

**3GPP TSG\_CN#6**  
**ETSI SMG3 Plenary Meeting #6,**  
**Nice, France**  
**13<sup>th</sup> – 15<sup>th</sup> December 1999**

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**NP-99471**

**Agenda item:** 5.2.3  
**Source:** TSG\_N WG2  
**Title:** CRs to 3G TS 23.078 & 29.078 (Work Item CAMEL phase3)

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**Introduction:**

This document contains 1 CRs to **3G TS 23.078** agreed by **TSG\_N WG2** and forwarded to **TSG\_N Plenary** meeting #6 for approval.

<b>Tdoc</b>	<b>Spec</b>	<b>CR</b>	<b>Rev</b>	<b>CAT</b>	<b>Rel.</b>	<b>Old Ver</b>	<b>New Ver</b>	<b>Subject</b>
N2-99L23	23.078	032	2	B	R99	3.2.0	3.3.0	Revised for CAMEL phase 3 Release 99
N2-99L22	29.078	013		B	R99	3.2.0	3.3.0	Introduction of CAMEL Phase 3

<h2 style="margin: 0;">CHANGE REQUEST</h2>			Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.
<b>23.078</b>	<b>CR</b>	<b>032r2</b>	Current Version: <b>3.2.0</b>
GSM (AA.BB) or 3G (AA.BBB) specification number ↑		↑ CR number as allocated by MCC support team	
For submission to: <b>CN #06</b>	for approval	<input checked="" type="checkbox"/>	strategic <input type="checkbox"/>
list expected approval meeting # here ↑	for information	<input type="checkbox"/>	non-strategic <input type="checkbox"/> <small>(for SMG use only)</small>

Form: CR cover sheet, version 2 for 3GPP and SMG      The latest version of this form is available from: <ftp://ftp.3gpp.org/Information/CR-Form-v2.doc>

**Proposed change affects:** (U)SIM     ME     UTRAN / Radio     Core Network   
(at least one should be marked with an X)

**Source:** N2      **Date:** 6.12.1999

**Subject:** Introduction of CAMEL Phase 3

**Work item:** CAMEL Phase 3

<b>Category:</b>	F Correction	<input type="checkbox"/>	<b>Release:</b>	Phase 2	<input type="checkbox"/>
(only one category shall be marked with an X)	A Corresponds to a correction in an earlier release	<input type="checkbox"/>		Release 96	<input type="checkbox"/>
	B Addition of feature	<input checked="" type="checkbox"/>		Release 97	<input type="checkbox"/>
	C Functional modification of feature	<input type="checkbox"/>		Release 98	<input type="checkbox"/>
	D Editorial modification	<input type="checkbox"/>		Release 99	<input checked="" type="checkbox"/>
			<input type="checkbox"/>		Release 00

**Reason for change:** Implementation of CAMEL Phase 3 Requirements into 23.078 CAMEL Stage 2 (Release 1999).  
The proposed new version attached to this CR replaces completely the old version 3.2.0 of 23.078.

**Clauses affected:** Detailed in the "Other comments" section below.

<b>Other specs</b>	Other 3G core specifications	<input checked="" type="checkbox"/>	→ List of CRs:	23.008-010r2, 23.016-008r1, 23.018-027r3, 23.079-008, 29.002-073r1, 29.078-013
<b>affected:</b>	Other GSM core specifications	<input type="checkbox"/>	→ List of CRs:	
	MS test specifications	<input type="checkbox"/>	→ List of CRs:	
	BSS test specifications	<input type="checkbox"/>	→ List of CRs:	
	O&M specifications	<input type="checkbox"/>	→ List of CRs:	

**Other comments:** This section provides details on the differences between 23.078 version 3.2.0 and the proposed new 23.078 version by this CR. The details are given per new clause.

Restructure and renumber old clauses 4 - 10 to new subclauses 4.1 - 4.7 within clause "4 Circuit switched Call Control".

Include the new clauses 5 to 11. Each single new clause has the same layout as the new clause 4.

1 Scope  
Enhanced to cover CAMEL Phase 3.

2 Normative references  
Update references to 3GPP TSs.  
Enhanced as necessary

### 3 Definitions and abbreviations

Enhanced as necessary

### 4 Circuit switched Call Control

#### 4.2 Detection Points (DPs)

Support of new criteria.

#### 4.3 Description of CAMEL Subscriber Data

Inclusion of further CSIs and indications: D-CSI, N-CSI, VT-CSI

#### 4.4 Description of CAMEL BCSMs (and others)

Inclusion of new EDPs and TDPs:

Inclusion of the T-BCSM in the VMSC.

#### 4.5 Procedures for CAMEL

Inclusion of new TDP and new EDPs.

User interaction during Waiting for Instruction and Monitoring state.

No check for modified destination number.

Inclusion of the T-BCSM in the VMSC.

Procedures for subscribed and network dialled services.

#### 4.6 Description of information flows

Enhancements of information flows due to the newly supported features.

#### 4.7 Interaction with supplementary services

Not changed

### 5 USSD to/from gsmSCF

This clause contains the USSD material from the old 23.078. No technical change to the new version.

### 6 GPRS interworking

New CAMEL Phase 3 feature

### 7 Short Message Service

New CAMEL Phase 3 feature

### 8 SS Notifications

This clause contains the SS Notifications material from the old 23.078. Minor technical changes.

### 9 Mobility Management

New CAMEL Phase 3 feature

### 10 Control and interrogation of subscription data

New CAMEL Phase 3 feature.

### 11 Location Services

This clause contains the Any Time Interrogation material from the current 23.078 version.

Furthermore, it includes the new CAMEL Phase 3 feature using the GMLC.



help.doc

<----- double-click here for help and instructions on how to create a CR.

<b>CHANGE REQUEST</b>		Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.	
<b>29.078 CR 013</b>		Current Version: <b>3.2.0</b>	
GSM (AA.BB) or 3G (AA.BBB) specification number ↑		↑ CR number as allocated by MCC support team	
For submission to: <b>CN #06</b>	for approval <input checked="" type="checkbox"/>	strategic <input type="checkbox"/>	(for SMG use only)
<i>list expected approval meeting # here ↑</i>	for information <input type="checkbox"/>	non-strategic <input type="checkbox"/>	

Form: CR cover sheet, version 2 for 3GPP and SMG      The latest version of this form is available from: <ftp://ftp.3gpp.org/Information/CR-Form-v2.doc>

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**Source:**      N2      **Date:**      6.12.1999

**Subject:**      Introduction of CAMEL Phase 3

**Work item:**      CAMEL Phase 3

<b>Category:</b>	F Correction <input type="checkbox"/> A Corresponds to a correction in an earlier release <input type="checkbox"/> B Addition of feature <input checked="" type="checkbox"/> C Functional modification of feature <input type="checkbox"/> D Editorial modification <input type="checkbox"/>	<b>Release:</b>	Phase 2 <input type="checkbox"/> Release 96 <input type="checkbox"/> Release 97 <input type="checkbox"/> Release 98 <input type="checkbox"/> Release 99 <input checked="" type="checkbox"/> Release 00 <input type="checkbox"/>
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(only one category shall be marked with an X)

**Reason for change:**      Implementation of CAMEL Phase 3 Requirements into 29.078 CAMEL Stage 3 (Release 1999).  
 The proposed new version attached to this CR replaces completely the old version 3.2.0 of 29.078.

**Clauses affected:**      Detailed in the "Other comments" section below.

<b>Other specs</b>	Other 3G core specifications <input checked="" type="checkbox"/>	→ List of CRs: 23.008-010r1, 23.016-008r1, 23.018-027r3, 23.079-008, 29.002-073r1, 29.078-???
<b>affected:</b>	Other GSM core specifications <input type="checkbox"/>	→ List of CRs:
	MS test specifications <input type="checkbox"/>	→ List of CRs:
	BSS test specifications <input type="checkbox"/>	→ List of CRs:
	O&M specifications <input type="checkbox"/>	→ List of CRs:

**Other comments:**



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<----- double-click here for help and instructions on how to create a CR.

## Presentation of Specification to TSG

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**Presentation to:** TSG CN Plenary Meeting #6

**Document for presentation:** TS 23.078, Version new 3.3.0

**Presented for:** Approval

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### Abstract of document:

This Technical Specification (TS) specifies the stage 2 description for the third phase of the Customized Applications for Mobile network Enhanced Logic (CAMEL) feature which provides the mechanisms to support services of operators which are not covered by standardized GSM services even when roaming outside the HPLMN.

The following related 3G specifications are supporting CAMEL Phase 3. TS 22.078 specifies the stage 1 on CAMEL Phase 3. 23.018 specifies the stage 2 for the Basic call handling. 23.008 specifies Organization of subscriber data. 23.016 specifies Subscriber data management - Stage 2. 23.079 specifies Optimal Routeing. 29.002 specifies the MAP protocol. 29.078 specifies the CAP protocol.

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### Changes since last presentation to TSG Plenary Meeting #5:

Introduction of CAMEL Phase 3.

More details are indicated in the following:

Restructure and renumber old clauses 4 - 10 to new subclauses 4.1 - 4.7 within clause "4 Circuit switched Call Control".

Include the new clauses 5 to 11. Each single new clause has the same layout as the new clause 4.

#### 1 Scope

Enhanced to cover CAMEL Phase 3.

#### 2 Normative references

Update references to 3GPP TSs.

