),
  ...,
  deferredMo-lrTTTTInitiation (3),
  deferredMo-lrSelfLocationInitiation (4),
  deferredMt-lrOrmo-lrTTTTLocationEstimate (5),
  deferredMt-lrOrmo-lrCancellation (6),
  periodicEvent (7),
  enteringAreaEvent (8),
  leavingAreaEvent (9),
  beingInsideAreaEvent (10),
  motionEvent (11),
  maximumIntervalExpirationEvent (12) }
-- exception handling:
-- an unrecognized value shall be rejected by the receiver with a return error cause of
-- unexpected data value.
-- For E-UTRAN access, only locationEstimate, assistanceData, periodicEvent,
-- deferredMt-lrOrmo-lrCancellation, enteringAreaEvent, leavingAreaEvent, beingInsideAreaEvent,
-- motionEvent or maximumIntervalExpirationEvent shall be included

```

```

LocationMethod ::= ENUMERATED {
  msBasedEOTD (0),
  msAssistedEOTD (1),
  assistedGPS (2),
  ...,
  msBasedOTDOA (3),
  assistedGANSS (4),

```

```

    assistedGPSandGANSS (5)
  }
-- exception handling:
-- When this parameter is received with value msBasedEOTD or msAssistedEOTD and the MS
-- is camped on an UMTS Service Area then the receiver shall reject it
-- with a return error cause of unexpected data value.
-- When this parameter is received with value msBasedOTDOA and the MS
-- is camped on a GSM Cell then the receiver shall reject it with a return error cause of
-- unexpected data value.
-- an unrecognized value shall be rejected by the receiver with a return error cause of
-- unexpected data value.

GPSAssistanceData ::= OCTET STRING (SIZE (1..38))
-- Octets 1 to 38 are coded in the same way as the octets 3 to 7+2n of Requested GPS Data IE
-- in 3GPP TS 49.031 [14].

GANSSAssistanceData ::= OCTET STRING (SIZE (1..40))
-- Octets 1 to 40 are coded in the same way as the octets 3 to 9+2n of Requested GANSS Data IE
-- in 3GPP TS 49.031 [14] .

TerminationCause ::= ENUMERATED {
    subscriberTermination (0),
    ueTermination (1),
    ...,
    normalTermination (2),
    networkTermination (3)}
-- normalTermination shall be included for a normal end to periodic or triggered event
-- reporting

MultiplePositioningProtocolPDUs ::= SEQUENCE (SIZE (1..maxNumLPPMsg)) OF PositioningProtocolPDU

PositioningProtocolPDU ::= OCTET STRING
-- PositioningProtocolPDU contains a LPP message defined in 3GPP TS 36.355 [17].

maxNumLPPMsg INTEGER ::= 3

LCS-MOLRRes ::= SEQUENCE {
    locationEstimate [0] Ext-GeographicalInformation OPTIONAL,
    decipheringKeys [1] DecipheringKeys OPTIONAL,
    ...,
    add-LocationEstimate [2] Add-GeographicalInformation OPTIONAL,
    velocityEstimate [3] VelocityEstimate OPTIONAL,
    referenceNumber [4] LCS-ReferenceNumber OPTIONAL,
    h-gmlc-address [5] GSN-Address OPTIONAL,
    mo-lrShortCircuit [6] NULL OPTIONAL,
    reportingPLMNList [7] ReportingPLMNList OPTIONAL,
    timestampOfLocationEstimate [8] DateTime OPTIONAL
}
-- Parameters locationEstimate or add-LocationEstimate (one but not both)
-- shall be included if and only if the
-- molr-Type in LocationRequestArg was set to value locationEstimate.
-- Parameter add-LocationEstimate shall not be included if the supportedGADShapes
-- parameter was not received in the LCS-MOLRArg.
-- The locationEstimate and the add-locationEstimate parameters shall not be sent if
-- the supportedGADShapes parameter has been received in LCS-MOLRArg
-- and the shape encoded in locationEstimate or add-LocationEstimate is not marked
-- as supported in supportedGADShapes. In such a case LCS-MOLRArg
-- shall be rejected with error FacilityNotSupported with additional indication
-- shapeOfLocationEstimateNotSupported.
-- Parameter decipheringKeys shall be included if and only if the molr-Type
-- in LocationRequestArg was set to value decipheringKeys.
-- Parameter velocityEstimate may only be included if the lcs-QoS in LCS-MOLRArg includes
-- velocityRequest
-- decipheringKeys shall not be included for E-UTRAN access.
-- referenceNumber shall not be included for E-UTRAN access.
-- h-gmlc-address shall not be included for E-UTRAN access.
-- mo-lrShortCircuit shall not be included for E-UTRAN access.
-- reportingPLMNList shall not be included for E-UTRAN access.

