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Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Customized Applications for Mobile network Enhanced Logic
(CAMEL);
CAMEL Application Part (CAP) specification
(GSM 09.78 version 5.6.0 Release 1996)**



GSM®
GLOBAL SYSTEM FOR
MOBILE COMMUNICATIONS

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Foreword

This Technical Specification (TS) has been produced by the Special Mobile Group (SMG).

The present document specifies the Customized Applications for Mobile network Enhanced Logic (CAMEL) CAMEL Application Part (CAP) within the digital cellular telecommunications system (Phase 2/Phase 2+).

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

Version 5.x.y

where:

- x the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated in the specification.

1 Scope

The present document specifies the CAMEL Application Part (CAP) supporting the first phase of the network feature Customized Applications for Mobile network Enhanced Logic. CAP is based on a sub-set of the CS1 Core INAP as specified by ETS 300 374-1 [14]. Descriptions and definitions provided by ETS 300 374-1 [14] are directly referenced by the present document in case no additions or clarifications are needed for the use in the CAP.

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] ETS 300 008 (1993): "Integrated Services Digital Network (ISDN); CCITT Signalling System No.7; Message Transfer Part (MTP) to support international interconnection".
- [2] ETS 300 009 (1994): "Integrated Services Digital Network (ISDN); CCITT Signalling System No.7; Signalling Connection Control Part (SCCP) [connectionless and connection-oriented] to support international interconnection".
- [3] ETS 300 287 (1993): "Integrated Services Digital Network (ISDN); CCITT Signalling System No.7; Transaction Capabilities Application Part (TCAP) version 2".
- [4] ETS 300 356-1: "Integrated Services Digital Network (ISDN); CCITT Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services".
- [5] ETS 300 403-1: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1); User-network interface layer 3 specification for basic call control; Part 1: Protocol specification [ITU-T Recommendation Q.931 (1993), modified]".
- [6] ITU-T Recommendation Q.773 (1993): "Specifications of Signalling System No.7; Transaction Capabilities formats and encoding".
- [7] ITU-T Recommendation Q.1218 (1993): "Interface Recommendation for intelligent network CS1".
- [8] ITU-T Recommendation Q.1400 (1993): "Architecture framework for the development of signalling and organization, administration and maintenance protocols using OSI principles".
- [9] CCITT Recommendation X.208 (1988): "Specification of Abstract Syntax Notation One (ASN.1)".
- [10] CCITT Recommendation X.209 (1988): "Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1)".
- [11] CCITT Recommendation X.219 (1988): "Remote operations: Model, notation and service definition".
- [12] CCITT Recommendation X.229 (1988): "Remote operations: Protocol specification".
- [13] ISO 9545 (1989): "Information technology - Open Systems Interconnection - Application Layer structure".

- [14] ETS 300 374-1 (1994): "Intelligent Network (IN); Intelligent Network Capability Set 1 (CS1) Core Intelligent Network Application Protocol (INAP) Part 1: Protocol specification".
- [15] GSM 09.02 (ETS 300 974): "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".
- [16] GSM 03.78 (TS 101 044): "Digital cellular telecommunications system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL) - stage 2".
- [17] CCITT Recommendation Q.713 : "Specifications of Signalling System No.7; SCCP formats and codes".
- [18] ITU-T Recommendation X.680 (1994) | ISO/IEC 8824-1:1994, Information technology - Open Systems Interconnection - Abstract Syntax Notation One (ASN.1): Specification of basic notation.
- [19] ITU-T Recommendation X.681 (1994) | ISO/IEC 8824-2:1994, Information technology - Open Systems Interconnection - Abstract Syntax Notation One (ASN.1): Information object specification.
- [20] ITU-T Recommendation X.682 (1994) | ISO/IEC 8824-3:1994, Information technology - Open Systems Interconnection - Abstract Syntax Notation One (ASN.1): Constraint specification.
- [21] ITU-T Recommendation X.683 (1994) | ISO/IEC 8824-4:1994, Information technology - Open Systems Interconnection - Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications.
- [22] ITU-T Recommendation X.690 (1994) | ISO/IEC 8825-1:1994, Information technology - Open Systems Interconnection - Specification of ASN.1 encoding rules: Basic, Canonical, and Distinguished Encoding Rules.
- [23] ITU-T Recommendation X.880 (1994) | ISO/IEC 13712-1:1994, Information technology - Remote Operations: Concepts, model and notation.
- [24] GSM 09.12 (prETS 300 646-1): "Digital cellular telecommunications system (Phase 2); Signalling System No 7 - Application of ISUP version 2 for the ISDN-PLMN (GSM) signalling Interface
- [25] GSM 04.08 (ETS 300 940): "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".
- [26] GSM 03.03: "Digital cellular telecommunications system (Phase 2+); Numbering, Addressing and Identification".
- [27] ETS 300 009 (1988): "Integrated Services Digital Network (ISDN); CCITT Signalling System No.7; Signalling Connection Control Part (SCCP) [connectionless and connection-oriented] to support international interconnection".

3 Abbreviations

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

AC	Application Context
ACM	Address Complete Message
AE	Application Entity
ASE	Application Service Element
ASN.1	Abstract Syntax Notation One
BCSM	Basic Call State Model
CAP	CAMEL Application Part
CS1	Capability Set 1
CSI	CAMEL Subscription Information
DP	Detection Point
DSS1	Digital Subscriber Signalling System No. One
EDP	Event Detection Point

EDP-R	Event Detection Point - Request
FE	Functional Entity
FSM	Finite State Model
gsmSCF	GSM SCF
gsmSSF	GSM SSF
IAM	Initial Address Message
ID	Identifier
IN	Intelligent Network
INAP	Intelligent Network Application Protocol
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
MACF	Multiple Association Control Function
MTP	Message Transfer Part
OCSI	Originating CSI
PE	Physical Entity
REL	Release
ROSE	Remote Operations Service Element
SACF	Single Association Control Function
SAO	Single Association Object
SCCP	Signalling Connection Control Part
SCF	Service Control Function
SCME	SCF Management Entity
SCSM	SCF Call State Model
SLP	Service Logic Program
SSF	Service Switching Function
SSME	SSF Management Entity
SSN	Sub-System Number
TC	Transaction Capabilities
TCAP	Transaction Capabilities Application Part
TCSI	Terminating CSI
TDP	Trigger Detection Point
TDP-R	Trigger Detection Point - Request

4 General

4.1 Definition methodology

The definition of the protocol is split into three Clauses:

- the definition of the Single/Multiple Association Control Function (SACF/MACF) rules for the protocol (Clause 5);
- the definition of the operations transferred between entities (Clause 6);
- the definition of the actions taken at each entity (Clause 7).

The SACF/MACF rules are defined in prose. The operation definitions are in Abstract Syntax Notation 1 (ASN.1, see CCITT Recommendation X.208 [9]), and the actions are defined in terms of state transition diagrams. Further guidance on the actions to be performed on receipt of an operation can be gained from Clause 6 and from the relevant detailed procedures in Clause 7.

The CAP is a Remote Operations Service Element (ROSE) user protocol (see CCITT Recommendations X.219 [11] and X.229 [12] and ITU-T Recommendation X.880 [23]). CAP uses the Basic Encoding Rules (see CCITT Recommendation X.209 [10] and ITU-T recommendation X.690 [22]).

4.2 Spare

4.3 CAP protocol architecture

Many of the terms used in this subclause are based on the OSI Application Layer Structure as defined in ISO 9545 [13].

The CAP protocol architecture can be illustrated as shown in figure 1.

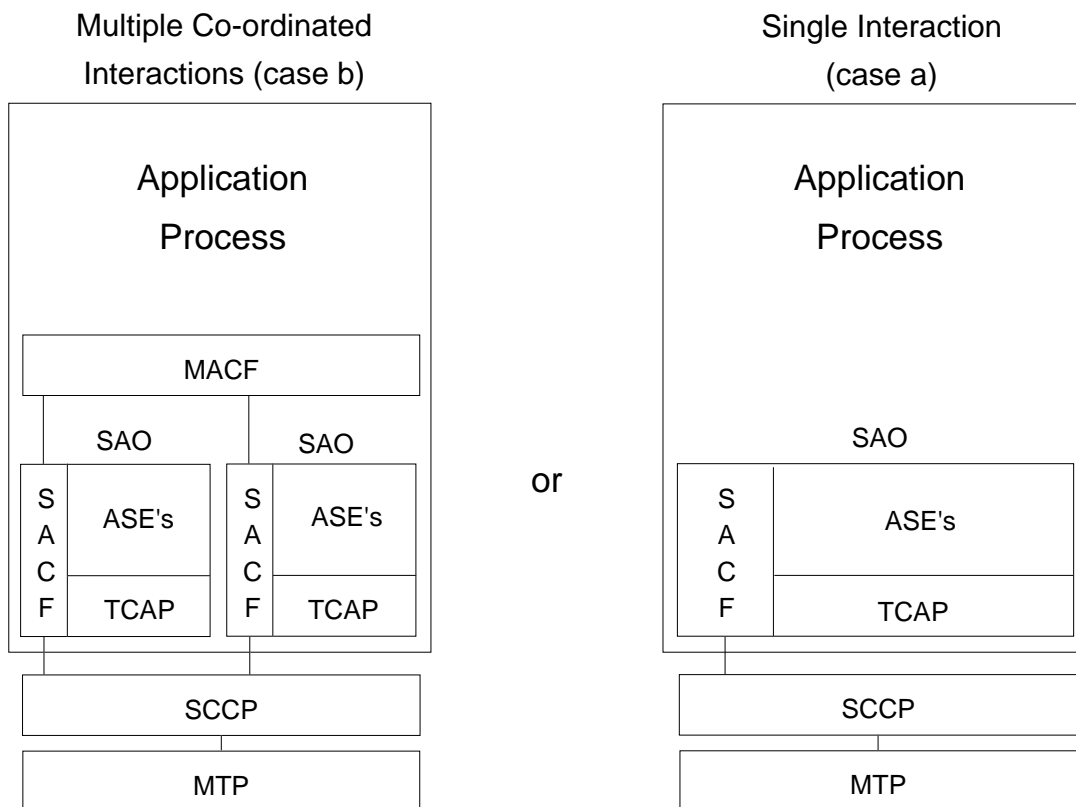


Figure 1: CAP protocol architecture

A PE has either single interactions (case a) or multiple co-ordinated interactions (case b) with other PEs.

In case a, SACF provides a co-ordination function in using Application Service Elements (ASEs), which includes the ordering of operations supported by ASE(s), (based on the order of received primitives). The Single Association Object (SAO) represents the SACF plus a set of ASEs to be used over a single interaction between a pair of PEs.

In case b, MACF provides a co-ordinating function among several SAOs, each of which interacts with an SAO in a remote PE.

Each ASE supports one or more operations. Description of each operation is tied with the action of corresponding FE modelling (see GSM 03.78 [16] and Clause 7 of this ETS). Each operation is specified using the operation macro described in figure 2.