Enhanced as necessary

#### 3 Definitions and abbreviations

Enhanced as necessary

#### 4 Circuit switched Call Control

##### 4.2 Detection Points (DPs)

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##### 4.3 Description of CAMEL Subscriber Data

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7 Short Message Service  
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New CAMEL Phase 3 feature

10 Control and interrogation of subscription data  
New CAMEL Phase 3 feature.

11 Location Services  
This clause contains the Any Time Interrogation material from the current 23.078 version.  
Furthermore, it includes the new CAMEL Phase 3 feature using the GMLC.

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### **Outstanding Issues:**

In the following open issues are identified. It is expected that they will be solved until the next CN plenary in March 2000.

- Interactions between CAMEL CUG & GSM CUG. Use of CUG index or interlock code for subscribed services.
- Which number (CdPartyNumber or CdPartyBCD-Number) do we send in the InitialDP for Analysed Information and unsuccessful call attempts?
- Need to specify that call completion treatment indicator can be sent in the connect for the T BCSM in the GMSC, and the forwarding O-BCSM.
- Some service interactions need to be resolved, e.g. when a dialled service logic instructs the switch to release the call; how do we relay this information to subscribed service logic?
- We need to look at the way in which we model multiple instances of the gsmSSF: one for "DP2" services, one for "DP3" services.
- Interactions between CAMEL and long FTNs will need work to allow the long FTN to be carried in the InitialDP and in the Connect.
- We may need to provide for the transfer of O-CSI trigger criteria in Resume Call Handling, to allow for the use of criteria on the Route Select Failure DP in the GMSC on ORLCF.
- Inclusion of D-CSI in various information flows and modeling.

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### **Contentious Issues:**

No contentious issues are identified.

## **3rd Generation Partnership Project; Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 3; CAMEL Application Part (CAP) specification**

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The present document has been developed within the 3<sup>rd</sup> Generation Partnership Project (3GPP™) and may be further elaborated for the purposes of 3GPP. The present document has not been subject to any approval process by the 3GPP Organisational Partners and shall not be implemented. This Specification is provided for future development work within 3GPP only. The Organisational Partners accept no liability for any use of this Specification. Specifications and reports for implementation of the 3GPP™ system should be obtained via the 3GPP Organisational Partners' Publications Offices.



***European Telecommunications Standards Institute***

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Reference

DTS/TSGCN-0027xxxU

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Keywords

Digital cellular telecommunications system,  
Global System for Mobile communications (GSM)

**3GPP**

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Postal address

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3GPP support office address

650 Route des Lucioles - Sophia Antipolis  
Valbonne - FRANCE  
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

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Internet

<http://www.3gpp.org>



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## Foreword

This Technical Specification has been produced by the 3GPP.

This TS identifies the 3G system specifications for Release 1999.

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

Version 3.y.z

where:

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

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# 1 Scope

This Technical Specification specifies the CAMEL Application Part (CAP) supporting the third phase of the network feature Customized Applications for Mobile network Enhanced Logic. CAP is based on a sub-set of the ETSI Core INAP CS-2 as specified by EN 301 140-1 [14]. Descriptions and definitions provided by EN 301 140-1 [14] are directly referenced by this standard in case no additions or clarifications are needed for the use in the CAP.

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## 2 References

References may be made to:

- a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or
- b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or
- c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or
- d) publications without mention of a specific version, in which case 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.

### 2.1 Normative references

- [1] ETR 186-2:"Intelligent Network (IN); Interaction between IN Application Protocol (CAP) and Integrated Services Digital Network (ISDN) signalling protocols; Part 2: Switching signalling requirements for IN Capability Set 2 (CS2) service support in a Narrowband ISDN (N-ISDN) environment".
- [2] ETS 300 008-1:"Integrated Services Digital Network (ISDN); Signalling System No.7; Message Transfer Part (MTP) to support international interconnection; Part 1: Protocol specification [ITU-T Recommendations Q.701 (1993), Q.702 (1988), Q.703 to Q.706 (1993), modified]".
- [3] ETS 300 009-1:"Integrated Services Digital Network (ISDN); Signalling System No.7; Signalling Connection Control Part (SCCP) (connectionless and connection-oriented class 2) to support international interconnection; Part 1: Protocol specification [ITU-T Recommendations Q.711 to Q.714 and Q.716 (1993), modified]".
- [4] ETS 300 121:"Integrated Services Digital Network (ISDN); Application of the ISDN User Part (ISUP) of CCITT Signalling System No.7 for international ISDN interconnections (ISUP version 1)".
- [5] EN 300 196-1:"Integrated Services Digital Network (ISDN); Generic functional protocol for the support of supplementary services; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [6] ETS 300 287-1:"Integrated Services Digital Network (ISDN); Signalling System No.7; Transaction Capabilities (TC) version 2; Part 1: Protocol specification [ITU-T Recommendations Q.771 to Q.775 (1993), modified]".
- [7] ETS 300 348:"Intelligent Network (IN); Physical plane for intelligent network Capability Set 1 (CS1) [ITU-T Recommendation Q.1215 (1993)]".
- [8] EN 300 356-1:"Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 3 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1997), modified]".

- [9] ETS 300 374-1:"Intelligent Network (IN); Intelligent Network Capability Set 1 (CS1); Core Intelligent Network Application Protocol (CAP); Part 1: Protocol specification".
- [10] EN 300 403-1:"Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Signalling network layer for circuit-mode basic call control; Part 1: Protocol specification [ITU-T Recommendation Q.931 (1993), modified]".
- [11] EN 301 070-1:"Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 3 interactions with the Intelligent Network Application Part (CAP); Part 1: Protocol specification [ITU-T Recommendation Q.1600 (1997), modified]".
- [12] 3G TS 24.008:"Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification (3G TS 24.008)".
- [13] 3G TS 29.002:"Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification (3G TS 29.002)".
- [14] ISO 639 (1988):"Code for the representation of names of languages".
- [15] ISO 9545 (1989):"Information technology - Open Systems Interconnection –Application Layer structure".
- [16] ITU-T Recommendation Q.71:"ISDN circuit mode switched bearer services".
- [17] ITU-T Recommendation Q.700:"Introduction to CCITT Signalling System No.7".
- [18] ITU-T Recommendation Q.710:"Signalling System No.7 - Simplified MPT version of small systems".
- [19] ITU-T Recommendation Q.762:"General function of messages and signals of the ISDN user part of signalling system no.7".
- [20] ITU-T Recommendation Q.763:"Formats and codes of the ISDN user part of Signalling System No.7".
- [21] ITU-T Recommendation Q.767:"Application of the ISDN user part of CCITT Signalling System No.7 for international ISDN interconnections
- [22] ITU-T Recommendation Q.850:"Usage of cause and location in the digital subscriber signalling system no.1 and the signalling system no.7 ISDN user part".
- [23] ITU-T Recommendation Q.932:"Digital subscriber Signalling System No.1 (DSS 1) - Generic procedures for the control of ISDN supplementary services".
- [24] ITU-T Recommendation Q.1224:"Distributed functional plane for intelligent network CS2".
- [25] ITU-T Recommendation Q.1225:"Physical plane for intelligent network CS2".
- [26] ITU-T Recommendation Q.1228:"Interface ITU-T Recommendation for intelligent network CS2".
- [27] ITU-T Recommendation Q.1290:"Glossary of terms used in the definition of intelligent networks".
- [28] ITU-T Recommendation Q.1400:"Architecture framework for the development of signalling and organization, administration and maintenance protocols using OSI principles".
- [29] CCITT Recommendation X.208:"Specification of Abstract Syntax Notation One (ASN.1)".
- [30] CCITT Recommendation X.209:"Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1)".
- [31] CCITT Recommendation X.219:"Remote operations: Model, notation and service definition".
- [32] CCITT Recommendation X.229:"Remote operations: Protocol specification".
- [33] ITU-T Recommendation X.680 ASN.1:"Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation".

- [34] ITU-T Recommendation X.690: "ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)".
- [35] ITU-T Recommendation X.831: "Information technology – Open Systems Interconnection – Generic upper layers security: Security Exchange Service Element (SESE) service definition".
- [36] ITU-T Recommendation X.832: "Information technology – Open Systems Interconnection – Generic upper layers security: Security Exchange Service Element (SESE) protocol specification".
- [37] ITU-T Recommendation X.880 | ISO/IEC 9072-1: "Information technology – Remote Operations: Concepts, model and notation".
- [38] ES 201 296: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP); Signalling aspects of charging".
- [39] EN 301 140-5 "Intelligent Network (IN); Intelligent Network Application Protocol (INAP); Capability Set 2 (CS2); Part 1: Protocol Specification".