DecipheringKeys ::= OCTET STRING (SIZE (15))
-- Octets in DecipheringKeys are coded in the same way as the octets 3 to 17 of Deciphering Key IE
-- in 3GPP TS 49.031 [14]. I.e. these octets contain Current Deciphering Key, Next Deciphering Key
-- and
-- Cipherring Key Flag.

```

```

LCS-AreaEventRequestArg ::= SEQUENCE {
    referenceNumber [0] LCS-ReferenceNumber,
    h-gmlc-address [1] GSN-Address,
    deferredLocationEventType [3] DeferredLocationEventType,
    areaEventInfo [4] AreaEventInfo,
    ... }

-- the msAvailableValue in the DeferredLocationEventType is not applicable for this procedure

LCS-AreaEventReportArg ::= SEQUENCE {
    referenceNumber [0] LCS-ReferenceNumber,
    h-gmlc-address [1] GSN-Address,
    ... }

LCS-AreaEventCancellationArg ::= SEQUENCE {
    referenceNumber [0] LCS-ReferenceNumber,
    h-gmlc-address [1] GSN-Address,
    ... }

LCS-PeriodicLocationRequestArg ::= SEQUENCE {
    referenceNumber [0] LCS-ReferenceNumber,
    periodicLDRInfo [1] PeriodicLDRInfo,
    lcsClientExternalID [2] LCSCClientExternalID,
    qos [3] LCS-QoS OPTIONAL,
    h-gmlc-address [4] GSN-Address OPTIONAL,
    mo-lrShortCircuit [5] NULL OPTIONAL,
    reportingPLMNList [6] ReportingPLMNList OPTIONAL,
    ... }

LCS-PeriodicLocationRequestRes ::= SEQUENCE {
    mo-lrShortCircuit [0] NULL OPTIONAL,
    ... }

LCS-LocationUpdateArg ::= SEQUENCE {
    referenceNumber [0] LCS-ReferenceNumber OPTIONAL,
    add-LocationEstimate [1] Add-GeographicalInformation OPTIONAL,
    velocityEstimate [2] VelocityEstimate OPTIONAL,
    sequenceNumber [3] SequenceNumber OPTIONAL,
    ... }
-- add-LocationEstimate shall be included if and only if a location estimate was successfully
-- transferred towards an External LCS Client or was successfully obtained for UE self location
-- velocityEstimate may only be included if add-LocationEstimate is included

LCS-LocationUpdateRes ::= SEQUENCE {
    terminationCause [0] TerminationCause OPTIONAL,
    ... }

LCS-PeriodicLocationCancellationArg ::= SEQUENCE {
    referenceNumber [0] LCS-ReferenceNumber,
    h-gmlc-address [1] GSN-Address OPTIONAL,
    ... }

LCS-PeriodicTriggeredInvokeArg ::= SEQUENCE {
    referenceNumber [0] LCS-ReferenceNumber,
    h-gmlc-address [1] GSN-Address,
    qos [2] LCS-QoS OPTIONAL,
    reportingPLMNList [3] ReportingPLMNList OPTIONAL,
    periodicLocation [4] PeriodicLocation OPTIONAL,
    areaEventReporting [5] AreaEventReporting OPTIONAL,
    motionEventReporting [6] MotionEventReporting OPTIONAL,
    ...,
    referenceNumberExt [7] LCS-ReferenceNumberExt OPTIONAL,
    h-gmlc-callBackUri [8] UTF8String OPTIONAL,
    supportedGADShapes [9] SupportedGADShapes OPTIONAL,
    deferredRoutingIdentifier [10] OCTET STRING OPTIONAL,
    reportingAccessTypes [11] ReportingAccessTypes OPTIONAL,
    multiplePositioningProtocolPDUs [12] MultiplePositioningProtocolPDUs OPTIONAL,
    controlPlane-CIoT-5GS-Optimisation [13] ControlPlane-CIoT-5GS-Optimisation OPTIONAL,
    scheduledLocTime [14] DateTime }
-- Only one of periodicLocation, areaEventReporting and motionEventReporting shall be included.
-- responseTime and velocityRequest are not applicable in LCS-QoS.
-- reportingPLMNList provides a list of PLMNs in which event reporting is allowed.
-- If referenceNumberExt is included, an MS shall ignore referenceNumber.
-- h-gmlc-address shall be ignored by a UE for 5GS access.
-- referenceNumberExt, h-gmlc-callBackUri, supportedGADShapes, deferredRoutingIdentifier,

```



```
-- reportingAccessTypes, multiplePositioningProtocolPDUs and controlPlane-CIoT-5GS-Optimisation
-- shall not be included for E-UTRA access to EPC.
-- reportingPLMNList shall not be included for 5GS access.
-- scheduledLocTime is only applicable for periodic location reporting, which indicates a time in
future for the first periodic location to be reported.
```

```
PeriodicLocation ::= SEQUENCE {
    periodicLDRInfo [0] PeriodicLDRInfo,
    ... }

```

```
AreaEventReporting ::= SEQUENCE {
    deferredLocationEventType [0] DeferredLocationEventType,
    areaList [1] AreaList,
    occurrenceInfo [2] OccurrenceInfo OPTIONAL,
    intervalTime [3] IntervalTime OPTIONAL,
    maximumInterval [4] MaximumInterval OPTIONAL,
    samplingInterval [5] SamplingInterval OPTIONAL,
    duration [6] Duration OPTIONAL,
    locationInfo [7] LocationInfo OPTIONAL,
    ... }

```