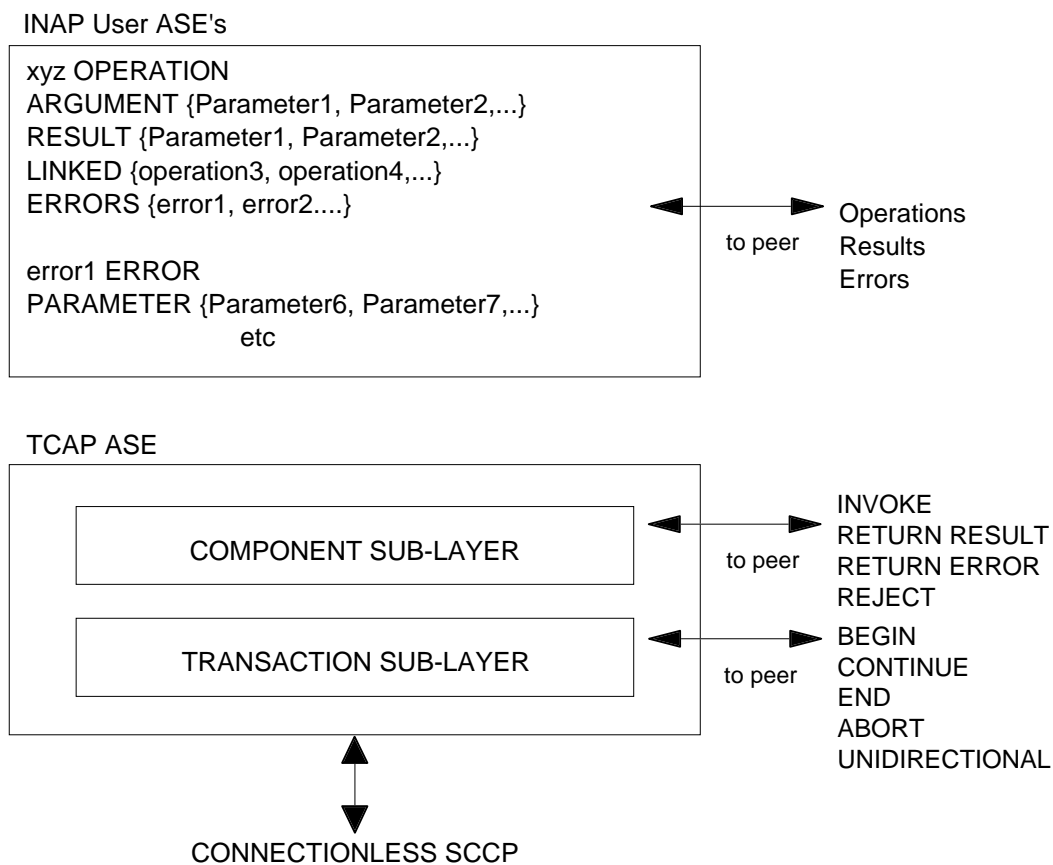


Figure 2: Operation description

The use of the Application Context (AC) negotiation mechanism (as defined in ETS 300 287 [3]) allows the two communicating entities to identify exactly what their capabilities are and also what the capabilities required on the interface should be. This should be used to allow evolution through capability sets.

If the indication of a specific AC is not supported by a pair of communicating FEs, some mechanism to pre-arrange the context shall be supported.

4.4 CAP addressing

The CAMEL Application Part makes use of the services offered by the Signalling Connection Control Part of signalling System No. 7. CCITT Blue Book or ITU-T (03/93) Recommendations Q.711 to Q.716 should be consulted for the full specification of SCCP.

4.4.1 Sub-System Number (SSN)

The use of SSN is a network operator option and values for intra-PLMN usage are network specific. A CAP SSN has been reserved for inter-PLMN use, as defined in GSM 03.03.

4.4.2 Quality of service parameters

The class (class 0 or class 1) of SCCP is set as required by the application. However class 1 shall be requested by any application that can send more than 1 TCAP message to its peer (consecutive TR-CONTINUE) before receiving a response from its peer (TR-CONTINUE or TR-END). RESULT_NL should not be used. However, if RESULT_NL is used by the application (and thus segmentation is needed) class 1 shall be set by the application.

According to Q.771, TC imposes no limitation on the number of segments. However if the peer TC users are certain that the Network Service used supports segmentation and reassembly of user data, the TC_RESULT_NL (RR_NL) facility is not necessary and should be avoided.

The return option may be used if requested by the application (Network Operator to determine).

4.4.3 SCCP addressing

Within the GSM System there is a need to communicate between entities within the same PLMN and in different PLMNs. Using the CAMEL Application Part (CAP) for this function implies the use of Transaction Capabilities (TC) and the Signalling Connection Control Part (SCCP) of CCITT Signalling System No. 7.

The format and coding of address parameters carried by the SCCP for that purpose shall comply with CCITT Recommendation Q.713 [17] with the following restrictions:

1) Intra-PLMN addressing

For communication between entities within the same PLMN, the use of SCCP addressing is network specific.

2) Inter-PLMN addressing

a) Called Party Address

- SSN indicator = a standardised SSN shall be used. The code point used shall be that specified for CAP in GSM 03.03;
- Point Code indicator = 0;
- Global title indicator = 0100 (Global title includes translation type, numbering plan, encoding scheme and nature of address indicator);
- Translation type = 0 (Not used);
- Routing indicator = 0 (Routing on global title);

b) Calling Party Address

- SSN indicator = a standardised SSN shall be used. The code point used shall be that specified for CAP in GSM 03.03;
- Point code indicator = 0;
- Global title indicator = 0100 (Global title includes translation type, numbering plan, encoding scheme and nature of address indicator);
- Translation type = 0 (Not used);
- Routing indicator = 0 (Routing on Global Title).

4.5 Spare

4.6 Compatibility mechanisms used for CAP

4.6.1 Introduction

This subclause specifies the compatibility mechanisms that shall be used for CAP

Two major categories of compatibility are handled by these mechanisms:

- compatibility with the ITU-T Recommendation Q.1218 [7] version of CS1 INAP and the ETSI specification ETS 300 374 -1 version [14] of CS1 INAP;
- compatibility with future versions of CAP.

The second category has three sub-categories of compatibility dealt with in this subclause:

- minor changes to the CAP in future standardized versions:

A minor change can be defined as a change of a functionality which is not essential for the requested CAMEL service. In case it is a modification of an existing function, it is acceptable that the addressed function is executed in either the older or the modified variant. If the change is purely additional, it is acceptable that it is not executed at all and that the peer Application Entity (AE) need not know about the effects of the change. For minor changes, a new AC is not required;

- major changes to the CAP in future standardized versions:

A major change can be defined as a change of a functionality which is essential for the requested CAP service. In case it is a modification of an existing function, both application entities shall have a shared knowledge about the addressed functional variant. If the change is purely additional, the requested CAMEL service will not be provided if one of the application entities does not support the additional functionality. For major changes, a new AC is required;

- network specific changes to CAP:

These additions may be of either the major or minor type for a service. No new AC is expected to be defined for this type of change. At the time of definition, the additions would not be expected to be included in identical form in future versions of the ETS.

4.6.2 Definition of CAP compatibility mechanisms

4.6.2.1 Compatibility mechanism for interworking of CAP with ETSI CS1 Core INAP and ITU-T Q.1218 INAP

On receipt of an operation according to ITU-T Recommendation Q.1218 [7] or an operation according to ETSI ETS 300 374-1 [14] which is not part of the CAP or is part of the CAP but which contains parameters which are not part of the CAP:

- the gsmSSF shall apply the normal error handling for unknown operations or parameters, i.e. the normal error handling procedures as specified in Clause 10 shall be followed;
- the gsmSCF shall apply the normal error handling for unknown operations or parameters except for parameters in the InitialDP operation. All parameters specified in ITU-T Recommendation Q.1218 [7] and in ETSI ETS 300 374-1 [14] for InitialDP shall be known by the gsmSCF, those not included in the CAP shall be ignored.

Tagging of CAP additions to ITU-T Recommendation Q.1218[7] and ETSI ETS 300 374-1 [14] are specified from 50 and upwards.

4.6.2.2 Procedures for major additions to CAP

In order to support the introduction of major functional changes, the protocol allows a synchronization between the two applications with regard to which functionality is to be performed. This synchronization takes place before the new function is invoked in either application entity, in order to avoid complicated fall-back procedures. The solution chosen to achieve such a synchronization is use of the AC negotiation provided in ETS 300 287 [3].

4.6.2.3 Procedures for minor additions to CAP

The extension mechanism marker shall be used for future standardized minor additions to CAP. This mechanism implements extensions by including an "extensions marker" in the type definition. The extensions are expressed by optional fields that are placed after the marker. When an entity receives unrecognized parameters that occur after the marker, they are ignored (see ITU-T Recommendation X.680 [18]).

4.6.2.4 Procedures for inclusion of network specific additions to CAP

This mechanism is based on the ability to explicitly declare fields of any type via the Macro facility in ASN.1 at the outermost level of a type definition. It works by defining an "ExtensionField" that is placed at the end of the type definition. This extension field is defined as a set of extensions, where an extension can contain any type. Each extension is associated with an identification that unambiguously identifies the extension. Refer to ITU-T Recommendation Q.1400 [8] for a definition of this mechanism.

5 Single/Multiple Association Control Function (SACF/MACF) rules

5.1 Reflection of TCAP Application Context (AC)

TCAP AC negotiation rules require that the proposed AC, if acceptable, is reflected in the first backwards message.

If the AC is not acceptable, and the TC-User does not wish to continue the dialogue, it may provide an alternate AC to the initiator which can be used to start a new dialogue.

TCAP AC negotiation applies only to the gsmSCF interfaces. Refer to ETS 300 287 [3] for a more detailed description of the TCAP AC negotiation mechanism.

5.2 Sequential/parallel execution of operations

In some cases, it may be necessary to distinguish whether operations should be performed sequentially or in parallel (synchronized). Operations which may be synchronized are:

- charging operations may be synchronized with any other operation.

The method of indicating that operations are to be synchronized is to include them in the same message. Where it is impossible to execute one of the operations identified above until some other operation has progressed to some extent or finished, the sending PE (usually SCP) can control this by sending the operations in two separate messages.

This method does not imply that all operations sent in the same message should be executed simultaneously, but simply that where it could make sense to do so (in the situations identified above) the operations should be synchronized.

In case of inconsistency between the above mentioned generic rules and the FE-specific rules as specified in Clause 7, the FE-specific rules take precedence over the generic rules.

6 Abstract syntax of the CAP

This Clause specifies the abstract syntax for the CAP version 1, using ASN.1 as defined in CCITT Recommendation X.208 [9] and ITU-T Recommendations X.680 [18], X.681 [19], X.682 [20] and X.683 [21].

The encoding rules which are applicable to the defined abstract syntax are the Basic Encoding Rules for ASN.1, defined in CCITT Recommendation X.209 [10] and ITU-T Recommendation X.690 [22] with the restrictions as described in ITU-T Recommendation Q.773 [6], § 4.1.1, modified by ETS 300 287 [3]. Additional encodings are cited for parameters used in existing ISUP (ETS 300 356-1 [4]) and DSS1 (ETS 300 403-1 [5]) standards.

For the ISUP and DSS1 parameters used in the CAP, only the coding of the parameter value is coded as defined in ISUP or DSS1. The DSS1/ISUP defined parameter identifiers are removed and replaced by the CAP defined parameter identifiers.

Where possible existing data types from the CS1 ETSI Core INAP (ETS 300 374-1 [14]) and MAP (Where possible existing data types from the CS1 ETSI Core INAP (ETS 300 374-1 [14]) and MAP (ETS 300 974 [15]) standards have been used.

The mapping of OPERATION and ERROR to TCAP components is defined in ITU-T Recommendation Q.773 [6] modified by ETS 300 287 [3]. The class of an operation is not stated explicitly but is specified in the ASN.1 OPERATION MACRO, as follows:

- class 2: only ERRORS appears in the ASN.1 OPERATION MACRO definition;
- class 3: only RESULT appears in the ASN.1 OPERATION MACRO definition;
- class 4: neither RESULT nor ERRORS appears in the ASN.1 OPERATION MACRO definition.

The abstract syntax for CAP is composed of several ASN.1 modules describing operations, errors, and associated data types. The values (operation codes and error codes) are defined in a separate module.

The module containing all the type definitions for CAP operations is **CAP-Operations** and is described in subclause 6.1.

The module containing all the type definitions for CAP errors is **CAP-Errors** and is described in subclause 6.2.

The module containing all the type definitions for CAP data types is **CAP-DataTypes** and is described in subclause 6.3.

The module containing the operation codes and error codes for CAP is **CAP-Codes** and is described in subclause 6.4.

All the AC definitions for CAP are described in subclause 6.5.