## 3 Definitions and abbreviations

### 3.1 Abbreviations

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

AC	Application Context
ACI	Access Control Information
AE	Application Entity
AEI	Application Entity Invocation
APDU	Application Protocol Data Unit
ASE	Application Service Element
ASN.1	Abstract Syntax Notation One
BCSM	Basic Call State Model
BCUSM	Basic Call Unrelated State Model
BPIM	Basic Primitive Interface Model
C-ALG	Data confidentiality algorithm
CBC	Connectionless Bearer Control
CCF	Call Control Function
CS	Call Segment
CS1	Capability Set 1
CS2	Capability Set 2
CSI	CAMEL Subscription Information
DP	Detection Point
DSS1	Digital Subscriber Signalling System No. One
EDP	Event Detection Point
EDP-N	Event Detection Point - Notification
EDP-R	Event Detection Point - Request
FE	Functional Entity
FEAM	Functional Entity Access Manager
ffs	for further study
FSM	Finite State Model
GprsSSF	GPRS SSF
gsmSCF	GSM SCF
gsmSSF	GSM SSF
gsmSRF	GSM SRF
GT	Global Title
GULS	Generic Upper Layers Security
I-ALG	data Integrity ALGORITHM
ID	IDentifier
IE	Information Element

IN	Intelligent Network
CAP	Intelligent Network Application Protocol
IP	Intelligent Peripheral
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
K-ALG	Key management ALGORITHM
LE	Local Exchange
MAC	Message Authentication Code
MACF	Multiple Association Control Function
MSC	Mobile services Switching Centre
MTP	Message Transfer Part
NA	North American
O-ALG	One-way function ALGORITHM
O-BCSM	Originating BCSM
PCO	Point of Control and Observation
PDU	Protocol Data Unit
PE	Physical Entity
PIA	Point In Association
PIC	Point In Call
PLMN	Public Land Mobile Network
PSTN	Public Switched Telecommunication Network
QOP	Quality of Protection
RCO	Resource Control Object
ROS	Remote Operations Service
ROSE	ROS Element
RRB	Request Report BCSM Event
SACF	Single Association Control Function
SAO	Single Association Object
SCCP	Signalling Connection Control Part
gsmSCF	Service Control Function
SCP	Service Control Point
SDL	System Description Language
SESE	Security Exchange Service Element
SL	Service Logic
SLP	Service Logic Program
SLPI	Service Logic Program Instance
SMSC	Short Message Service Centre
SMF	Service Management Function
SPKM	Simple Public Key GSS-API Mechanism
gsmSRF	Specialized Resource Function
SRME	gsmSRF Management Entity
SRSM	gsmSRF Call State Model
SS7	Signalling System no. 7
gsmSSF	Service Switching Function
SSME	gsmSSF Management Entity
SSN	Sub-System Number
SSP	Service Switching Point
STUI	Service To User Information
T-BCSM	Terminating BCSM
tbd	to be determined
TC	Transaction Capabilities
TCAP	Transaction Capabilities Application Part
TDP	Trigger Detection Point
TDP-R	Trigger Detection Point - Request

---

## 4 Interface specification for telecommunication services

### 4.1 General

#### 4.1.1 Definition methodology

The definition of the protocol can be split into three sections:

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

The SACF/MACF rules are defined in prose. The operation definitions are in Abstract Syntax Notation One (ASN.1), see CCITT Recommendations X.208 [**Error! Bookmark not defined.**, ITU-T Recommendation X.680 [**Error! Bookmark not defined.**), 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 the description of the relevant information flow in ITU-T Recommendation Q.1224 [**Error! Bookmark not defined.**

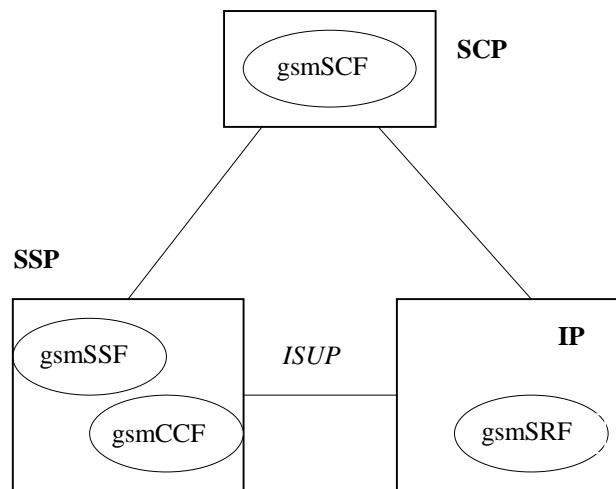
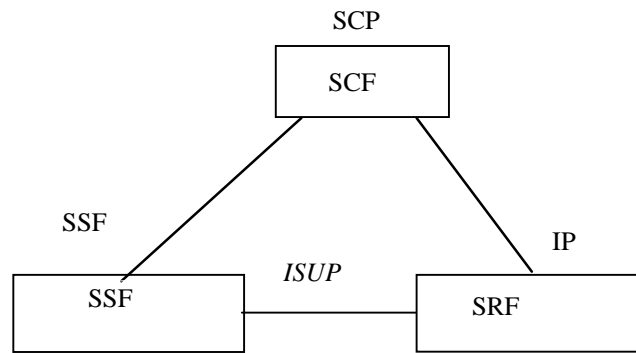
The CAMEL Application Protocol (CAP) is a ROS Element (ROSE) user protocol (see CCITT Recommendation X.219 [**Error! Bookmark not defined.** and CCITT Recommendation X.229 ). The ROSE protocol is contained within the component sublayer of Transaction Capabilities Application Part (TCAP) (see ETS 300 287-1 ) and Digital Subscriber Signalling System No One (DSS1) (ITU-T Recommendation Q.932 ). At present the ROSE Application Protocol Data Units (APDUs) are conveyed in transaction sublayer messages in Signalling System no. 7 (SS7) and in the EN 300 403-1 REGISTER, FACILITY and call control messages in DSS1. Other supporting protocols may be added at a later date.

The CAP (as a ROSE user) and the ROSE protocol have been specified using ASN.1 (see ITU-T Recommendation X.680 ). The encoding of the resulting Protocol Data Units (PDUs) should use the Basic Encoding Rules (see ITU-T Recommendation X.690 ).

#### 4.1.2 Example physical scenarios

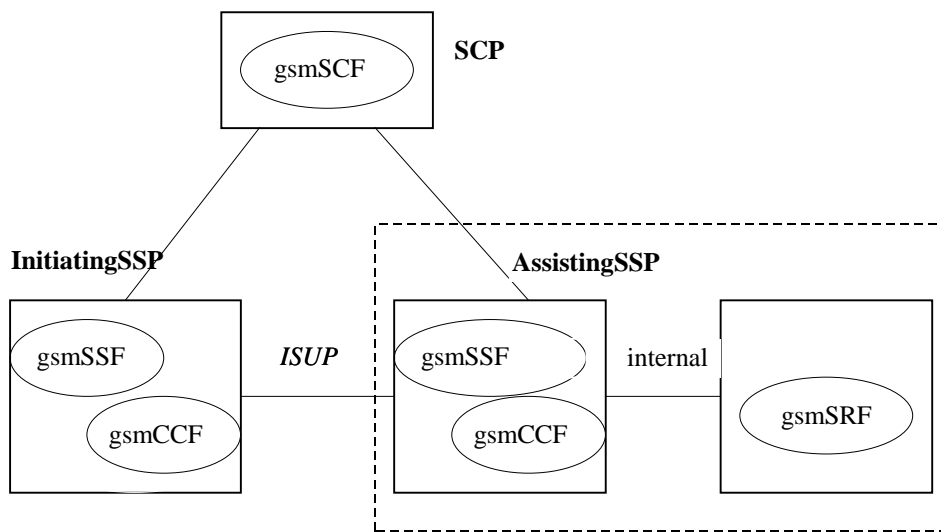
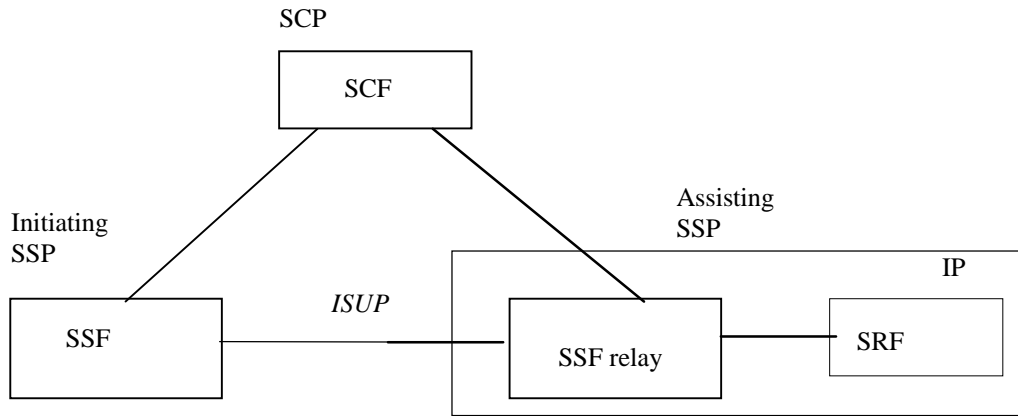
The reader is referred to Intelligent Network Capability Set 1 (CS1) Core INAP [14] for details of the example physical scenarios.