```
-- msAvailable and periodicLDR in DeferredLocationEventType are not applicable.
-- intervalTime and maximumInterval are not applicable when OccurrenceInfo is present with
-- the value of oneTimeEvent.
```

```
AreaList ::= SEQUENCE SIZE (1..maxAreas) OF Area

```

```
maxAreas INTEGER ::= 250

```

```
Area ::= SEQUENCE {
    areaType [0] AreaType,
    areaIdentification [1] AreaIdentification,
    ...,
    areaIdentificationExt [2] AreaIdentificationExt }

```

```
AreaType ::= ENUMERATED {
    trackingArea (0),
    ecgi (1),
    ...,
    trackingArea5GS (2),
    ncgi (3) }

```

```
-- trackingArea5GS and ncgi shall not be included for an MS without 5GS access

```

```
AreaIdentification ::= OCTET STRING (SIZE (5..7))
-- The internal structure is defined as follows:
-- octet 1 bits 4321 Mobile Country Code 1st digit
-- bits 8765 Mobile Country Code 2nd digit
-- octet 2 bits 4321 Mobile Country Code 3rd digit
-- bits 8765 Mobile Network Code 3rd digit if 3 digit MNC included
-- or filler (1111)
-- octet 3 bits 4321 Mobile Network Code 1st digit
-- bits 8765 Mobile Network Code 2nd digit
-- octets 4 and 5 Tracking Area Code for an EPS Tracking Area (bit 8 of octet 4 is the
-- most significant bit and bit 1 of octet 5 the least significant bit)
-- octets 4 until 7 E-UTRAN Cell Identity for an ECGI (bit 8 of octet 4 is the most
-- significant bit and bit 5 of octet 7 the least significant bit)
-- octets 4 until 6 Tracking Area Code for a 5GS Tracking Area (bit 8 of octet 4 is the
-- most significant bit and bit 1 of octet 6 the least significant bit)
-- octets 4 until 7 Cell Identity for an NCGI (bit 8 of octet 4 is the most
-- significant bit and bit 1 of octet 7 the fifth least significant bit. The 4 least
-- significant bits are included in areaIdentificationExt)
```

```
AreaIdentificationExt ::= OCTET STRING (SIZE (1))
-- contains the 4 least significant bits of an NCGI in bits 8765 with bit 8 containing the
-- the most significant bit

```

```
OccurrenceInfo ::= ENUMERATED {
    oneTimeEvent (0),
    multipleTimeEvent (1),
    ... }

```

```
-- exception handling:
```

```
-- an unrecognized value shall be rejected by the receiver with a return error cause of
-- unexpected data value.
```

```
MaximumInterval ::= INTEGER (1..86400)
-- maximum time interval between consecutive event reports in seconds.
```

```

SamplingInterval ::= INTEGER (1..3600)
-- maximum time interval between consecutive evaluations by a UE of a trigger event,
-- in seconds.

Duration ::= INTEGER (1..8640000)
-- maximum duration of event reporting by a UE, in seconds

LocationInfo ::= BIT STRING {
    locationEstimate (0) } (SIZE (1..32))
-- A bit set to one indicates that the corresponding requirement is present.
-- A bit set to zero indicates that the corresponding requirement is absent.
-- The locationEstimate is a requirement to provide the UE location for an event report to
-- the external client, but the location may be provided by either the UE or network.

MotionEventReporting ::= SEQUENCE {
    linearDistance [0] LinearDistance,
    occurrenceInfo [1] OccurrenceInfo OPTIONAL,
    intervalTime [2] IntervalTime OPTIONAL,
    maximumInterval [3] MaximumInterval OPTIONAL,
    samplingInterval [4] SamplingInterval OPTIONAL,
    duration [5] Duration OPTIONAL,
    locationInfo [6] LocationInfo OPTIONAL,
    ... }
-- intervalTime and maximumInterval are not applicable when OccurrenceInfo is present with
-- the value of oneTimeEvent.

LinearDistance ::= INTEGER (1..10000)
-- the minimum straight line distance moved by a UE to trigger a motion event report, in meters.

LCS-ReferenceNumberExt ::= OCTET STRING (SIZE (1..255))

ReportingAccessTypes ::= BIT STRING {
    nR (0),
    eUTRANConnectedTo5GC (1),
    non3GPPConnectedTo5GC (2),
    eUTRANConnectedToEPC (3),
    nR-LEO (4),
    nR-MEO (5),
    nR-GEO (6),
    nR-OTHER-SAT (7) } (SIZE (1..16))
-- A bit set to one indicates that the access type is allowed for event reporting.
-- A bit set to zero or omitted indicates that the access types is not allowed.