The module containing the class definitions for CAP is **CAP-Classes** and is described in subclause 6.6.

6.1 Operation types

```
CAP-Operations {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1)
modules(3)
cap-operations(50) version1(0)}

-- This module contains the type definitions for the CAP v.1 operations.

DEFINITIONS ::=

BEGIN

IMPORTS

    OPERATION

FROM TCAPMessages {ccitt recommendation q 773 modules(2) messages(1) version2(2)}

-- error types
MissingCustomerRecord,
MissingParameter,
TaskRefused,
UnexpectedComponentSequence,
UnexpectedDataValue,
UnexpectedParameter

FROM Core-INAP-CS1-Errors {ccitt(0) identified-organization(4) etsi(0) inDomain(1) in-network(1)
modules(0) cs1-errors(1) version1(0)}

-- CAP error types
SystemFailure

FROM CAP-Errors {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1)
modules(3) cap-errors(51) version1(0)}

-- argument types
ConnectArg,
EventReportBCSMArg,
InitialDPArg,
ReleaseCallArg,
RequestReportBCSMEEventArg

FROM CAP-DataTypes {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1)
modules(3) cap-datatypes(52) version1(0)};

-- TYPE DEFINITIONS FOR CAP v.1 OPERATIONS FOLLOW

ActivityTest ::= OPERATION
RESULT
```



```

-- Direction: gsmSCF -> gsmSSF, Timer: Tat
-- This operation is used to check for the continued existence of a relationship between the
-- gsmSCF and gsmSSF. If the relationship is still in existence, then the gsmSSF will respond.
-- If no reply is received, then the gsmSCF will assume that the gsmSSF has failed in some way
-- and will take the appropriate action.

Connect ::= OPERATION
  ARGUMENT
    ConnectArg
  ERRORS {
    MissingParameter,
    SystemFailure,
    TaskRefused,
    UnexpectedComponentSequence,
    UnexpectedDataValue,
    UnexpectedParameter
  }
-- Direction: gsmSCF -> gsmSSF, Timer: Tcon
-- This operation is used to request the gsmSSF to perform the call processing actions to route
-- or forward a call to a specified destination. To do so, the gsmSSF may or may not use
-- destination information from the calling party (e.g., dialled digits) and existing call setup
-- information depending on the information provided by the gsmSCF.

Continue ::= OPERATION

-- Direction: gsmSCF -> gsmSSF, Timer: Tcue
-- This operation is used to request the gsmSSF to proceed with call processing at the DP at
-- which it previously suspended call processing to await gsmSCF instructions (i.e., proceed to
-- the next point in call in the BCSM). The gsmSSF continues call processing without
-- substituting new data from gsmSCF.

EventReportBCSM ::= OPERATION
  ARGUMENT
    EventReportBCSMArg

-- Direction: gsmSSF -> gsmSCF, Timer: Terb
-- This operation is used to notify the gsmSCF of a call-related event (e.g., BCSM events such
-- as answer or disconnect) previously requested by the gsmSCF in a RequestReportBCSMEvent
-- operation.

InitialDP ::= OPERATION
  ARGUMENT
    InitialDPArg
  ERRORS {
    MissingCustomerRecord,
    MissingParameter,
    SystemFailure,
    TaskRefused,
    UnexpectedComponentSequence,
    UnexpectedDataValue,
    UnexpectedParameter
  }

-- Direction: gsmSSF -> gsmSCF, Timer: Tidp
-- This operation is used after a TDP to indicate request for service.

ReleaseCall ::= OPERATION
  ARGUMENT
    ReleaseCallArg

-- Direction: gsmSCF -> gsmSSF, Timer: Trc
-- This operation is used to tear down an existing call at any phase of the call for all
-- parties involved in the call.

RequestReportBCSMEvent ::= OPERATION
  ARGUMENT
    RequestReportBCSMEventArg
  ERRORS {
    MissingParameter,
    SystemFailure,
    TaskRefused,
    UnexpectedComponentSequence,
    UnexpectedDataValue,
    UnexpectedParameter
  }

-- Direction: gsmSCF -> gsmSSF, Timer: Trrb
-- This operation is used to request the gsmSSF to monitor for a call-related event (e.g., BCSM
-- events such as answer or disconnect), then send a notification back to the gsmSCF when the
-- event is detected.

END

```

Operation timers

The following value ranges apply for operation specific timers in CAP:

short: 1 to 20 seconds;

Table 1 lists all operation timers and the value range for each timer. The definitive value for each operation timer may be network specific and has to be defined by the network operator.

Table 1

Operation Name	Timer	value
ActivityTest	T _{at}	short
Connect	T _{con}	short
Continue	T _{cue}	short
EventReportBCSM	T _{erb}	short
InitialDP	T _{idp}	short
ReleaseCall	T _{rc}	short
RequestReportBCSMEvent	T _{rrb}	short

6.2 Error types

```
CAP-Errors { ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1) modules(3)
cap-errors(51) version1(0)}
```

```
-- This module contains the type definitions for the CAP v.1 errors.
```

```
DEFINITIONS IMPLICIT TAGS ::=
```

```
BEGIN
```

```
IMPORTS
```

```
    ERROR
```

```
FROM TCAPMessages {ccitt recommendation q 773 modules(2) messages(1) version2(2)}
```

```
    UnavailableNetworkResource
```

```
FROM CAP-DataTypes {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1)
modules(3) cap-datatypes(52) version1(0)};
```

```
-- TYPE DEFINITIONS FOR CAP v.1 ERRORS FOLLOW
```

```
SystemFailure ::= ERROR
    PARAMETER
        UnavailableNetworkResource
```

```
-- The operation could not be completed due to a system failure at the serving entity.
```

```
END
```

6.3 Data types

```
CAP-DataTypes {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1) modules(3)
cap-datatypes(52) version1(0)}
```

```
-- This module contains the type definitions for the CAP v.1 data types.
```

```
DEFINITIONS IMPLICIT TAGS ::=
```

```
BEGIN
```

```
IMPORTS
```

```
    CallingPartysCategory,
    HighLayerCompatibility,
```

MiscCallInfo,
MonitorMode,
RedirectionInformation,
ServiceKey

FROM Core-INAP-CS1-DataTypes { ccitt(0) identified-organization(4) etsi(0) inDomain(1)
in-network(1) modules(0) cs1-datatypes(2) version1(0)}

IMSI,
Ext-BasicServiceCode

FROM MAP-CommonDataTypes { ccitt(0) identified-organization(4) etsi(0) mobileDomain(0)
gsm-Network(1) modules(3) map-CommonDataTypes(18) version3(3)}

LocationInformation,
SubscriberState

FROM MAP-MS-DataTypes { ccitt(0) identified-organization(4) etsi(0) mobileDomain(0)
gsm-Network(1) modules(3) map-MS-DataTypes(11) version3(3)}

CallReferenceNumber,
SuppressionOfAnnouncement

FROM MAP-CH-DataTypes { ccitt(0) identified-organization(4) etsi(0) mobileDomain(0)
gsm-Network(1) modules(3) map-CH-DataTypes(13) version3(3)}

;

ISDN-AddressString,

FROM MAP-CommonDataTypes { ccitt identified-organization(4) etsi(0) mobileDomain(0)
gsm-Network (1) modules (3) map-CommonDataTypes (18) version3 (3)};

-- TYPE DEFINITIONS FOR CAP v.1 DATA TYPES FOLLOW

-- Argument Data Types

ConnectArg ::= SEQUENCE {
destinationRoutingAddress [0] DestinationRoutingAddress,
originalCalledPartyID [6] OriginalCalledPartyID OPTIONAL,
extensions [10] SEQUENCE SIZE(1..numOfExtensions) OF ExtensionField
OPTIONAL,
genericNumbers [14] GenericNumbers OPTIONAL,
callingPartysCategory [28] CallingPartysCategory OPTIONAL,
redirectingPartyID [29] RedirectingPartyID OPTIONAL,
redirectionInformation [30] RedirectionInformation OPTIONAL,
suppressionOfAnnouncement [55] SuppressionOfAnnouncement OPTIONAL,
oCSIApplicable [56] OCSIApplicable OPTIONAL,
...
}

EventReportBCSMArg ::= SEQUENCE {
eventTypeBCSM [0] EventTypeBCSM,
eventSpecificInformationBCSM [2] EventSpecificInformationBCSM OPTIONAL,
legID [3] LegID OPTIONAL,
miscCallInfo [4] MiscCallInfo DEFAULT {messageType request},
extensions [5] SEQUENCE SIZE(1..numOfExtensions) OF ExtensionField
OPTIONAL,
...
}

InitialDPArg ::= SEQUENCE {
serviceKey [0] ServiceKey,
calledPartyNumber [2] CalledPartyNumber OPTIONAL,
callingPartyNumber [3] CallingPartyNumber OPTIONAL,
callingPartysCategory [5] CallingPartysCategory OPTIONAL,
locationNumber [10] LocationNumber OPTIONAL,
originalCalledPartyID [12] OriginalCalledPartyID OPTIONAL,
extensions [15] SEQUENCE SIZE(1..numOfExtensions) OF ExtensionField
OPTIONAL,
highLayerCompatibility [23] HighLayerCompatibility OPTIONAL,
additionalCallingPartyNumber [25] AdditionalCallingPartyNumber OPTIONAL,
bearerCapability [27] BearerCapability OPTIONAL,
eventTypeBCSM [28] EventTypeBCSM OPTIONAL,
redirectingPartyID [29] RedirectingPartyID OPTIONAL,
redirectionInformation [30] RedirectionInformation OPTIONAL,
imsi [50] IMSI OPTIONAL,
subscriberState [51] SubscriberState OPTIONAL,
locationInformation [52] LocationInformation OPTIONAL,
ext-basicServiceCode [53] Ext-BasicServiceCode OPTIONAL,
callReferenceNumber [54] CallReferenceNumber OPTIONAL,
mscAddress [55] ISDN-AddressString OPTIONAL,
calledPartyBCDNumber [56] CalledPartyBCDNumber OPTIONAL

```

...
}

ReleaseCallArg ::= Cause

RequestReportBCSMEventArg ::= SEQUENCE {
  bcsmEvents [0] SEQUENCE SIZE (1..numOfBCSMEvents) OF BCSMEvent,
  extensions [2] SEQUENCE SIZE (1..numOfExtensions) OF ExtensionField
  OPTIONAL,
  ...
}

-- Indicates the BCSM related events for notification.

-- Common Data Types

AdditionalCallingPartyNumber ::= Digits

-- Indicates the Additional Calling Party Number.

BCSMEvent ::= SEQUENCE {
  eventTypeBCSM [0] EventTypeBCSM,
  monitorMode [1] MonitorMode,
  legID [2] LegID OPTIONAL
}

-- Indicates the BCSM Event information for monitoring.

BearerCapability ::= CHOICE {
  bearerCap [0] OCTET STRING (SIZE (2..maxBearerCapabilityLength))
}

-- Indicates the type of bearer capability connection to the user. For bearerCap, the value as
-- described in ISUP (ETS 300 356-1 [4], User Service Information) shall be used.

CalledPartyBCDNumber ::= OCTET STRING (SIZE (minCalledPartyBCDNumberLength ..
maxCalledPartyBCDNumberLength))

-- Indicates the Called Party Number, including service selection information. Refer to GSM
-- 04.08 [25] for encoding. This data type carries only the "type of number", "numbering plan
-- identification" and "number digit" fields defined in [25]; it does not carry the "called
-- party BCD number IEI" or "length of called party BCD number contents".

CalledPartyNumber ::= OCTET STRING (SIZE (minCalledPartyNumberLength ..
maxCalledPartyNumberLength))

-- Indicates the Called Party Number. Refer to ETS 300 356-1 [4] for encoding.

CallingPartyNumber ::= OCTET STRING (SIZE (minCallingPartyNumberLength ..
maxCallingPartyNumberLength))

-- Indicates the Calling Party Number. Refer to ETS 300 356-1 [4] for encoding.

Cause ::= OCTET STRING (SIZE (minCauseLength .. maxCauseLength))

-- Indicates the cause for interface related information. Refer to the ETS 300 356-1 [4] Cause
-- parameter for encoding. For the use of Cause and Location values refer to Q.850.
-- Shall only include the cause value.

DestinationRoutingAddress ::= SEQUENCE SIZE (1) OF CalledPartyNumber

-- Indicates the Called Party Number.

Digits ::= OCTET STRING (SIZE (minDigitsLength .. maxDigitsLength))

-- Indicates the address signalling digits. Refer to the ETS 300 356-1 [4] Generic Number and
-- Generic Digits parameters for encoding. The coding of the subfields "NumberQualifier" in
-- Generic Number and "Type Of Digits" in Generic Digits are irrelevant to the CAP, the ASN.1
-- tags are sufficient to identify the parameter. The ISUP format does not allow to exclude
-- these subfields, therefor the value is network operator specific.
--
-- The following parameter should use Generic Number:
-- AdditionalCallingPartyNumber for InitialDP

EventSpecificInformationBCSM ::= CHOICE {
  oDisconnectSpecificInfo [7] SEQUENCE {
    releaseCause [0] Cause OPTIONAL
    ---
  },
  tDisconnectSpecificInfo [12] SEQUENCE {
    releaseCause [0] Cause OPTIONAL
    ---
  }
}