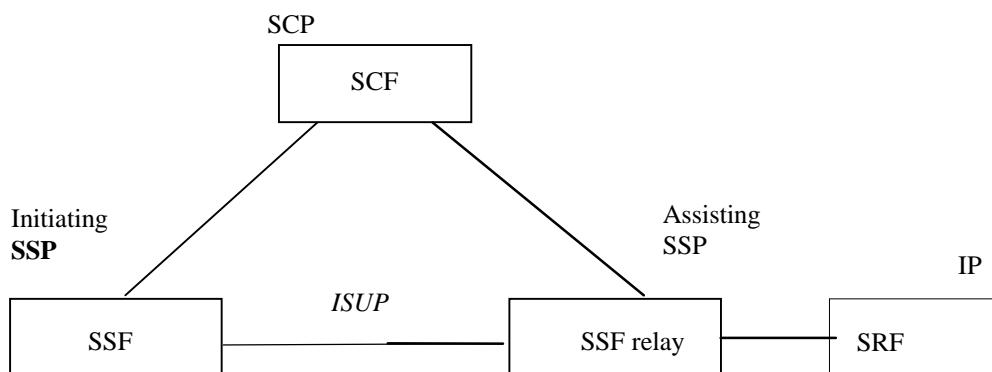


Scenario 1, Direct Path To IP ( Ref. CS1 cases b) & d))

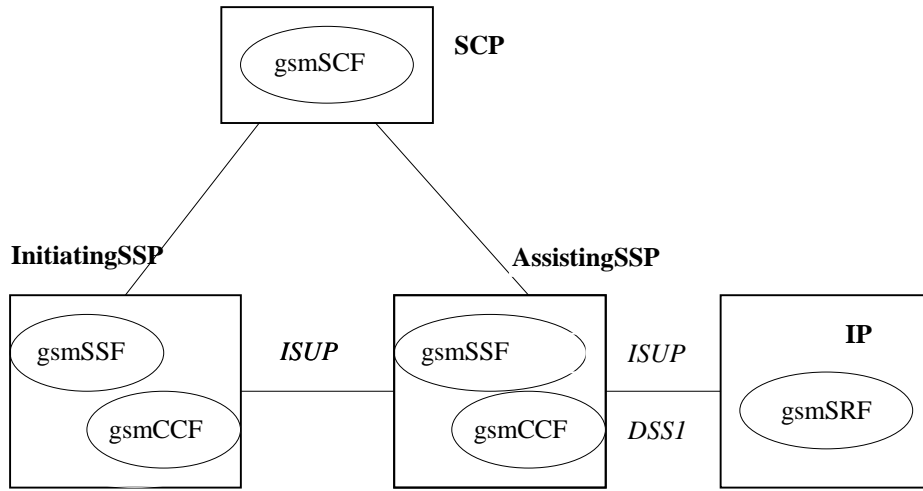
**Figure 1 (continued): Scenarios**



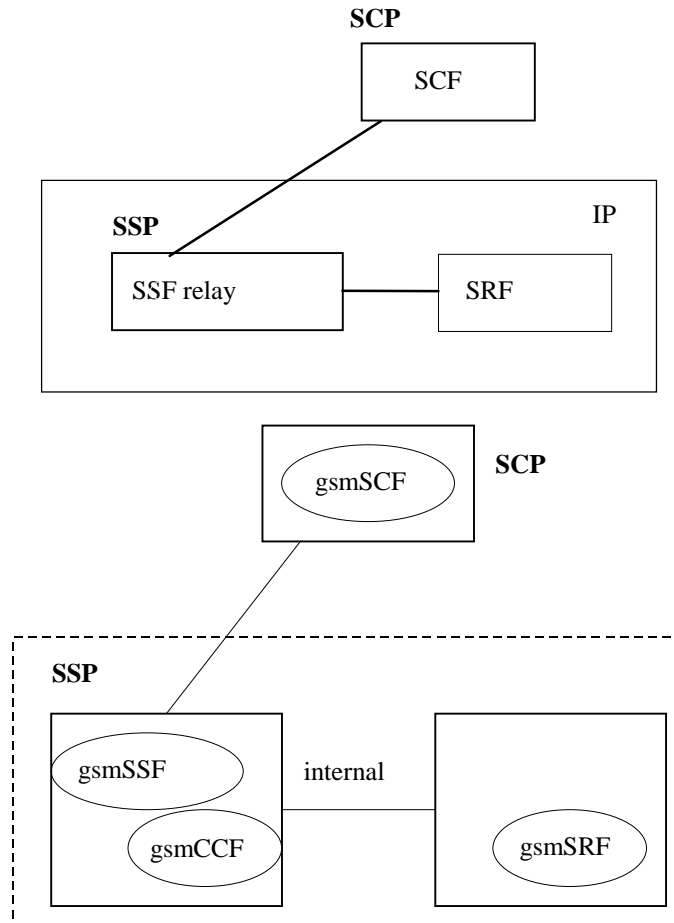
Scenario 2a. Connection to IP via an Assisting SSF with relay function; IP co-located with Assisting gsmSSF (Ref. CS1 case c)



**Figure 1 (continued): Scenarios**

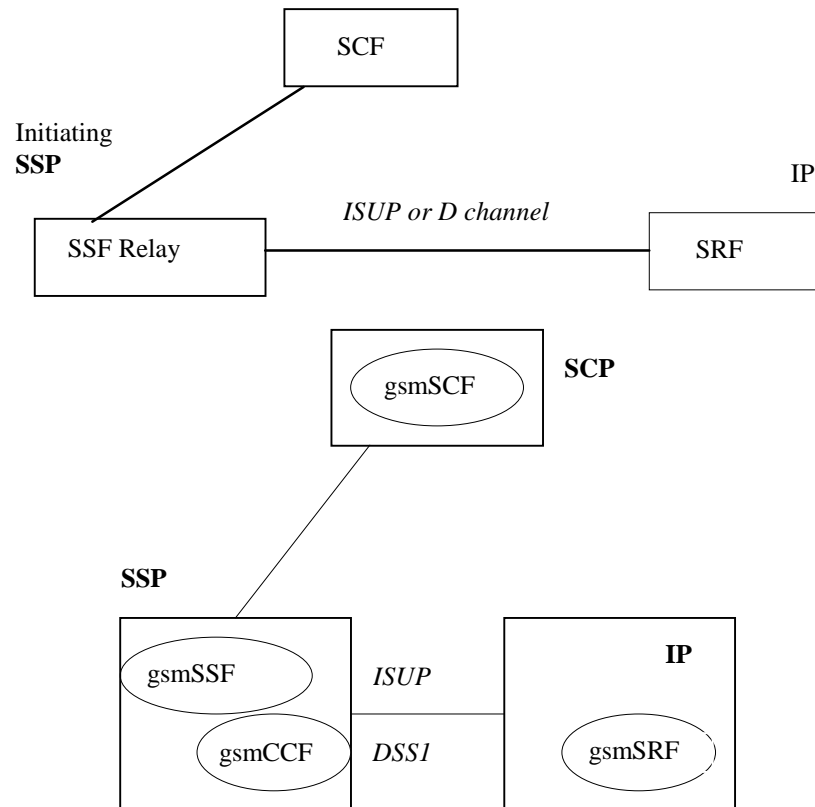


Scenario 2b: Connection to IP via an Assisting SSF with relay function; IP not co-located with Assisting gsmSSF (Ref CS1 case c))

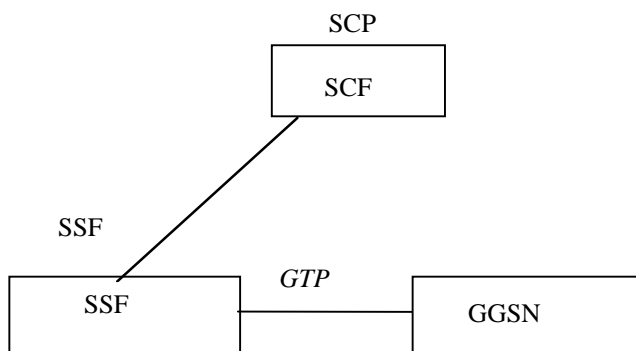


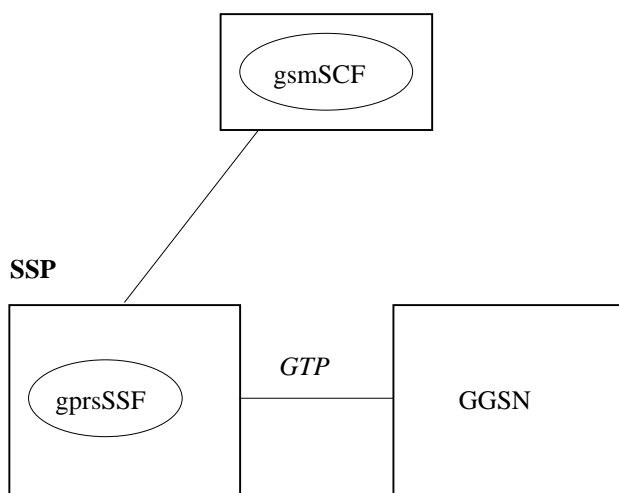
Scenario 3, Connection to IP with relay function; IP co-located with gsmSSF ( Ref CS1 case a))

**Figure 1 (continued): Scenarios**



Scenario 4. Connection to IP with relay function; IP not co-located with gsmSSF (Ref CS1 case a))





Scenario 5, GPRS interworking. No connection to IP

### Figure 1 (concluded): Scenarios

The following table summarises the scenarios and corresponding interface connections that shall be supported by the CAP protocol. The following terms used in the table are defined as follows:

- Basic:** Fully defined in CAP and may be used between any two network operators supporting CAP
- Bilateral:** Additional clarifications of CAP capabilities between network operators and/or equipment vendors are necessary in order for CAP to be used between any two network operators supporting CAP.
- Direct:** This refers to the case where CAP operations are exchanged between the gsmSRF and the gsmSCF via a transaction-level relationship established directly between the gsmSRF and the gsmSCF.
- Relay:** This refers to the case where CAP operations are exchanged between the gsmSRF and the gsmSCF via two transaction-layer relationships. These relationships are:
- gsmSCF to/from gsmSSF,
  - gsmSSF to/from gsmSRF.

The gsmSSF sends operations it receives from the gsmSCF to the gsmSRF, and operations it receives from the gsmSRF to the gsmSCF. This is done without unpacking (and thus processing) of the relayed operations.

The gsmSSF function referred to in the table is always located in an MSC or GMSC.