LCS-PeriodicTriggeredInvokeRes ::= SEQUENCE {
    ... }

LCS-EventReportArg ::= SEQUENCE {
    eventType [0] EventType,
    referenceNumberExt [1] LCS-ReferenceNumberExt,
    h-gmlc-callBackUri [2] UTF8String,
    locationInfo [3] LocationInfo OPTIONAL,
    supportedGADShapes [4] SupportedGADShapes OPTIONAL,
    lcs-QoS [5] LCS-QoS OPTIONAL,
    multiplePositioningProtocolPDUs [6] MultiplePositioningProtocolPDUs OPTIONAL,
    terminationCause [7] TerminationCause OPTIONAL,
    ... }
-- inclusion of the terminationCause signifies termination of event reporting by the MS

EventType ::= ENUMERATED {
    periodicEvent (0),
    enteringAreaEvent (1),
    leavingAreaEvent (2),
    beingInsideAreaEvent (3),
    motionEvent (4),
    maximumIntervalExpirationEvent (5),
    locationCancellationEvent (6),
    ... }
-- exception handling:
-- an unrecognized value shall be rejected by the receiver with a return error cause of
-- unexpected data value.

ControlPlane-CIoT-5GS-Optimisation ::= SEQUENCE {
    maximumDuration [0] MaximumDuration OPTIONAL,
    maximumConsecutiveEventReports [1] MaximumConsecutiveEventReports OPTIONAL,
    ... }

MaximumDuration ::= INTEGER (1..10080)
-- maximum duration for use of Control Plane CIoT 5GS Optimisation in minutes.

```

```

MaximumConsecutiveEventReports ::= INTEGER (1..1023)
-- maximum number of consecutive event reports for Control Plane CIoT 5GS Optimisation.

LCS-EventReportRes ::= SEQUENCE {
    deferredRoutingIdentifier [0] OCTET STRING OPTIONAL,
    terminationCause [1] TerminationCause OPTIONAL,
    ... }

LCS-CancelDeferredLocationArg ::= SEQUENCE {
    referenceNumberExt [0] LCS-ReferenceNumberExt,
    h-gmlc-callBackUri [2] UTF8String,
    ... }

LCS-LocationPrivacySettingArg ::= SEQUENCE {
    locationPrivacyIndication [0] LCS-LocationPrivacyIndication,
    validTimePeriod [1] LCS-ValidTimePeriod OPTIONAL,
    ... }

LCS-LocationPrivacyIndication ::= ENUMERATED {
    locationDisallowed (0),
    locationAllowed (1),
    ... }

LCS-ValidTimePeriod ::= SEQUENCE {
    startTime [0] DateTime OPTIONAL,
    endTime [1] DateTime OPTIONAL,
    ... }

DateTime ::= OCTET STRING (SIZE (30))
-- The timestamp at which certain event occurs. Octets are coded according to RFC 3339 [18]