```

```

    }

-- Indicates the call related information specific to the event.

EventTypeBCSM ::= ENUMERATED {
    collectedInfo(2),
    oAnswer(7),
    oDisconnect(9),
    termAttemptAuthorized(12),
    tAnswer(15),
    tDisconnect(17)
}

-- Values collectedInfo and termAttemptAuthorized can only be
-- used for TDPs.

ExtensionField ::= SEQUENCE {
    type          EXTENSION.&id ({SupportedExtensions}),
    -- shall identify the value of an EXTENSION type
    criticality   EXTENSION.&criticality ({SupportedExtensions}@type)},
    value         [1]EXTENSION.&ExtensionType
                ({SupportedExtensions}@type)
}
--This parameter indicates an extension of an argument data type. Its content is network operator
specific

GenericNumber   ::= OCTET STRING (SIZE(minGenericNumberLength..
                                     maxGenericNumberLength))

-- Indicates a generic number. Refer to ETS 300 356-1 [4] Generic number for encoding.

GenericNumbers  ::= SET SIZE(1..numOfGenericNumbers) OF GenericNumber

LegID          ::= CHOICE {
    sendingSideID [0] LegType, -- used in operations sent from gsmSCF to gsmSSF
    receivingSideID [1] LegType -- used in operations sent from gsmSSF to gsmSCF
}

-- Indicates a reference to a specific party in a call.

LegType        ::= OCTET STRING (SIZE(1))
    leg1 LegType ::= '01'H
    leg2 LegType ::= '02'H

LocationNumber ::= OCTET STRING (SIZE (minLocationNumberLength ..
                                     maxLocationNumberLength))

-- Indicates the Location Number for the calling party. Refer to ETS 300 356-1 [4] for encoding.

OriginalCalledPartyID ::= OCTET STRING (SIZE (minOriginalCalledPartyIDLength ..
                                             maxOriginalCalledPartyIDLength))

-- Indicates the original called number. Refer to ETS 300 356-1 [4] Original Called Number for
encoding.

OCSIApplicable ::= NULL
-- Indicates that the Originating CAMEL Subscription Information, if present, shall be applied on
the
-- outgoing call leg created with a Connect operation. For the use of this parameter see GSM
03.78 [16].

RedirectingPartyID ::= OCTET STRING (SIZE (minRedirectingPartyIDLength ..
                                           maxRedirectingPartyIDLength))

-- Indicates redirecting number. Refer to ETS 300 356-1 [4] Redirecting number for encoding.

UnavailableNetworkResource ::= ENUMERATED {
    unavailableResources(0),
    componentFailure(1),
    basicCallProcessingException(2)
}

-- Definition of range constants

maxBearerCapabilityLength      INTEGER ::= 11
minCalledPartyBCDNumberLength  INTEGER ::= 1
maxCalledPartyBCDNumberLength  INTEGER ::= 41
minCalledPartyNumberLength     INTEGER ::= 3
maxCalledPartyNumberLength     INTEGER ::= 12

```

```

minCallingPartyNumberLength    INTEGER ::= 2
maxCallingPartyNumberLength    INTEGER ::= 10
minCauseLength                 INTEGER ::= 2
maxCauseLength                 INTEGER ::= 2
minDigitsLength               INTEGER ::= 3
maxDigitsLength               INTEGER ::= 11
minGenericNumberLength        INTEGER ::= 3
maxGenericNumberLength        INTEGER ::= 11
minLocationNumberLength       INTEGER ::= 2
maxLocationNumberLength       INTEGER ::= 10
minOriginalCalledPartyIDLength INTEGER ::= 2
maxOriginalCalledPartyIDLength INTEGER ::= 10
minRedirectingPartyIDLength    INTEGER ::= 2
maxRedirectingPartyIDLength    INTEGER ::= 10
numOfBCSMEvents               INTEGER ::= 10
numOfExtensions               INTEGER ::= 10
numOfGenericNumbers           INTEGER ::= 5
    
```

END

6.4 Operation and error codes)

```

CAP-Codes {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1) modules(3)
cap-codes(53) version1(0)}
    
```

```

-- This module contains the operation and error code assignments for the CAP v.1 application
-- protocol.
    
```

DEFINITIONS ::=

BEGIN

```

-- OPERATION AND ERROR CODE ASSIGNMENTS FOR THE CAP v.1 PROTOCOL FOLLOWS
    
```

IMPORTS

```

-- macros
APPLICATION-SERVICE-ELEMENT
    
```

```

FROM Remote-Operations-Notation-Extension {joint-iso-ccitt remote-operations(4) notation-
extension(2)}
    
```

```

-- operation types
    
```

```

    ActivityTest,
    Connect,
    Continue,
    EventReportBCSM,
    InitialDP,
    ReleaseCall,
    RequestReportBCSMEvent
    
```

```

FROM CAP-Operations { ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1)
modules(3) cap-operations(50) version1(0)}
    
```

```

-- CS1 error types
    MissingCustomerRecord,
    MissingParameter,
    TaskRefused,
    UnexpectedComponentSequence,
    UnexpectedDataValue,
    UnexpectedParameter
    
```

```

FROM Core-INAP-CS1-Errors {ccitt(0) identified-organization(4) etsi(0) inDomain(1) in-network(1)
modules(0) cs1-errors(1) version1(0)}
    
```

```

-- CAP error types
    SystemFailure
    
```

```

FROM CAP-Errors {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1)
modules(3) cap-errors(51) version1(0)};
    
```

```

-- the operations are grouped by the identified ASEs.
    
```

```

-- gsmSCF activation ASE
    
```

```

initialDP          InitialDP          ::= localValue 0
    
```

```

-- Connect ASE (elementary gsmSSF function)
    
```

```

connect           Connect             ::= localValue 20
    
```

```

-- Call handling ASE (elementary gsmSSF function)
releaseCall          ReleaseCall          ::= localValue 22

-- BCSM Event handling ASE
requestReportBCSMEvent RequestReportBCSMEvent ::= localValue 23
eventReportBCSM      EventReportBCSM      ::= localValue 24

-- gsmSSF call processing ASE
continue             Continue              ::= localValue 31

-- Activity Test ASE
activityTest         ActivityTest         ::= localValue 55

-- ERROR codes
missingCustomerRecord MissingCustomerRecord ::= localValue 6
missingParameter     MissingParameter     ::= localValue 7
systemFailure        SystemFailure        ::= localValue 11
taskRefused          TaskRefused          ::= localValue 12
unexpectedComponentSequence UnexpectedComponentSequence ::= localValue 14
unexpectedDataValue  UnexpectedDataValue  ::= localValue 15
unexpectedParameter  UnexpectedParameter  ::= localValue 16

-- APPLICATION SERVICE ELEMENTS
gsmSCF-Activation-ASE ::= APPLICATION-SERVICE-ELEMENT
  -- consumer is gsmSSF
  CONSUMER INVOKES {
    initialDP
  }
Connect-ASE ::= APPLICATION-SERVICE-ELEMENT
  -- supplier is gsmSCF
  SUPPLIER INVOKES {
    connect
  }
Call-handling-ASE ::= APPLICATION-SERVICE-ELEMENT
  -- supplier is gsmSCF
  SUPPLIER INVOKES {
    releaseCall
  }
BCSM-event-handling-ASE ::= APPLICATION-SERVICE-ELEMENT
  -- consumer is gsmSSF
  CONSUMER INVOKES {
    eventReportBCSM
  }
  -- supplier is gsmSCF
  SUPPLIER INVOKES {
    requestReportBCSMEvent
  }
gsmSSF-call-processing-ASE ::= APPLICATION-SERVICE-ELEMENT
  -- supplier is gsmSCF
  SUPPLIER INVOKES {
    continue
  }
Activity-test-ASE ::= APPLICATION-SERVICE-ELEMENT
  -- supplier is gsmSCF
  SUPPLIER INVOKES {
    activityTest
  }
END

```

6.5 Application contexts

APPLICATION-CONTEXT MACRO ::=

BEGIN

```

TYPE NOTATION ::= Symmetric | InitiatorConsumerOf ResponderConsumerOf | empty
VALUE NOTATION ::= value(VALUE OBJECT IDENTIFIER)
Symmetric ::= "OPERATIONS OF" "{" ASEList "}"
InitiatorConsumerOf ::= "INITIATOR CONSUMER OF" "{" ASEList "}" | empty
ResponderConsumerOf ::= "RESPONDER CONSUMER OF" "{" ASEList "}" | empty
ASEList ::= ASE | ASEList "," ASE
ASE ::= type -- shall reference an APPLICATION-SERVICE-ELEMENT type.

```

END

```

CAP-v1-gsmSSF-to-gsmSCF-AC APPLICATION-CONTEXT
-- dialogue initiated by gsmSSF with InitialDP
INITIATOR CONSUMER OF {
    gsmSCF-activation-ASE,
    Connect-ASE
    Call-handling-ASE,
    BCSM-event-handling-ASE,
    gsmSSF-call-processing-ASE,
    Activity-test-ASE
}
 ::= {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1) ac(0)
cap-gsmssf-to-gsmscf(50) version1(0)};

```

6.6 Classes

```

CAP-Classes {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1) modules(3)
cap-classes(54) version1(0)}

```

-- This module contains the class definitions for CAP v.1.

```

DEFINITIONS ::=
BEGIN

```

IMPORTS

```

    ROS-OBJECT-CLASS, CONTRACT, OPERATION-PACKAGE, Code, OPERATION,
    CONNECTION-PACKAGE
    FROM Remote-Operations-Information-Objects
        {joint-iso-ccitt remote-operations(4) informationObjects(5) version1(0)}

```

```

EXTENSION ::= CLASS {
    &ExtensionType,
    &criticality CriticalityType DEFAULT ignore,
    &id Code
}

```

```

WITH SYNTAX {
    EXTENSION-SYNTAX &ExtensionType
    CRITICALITY &criticality
    IDENTIFIED BY &id
}

```

```

CriticalityType ::= ENUMERATED {
    ignore(0),
    abort(1)
}

```

-- Only value Global OBJECT IDENTIFIER is used for &id
-- Only the value ignore (0) is used for &criticality.