The gprsSSF function is always located in a SGSN node.

## 4.1.2 CAP protocol architecture

Many of the terms used in this clause are based on the OSI application layer structure as defined in ISO 9545 .

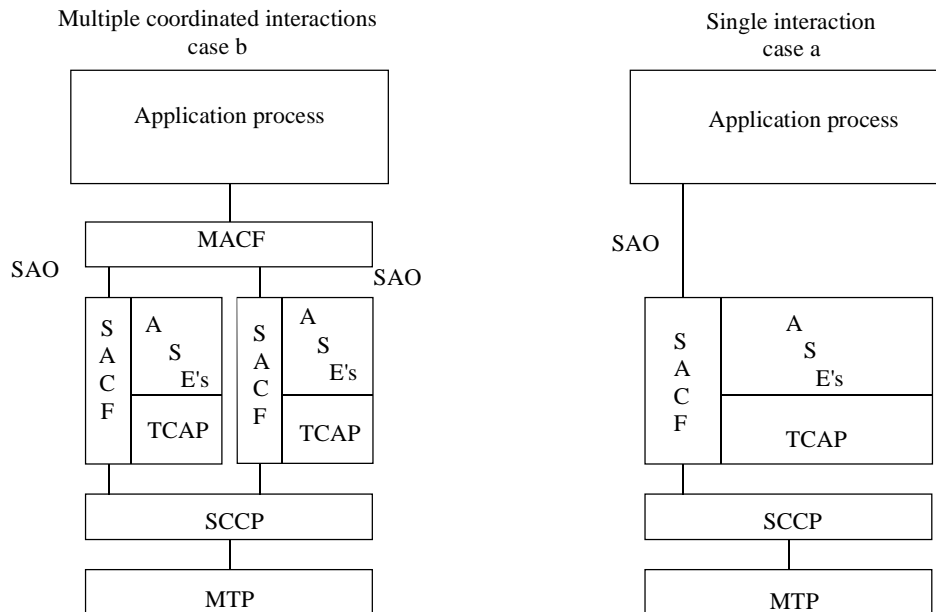
The CAP protocol architecture is illustrated in figure 4-9.

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

In case a, SACF provides a co-ordination function in using ASE's, 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 ASE's to be used over a single interaction between a pair of PE's.

In case b, MACF provides a co-ordinating function among several SAO's, 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 ITU-T Recommendation Q.1224 and clause 12-18 of the present document). Each operation is specified using the OPERATION macro described in figure 4-10.



Note: CAP is the collection of all specifications in ASEs

**Figure 4-9: CAP protocol architecture**

The use of the Application Context (AC) negotiation mechanism as defined in X.208 **[Error! Bookmark not defined.]** 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 Intelligent Network (IN) 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 needs to be supported.

### 4.1.3 CAP addressing

CAMEL Applications Part (CAP) makes use of the services offered by the Signalling Connection Control Part (SCCP).

The following SCCP revisions are supported by CAP Version 3:

- Signalling Connection Control Part , Signalling System no. 7 CCITT ('Blue Book SCCP')
- Signalling Connection Control Part , Signalling System no. 7 ITU-T Recommendation Q.711 to Q.716 ('White Book SCCP')

When CAP uses White Book SCCP to send a message, and SCCP segments the message into one or more XUDT messages, then the transmission of this message may fail.

Failure will occur when the destination SCCP, or any intermediate SCCP, does not support White Book SCCP.

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 3G TS 23.003.

## 4.1.4 Compatibility mechanisms used for CAP

### 4.1.4.1 Introduction

This subclause specifies the compatibility mechanisms that shall be used to ensure consistent future versions of CAP.

There are three categories of compatibility:

- Minor changes to CAP in future standardized versions:  
A minor change can be defined as a change of a functionality which is not essential for the requested IN service. Where 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 CAP in future standardized versions:  
A major change can be defined as a change of a functionality which is essential for the requested IN service. Where 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 IN 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 ITU-T Recommendations.

### 4.1.4.2 Definition of CAP compatibility mechanisms

### 4.1.4.3 Compatibility mechanism for interworking of CAP with ETSI CS2 Core INAP and ITU-T Q.1228 INAP

On receipt of an operation according to ITU-T Recommendation Q.1218 [7] or an operation according to 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 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 ETS 300 374-1 [14] are specified from 50 to 59.

### 4.1.4.4 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].

### 4.1.4.5 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]).

#### 4.1.4.6 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.

## 4.2 SACF/MACF rules

### 4.2.1 Reflection of TCAP 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 the ITU-T Recommendations Q.77 X-Series (*Transaction capabilities application part*) for a more detailed description of the TCAP AC negotiation mechanism.

### 4.2.2 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 one of the operations identified above is not to be executed until some other operation has progressed to some extent or finished, the sending PE (usually SCP) shall control this by sending the operations in two separate messages.

This method does not imply that all operations sent in the same message have to 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 3, the FE-specific rules take precedence over the generic rules.

## 5 Common CAP Types

### 5.1 Data types

-- The **Definition of Common Data Types** follows

```
CAP-datatypes {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(3)
CAP-datatypes (50) version3(0)}
```

```
DEFINITIONS IMPLICIT TAGS ::=
BEGIN
IMPORTS
    tc-Messages, classes FROM CAP-object-identifiers
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) module(0) CAP-
object-identifiers(17) version3(0)}
    InvokeIdType
FROM TCAPMessages tc-Messages
    EXTENSION,
    PARAMETERS-BOUND,
    SupportedExtensions {}
FROM CAP-classes classes
```



```

AccessPointName {PARAMETERS-BOUND: bound} ::= OCTET STRING (SIZE(
    bound.&minAccessPointNameLength ..
    bound.&maxAccessPointNameLength))

-- Indicates the AccessPointName, refer to 3G TS 24.008 for the encoding.

AChBillingChargingCharacteristics {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE
(bound.&minAChBillingChargingLength..bound.&maxAChBillingChargingLength))
(CONSTRAINED BY {-- shall be the result of the BER-encoded value of the type CAMEL-
AChBillingChargingCharacteristics --})

-- The AChBillingChargingCharacteristics parameter specifies the charging related information
-- to be provided by the gsmSSF and the conditions on which this information has to be reported
-- back to the gsmSCF with the ApplyChargingReport operation. The value of the
-- AchBillingChargingCharacteristics of type OCTET STRING carries a value of the ASN.1 data type :
-- CAMEL-AchBillingChargingCharacteristics. The normal encoding rules are used to encode this
-- value.
-- The violation of the UserDefinedConstraint shall be handled as an ASN.1 syntax error.

AdditionalCallingPartyNumber {PARAMETERS-BOUND : bound} ::= Digits {bound}
-- Indicates the Additional Calling Party Number.
AlertingPattern ::= OCTET STRING (SIZE(3))
-- Indicates a specific pattern that is used to alert a subscriber
■ (e.g. distinctive ringing, tones, etc.).
■ -- The encoding of the last octet of this parameter is as defined in 3G TS 29.002 [Reference
15].
-- Only the trailing OCTET is used, the remaining OCTETS shall be sent as NULL (zero)
-- The receiving side shall ignore the leading two OCTETS.

AOCBeforeAnswer ::= SEQUENCE {
    aOCInitial [0] CAI-GSM0224,
    aOCSubsequent [1] AOCSubsequent OPTIONAL
}

AOCGPRS ::= SEQUENCE {
    aOCInitial [0] CAI-GSM0224,
    aOCSubsequent [1] AOCSubsequent OPTIONAL
}

AOCSubsequent ::= SEQUENCE {
    cAI-GSM0224 [0] CAI-GSM0224 ,
    tariffSwitchInterval [1] INTEGER (1..86400) OPTIONAL
}

-- tariffSwitchInterval is measured in 1 second units

AppendFreeFormatData ::= ENUMERATED {
    overwrite (0),
    append (1)
}

ApplicationTimer ::= INTEGER (0..2047)
-- Used by the gsmSCF to set a timer in the gsmSSF. The timer is in seconds.

AssistingSSPIPRoutingAddress {PARAMETERS-BOUND : bound} ::= Digits {bound}
-- Indicates the destination address of the gsmSRF for the assist procedure.

BackwardServiceInteractionInd ::= SEQUENCE {
    conferenceTreatmentIndicator [1] OCTET STRING (SIZE(1)) OPTIONAL,
    -- acceptConferenceRequest 'xxxx xx01'B
    -- rejectConferenceRequest 'xxxx xx10'B
    -- network default is accept conference request,
    callCompletionTreatmentIndicator [2] OCTET STRING (SIZE(1)) OPTIONAL,
    -- acceptCallCompletionServiceRequest 'xxxx xx01'B,
    -- rejectCallCompletionServiceRequest 'xxxx xx10'B
    -- network default is accept call completion service request
    ...
}

BCSMEvent {PARAMETERS-BOUND : bound} ::= SEQUENCE {
    eventTypeBCSM [0] EventTypeBCSM,
    monitorMode [1] MonitorMode,
    legID [2] LegID OPTIONAL,
    dpSpecificCriteria [30] DpSpecificCriteria {bound} OPTIONAL
}
-- Indicates the BCSM Event information for monitoring.

BearerCapability {PARAMETERS-BOUND : bound} ::= CHOICE {
    bearerCap [0] OCTET STRING (SIZE(2..bound.&maxBearerCapabilityLength))