END

```

4.4.3 Identifiers definition

The parameters which are described in the following clauses correspond to the identifiers used in operation and error descriptions.

4.4.3.1 chargingInformation

The chargingInformation identifier refers to the necessary information for the Advice of Charge supplementary service (see TS 22.024).

4.4.3.2 e1

The e1 identifier refers to 10 times the number of LPLMN units per time interval in connection with the Advice of Charge supplementary service, see TS 22.024.

4.4.3.3 e2

The e2 identifier refers to 10 times the length of the time interval in seconds in connection with the Advice of Charge supplementary service, see TS 22.024.

4.4.3.4 e3

The e3 identifier refers to 100 times the scaling factor to convert from LPLMN units to HPLMN units in connection with the Advice of Charge supplementary service, see TS 22.024.

4.4.3.5 e4

The e4 identifier refers to 10 times the LPLMN increment in connection with the Advice of Charge supplementary service, see TS 22.024.

4.4.3.6 e5

The e5 identifier refers to 10 times the number of LPLMN units incremented per data interval in connection with the Advice of Charge supplementary service, see TS 22.024.

4.4.3.7 e6

The e6 identifier refers to the number of segments per data interval in connection with the Advice of Charge supplementary service, see TS 22.024.

4.4.3.8 e7

The e7 identifier refers to 10 times the length of the initial time interval in seconds in connection with the Advice of Charge supplementary service, see TS 22.024.

4.4.3.9 ss-Code

The ss-Code identifier refers to the code which identify a supplementary service or a group of supplementary services.

4.4.3.10 ss-Notification

The ss-Notification identifier refers to one or several supplementary service notifications which have to be forwarded to a mobile subscriber.

4.4.3.11 ss-Status

The ss-Status identifier refers to the status of a supplementary service.

4.4.3.12 callIsWaiting-Indicator

The callIsWaiting-Indicator identifier refers to the indication given to the mobile station that the call is waiting.

4.4.3.13 callOnhold-Indicator

The callOnHold-Indicator identifier refers to the indication given to the mobile station that the call has been put on hold or has been retrieved.

4.4.3.14 mpty-Indicator

The mpty-Indicator identifier refers to the indication given to the mobile station that the multi party call has been invoked.

4.4.3.15 forwardCUG-InfoArg

The forwardCUG-InfoArg identifier refers to the indication given from the mobile subscriber to the network in connection with explicit invocation of a CUG call.

4.4.3.16 cug-Index

The cug-Index identifier refers to the index of a CUG given in an explicit invocation of a CUG call.

4.4.3.17 suppressPrefCUG

The suppressPrefCUG identifier refers to the mobile subscribers request to the network to prohibit the use of the preferential CUG.

4.4.3.18 suppressOA

The suppressOA identifier refers to the mobile subscribers request to the network to prohibit the use of the subscriber option "OA allowed".

4.4.3.19 clirSuppressionRejected

The clirSuppressionRejected identifier refers to the indication given to the mobile station that the CLIR suppression request has been rejected.

4.4.3.20 ect-Indicator

The ect-Indicator identifier refers to the indication given to the mobile station that the call was transferred.

4.4.3.21 ect-CallState

The ect-CallState identifier refers to the state of the call to the other remote party in which Explicit Call Transfer was invoked.

4.4.3.22 rdn

The Rdn identifier refers to the line identity information of the other remote party.

4.4.3.23 presentationAllowedAddress

The presentationAllowedAddress identifier refers to the line identity of the other remote party that is allowed to be presented.

4.4.3.24 presentationRestricted

The presentationRestricted identifier refers to the restriction of presentation of the line identity of the other remote party.

Also, the identifier refers to the restriction of presentation of the name identity of the calling party to the called party.

4.4.3.25 numberNotAvailableDueToInterworking

The numberNotAvailableDueToInterworking identifier refers to the unavailability of the line identity of the other remote party.

4.4.3.26 presentationRestrictedAddress

The presentationRestrictedAddress identifier refers to the line identity of the other remote party which presentation restriction is overridden.

4.4.3.27 partyNumber

The partyNumber identifier refers to the remote party number.

4.4.3.28 partyNumberSubaddress

The partyNumberSubaddress identifier refers to remote party number subaddress.

4.4.3.29 nameIndicator

The nameIndicator identifier refers to the indication given to the mobile station that the name presentation has been invoked.

4.4.3.30 namePresentationAllowed

The namePresentationAllowed identifier refers to the presentation of the calling party's name identity to the called party.

4.4.3.31 nameUnavailable

The nameUnavailable identifier refers to the unavailability of the calling party's name identity to be offered to the called party.

4.4.3.32 namePresentationRestricted

The namePresentationRestricted identifier refers to the calling party's name identity to be offered to the called party with which presentation restriction is overridden.

4.4.3.33 deflectedToNumber

The DeflectedToNumber identifier refers to a party an incoming shall be deflected to.

4.4.3.34 deflectedToSubaddress

The DeflectedToSubaddress identifier refers to a subaddress an incoming call shall be deflected to.

4.4.3.35 uUS-Service

The uUS-Service identifier refers to the UUS service (service 1, service 2 or service 3) to be requested.

4.4.3.36 uUS-Required

The uUS-Required identifier refers to the option ("UUS required" or "UUS not required") given when requesting the UUS service.

4.4.3.37 locationNotificationArg

The locationNotificationArg identifier refers to the location notification request which is sent to the MS by the network.

4.4.3.38 notificationType

The notificationType identifier refers to the type of location notification (notification or privacy verification).

4.4.3.39 locationNotificationRes

The locationNotificationRes identifier refers to the location notification response which is sent to the network by the MS.

4.4.3.40 verificationResponse

The VerificationResponse identifier refers to the privacy verification response given by the MS user.

4.4.3.41 lcs-MOLRArg

The lcs-MOLRArg identifier refers to the MO-LR request parameters which are sent to the network by the MS.

4.4.3.42 molr-Type

The molr-Type identifier refers to the type of MO-LR.

4.4.3.43 locationMethod

The locationMethod identifier refers to the location method, for which assistance data is requested by the MS.

4.4.3.44 gpsAssistanceData

The gpsAssistanceData identifier refers to the indication, which GPS assistance data is requested by the MS.

4.4.3.45 lcs-MOLRRes

The lcs-MOLRRes identifier refers to the MO-LR response parameters which are sent to the MS by the network.