-- Example of addition of an extension named 'Some Network Specific Indicator' of type
-- BOOLEAN, with criticality 'ignore' and to be identified with object ID 'ccitt(0)
-- identified-organization(4) organisation(x) gsm(x) capextension':
-- Example of definition using the above information object class:

```

--
-- SomeNetworkSpecificIndicator EXTENSION ::= {
--     EXTENSION-SYNTAX    BOOLEAN
--     CRITICALITY        ignore
--     IDENTIFIED BY      global : xxxxxx
-- }

```

```

firstExtension EXTENSION ::= {
    EXTENSION-SYNTAX    NULL
    CRITICALITY        ignore
    IDENTIFIED BY      global:{xxxxxx}
}

```

SupportedExtensions EXTENSION ::= {firstExtension -- full set of network operator extensions}

END

7 Application entity procedures

The description of the application entity procedures for CAMEL can be found in GSM 03.78 [16].

8 Error procedures

This subclause defines the generic error procedures for the CAP. The error procedure descriptions have been divided in two subclauses, subclause 8.1 listing the errors related to CAP operations and subclause 8.2 listing the errors related to error conditions in the different FEs which are not directly related to the CAP operations.

The gsmSSF states which are referred to in this section are described in GSM 03.78 [16].

8.1 Operation related error procedures

The following subclauses define the generic error handling for the operation related errors. The errors are defined as operation errors in Clause 6. Errors which have a specific procedure for an operation are described in Clause 9 with the detailed procedure of the related operation.

The TCAP services which are used for reporting operation errors are described in Clause 10. All errors which can be detected by the ASN.1 decoder already may have been detected during the decoding of the TCAP message and indicated by the TC error indication "MistypedParameter".

8.1.2-8.1.5 Spare

8.1.6 MissingCustomerRecord

8.1.6.1 General description

8.1.6.1.1 Error description

The SLP could not be found in the gsmSCF, because the required customer record does not exist.

8.1.6.2 Operations gsmSSF->gsmSCF

InitialDP

Procedures at invoking entity (gsmSSF)

gsmSSF receives error "MissingCustomerRecord"

precondition: gsmSSF state Waiting for Instructions

postcondition: gsmSSF state Idle

The GMSC/VMSC handles the call according to the Default Call Handling parameter of the valid CSI.

8.1.6.3 Spare

8.1.7 MissingParameter

8.1.7.1 General description

8.1.7.1.1 Error description

There is an error in the received operation argument. The responding entity cannot start to process the requested operation because the argument is incorrect: an expected optional parameter which is essential for the application is not included in the operation argument.

8.1.7.2 Operations gsmSCF->gsmSSF

Call Associated/Non-call Processing

RequestReportBCSMEvent

Call Associated/Call Processing
Connect

Procedures at responding entity (gsmSSF)

precondition: (1) gsmSSF appropriate state.

(2) gsmSSF operation received, appropriate event occurred.

postcondition: (1) gsmSSF transition to the same state.

The gsmSSF detects the error in the received operation. The error parameter is returned to inform the gsmSCF of this situation.

8.1.7.3 Operations gsmSSF->gsmSCF

InitialDP

Procedures at invoking entity (gsmSSF)

gsmSSF receives error "MissingParameter"

precondition: gsmSSF any state as result of the transfer of any of the above operations.

postcondition: gsmSSF state Idle

After receiving this error, the gsmSSF returns to the state Idle, the GMSC/VMSC handles the call according to the Default Call Handling parameter of the valid CSI.

8.1.7.4-8.1.7.5 Spare

8.1.8-8.1.9 Spare

8.1.10 SystemFailure

8.1.10.1 General description

8.1.10.1.1 Error description

This error is returned by a PE if it was not able to fulfil a specific task as requested by an operation, and recovery is not expected to be completed within the current call instance.

8.1.10.1.2 Argument description

PARAMETER

UnavailableNetworkResource

```
UnavailableNetworkResource ::= ENUMERATED {
    unavailableResources(0),
    componentFailure(1),
    basicCallProcessingException(2)
}
```

8.1.10.2 Operations gsmSCF->gsmSSF

Call Associated/Non-call Processing

RequestReportBCSMEvent

Call Associated/Call Processing
Connect

Refer to subclause 8.1.7 for the appropriate error procedures.

8.1.10.3 Operations gsmSSF->gsmSCF

InitialDP

Refer to subclause 8.1.7 for the appropriate error procedures.

8.1.10.4 Spare

8.1.11 TaskRefused

8.1.11.1 General introduction

8.1.11.1.1 Error description

This error is returned by a PE if it was not able to fulfil a specific task as requested by an operation, and recovery is expected to be completed within the current call instance.

8.1.11.1.2 Argument description

```
PARAMETER ENUMERATED {
    generic(0),
    unobtainable(1),
    congestion(2)
}
```

8.1.11.2 Operations gsmSCF->gsmSSF

Call Associated/Non-call Processing

RequestReportBCSMEvent

Call Associated/Call Processing

Connect

Refer to subclause 8.1.7 for the appropriate error procedures.

8.1.11.3 Operations gsmSSF->gsmSCF

InitialDP

Refer to subclause 8.1.7 for the appropriate error procedures.

8.1.11.4-8.1.11.5 Spare

8.1.12 Spare

8.1.13 UnexpectedComponentSequence

8.1.13.1 General description

8.1.13.1.1 Error description

The responding entity cannot start the processing of the requested operation because a SACF or MACF rule is violated, or the operation could not be processed in the current state of the receiving entity.

8.1.13.2 Operations gsmSCF->gsmSSF

Call Associated/Non-call Processing

RequestReportBCSMEvent

Call Associated/Call Processing

Connect

In this case the gsmSSF detects the erroneous situation, sends the UnexpectedComponentSequence error and remains in the same state.

8.1.13.3 Operations gsmSSF->gsmSCF

InitialDP

In case the operation is sent by an "initiating" gsmSSF in the context of an existing relationship, the gsmSCF returns the error parameter. On receiving the error the gsmSSF moves to Idle.

8.1.13.4-8.1.13.5 Spare

8.1.14 UnexpectedDataValue

8.1.14.1 General description

8.1.14.1.1 Error description

The responding entity cannot complete the processing of the requested operation because a parameter has an unexpected data value.

NOTE: This error does not overlap with "ParameterOutOfRange".

8.1.14.2 Operations gsmSCF->gsmSSF

Call Associated/Non-call Processing

RequestReportBCSMEvent

Call Associated/Call Processing

Connect

Refer to subclause 8.1.7 for the appropriate error procedures.

8.1.14.3 Operations gsmSSF->gsmSCF

InitialDP

Refer to subclause 8.1.7 for the appropriate error procedures.

8.1.14.4-8.1.14.5 Spare

8.1.15 UnexpectedParameter

8.1.15.1 General description

8.1.15.1.1 Error description

There is an error in the received operation argument. A valid but unexpected parameter was present in the operation argument. The presence of this parameter is not consistent with the presence of the other parameters. The responding entity cannot start to process the operation.

8.1.15.2 Operations gsmSCF->gsmSSF

Call Associated/Non-call Processing

RequestReportBCSMEvent

Call Associated/Call Processing

Connect

Refer to subclause 8.1.7 for the appropriate error procedures.

8.1.15.3 Operations gsmSSF->gsmSCF

InitialDP

Refer to subclause 8.1.7 for the appropriate error procedures.

8.1.15.4-8.1.15.5 Spare**8.1.16 Spare****8.2 Entity related error procedures**

The following subclauses define the error handling for the entity related errors. Since the error situations are not originated by the reception of an operation, the invoking entity is denoted here as the entity at which the error situation is detected. The responding entity is the entity which receives the error report.

The TCAP services used for reporting errors are described in Clause 10.

8.2.1 Expiration of T_{SSF} **8.2.1.1 General description****8.2.1.1.1 Error description**

A timeout occurred in the gsmSSF on the response from the gsmSCF.

8.2.1.2 Procedures gsmSSF->gsmSCF**Procedure at the invoking entity (gsmSSF)**

Timeout occurs in gsmSSF on T_{SSF}

precondition: gsmSSF state Waiting for instructions

postcondition: gsmSSF state Idle

The gsmSSF aborts the dialogue and moves to the Idle state, the GMSC/VMSC handles the call according to the Default Call Handling parameter of the valid CSI.

8.2.2 Spare

9 Detailed operation procedures

The gsmSSF states which are referred to in this section are described in GSM 03.78 [16].

9.1 Spare

9.2 ActivityTest procedure

9.2.1 General description

This operation is used to check for the continued existence of a relationship between the gsmSCF and gsmSSF. If the relationship is still in existence, then the gsmSSF will respond. If no reply is received, then the gsmSCF will assume that the gsmSSF has failed in some way and will take the appropriate action.

9.2.1.1 Parameters

None.

9.2.2 Spare

9.2.3 Responding entity (gsmSSF)

9.2.3.1 Normal procedure

gsmSSF precondition:

- 1) A relationship exists between the gsmSCF and the gsmSSF.

gsmSSF postconditions:

- 1) The SSME FSM stays in, or moves to the state "Non-call Associated Treatment".
- 2) If the dialogue ID is active and if there is a gsmSSF using the dialogue, the SSME sends a return result "ActivityTest" to the gsmSCF. If there are no other management activities, the SSME FSM returns to the state "Idle Management", or

If the dialogue ID is not active, the TCAP in the gsmSSF will issue a P-Abort, the SSME will in that case never receive the ActivityTest operation and thus will not be able to reply.

9.2.3.2 Error handling

Not applicable.

9.3-9.10 Spare

9.11 Connect procedure

9.11.1 General description

This operation is used to request the gsmSSF to perform the call processing actions to route a call to a specific destination or to influence other call set-up information, e.g. the Generic Number.

9.11.1.1 Parameters

- destinationRoutingAddress:

This parameter contains the called party number towards which the call is to be routed.

- callingPartysCategory:

This parameter indicates the type of calling party (e.g., operator, pay phone, ordinary subscriber).

- originalCalledPartyID:

This parameter carries the dialled digits if the call is forwarded by the gsmSCF.

- redirectingPartyID:

This parameter indicates the directory number the call was redirected from.

- redirectionInformation:

This parameter contains forwarding related information, such as redirecting counter.

- genericNumbers:

This parameter allows the gsmSCF to set the Generic Number parameter used in the network. It is used for transfer of Additional Calling Party Number.

- suppressionOfAnnouncement:

This parameter indicates that announcements and tones which are played in the GMSC or the VMSC at non-successful call set-up attempts shall be suppressed.

- oCSIApplicable:

This parameter indicates to the GMSC/gsmSSF that the Originating CAMEL Subscription Information, if present, shall be applied on the outgoing call leg created with the Connect operation. For the use of this parameter see GSM 03.78 [16].

9.11.2 Spare

9.11.3 Responding entity (gsmSSF)

9.11.3.1 Normal procedure

gsmSSF preconditions:

- 1) Mobile originating or terminating call attempt has been initiated.
- 2) Basic call processing has been suspended at a DP.
- 3) The gsmSSF waits for instructions.

gsmSSF postcondition:

- 1) The gsmSSF performs the call processing actions to route the call to the specified destination.

On receipt of this operation in the gsmSSF state "Waiting for Instructions", the gsmSSF performs the following actions:

- the gsmSSF cancels T_{SSF} ;
- if no EDPs have been armed the gsmSSF goes to state "Idle". Otherwise, the gsmSSF goes to state "Monitoring".

No implicit activation or deactivation of DPs occurs.

Statistic counter(s) are not affected.

9.11.3.2 Error handling

Generic error handling for the operation related errors is described in Clause 8 and the TCAP services which are used for reporting operation errors are described in Clause 10.

9.12 Spare

9.13 Continue procedure

9.13.1 General description

This operation is used to request the gsmSSF to proceed with call processing at the DP at which it previously suspended call processing to await gsmSCF instructions. The gsmSSF continues call processing without substituting new data from the gsmSCF.

9.13.1.1 Parameters

None.

9.13.2 Spare

9.13.3 Responding entity (gsmSSF)

9.13.3.1 Normal procedure

gsmSSF preconditions

- 1) BCSM: Basic call processing has been suspended at any DP.
- 2) gsmSSF is in the state "Waiting for Instructions".

gsmSSF postconditions

- 1) BCSM: Basic call processing continues.
- 2) gsmSSF is in the state "Monitoring", because at least one EDP was armed, or
gsmSSF is in the state "Idle", because no EDPs were armed.