```

```

}
-- Indicates the type of bearer capability connection to the user. For bearerCap, the ISUP User
Service Information (ETS 300 356-1)
-- encoding shall be used.

CAI-GSM0224 ::= SEQUENCE {
    e1 [0] INTEGER (0..8191) OPTIONAL,
    e2 [1] INTEGER (0..8191) OPTIONAL,
    e3 [2] INTEGER (0..8191) OPTIONAL,
    e4 [3] INTEGER (0..8191) OPTIONAL,
    e5 [4] INTEGER (0..8191) OPTIONAL,
    e6 [5] INTEGER (0..8191) OPTIONAL,
    e7 [6] INTEGER (0..8191) OPTIONAL
}

-- Indicates Charge Advice Information to the Mobile Station. For information regarding
-- parameter usage, refer to 3G TS 22.040 [26].

CalledPartyBCDNumber {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE(
    bound.&minCalledPartyBCDNumberLength ..
    bound.&maxCalledPartyBCDNumberLength))
-- Indicates the Called Party Number, including service selection information. Refer to 3G
TS 24.008
-- for encoding. This data type carries only the "type of number", "numbering plan
-- identification" and "number digit" fields defined in 3G TS 24.008;
-- it does not carry the "called party
-- BCD number IEI" or "length of called party BCD number contents".

CalledPartyNumber {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE
    (bound.&minCalledPartyNumberLength ..
    bound.&maxCalledPartyNumberLength))
-- Indicates the Called Party Number. Refer to ETS 300 356-1 [4] for encoding.

CallingPartyNumber {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE (
    bound.&minCallingPartyNumberLength..
    bound.&maxCallingPartyNumberLength))
-- Indicates the Calling Party Number. Refer to ETS 300 356-1 [4] for encoding.

CallResult {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE (bound.&minCallResultLength ..
    bound.&maxCallResultLength)) (CONSTRAINED BY {-- shall be the result of the BER-encoded
value of type CAMEL-CallResult --})

-- The violation of the UserDefinedConstraint shall be handled as an ASN.1 syntax error.

-- This parameter provides the gsmSCF with the charging related information previously requested
-- using the ApplyCharging operation. This shall include the partyToCharge parameter as
-- received in the related ApplyCharging operation to correlate the result to the request

CAMEL-AChBillingChargingCharacteristics ::= CHOICE {
    timeDurationCharging [0] SEQUENCE {
        maxCallPeriodDuration [0] INTEGER (1..864000),
        releaseIfdurationExceeded [1] ReleaseIfDurationExceeded BOOLEAN DEFAULT
FALSE,
        tariffSwitchInterval [2] INTEGER (1..86400) OPTIONAL,
        tone [3] BOOLEAN DEFAULT FALSE,
        extensions [4] SEQUENCE SIZE(1..numOfExtensions) OF
ExtensionField OPTIONAL
    }
    ....
}
-- tariffSwitchInterval is measured in 1 second units.
-- maxCallPeriodDuration is measured in 100 millisecond units

CAMEL-CallResult ::= CHOICE {
    timeDurationChargingResult [0] SEQUENCE {
        partyToCharge [0] ReceivingSideID,
        timeInformation [1] TimeInformation,
        callActive [2] BOOLEAN DEFAULT TRUE,
        callReleasedAtTcpExpiry [3] NULL OPTIONAL,
        extensions [3] SEQUENCE SIZE(1..numOfExtensions) OF
ExtensionField OPTIONAL
    }
}

CAMEL-FCIBillingChargingCharacteristics {PARAMETERS-BOUND : bound} ::= CHOICE{
    fCIBCCAMELsequence1 [0] SEQUENCE {
        freeFormatData [0] OCTET STRING (SIZE
(bound.&minFCIBillingChargingDataLength..
    bound.&maxFCIBillingChargingDataLength)),
        appendFreeFormatData [1] AppendFreeFormatData DEFAULT overwrite
partyToCharge [2] SendingSideID
    }
}

```

```

                                DEFAULT sendingSideID : leg1
        }
    }

CAMEL-FCIGPRSBillingChargingCharacteristics {PARAMETERS-BOUND : bound} ::= CHOICE{
    fCIBCCAMELsequence1          [0] SEQUENCE {
        freeFormatData           [0] OCTET STRING (SIZE
(bound.&minFCIBillingChargingDataLength..
    bound.&maxFCIBillingChargingDataLength)),
        appendFreeFormatData     [1] AppendFreeFormatData DEFAULT override,
        pDPID                    [2] PDPID OPTIONAL
    }
}

CAMEL-FCISMSBillingChargingCharacteristics ::= CHOICE{
    fCIBCCAMELsequence1          [0] SEQUENCE {
        freeFormatData           [0] OCTET STRING (SIZE (minFCIBillingChargingDataLength..
                                                                maxFCIBillingChargingDataLength)),
        appendFreeFormatData     [1] AppendFreeFormatData DEFAULT overwrite
    }
}

CAMEL-SCIBillingChargingCharacteristics ::= CHOICE {
    aOCBeforeAnswer              [0] AOCBeforeAnswer,
    aOCAfterAnswer               [1] AOCSubsequent
}

CAMEL-SCIGPRSBillingChargingCharacteristics ::= SEQUENCE {
    aOCGPRS                      [0] AOCGPRS,
    pDPID                        [1] PDPID          OPTIONAL
}

Cause {PARAMETERS-BOUND : bound}          ::= OCTET STRING (SIZE (bound.&minCauseLength..
    bound.&maxCauseLength))
-- Indicates the cause for interface related information.
-- Refer to ETS 300 356-1 [4] Cause parameter for encoding.
-- For the use of cause and location values refer to ITU-T Recommendation Q.850
-- Shall only include the cause value.

ChargingCharacteristics                ::= CHOICE {
    maxTransferredVolume            [0] INTEGER (0..4294967295)
    maxElapsedTime                  [1] INTEGER (0..864000)
}

-- maxTransferredVolume is measured in number of bytes
-- maxElapsedTime is measured in 100 milliseconds

ChargingResult                          ::= CHOICE {
    transferredVolume               [0] TransferredVolume,
    elapsedTime                      [1] ElapsedTime
}

CliPresentationIndicator                ::= OCTET STRING (SIZE (1))
-- Indicates the Presentation Indicator to be used in the Calling Party Number.
-- Bits 8, 7, 6, 5, 2 and 1 are spare, encoded as 1 by the sender and ignored by the receiver.
-- Bits 4 and 3 encode the Address presentation restricted indicator in the Calling Party Number
-- as shown in ITU-T Recommendation Q.763

CollectedDigits                        ::= SEQUENCE {
    minimumNbOfDigits               [0] INTEGER (1..16) DEFAULT 1,
    maximumNbOfDigits               [1] INTEGER (1..16),
    endOfReplyDigit                 [2] OCTET STRING (SIZE (1..2)) OPTIONAL,
    cancelDigit                     [3] OCTET STRING (SIZE (1..2)) OPTIONAL,
    startDigit                       [4] OCTET STRING (SIZE (1..2)) OPTIONAL,
    firstDigitTimeOut               [5] INTEGER (1..127)          OPTIONAL,
    interDigitTimeOut               [6] INTEGER (1..127)          OPTIONAL,
    errorTreatment                   [7] ErrorTreatment           DEFAULT stdErrorAndInfo,
    interruptableAnnInd              [8] BOOLEAN                  DEFAULT TRUE,
    voiceInformation                 [9] BOOLEAN                  DEFAULT FALSE,
    voiceBack                        [10] BOOLEAN                 DEFAULT FALSE
}
-- The use of voiceBack and the support of voice recognition via voiceInformation is network
operator specific.
-- The endOfReplyDigit, cancelDigit, and startDigit parameters have been designated as OCTET STRING,
-- and are to be encoded as BCD, one digit per octet only, contained
-- in the four least significant bits of each OCTET. The usage is service dependent.

CollectedInfo                          ::= CHOICE {
    collectedDigits                  [0] CollectedDigits
}