4.4.3.46 decipheringKeys

The decipheringKeys identifier refers to the set of deciphering keys, that contains Current Deciphering Key, Next Deciphering Key and Ciphering Key Flag.

4.4.3.47 multical-Indicator

The multical-Indicator identifier refers to the indication given to the mobile station that the number of active bearers has exceeded the maximum number.

4.4.3.48 pseudonymIndicator

The pseudonymIndicator identifier refers to the indication given to the LCS server that the pseudonym is needed.

4.4.3.49 LCS-PeriodicLocationRequestArg

The LCS-PeriodicLocationRequestArg identifier refers to the LCS periodic location request sent to the MS by the network.

4.4.3.50 LCS-PeriodicLocationRequestRes

The LCS-PeriodicLocationRequestRes identifier refers to the LCS Periodic Location response sent by the MS to the network.

4.4.3.51 LCS-LocationUpdateArg

The LCS-LocationUpdateArg identifier refers to the location update request sent to the MS by the network.

4.4.3.52 LCS-LocationUpdateRes

The LCS-LocationUpdateRes identifier refers to the location update response sent to the network by the MS.

4.4.3.53 LCS-PeriodicLocationCancellationArg

The LCS-PeriodicLocationCancellationArg identifier refers to the periodic location cancel request sent to the MS by the network.

4.4.3.54 terminationCause

The terminationCause identifier refers to the cause of cancellation or termination of the periodic or triggered location procedure by the MS or by the network.

4.4.3.55 mo-IrShortCircuit

The mo-IrShortCircuit identifier indicates use of MO-LR Short Circuit.

4.4.3.56 locationUpdateRequest

The locationUpdateRequest identifier indicates location update are required.

4.4.3.57 ganssAssistanceData

The ganssAssistanceData identifier refers to the indication, which GANSS assistance data is requested by the MS.

4.4.3.58 positioningProtocolPDU

The positioningProtocolPDU identifier refers to the positioning information (in LPP message format see 3GPP TS 36.355 [17]) passed in a lcs-MOLR Invoke for E-UTRA connected to EPC LCS or in an lcs-PeriodicTriggeredInvoke or lcs-EventReport for 5GS.

4.4.3.59 multiplePositioningProtocolPDUs

The multiplePositioningProtocolPDUs identifier refers to a set of Positioning Protocol PDUs passed in a lcs-MOLRInvoke for E-UTRA connected to EPC LCS or in an lcs-PeriodicTriggeredInvoke or lcs-EventReport for 5GS.

4.4.3.60 LCS-PeriodicTriggeredInvokeArg

The LCS-PeriodicTriggeredInvokeArg identifier refers to the LCS periodic and triggered location invoke sent to the MS by the network for EPS or 5GS.

4.4.3.61 LCS-PeriodicTriggeredInvokeRes

The LCS-PeriodicTriggeredInvokeRes identifier refers to the LCS periodic and triggered location response sent by the MS to the network for EPS or 5GS.

4.4.3.62 periodicLocation

The periodicLocation identifier refers to parameters for periodic location of the MS.

4.4.3.63 areaEventReporting

The areaEventReporting identifier refers to parameters for periodic and triggered area event reporting for the MS.

4.4.3.64 areaList

The areaList identifier refers to a set of one or more areas for periodic and triggered area event reporting for the MS.

4.4.3.65 area

The area identifier refers to parameters for a single area for periodic and triggered area event reporting for the MS.

4.4.3.66 areaType

The areaType identifier refers to the type of an area for periodic and triggered area event reporting for the MS.

4.4.3.67 areaIdentification

The areaIdentification identifier refers to an identification of an area for periodic and triggered area event reporting for the MS.

4.4.3.68 maximumInterval

The maximumInterval identifier refers to the maximum time interval between consecutive periodic and triggered event reports for the MS.

4.4.3.69 samplingInterval

The samplingInterval identifier refers to the maximum evaluation interval for determining periodic and triggered event reports for the MS.

4.4.3.70 duration

The duration identifier refers to the maximum duration for periodic and triggered event reports for the MS.

4.4.3.71 location-Info

The location-Info identifier refers to requirements for obtaining location information for periodic and triggered event reports for the MS for EPS or 5GS.

4.4.3.72 motionEventReporting

The motionEventReporting identifier refers to parameters for periodic and triggered motion event reporting for the MS.

4.4.3.73 linearDistance

The linearDistance identifier refers to a minimum linear distance for periodic and triggered motion event reporting for the MS.

4.4.3.74 LCS-EventReportArg

The LCS-EventReportArg identifier refers to the LCS event report invoke sent to the MS by the network for 5GS for periodic and triggered location.

4.4.3.75 LCS-EventReportRes

The LCS-EventReportRes identifier refers to the LCS event report response sent by the MS to the network for 5GS for periodic and triggered location.

4.4.3.76 LCS-CancelDeferredLocationArg

The LCS-CancelDeferredLocationArg identifier refers to the location cancel request sent to the MS by the network or sent to the network by the MS for deferred periodic or triggered location for 5GS.

4.4.3.77 eventType

The eventType identifier refers to the type of event report.

4.4.3.78 referenceNumberExt

The referenceNumberExt identifier refers to the LDR reference number for a 5GC GMLC.

4.4.3.79 h-gmlc-callBackUri

The h-gmlc-callBackUri identifier refers to the UTF-8 encoded URI for a 5GC GMLC.

4.4.3.80 supportedGADShapes

The supportedGADShapes identifier refers to GAD shapes supported by a GMLC.

4.4.3.81 lcs-QoS

The lcs-QoS identifier refers to the QoS requirements for a location estimate.

4.4.3.82 controlPlane-CIoT-5GS-Optimisation

The controlPlane-CIoT-5GS-Optimisation identifier indicates the MS is allowed to use Control Plane CIoT 5GS Optimisation for sending event reports for triggered and periodic location.

4.4.3.83 LCS-LocationPrivacySettingArg

TheLCS-LocationPrivacySettingArg identifier refers to parameters(s) for the MS indicated Location Privacy Indication information and optional validity time for the indication sent to the network by the MS.

4.4.3.84 locationPrivacyIndication

The LocationPrivacyIndication identifier refers to MS indicated Location Privacy Indication.

4.4.3.85 validTimePeriod

The validTimePeriod identifier refers to validity period for the MS indicated Location Privacy Indication.

4.4.3.86 endTime

The endTime identifier refers to the validity time (in UTC time) when MS indicated Location Privacy Indication become invalid.

4.4.3.86 timestampOfLocationEstimate

The timestampOfLocationEstimate identifier refers to the time stamp of the estimate location of the MS.

4.4.3.87 scheduledLocTime

The scheduledLocTime identifier refers to the scheduled time that the UE needs to be located.

4.5 Operations and errors implementation

For the actual implementation of supplementary services, operations and errors have to be defined by value. The following ASN.1 module, imports operation from the ASN.1 module described in clause 4.2 and operations and errors from MAP.