The gsmSSF is in state "Waiting for instructions".. The gsmSSF transitions to state "Idle" in case no EDPs are armed. The gsmSSF transits to state "Monitoring" if at least one EDP is armed. Basic call processing is resumed.

9.13.3.2 Error handling

Operation related error handling is not applicable, due to class 4 operation.

9.14-9.16 Spare

9.17 EventReportBCSM procedure

9.17.1 General description

This operation is used to notify the gsmSCF of a call related event previously requested by the gsmSCF in an RequestReportBCSMEvent operation. The monitoring of more than one event could be requested with a RequestReportBCSMEvent operation, but each of these requested events is reported in a separate EventReportBCSM operation.

9.17.1.1 Parameters

- eventTypeBCSM:
This parameter specifies the type of event that is reported.
- eventSpecificInformationBCSM:
This parameter indicates the call related information specific to the event.

For O- or T-Answer it will be empty.

For O- or T-Disconnect it will contain the "releaseCause", if available.
- legID:
This parameter indicates the party in the call for which the event is reported. gsmSSF will use the option "receivingSideID" only.
 - receivingSideID:
The following values for "legID" are assumed:
"legID" = 1 indicates the party that was present at the moment of the InitialDP.
"legID" = 2 indicates the party that was created with a Connect operation (Continue operation).

If not included, the following defaults are assumed:

"legID" = 2 for the events O-Answer and T-Answer.

The "legID" parameter shall always be included for the events O-Disconnect and T-Disconnect.
- miscCallInfo:
This parameter indicates DP related information.
- messageType:
This parameter indicates whether the message is a request, i.e. resulting from a RequestReportBCSMEvent with "monitorMode" = "interrupted", or a notification, i.e. resulting from a RequestReportBCSMEvent with "monitorMode" = "notifyAndContinue".

9.17.2 Invoking entity (gsmSSF)

9.17.2.1 Normal procedure

gsmSSF preconditions:

- 1) The gsmSSF shall be in the state "Monitoring"; or
the gsmSSF may be in state "Waiting for Instructions" if the Disconnect DP is armed and encountered.
- 2) The BCSM proceeds to an EDP that is armed.

gsmSSF postconditions:

- 1) The gsmSSF stays in the state "Monitoring" if the message type was notification and there are still EDPs armed.
- 2) The gsmSSF moves to the state "Idle" if the message type was notification and there are no more EDPs armed.
- 3) The gsmSSF moves to the state "Waiting for Instructions" if the message type was request. Call processing is interrupted.

If a EDP-R is met that causes the release of the related leg all EDPs related to that leg are disarmed and the event is reported via EventReportBCSM.

9.17.2.2 Error handling

In case the message type is request, on expiration of T_{SSF} before receiving any operation, the gsmSSF aborts the interaction with the gsmSCF and instructs the GMSC/MSC to handle the call according to the Default Call Handling parameter of the valid CSI.

Operation related error handling is not applicable, due to class 4 operation.

9.17.3 Spare

9.18 Spare

9.19 InitialDP procedure

9.19.1 General description

This operation is sent by the gsmSSF after detection of a TDP-R in the BCSM, to request the gsmSCF for instructions to complete the call.

9.19.1.1 Parameters

- serviceKey:

This parameter identifies for the gsmSCF unambiguously the requested IN service. It is used to address the correct application/SLP within the gsmSCF (not for gsmSCF addressing).

- calledPartyNumber:

This parameter contains the number used to identify the called party in the forward direction, e.g. the Called party number of ISUP (see ETS 300 356-1 [4]). This parameter shall be sent only in the Mobile Forwarding and Mobile Terminating cases.

- callingPartyNumber:

This parameter carries the calling party number to identify the calling party or the origin of the call. The encoding of the parameter is defined in ETS 300 356-1 [4].

- callingPartysCategory:

Indicates the type of calling party (e.g., operator, pay phone, ordinary subscriber).

- originalCalledPartyID:

This parameter carries the dialled digits if the call has met call forwarding on the route to the gsmSSF.

- locationNumber:

This parameter is used to convey the geographical area address for mobility services. It is used when "callingPartyNumber" does not contain any information about the geographical location of the calling party (e.g., origin dependent routing when the calling party is a mobile subscriber).

- bearerCapability:

This parameter indicates the type of the bearer capability connection to the user:

- bearerCap:

This parameter contains the value of the ISUP User Service Information parameter.

The parameter "bearerCapability" shall only be included in the InitialDP operation in case the ISUP User Service Information parameter is available at the gsmSSF.

If User Service Information and User Service Information Prime are available at the gsmSSF the "bearerCap" shall contain the value of the User Service Information Prime parameter.

- eventTypeBCSM:

This parameter indicates the armed BCSM DP event, resulting in the InitialDP operation.

- redirectingPartyID:

This parameter indicates the directory number the call was redirected from.

- redirectionInformation:

It contains forwarding related information, such as redirecting counter.

- additionalCallingPartyNumber:

The calling party number provided by the access signalling system of the calling user.

- highlayerCompatibility:

This parameter indicates the type of the high layer compatibility, which will be used to determine the ISDN-teleservice of a connected ISDN terminal. For encoding, DSS1 (see ETS 300 403-1 [5]) is used.

- iMSI:

IMSI of the mobile subscriber for which the CAMEL service is invoked. For encoding see GSM 09.02 [15].

- subscriberState:

The state of the mobile subscriber for which the CAMEL service is invoked. The possible states are busy, idle and not reachable. For encoding see GSM 09.02 [15].

- locationInformation:

This parameter indicates the whereabouts of the MS, and the age of the information defining the whereabouts. For encoding see GSM 09.02 [15].

- ext-BasicServiceCode:

Indicates the Basic Service Code. For encoding see GSM 09.02 [15].

- callReferenceNumber:

This parameter gives the call reference number assigned to the call by the GMSC/MSC. For encoding see GSM 09.02 [15].

- mscAddress:

This parameter gives the mscId assigned to the GMSC/MSC. For encoding see GSM 09.02 [15].

- calledPartyBCDNumber:

This parameter contains the number used to identify the called party in the forward direction. It may also include service selection information, including * and # digits. This parameter shall be sent only in the Mobile Originating case.

9.19.2 Invoking entity (gsmSSF)

9.19.2.1 Normal procedure

gsmSSF preconditions:

- 1) Call origination attempt has been initiated.

2) An event has been detected at a DP.

gsmSSF postcondition:

1) A control relationship has been established and the gsmSSF waits for instructions from the gsmSCF.

The address of the gsmSCF the InitialDP operation shall be sent to is fetched from the valid CSI. The gsmSSF provides all available parameters.

A control relationship is established to the gsmSCF. The gsmSSF application timer T_{SSF} is set when the gsmSSF sends InitialDP for requesting instructions from the gsmSCF. It is used to prevent from excessive call suspension time.

9.19.2.2 Error handling

If the destination gsmSCF is not accessible then the gsmSSF instructs the GMSC/MSC to handle the call according to the Default Call Handling parameter of the valid CSI.

On expiration of T_{SSF} before receiving any operation, the gsmSSF aborts the interaction with the gsmSCF and instructs the GMSC/VMSC to handle the call according to the Default Call Handling parameter of the valid CSI.

If the calling party abandons after the sending of InitialDP, then the gsmSSF aborts the control relationship after the first answer message from the gsmSCF has been received.

Generic error handling for the operation related errors is described in Clause 8 and the TCAP services which are used for reporting operation errors are described in Clause 10.

9.19.3 Spare

9.20-9.22 Spare

9.23 ReleaseCall procedure

9.23.1 General description

This operation is used to tear down by the gsmSCF an existing call at any phase of the call for all parties involved in the call. The operation can only be sent within a control relationship and is not allowed in a monitor relationship.

9.23.1.1 Parameters

- Cause

A number giving an indication to the gsmSSF about the reason of releasing this specific call. This may be used by gsmSSF for generating specific tones to the different parties in the call or to fill in the "cause" in the release message.

9.23.2 Spare

9.23.3 Responding entity (gsmSSF)

9.23.3.1 Normal procedure

gsmSSF preconditions:

1) State "Waiting for Instructions"; or

State "Monitoring".

gsmSSF postcondition:

- 1) "Idle". Possible armed EDPs are ignored. All connections and resources related to the call are released.

9.23.3.2 Error handling

Operation related error handling is not applicable, due to class 4 operation.

9.24 Spare

9.25 RequestReportBCSMEvent procedure

9.25.1 General description

This operation is used to request the gsmSSF to monitor for a call-related event, then send a notification back to the gsmSCF when the event is detected.

9.25.1.1 Parameters

- bcsmEvents:

This parameter specifies the event or events of which a report is requested.

- eventTypeBCSM:

This parameter specifies the type of event of which a report is requested. Values collectedInfo and termAttemptAuthorized are not valid for the RequestReportBCSMEvent operation.

- monitorMode:

This parameter indicates how the event should be reported. When the "monitorMode" is "interrupted", the event shall be reported as a request; if the "monitorMode" is "notifyAndContinue", the event shall be reported as a notification.

- legID:

This parameter indicates the party in the call for which the event shall be reported. gsmSCF will use the option "sendingSideID" only.

- sendingSideID:

The following values for "legID" are assumed:

"legID" = 1 indicates the party that was present at the moment of the InitialDP.

"legID" = 2 indicates the party that was created with a "Connect" operation (Continue operation).

If not included, the following defaults are assumed:

"legID" = 2 for the events O-Answer and T-Answer.

The "legID" parameter shall always be included for the events O-Disconnect and T-Disconnect.

9.25.2 Spare

9.25.3 Responding entity (gsmSSF)

9.25.3.1 Normal procedure

gsmSSF precondition:

1) The gsmSSF is in the state "Waiting for Instructions".

gsmSSF postconditions:

- 1) The requested EDPs have been armed as indicated.
- 2) Previously requested events are monitored, until the end of the call, until the EDPs are detected or until the corresponding leg is released.
- 3) The gsmSSF remains in the same state.

9.25.3.2 Error handling

Generic error handling for the operation related errors is described in Clause 8 and the TCAP services which are used for reporting operation errors are described in Clause 10.

9.26-9.29 Spare

10 Services assumed from TCAP

10.1 Normal procedures

This subclause describes the procedures and TCAP primitives that shall be used for transmitting messages between gsmSSF and gsmSCF under normal operation.

The CAP, as TC-user, uses only the structured dialogue facility provided by TCAP. The following situations can occur when a message is sent between two physical entities:

- a dialogue shall be established: the TC-user issues a TC-BEGIN request primitive;
- a dialogue shall be maintained: the TC-user issues a TC-CONTINUE request primitive;
- a dialogue shall no longer be maintained: the TC-user issues a TC-END request primitive with either basic end or with pre-arranged end depending on the following conditions:
 - basic end:
 - operations leading to a termination of the control relationship can be transmitted by the gsmSCF with a TC-END request primitive (basic) in case the gsmSCF is not interested in the reception of any ERROR or REJECT components for these sent operations;

once the gsmSCF dialogue resources have been released any ERROR or REJECT components received for these sent operations will be discarded by TC as described in ETS 300 287 [3] (ITU-T Recommendation Q.774);
 - if the gsmSCF entity has received an operation leading to the termination of the control relationship, a TC-END request primitive (basic) with zero components can be sent from the gsmSCF;
 - pre-arranged end:

in case of an entity being interested in possible ERROR or REJECT messages in response to sent operations leading to a termination of the control relationship, the dialogue is ended with a TC-END request primitive (pre-arranged end) after the last associated operation timer expires. The receiving entity shall end the dialogue with a TC-END request primitive (basic or pre-arranged end) after successful processing of these operations (i.e. the control relationship is terminated);

10.1.1 gsmSSF-to-gsmSCF messages

10.1.1.1 gsmSSF related messages

A dialogue shall be established when the gsmSSF has finalised trigger processing and moves to the state **Waiting for Instructions**. The relevant CAP operation, which can only be the InitialDP operation, shall be transmitted in the same message.