```

```

}

CorrelationID {PARAMETERS-BOUND : bound} ::= Digits {bound}
-- used by gsmSCF for correlation with a previous operation.
-- Refer to clause xx for a description of the procedures associated with this parameter.

DateAndTime ::= OCTET STRING (SIZE(7))
-- DateAndTime is BCD encoded. The year digit indicating millenium occupies bits 0-3 of
-- the first octet, and the year digit indicating century occupies bits 4-7 of the first octet.
-- The year digit indicating decade occupies bits 0-3 of the second octet, whilst the digit
-- indicating the year within the decade occupies bits 4-7 of the second octet.
-- The most significant month digit occupies bits 0-3 of the third octet, and the least
-- significant month digit occupies bits 4-7 of the third octet.
-- The most significant day digit occupies bits 0-3 of the fourth octet, and the least significant
-- day digit occupies bits 4-7 of the fourth octet.
-- The most significant hours digit occupies bits 0-3 of the fifth octet, and the least significant
-- digit occupies bits 4-7 of the fifth octet.
-- The most significant minutes digit occupies bits 0-3 of the sixth octet, and the least
-- significant digit occupies bits 4-7 of the sixth octet.
-- The most significant seconds digit occupies bits 0-3 of the seventh octet, and the least seconds
-- significant digit occupies bits 4-7 of the seventh octet.
-- For the encoding of digits in an octet, refer to the timeAndtimezone parameter.

DestinationRoutingAddress {PARAMETERS-BOUND : bound} ::= SEQUENCE SIZE(1) OF
                                                                 CalledPartyNumber {bound}
-- Indicates the Called Party Number.

Digits {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE
                                                                 bound.&minDigitsLength..bound.&maxDigitsLength)
-- Indicates the address signalling digits.
-- Refer to ETS 300 356-1 [4] Generic Number & Generic Digits parameters for encoding.
-- The coding of the subfields 'NumberQualifier' in Generic Number and 'TypeOfDigits' 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,
-- therefore the value is network operator specific.
-- The following parameters should use Generic Number:
-- AdditionalCallingPartyNumber for InitialDP
-- AssistingSSIPRoutingAddress for EstablishTemporaryConnection
-- CorrelationID for AssistRequestInstructions
--
-- The following parameters should use Generic Digits:
-- CorrelationID in EstablishTemporaryConnection
-- number in VariablePart
-- digitsResponse in ReceivedInformationArg
-- Note that when CorrelationID is transported in Generic Digits, then the digits shall
-- always be BCD encoded.

DpSpecificCriteria {PARAMETERS-BOUND : bound} ::= CHOICE {
  applicationTimer [1] ApplicationTimer
}

-- The gsmSCF may set a timer in the gsmSSF for the No Answer event. If the user does not answer the
-- call
-- within the allotted time, the gsmSSF reports the event to the gsmSCF

ElapsedTime ::= CHOICE {
  timeGPRSIfNoTariffSwitch ::= INTEGER (0..86400),
  timeGPRSIfTariffSwitch ::= SEQUENCE {
    timeGPRSSinceLastTariffSwitch ::= INTEGER (0..864000),
    timeGPRSTariffSwitchInterval ::= INTEGER (0..864000)
  }
}

-- timeGPRSSinceLastTariffSwitch and timeGPRSTariffSwitchInterval are measured in seconds

ErrorTreatment ::= ENUMERATED {
  stdErrorAndInfo (0),
  help (1),
  repeatPrompt (2)
}

-- stdErrorAndInfomeans returning the "ImproperCallerResponse" error in the event of an error
-- condition during collection of user info.

EventSpecificInformationBCSM {PARAMETERS-BOUND : bound} ::= CHOICE {
  routeSelectFailureSpecificInfo [2] SEQUENCE {
    failureCause [0] Cause {bound} OPTIONAL,
    ...
  },
  oCalledPartyBusySpecificInfo [3] SEQUENCE {
    busyCause [0] Cause {bound} OPTIONAL,
    ...
  },
}

```

```

    oNoAnswerSpecificInfo          [4] SEQUENCE {
-- no specific info defined --
        ...
    },
    oAnswerSpecificInfo            [5] SEQUENCE {
-- no specific info defined--
        ...
    },
    oDisconnectSpecificInfo [7] SEQUENCE {
        releaseCause              [0] Cause {bound}          OPTIONAL,
        ...
    },
    tBusySpecificInfo [8] SEQUENCE {
        busyCause                  [0] Cause {bound}          OPTIONAL,
        callForwarded              [50] NULL                  OPTIONAL,
        ...
    },
    tNoAnswerSpecificInfo [9] SEQUENCE {
        callForwarded              [50] NULL                  OPTIONAL,
        ...
    },
    tAnswerSpecificInfo [10] SEQUENCE {
-- no specific info defined --
        ...
    },
    tDisconnectSpecificInfo [12] SEQUENCE {
        releaseCause              [0] Cause {bound}          OPTIONAL,
        ...
    },
}

-- Indicates the call related information specific to the event.
EventSpecificInformationSMS ::= CHOICE {
    o-smsFailureSpecificInfo      [0] SEQUENCE {
        failureCause              [0] SMSCause                OPTIONAL,
        ...
    },
    o-smsSubmittedSpecificInfo    [1] SEQUENCE {
-- no specific info defined--
        ...
    }
}

EventTypesBCSM ::= ENUMERATED {
    collectedInfo                (2),
    analyzedInformation           (3),
    routeSelectFailure           (4),
    oCalledPartyBusy             (5),
    oNoAnswer                    (6),
    oAnswer                      (7),
    oDisconnect                  (9),
    oAbandon                     (10),
    termAttemptAuthorized        (12),
    tBusy                        (13),
    tNoAnswer                    (14),
    tAnswer                      (15),
    tDisconnect                  (17),
    tAbandon                     (18)
}

-- Indicates the BCSM detection point event.
-- Values collectedInfo,analyzedInformation and termAttemptAuthorized can only be used for TDPs
EventTypesSMS ::= ENUMERATED {
    sms-CollectedInfo           (1),
    o-smsFailure                 (2),
    o-smsSubmitted               (3)
}

-- Value sms-CollectedInfo can only be used for TDPs.
ExtensionField {PARAMETERS-BOUND : bound} ::= SEQUENCE {
    type      EXTENSION.&id ({SupportedExtensions {bound}}),
-- shall identify the value of an EXTENSION type
    criticality CriticalityType DEFAULT ignore,
    value     [1] EXTENSION.&ExtensionType
        ({SupportedExtensions {bound}}{@type}),
    ...
}
--This parameter indicates an extension of an argument data type.
-- Its content is network operator specific

```

```

FCIBillingChargingCharacteristics {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE
(bound.&minFCIBillingChargingLength..
    bound.&maxFCIBillingChargingLength)) (CONSTRAINED BY {-- shall
be the result of the BER-encoded value of type CAMEL-FCIBillingChargingCharacteristics --})
}

-- This parameter indicates the billing and/or charging characteristics.
-- The violation of the UserDefinedConstraint shall be handled as an ASN.1 syntax error.

FCIGPRSBillingChargingCharacteristics {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE
(bound.&minFCIBillingChargingLength..
    bound.&maxFCIBillingChargingLength)) (CONSTRAINED BY {-- shall
be the result of the BER-encoded value of type CAMEL-FCIGPRSBillingChargingCharacteristics --})
}

-- This parameter indicates the billing and/or charging characteristics.
-- The violation of the UserDefinedConstraint shall be handled as an ASN.1 syntax error.

FCISMSBillingChargingCharacteristics {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE
(bound.&minFCIBillingChargingLengthPlusTwo
    bound.&maxFCIBillingChargingLengthPlusTwo))
(CONSTRAINED BY {-- shall be the result of the BER-encoded
value of type CAMEL-FCISMSBillingChargingCharacteristics --})
-- The violation of the UserDefinedConstraint shall be handled as an ASN.1 syntax error.

ForwardServiceInteractionInd ::= SEQUENCE {
    conferenceTreatmentIndicator [1] OCTET STRING (SIZE(1)) OPTIONAL,
    -- acceptConferenceRequest 'xxxx xx01'B
    -- rejectConferenceRequest 'xxxx xx10'B
    -- network default is accept conference request
    callDiversionTreatmentIndicator [2] OCTET STRING (SIZE(1)) OPTIONAL,
    -- callDiversionAllowed 'xxxx xx01'B
    -- callDiversionNotAllowed 'xxxx xx10'B
    -- network default is Call Diversion allowed
    callCompletionTreatmentIndicator [53] OCTET STRING (SIZE(1)) OPTIONAL,
    -- acceptCallCompletionServiceRequest 'xxxx xx01'B,
    -- rejectCallCompletionServiceRequest 'xxxx xx10'B
    -- network default is accept call completion service request
    ...
}

GenericNumber {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE(
    bound.&minGenericNumberLength..
    bound.&maxGenericNumberLength))
-- Indicates a generic number. Refer to ETS 300 356-1 [4] Generic number for encoding.

GenericNumbers {PARAMETERS-BOUND : bound} ::= SET SIZE(1..bound.&numOfGenericNumbers) OF
GenericNumber {bound}

GPRSCause {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE (bound.&minCauseLength..
    bound.&maxCauseLength))
-- Indicates the cause for interface related information.
-- Refer to 3G TS 29.060 Cause parameter for encoding.
-- For the use of cause and location values refer to ITU-T Recommendation Q.850
-- Shall only include the cause value.

GPRSChargingID ::= INTEGER (0..4294967295)
-- The Charging ID is a counter which value is allocated by the GGSN during PDP context
-- establishment.

GPRSEvent ::= SEQUENCE {
    gPRSEventType [0] GPRSEventType,
    monitorMode [1] MonitorMode
}

-- Indicates the GPRS event information for monitoring.

GPRSEventSpecificInformation {PARAMETERS-BOUND : bound} ::= CHOICE {
    attachChangeOfPositionSpecificInformation [0] SEQUENCE {
        newRoutingAreaIdentity [0] RAIdentity
    },
    pdp-ContextchangeOfPositionSpecificInformation [0] SEQUENCE {
        newRoutingAreaIdentity [0] RAIdentity,
        chargingID [1] GPRSChargingID
    },
    detachSpecificInformation [1] SEQUENCE {
        initiatingEntity [0] InitiatingEntity
    },
    disconnectSpecificInformation [2] SEQUENCE {
        initiatingEntity [0] InitiatingEntity
    },
    pDPContextEstablishmentSpecificInformation [3] SEQUENCE {

```

```

        accessPointName                [0] AccessPointName {bound}
    },
    pdpContextEstablishmentAcknowledgementSpecificInformation [4] SEQUENCE {
        chargingID                      [0] GPRSChargingID
    }
}

```

-- For the encoding of NewRoutingAreaIdentity refer to 3G TS 29.060

```

GPRSEventType ::= ENUMERATED {
    attach                (1),
    attachChangeOfPosition (2),
    detached              (3),
    pdp-ContextEstablishment (11),
    pdp-ContextEstablishmentAcknowledgement (12),
    disonnect             (13),
    pdp-ContextChangeOfPosition (14)
}

GPRSMSCClass ::= SEQUENCE {
    msNetworkCapability [0] MSNetworkCapability,
    msRadioAccessCapability [1] MSRadioAccessCapability
}

```

-- GPRS MS class mark describes the terminal capabilities. For encoding refer to 3G TS 24.008

```

InbandInfo {PARAMETERS-BOUND : bound} ::= SEQUENCE {
    messageID [0] MessageID {bound},
    numberOfRepetitions [1] INTEGER (1..127) OPTIONAL,
    duration [2] INTEGER (0..32767) OPTIONAL,
    interval [3] INTEGER (0.. 32767) OPTIONAL,
    ...
}

```

-- Interval is the time in seconds between each repeated announcement. Duration is the total amount of time in seconds, including repetitions and intervals.  
-- The end of announcement is either the end of duration or numberOfRepetitions, whatever comes first.  
-- duration with value 0 indicates infinite duration

```

InformationToSend {PARAMETERS-BOUND : bound} ::= CHOICE {
    inbandInfo [0] InbandInfo {bound},
    tone [1] Tone
}

```

```

InitiatingEntity ::= ENUMERATED {
    ms (0),
    sgsn (1),
    hlr (2),
    ggsn (3)
}

```

```

IPRoutingAddress {PARAMETERS-BOUND : bound} ::= CalledPartyNumber {bound}
-- Indicates the routing address for the IP.