```

SS-Protocol {
    itu-t identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Access (2) modules (3) ss-Protocol (3) version16 (16)}

DEFINITIONS ::=

BEGIN

IMPORTS

OPERATION
FROM Remote-Operations-Information-Objects {
    joint-iso-itu-t remote-operations(4) informationObjects(5) version1(0)}

-- imports operations

-- imports operation from MAP-MobileServiceOperations
forwardCheckSS-Indication
FROM MAP-MobileServiceOperations {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Network (1) modules (3)
    map-MobileServiceOperations (5) version20 (20)}

-- imports operations from MAP-SupplementaryServiceOperations
registerSS, eraseSS, activateSS, deactivateSS, interrogateSS, registerPassword, getPassword,
processUnstructuredSS-Request, unstructuredSS-Request, unstructuredSS-Notify, eraseCC-Entry
FROM MAP-SupplementaryServiceOperations {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Network (1) modules (3)
    map-SupplementaryServiceOperations (8) version20 (20)}

```

```
-- imports operations from SS-Operations
processUnstructuredSS-Data, notifySS, forwardChargeAdvice, buildMPTY, holdMPTY, retrieveMPTY,
splitMPTY, explicitCT, forwardCUG-Info, accessRegisterCCEnter, callDeflection, userUserService,
lcs-LocationNotification, lcs-MOLR, lcs-AreaEventRequest, lcs-AreaEventReport,
lcs-AreaEventCancellation, lcs-PeriodicLocationRequest, lcs-LocationUpdate,
lcs-PeriodicLocationCancellation, lcs-PeriodicTriggeredInvoke, lcs-EventReport,
lcs-CancelDeferredLocation
FROM SS-Operations {
    itu-t identified-organization (4) etsi (0) mobileDomain (0) gsm-Access (2) modules (3)
    ss-Operations (0) version16 (16)}
;

Supported-SS-Operations OPERATION ::= {forwardCheckSS-Indication | registerSS | eraseSS |
    activateSS | deactivateSS | interrogateSS | registerPassword | getPassword |
    processUnstructuredSS-Request | unstructuredSS-Request | unstructuredSS-Notify | eraseCC-Entry |
    processUnstructuredSS-Data | notifySS | forwardChargeAdvice | buildMPTY | holdMPTY |
    retrieveMPTY | splitMPTY | explicitCT | forwardCUG-Info | accessRegisterCCEnter |
    callDeflection | userUserService | lcs-LocationNotification | lcs-MOLR | lcs-AreaEventRequest |
    lcs-AreaEventReport | lcs-AreaEventCancellation | lcs-PeriodicLocationRequest |
    lcs-LocationUpdate | lcs-PeriodicLocationCancellation | lcs-PeriodicTriggeredInvoke |
    lcs-EventReport | lcs-CancelDeferredLocation }