For all other operations sent from the gsmSSF, the dialogue shall be maintained.

The dialogue shall no longer be maintained when the prearranged end condition is met in the gsmSSF. When the gsmSSF makes a state transition to the state **Idle**, the dialogue is locally ended by means of a TC-END request primitive with prearranged end.

When the gsmSSF has sent the last EventReportBCSM the dialogue may be ended from the gsmSCF by a TC-END request primitive with basic end.

10.1.1.2 Spare

10.1.1.3 SSME FSM related messages

The following procedures shall be followed:

- the dialogue shall be maintained when the ActivityTest return result is sent;

10.1.2 gsmSCF-to-gsmSSF messages

10.1.2.1 SCSM FSM related messages

For subsequent operations sent from the SCSM FSM, the dialogue shall be maintained, i.e. all other operations are sent after a dialogue was established from the gsmSSF (the gsmSCF has previously received a TC-BEGIN indication primitive with an InitialDP operation).

The dialogue shall no longer be maintained when the prearranged end condition is met in the gsmSCF. When the gsmSCF does not expect any messages other than possibly REJECT or ERROR messages for the operations sent and when the last associated operation timer expires, the dialogue is locally ended by means of a TC-END request primitive with prearranged end.

Alternatively, the sending of operations, leading to the termination of the control relationship, by means of a TC-END request primitive (basic end) is possible.

10.1.2.2 SCME FSM related messages

The operations sent from the SCME FSM shall be issued according to the following procedures:

- the dialogue shall be maintained when the ActivityTest operation is sent;

10.1.3 Spare

10.2 Abnormal procedures

This subclause describes the procedures and TCAP primitives that shall be used for reporting abnormal situations between gsmSSF and gsmSCF. The error cases are defined in Clause 8.

The following primitives shall be used to report abnormal situations:

- operation errors, as defined in the CAP, are reported with TC-U-ERROR request primitive;
- rejection of a TCAP component by the TC-user shall be reported with TC-U-REJECT request primitive;

- a dialogue shall be aborted by the TC-user with a TC-U-ABORT request primitive.

For abnormal situations detected by TCAP the same rules shall apply for transmission of TC-R-REJECT indication as for transmission of TC-U-REJECT request and for transmission of TC-P-ABORT indication as for transmission of TC-U-ABORT request primitive.

In error situations prearranged end shall not be used. In case any AE encounters an error situation the peer entity shall be explicitly notified of the error, if possible. If from any entity's point of view the error encountered requires the relationship to be ended, it shall close the dialogue via a TC-END request primitive with basic end or via a TC-U-ABORT request primitive, depending on whether any pending ERROR or REJECT component is to be sent or not.

In case an entity receives a TC-END indication primitive and after all components have been considered, the gsmSSF is not in a state to terminate the control relationship, an appropriate internal error should be provided.

In cases when a dialogue needs to be closed by the initiating entity before its establishment has been completed (before the first TC indication primitive to the TC-BEGIN request primitive has been received from the responding entity), the TC-user shall issue a TC-END request primitive with prearranged end or a TC-U-ABORT request primitive. The result of these primitives will be only local, any subsequent TC indication received for this dialogue will be handled according to the abnormal procedures as specified in ETS 300 287 [3] (ITU-T Recommendation Q.774).

10.2.1 gsmSCF-to-gsmSSF messages

Considering that gsmSSF does not have the logic to recover from error cases detected on the gsmSCF-gsmSSF interface, the following shall apply:

- operation errors and rejection of TCAP components shall be transmitted to the gsmSSF with a TC-END request primitive, basic end.

If, in violation of the above procedure, an ERROR or REJECT component is received with a TC-CONTINUE indication primitive, the gsmSSF shall abort the dialogue with a TC-U-ABORT request primitive.

10.2.2 gsmSSF-to-gsmSCF messages

Operation errors and rejection of TCAP components shall be transmitted to the gsmSCF according to the following rules:

- the dialogue shall be maintained when the preceding message, which contained the erroneous component, indicated that the dialogue shall be maintained. I.e. the error or reject shall be transmitted with a TC-CONTINUE request primitive if the erroneous component was received with a TC-CONTINUE indication primitive;
- on receipt of an ERROR or REJECT component the gsmSCF decides on further processing. It may either continue, explicitly end or abort the dialogue;

If the error processing in the gsmSSF leads to the case where the gsmSSF is not able to process further gsmSCF operations while the dialogue is to be maintained, the gsmSSF aborts the dialogue with a TC-U-ABORT request primitive.

The gsmSSF aborts a dialogue with a TC-U-ABORT request primitive in case call release is initiated by any other entity then the gsmSCF and the gsmSSF has no armed EDP to notify the gsmSCF of the call release.

10.3 Dialogue establishment

The establishment of an CAP dialogue involves two application processes as described in subclause 4.3, one that is the dialogue-initiator and one that is the dialogue-responder.

AC negotiation may not be supported in all physical entities and/or all networks.

This procedure is driven by the following signals:

- a TC-BEGIN request primitive from the dialogue-initiator;

- a TC-BEGIN indication primitive occurring at the responding side;
- the first TC-CONTINUE indication primitive occurring at the initiating side or under specific conditions:
 - a TC-END indication primitive occurring at the initiating side;
 - a TC-U-ABORT indication primitive occurring at the initiating side;
 - a TC-P-ABORT indication primitive occurring at the initiating side.

10.3.1 Sending of a TC-BEGIN request primitive

Before issuing a TC-BEGIN request primitive, SACF shall store the AC-name and if present the user-information parameter.

SACF shall request the invocation of the associated operations using the TC-INVOKE service. See subclause 10.8 for a description of the invocation procedure.

After processing of the last invocation request, SACF shall issue a TC-BEGIN request primitive.

The requesting side SACF then waits for a TC indication primitive and will not issue any other requests, except a TC-U-ABORT request or a TC-END request with the release method parameter set to "pre-arranged release".

10.3.2 Receipt of a TC-BEGIN indication

On receipt of a TC-BEGIN indication primitive, SACF shall:

- analyze the application-context-name included in the primitive and if it is supported, process any other indication primitives received from TC as described in subclause 10.8.

Once all the received primitives have been processed, SACF does not accept any primitive from TC, except a TC-P-ABORT indication.

If the application-context-name included in the primitive is not supported, issue a TC-U-ABORT request primitive. If an alternative application-context can be offered its name is included in the TC-U-ABORT request primitive.

10.3.3 Receipt of the first TC-CONTINUE indication

On receipt of the first TC-CONTINUE indication primitive for a dialogue, SACF shall check the value of the application-context-name parameter. If this value matches the one used in the TC-BEGIN request primitive, SACF shall process the following TC component handling indication primitives as described in subclause 10.8, otherwise it shall issue a TC-U-ABORT request primitive.

10.3.4 Receipt of a TC-END indication

On receipt of a TC-END indication primitive in the dialogue initiated state, SACF shall check the value of the application-context-name parameter. If this value matches the one used in the TC-BEGIN request primitive then the SACF shall process the following TC component handling indication primitives as described in subclause 10.8, otherwise it shall not be processed.

10.3.5 Receipt of a TC-U-ABORT indication

Receipt of a TC-U-ABORT indication primitive is described as part of user abort procedure (see subclause 10.6.2).

If the abort reason is application-context-name not supported, the responding side may propose an alternative application-context-name in the TC-U-ABORT indication. If an alternative application context is proposed the receiving entity shall check this name and if it can be supported a new dialogue may be established.

10.3.6 Receipt of a TC-P-ABORT indication

Receipt of a TC-P-ABORT indication primitive is described as part of provider abort procedure (see subclause 10.7.1).

10.4 Dialogue continuation

Once established the dialogue is said to be in a continuation phase.

Both application processes can request the transfer of CAP APDUs until one of them requests the termination of the dialogue.

10.4.1 Sending entity

SACF shall process any component handling request primitives as described in subclause 10.8.

After processing the last component handling request primitive, SACF shall issue a TC-CONTINUE request primitive.

10.4.2 Receiving entity

On receipt of a TC-CONTINUE indication primitive SACF shall accept zero, one or several TC component handling indication primitives and process them as described in subclause 10.8.

10.5 Dialogue termination

Both the dialogue-initiator and the dialogue-responder have the ability to request the termination of a dialogue when no dialogue is to be established or when a dialogue is no longer to be maintained according to the rules as stated in subclauses 10.1 and 10.2.

The dialogue termination procedure is driven by the following events:

- a TC-END request primitive;
- a TC-END indication primitive.

10.5.1 Sending of TC-END request

When the dialogue shall no longer be maintained, SACF shall process any component handling request primitives as described in subclause 10.8.

After processing the last component handling request primitive (if any), SACF shall issue a TC-END request primitive with the release method parameter set to "basic end" or "pre-arranged release", according to the rules as stated in subclauses 10.1 and 10.2.

When no dialogue is to be established, refer to subclauses 10.3.1 and 10.3.2.

10.5.2 Receipt of a TC-END indication

On receipt of a TC-END indication primitive, the SACF shall accept any component handling indication primitives and process them as described in subclause 10.8.

After processing the last component handling primitive all dialogue related resources are released.

10.6 User Abort

Both the dialogue-initiator and the dialogue-responder have the ability to abort a dialogue at any time.

The user abort procedure is driven by one of the following events:

- a TC-U-ABORT request primitive;
- a TC-U-ABORT indication primitive.

10.6.1 Sending of TC-U-ABORT request

After issuing a TC-U-ABORT request primitive, all dialogue related resources are released.

10.6.2 Receipt of a TC-U-ABORT indication

On receipt of a TC-U-ABORT indication all dialogue related resources are released.

10.7 Provider Abort

TC has the ability to abort a dialogue at both the dialogue-initiator side and the dialogue-responder side.

The provider abort procedure is driven by the following event:

- a TC-P-ABORT indication primitive.

10.7.1 Receipt of a TC-P-ABORT indication

On receipt of a TC-P-ABORT indication, all dialogue related resources are released.

10.8 Procedures for CAP operations

This subclause describes the procedures for CAP operations.

10.8.1 Operation invocation

SACF shall build an operation argument from the parameters received and request the invocation of the associated operation using the TC-INVOKE procedure.

10.8.2 Operation invocation receipt

On receipt of a TC-INVOKE indication primitive, SACF shall:

- if the invoke ID is already in use by an active operation, request the transfer of a reject component using the TC-U-REJECT request primitive with the appropriate problem code (duplicated invokeID);
- if the operation code does not correspond to an operation supported by the application-context, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (unrecognized operation);
- if the type of the argument is not the one defined for the operation, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter);
- if the operation cannot be invoked because the dialogue is about to be released, requests the transfer of a reject component using the TC-U-REJECT request primitive with the problem code (Initiating Release);
- if sufficient CAP related resources are not available to perform the requested operation, request the transfer of a reject component using the TC-U-REJECT request primitive with the problem code (Resource Limitation);
- otherwise, accept the TC-INVOKE indication primitive. If the operation is to be user confirmed, SACF waits for the corresponding response.

10.8.3 Operation response

For user confirmed operations, SACF shall:

- if no error indication is included in the response to a class 1 or 3 operation, construct a result information element from the parameters received and request its transfer using the TC-RESULT-L service;
- if an error indication is included in the response to a class 1 or 2 operation, construct an error parameter from the parameters received and request its transfer using the TC-U-ERROR request primitive.

10.8.4 Receipt of a response

10.8.4.1 Receipt of TC-RESULT-NL indication

On receipt of a TC-RESULT-NL indication, SACF shall:

- request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter).

10.8.4.2 Receipt of TC-RESULT-L indication

On receipt of a TC-RESULT-L indication, SACF shall:

- if the type of the result parameter is not the one defined for the result of this operation, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter);
- otherwise, accept the TC-RESULT-L indication primitive.

10.8.4.3 Receipt of TC-U-ERROR indication

On receipt of a TC-U-ERROR indication, SACF shall:

- if the error code is not defined for the SACF or is not one associated with the operation referred to by the invoke identifier, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (unrecognized error or unexpected error);
- if the type of the error parameter is not the one defined for this error, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter);
- otherwise, accept the TC-U-ERROR indication primitive.

10.8.4.4 Receipt of TC-U-REJECT indication

On receipt of a TC-U-REJECT indication primitive which affects a pending operation, SACF shall accept the TC-U-REJECT indication primitive.

10.8.4.5 Receipt of a TC-L-REJECT indication

This event occurs when the local TC detects a protocol error in an incoming component which affects an operation.

On receipt of a TC-L-REJECT indicating "return result problem, return result unexpected", SACF shall inform the application process.

On receipt of a TC-L-REJECT indicating "return error problem, return error unexpected", SACF shall inform the application process.

When the problem code indicates a general problem, it is considered that the event cannot be related to an active operation even if the invoke ID is provided by TC. This is because it is unclear whether the invoke ID refers to a local or remote invocation. The behaviour of SACF in such a case is described in subclause 10.8.5.3.

10.8.4.6 Receipt of a TC-L-CANCEL indication

On receipt of a TC-L-CANCEL indication, the SACF shall:

- if the associated operation is a class 1 operation, inform the application process;
- if the associated operation is a class 2 operation and no linked operations are defined for this operation, ignore the primitive;
- if the associated operation is a class 2 operation and has linked operations but none of them has been invoked, inform the application process;
- if the associated operation is a class 2 operation and a linked operation invocation has already been received in response to this operation, ignore the primitive;
- if the associated operation is a class 3 operation, inform the application process;
- if the associated operation is a class 4 operation, ignore the primitive.

10.8.5 Other events

This subclause describes the behaviour of SACF on receipt of a component handling indication primitive which cannot be related to any operation or which does not affect a pending one.

10.8.5.1 Receipt of a TC-U-REJECT

On receipt of a TC-U-REJECT indication primitive which does not affect an active operation (i.e. indicating a return result or return error problem), it is up to the application process to abort, continue or terminate the dialogue, if not already terminated by the sending application process according to the rules as stated in subclause 10.2. This is also applicable for invoke problems related to a class 4 linked operation.

10.8.5.2 Receipt of a TC-R-REJECT indication

On receipt of a TC-R-REJECT indication (i.e. when a protocol error has been detected by the peer TC entity) which does not affect an active operation, it is up to the application process to abort, continue or terminate the dialogue, if not already terminated by the sending application process according to the rules as stated in subclause 10.2.

10.8.5.3 Receipt of a TC-L-REJECT indication

On receipt of a TC-L-REJECT indication primitive (i.e. when a protocol error has been detected by the local TC entity) which cannot be related to an active operation, it is up to the application process to continue, or to terminate the dialogue and implicitly trigger the transmission of the reject component or to abort the dialogue.

10.8.5.4 Receipt of a TC-NOTICE indication

This informs the SACF that a message cannot be delivered by the Network Layer, this can only occur if the Return Option has been set (see subclause 10.9.1.8). It is for the application process to decide whether to terminate the dialogue or retry.

10.9 Mapping on to TC services

10.9.1 Dialogue control

The TC-UNI service is not used by CAP.

10.9.1.1 Destination address

This parameter is set by the dialogue initiating application process, and may optionally be modified by the responding dialogue in the first backward TC-CONTINUE.

10.9.1.2 Originating address

This parameter is set by the dialogue initiating application process.

10.9.1.3 Dialogue ID

The value of this parameter is associated with the CAP invocation in an implementation dependent manner.

10.9.1.4 Application-context-name

The application-context-name parameter is set by SACF as defined in subclause 6.4.

10.9.1.5 User information

This parameter may be used by both initiating and responding application processes. The receiving side may ignore this parameter if received. The User Information parameter shall be encoded in accordance with the definition provided in Q.773 (section 3.2) and the definition of EXTERNAL type provided in X.690, with the restriction that an Object Identifier shall always be present to identify the user information and the entity which sent it.

10.9.1.6 Component present

This parameter is used by SACF as described in ETS 300 287 [3] (ITU-T Recommendation Q.771).

10.9.1.7 Termination

The value of the release method parameter of the TC-END request primitive is set by SACF according to the rules as stated in subclauses 10.1 and 10.2.

10.9.1.8 Quality of service

The quality of service of TC request primitives is set by the SACF to the following value:

- sequencing requested if required by the application (see section 4.4.2);
- return option as required by the application (see section 4.4.2).

10.9.2 Operation procedures

10.9.2.1 Invoke ID

This parameter is set by the sending application process.

10.9.2.2 Linked ID

This parameter is set by the sending application process.

10.9.2.3 Dialogue ID

The value of this parameter is associated with the CAP invocation in an implementation dependent manner.

10.9.2.4 Class

The value of this parameter is set by SACF according to the type of the operation to be invoked according to subclause 6.1.

10.9.2.5 Operation

The operation code of a TC-INVOKE request primitive is set by the sending application process as defined in subclause 6.4.

SACF shall set the operation code of the TC-RESULT-L primitive (if required) to the same value as the one received at invocation time.

10.9.2.6 Error

The error parameter of the TC-U-ERROR request primitive is set by the sending application process as defined in subclause 6.4.

10.9.2.7 Parameters

The argument parameter of TC-INVOKE primitives is set by the sending application process as defined in subclauses 6.1 and 6.3.

The result parameter of TC-RESULT-L primitives is set by the sending application process as defined in subclauses 6.1 and 6.3.

The parameter of TC-U-ERROR primitives are set by the sending application process as defined in subclauses 6.2 and 6.3.

10.9.2.8 Time out

The value of this parameter is set by SACF according to the type of operation invoked.

10.9.2.9 Last component

This parameter is used by SACF as described in ETS 300 287 [3] (ITU-T Recommendation Q.771).

10.9.2.10 Problem code

This parameter is used by SACF as described in subclause 10.8.

Annex A (normative): Mapping between CAP and ISUP

This annex defines the mapping between the CAP parameters and the call parameters sent/received in the ISUP. The functional handling of these parameters is defined in GSM 03.78 [16].

A.1 InitialDP operation

Table A.1

ISUP message IAM (Note 1)	CAP operation InitialDP
Called party number	calledPartyNumber
Calling party number	callingPartyNumber
Calling party's category	callingPartysCategory
Location number	locationNumber
Original called number	originalCalledPartyID
User teleservice information (1st priority)	highLayerCompatibility
High layer compatibility IE contained in access transport (2nd priority) (Note 2)	
Generic number 'additional calling party number'	additionalCallingPartyNumber
User service information prime (1st priority)	bearerCapability
User service information (2nd priority)	
Redirecting number	redirectingPartyID
Redirection information	redirectionInformation

NOTE 1: Optional parameters may be absent, i.e. they are only mapped, if these parameters are available at the DP.

NOTE 2: If two high layer compatibility information elements are contained in the access transport parameter, then the second information element, carrying the preferred HLC, is mapped to the CAP highLayerCompatibility parameter.

A.2 Connect operation

On receipt of a Connect operation from the gsmSCF the called party number used for routing is derived from the destinationRoutingAddress (see Table A.2). If the triggering of the CAMEL service was made for a mobile terminating or forwarded call, an ACM message shall be sent to the preceding exchange. The encoding of the backward call indicators in the ACM is specified in GSM 09.12 [24].

Table A.2 illustrates the mapping of parameters received in the Connect operation to parameters sent in the IAM message to the succeeding exchange. Parameters which were received in the IAM and are not replaced by parameters of the Connect operation are treated according to the normal procedures.

On sending of the IAM the awaiting address complete timer is started. If the timer expires the call is released in both directions and an appropriate indication is returned to the calling subscriber.

Table A.2

CAP operation Connect (Note 1)	ISUP message IAM
destinationRoutingAddress	Called party number
originalCalledPartyID	Original called number
callingPartysCategory	Calling party's category
redirectingPartyID	Redirecting number
redirectionInformation	Redirection information
genericNumbers	Generic number (Note 2)

NOTE 1: Optional parameters may be absent, i.e. they are only mapped, if received.

NOTE 2: The set of generic numbers received in the genericNumbers parameter is mapped to the appropriate number of Generic Number parameters in the ISUP IAM. This shall be performed irrespective of the value of the screening indicator in the ISUP calling party number.

A.3 ReleaseCall operation

Upon receipt of the ReleaseCall operation, the GMSC/gsmSSF (VMSC/gsmSSF) sends REL messages in both directions. The cause indicators parameter contains the releaseCallArg parameter of the ReleaseCall operation.

Annex B (informative): Change History

SMG#	TDoc	VERS	NEW_VERS	CR	REV	PHASE	CAT	WORKITEM	SUBJECT
s21	049/97	2.0.0	5.0.0	NEW		2+		CAMEL R96	CAMEL Application Part phase1 (stage 3), Annex B only electronic format
s22	374/97	5.0.0	5.1.0	A001	1	2+	C	CAMEL R96	CallingPartyNumber in Connect
s22	374/97	5.0.0	5.1.0	A002	1	2+	F	CAMEL R96	Description of Connect message
s22	374/97	5.0.0	5.1.0	A003		2+	C	CAMEL R96	MSC Id for Call Reference Number
s22	374/97	5.0.0	5.1.0	A004	1	2+	F	CAMEL R96	Coding of ISUP_ACM message
s22	374/97	5.0.0	5.1.0	A005		2+	F	CAMEL R96	Use of SSN for inter-plmn signalling
s22	374/97	5.0.0	5.1.0	A006		2+	F	CAMEL R96	Correction of references
s22	374/97	5.0.0	5.1.0	A007		2+	F	CAMEL R96	Range constants for address strings
s22	374/97	5.0.0	5.1.0	A008		2+	C	CAMEL R96	Mapping of CAP Generic Number to ISUP.
s22	374/97	5.0.0	5.1.0	A009	1	2+	F	CAMEL R96	Alignment of text in two sections
s22	374/97	5.0.0	5.1.0	A010		2+	D	CAMEL R96	SCCP addressing for CAP
s22	303/97	5.0.0	5.1.0	A011		2+	C	CAMEL R96	'*' and '#' in Called Party Number
s23	97-688	5.1.0	5.2.0	A013	1	R96	D	CAMEL R96	Modifications resulting from comments by SPS3
s23	97-688	5.1.0	5.2.0	A015		R96	F	CAMEL R96	Called Party BCD number with initial DP operation
s23	97-688	5.1.0	5.2.0	A016		R96	D	CAMEL R96	Removal of the informative Annex B
s23	97-688	5.1.0	5.2.0	A018		R96	F	CAMEL R96	Alignment with stage 2
s24	97-915	5.2.0	5.3.0	A019		R96	F	CAMEL R96	Removal of CallingPartyNumber from Connect
s24	97-915	5.2.0	5.3.0	A020		R96	F	CAMEL R96	Removal of the transparent mode monitoring
s24	97-915	5.2.0	5.3.0	A021		R96	F	CAMEL R96	Update the SCCP class requirements in 09.78
s24	97-915	5.2.0	5.3.0	A022		R96	F	CAMEL R96	Remove mapping of CalledPartyBCD number and order sequence in ASN.1
s25	98-092	5.3.0	5.4.0	A023r1		R96	D	CAMEL R96	Definition of CAP SSN replaced by a reference to GSM 03.03
s26	98-0	5.4.0	5.5.0	A025r1		R96	F	CAMEL R96	Encoding of TC User Information parameter
s28	P-99-192	5.5.0	5.6.0	A040		R96	D	CAMEL Ph 1	Addition of Blue Book SCCP to the reference list

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