END
```

Annex A (informative): Expanded ASN.1 Module "SS-Protocol"

The fully expanded ASN.1 sources of the SS protocol is provided for information at http://www.3gpp.org/ftp/Specs/archive/24_series/24.080/ASN.1/.

Annex B (informative): Change history

Change history							
Date	Meeting	TDoc	CR	R ev	Cat	Subject/Comment	New version
Apr 1999						Transferred to 3GPP CN1	
CN#03	CN#03			1		Approved at CN#03	3.0.0
CN#06	CN#06		001			Addition of LCS operations	3.1.0
CN#07	CN#07		002r1	1		Correction to Location Notification Type and LCS-MOLR errors	3.2.0
CN#08	CN#08		004			Correction of definition of Deflected-to number	3.3.0
CN#09	CN#09		005r1			Message type: Alignment to 24.007 and 24.008	3.4.0
CN#09	CN#09		006			Addition of error type description for PositionMethodFailure	3.4.0
						Update of Annex A	3.4.1
CN#11	CN#11					Release 4 after CN#11	4.0.0
CN#12	CN#12		008	-		Add support in DTAP for all shapes defined in 23.032	4.1.0
CN#12	CN#12		009	-		OTDOA location method to be added	4.1.0
CN#12	CN#12		011r1	1		Addition of the description for Multicall missing from 24.080	4.1.0
CN#14	CN#14		014	-		Message type: completion of alignment to 24.007 and 24.008	4.2.0
Cn~15	Cn~15		015r1	1		Introduction of the "Requestor ID"	5.0.0
CN#16	CN#16		023	-		LCS: error handling if shape not supported by MS	5.1.0
CN#16	CN#16		018	-		LCS: Error handling if wrong method requested in LCS-MOLR	5.1.0
CN#16	CN#16		016	-		LCS: Codeword and Service Type	5.1.0
CN#16	CN#16		020	-		Correction of Object Identifiers for ASN.1 modules	5.1.0
CN#17	CN#17		019r3	3		Compatible upgrade to ASN.1:1997 of 24.080	5.2.0
CN#17	CN#17		024	-		Correction of references to FACILITY information element	5.2.0
CN#18	CN#18		026	2		LCS: Exception handling for positioning methods MS Assisted E-OTD and MS Assisted OTDOA	5.3.0
CN#21	CN#21		029	-		Reduce maximum length of "LCS Requestor ID" and "LCS Codeword".	5.4.0
CN#21	CN#21			-		A wrong SS version indicator link corrected in table 2.4.	5.4.0
CN#22	CN#22		031	2		Deferred MT-LR Area Event	6.0.0
CN#23	CN#23		034	-		Removal of R-GMLC Address	6.1.0
CN#23	CN#23		033	1		MO-LR Service Identity support	6.1.0
CN#26	CN#26		042	1		Sequence numbering for SS via PS	6.2.0
CN#26	CN#26		038	-		Correction of setting for timer T(LCSL)	6.2.0
CN#27	CN#27		043	1		Miss alignment with stage 2 on reuse mechanism	6.3.0
CN#27	CN#27		0441	-		Pseudonym indicator support in MO-LR	6.3.0
CT#29	CT#29		0045	2		Enabling the Providing of Velocity	7.0.0
CT#29	CT#29		0046	-		ASN.1 module version update	7.0.0
CT#31	CT#31		0047	-		Addition of Periodic Location Feature Support	7.1.0
CT#33	CT#33		0048	1		Removal of ASN.1 Expanded Source	7.2.0
CT#36	CT#36		0053	2		Add Assisted GANSS as a New Positioning Method	7.30
CT#37	CT#37		0057	1		Clarification of SS LCS Location Notification	7.4.0
CT#37	CT#37		0056	1		Correction to GANSS Location Method	7.4.0
CT#42	CT#42			-		Upgraded unchanged from Rel-7	8.0.0
2009-12			-	-		Update to Rel-9 version (MCC)	9.0.0
CT#47			0059	1		E-UTRAN LCS Support	9.1.0
CT#48			0063	-		ASN.1 Module Version Update	9.2.0
2011-03			-	-		Update to Rel-10 version (MCC)	10.0.0
2012-06			-	-		Update to Rel-11 version (MCC)	11.0.0
2014-09			-	-		Update to Rel-12 version (MCC)	12.0.0
2015-12			-	-		Update to Rel-13 version (MCC)	13.0.0
2017-03	CT#75		-	-		Update to Rel-14 version (MCC)	14.0.0
2017-06	CT#76		0064	2		Enhancements to Location Services for CIoT	14.1.0
2018-06	CT#80		-	-		Update to Rel-15 version (MCC)	15.0.0
2019-06	CT#84		0066	-		ASN.1 corrections	15.1.0
2019-09	CT#85		0067	1		Supplementary services for a deferred 5GC-MT-LR	16.0.0
2020-06	CT#88e		0068	1	B	Supplementary LCS Service Operations	16.1.0
2020-09	CT#89e	CP-202112	0069	-	F	ASN.1 Corrections	16.2.0
2021-03	CT#91e	CP-210027	0070	-	D	Use of inclusive terminology	17.0.0
2021-03	CT#91e	CP-210036	0071	-	F	Reference change	17.0.0
2021-06	CT#92e	CP-211075	0073	-	F	ASN.1 module version update	17.1.0
2021-12	CT#94e	CP-213135	0075	1	A	Reference to 24.571	17.2.0
2021-12	CT#94e	CP-213096	0076	1	B	Add timestamp of location estimate	17.2.0
2021-12	CT#94e	CP-213096	0077	1	B	Update allowed access type for event report	17.2.0

2022-03	CT#95e	CP-220083	0089	1	A	Remove h-gmlc-address from LCS-MOLRArg	17.3.0
2022-03	CT#95e	CP-220083	0092	1	A	locationMethod in LCS-MOLRArg	17.3.0
2022-03	CT#95e	CP-220034	0078	1	B	Scheduled location time	17.3.0
2022-03	CT#95e	CP-220034	0093	-	B	Add scheduled location time in LCS-MOLRArg	17.3.0

History

Document history		
V17.3.0	May 2022	Publication