```

```

IPSSPCapabilities {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE (
    bound.&minIPSSPCapabilitiesLength..bound.&maxIPSSPCapabilitiesLength))
-- Indicates the gsmSRF resources available. The parameter has two parts, a standard and a
-- bilateral part. The standard part indicates capabilities defined as optional in CAP V.2
-- that shall be recognised (but not necessarily supported) by a CAP V.2 gsmSCF. The bilateral
-- part contains further information that is not specified in this standard, but which is set
-- according to bilateral agreements between network operators and/or equipment vendors.
-- The last octet of the standard part is indicated by bit 7 being set to 0, otherwise Bit 7 of
-- a standard part octet is set to 1 indicating that the standard part continues in the following
-- octet. Coding is as follows:
--

```

```

-- Octet 1          Standard Part for CAP V.3
-- Bit Value       Meaning
-- 0 0             IPRoutingAddress not supported
-- 0 1             IPRoutingAddress supported
-- 1 0             VoiceBack not supported
-- 1 1             VoiceBack supported
-- 2 0             VoiceInformation not supported, via speech recognition
-- 2 1             VoiceInformation supported, via speech recognition
-- 3 0             VoiceInformation not supported, via voice recognition
-- 3 1             VoiceInformation supported, via voice recognition
-- 4 0             Generation of voice announcements from Text not supported
-- 4 1             Generation of voice announcements from Text supported
-- 5 -             Reserved
-- 6 -             Reserved
-- 7 0             End of standard part
-- 7 1             This value is reserved in CAP V.3

```

```

--
-- Octets 2 to 4          Bilateral Part: Network operator / equipment vendor specific

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

LocationInformationGPRS ::= SEQUENCE {
    cellIdOrLAI          [0] OCTET STRING (SIZE(5..7)) OPTIONAL,
-- coded according to 3G TS 29.002.
    geographicalInformation [1] OCTET STRING (SIZE (8)) OPTIONAL,
-- Refers to geographical information defined in 3G TS 23.032.
    sgsn-Number          [2] ISDN-AddressString OPTIONAL,
}

LocationNumber {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE (
    bound.&minLocationNumberLength..
    bound.&maxLocationNumberLength))
-- Indicates the Location Number for the calling party.
-- Refer to ETS 300 356-1 [4] for encoding.

MessageID {PARAMETERS-BOUND : bound} ::= CHOICE {
    elementaryMessageID [0] Integer4,
    text                 [1] SEQUENCE {
        messageContent [0] IA5String (SIZE
            (bound.&minMessageContentLength..bound.&maxMessageContentLength)),
        attributes      [1] OCTET STRING (SIZE
            (bound.&minAttributesLength..bound.&maxAttributesLength)) OPTIONAL
    },
    elementaryMessageIDs [29] SEQUENCE SIZE (1.. bound.&numOfMessageIDs) OF Integer4,
    variableMessage      [30] SEQUENCE {
        elementaryMessageID [0] Integer4,
        variableParts        [1] SEQUENCE SIZE (1..5) OF VariablePart {bound}
    }
}
-- Use of the text parameter is network operator/equipment vendor specific.

MiscCallInfo           ::= SEQUENCE {
    messageType         [0] ENUMERATED {
        request          (0),
        notification     (1),
        ...
    }
}
-- Indicates detection point related information.

MonitorMode            ::= ENUMERATED {
    interrupted         (0),
    notifyAndContinue   (1),
    transparent         (2)
}
-- Indicates the event is relayed and/or processed by the SSP.
-- Transparent means that the gsmSSF or gprsSSF does not notify the gsmSCF of the event.
-- For the use of this parameter refer to the procedure descriptions in section 14.

MSNetworkCapability    ::= OCTET STRING (SIZE (3))
-- MS Network Capability describes the GPRS terminal capabilities related to the network, i.e. SMS
-- point to point service over packet data channels. For encoding refer to 3G TS 24.008

MSRadioAccessCapability ::= OCTET STRING (SIZE (3..32))
-- MS Radio Access Capability describes the terminal capabilities relevant for the radio network,
-- which may affect the way the network handles the mobile. For encoding refer to 3G TS 24.008

NACCarrierInformation  ::= SEQUENCE {
    naCarrierId          [0] NAEA-CIC                                OPTIONAL,
    naCICSelectionType   [1] NACCarrierSelectionInfo                OPTIONAL,
    ...
}

NACCarrierSelectionInfo ::= OCTET STRING (SIZE (1))
-- NA carrier selection information octet carries the same values as ANSI
-- ISUP T1.113:
-- '00'H - not indicated or not explicitly provided
-- '01'H - subscribed not dialed
-- '02'H - subscribed and dialed
-- '03'H - subscribed with dialing undetermined
-- '04'H - dialed CIC not subscribed

NAOliInfo              ::= OCTET STRING (SIZE (1))
-- NA Oli information takes the same value as defined in ANSI ISUP T1.113
-- e.g. '3D'H - Decimal value 61 - Cellular Service (Type 1)

```



```

--          '3E'H - Decimal value 62 - Cellular Service (Type 2)
--          '3F'H - Decimal value 63 - Cellular Service (roaming)

NAChargeNumber          ::= OCTET STRING (SIZE (2..7))
-- This parameter uniquely identifies the chargeable number for a call sent into a North American
-- long distance carrier. It transports the ChargeNumber Parameter Field
-- as defined in ANSI ISUP T1.113. This provides
-- - 1 octet for the nature of address indicator field, plus
-- - 1 octet for a numbering plan field, plus
-- - up to 5 octets for the address signal (up to 10 digits)

-- The Charge Number in ANSI T1.113 normally contains a 10 digit national number within the North
-- American Numbering Plan (NANP); longer (e.g. international) charge numbers are not supported in
-- T1.113

NA-Info                  ::= SEQUENCE {
    naCarrierInformation  [0] NACarrierInformation          OPTIONAL,
    naOliInfo             [1] NAOliInfo                    OPTIONAL,
    naChargeNumber        [2] NAChargeNumber                OPTIONAL,
    ...}

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 3G TS 23.078 [16].

PDPIID                   ::= OCTET STRING (SIZE (1))
-- PDP Identifier is a counter used to identify a specific PDP context within a control
-- relationship between gprsSSF and gsmSCF.

PDPTType                 ::= SEQUENCE {
    pDPTTypeOrganization [0] OCTET STRING (SIZE(1)),
    pDPTTypeNumber       [1] OCTET STRING (SIZE(1))
}

QualityOfService         ::= OCTET STRING (SIZE (5))
-- Quality of Service according to 3G TS 24.008.
-- The gprsSSF shall send the Quality of Service to the gsmSCF when a chargable change in Quality
-- of Service has been detected.

RAIdentity               ::= OCTET STRING (SIZE (7))
-- Routing Area Identity coded according to 3G TS 29.060.

ReceivingSideID          ::= CHOICE {receivingSideID [1] LegType}

-- used to identify LegID in operations sent from gsmSSF to gsmSCF

RedirectingPartyID {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE (
    bound.&minRedirectingPartyIDLength.. bound.&maxRedirectingPartyIDLength))
-- Indicates redirecting number.
-- Refer to ETS 300 356-1 [4] Redirecting number for encoding.

RequestedInformationList {PARAMETERS-BOUND : bound} ::= SEQUENCE SIZE (1..bound.&numOfInfoItems)
OF RequestedInformation {bound}

RequestedInformationTypeList {PARAMETERS-BOUND : bound} ::= SEQUENCE SIZE (1..bound.&numOfInfoItems)
OF RequestedInformationType

RequestedInformation {PARAMETERS-BOUND : bound} ::= SEQUENCE {
    requestedInformationType [0] RequestedInformationType,
    requestedInformationValue [1] RequestedInformationValue {bound},
    ...
}

RequestedInformationType ::= ENUMERATED {
    callAttemptElapsedTime (0),
    callStopTime (1),
    callConnectedElapsedTime (2),
    releaseCause (30)
}

RequestedInformationValue {PARAMETERS-BOUND : bound} ::= CHOICE {
    callAttemptElapsedTimeValue [0] INTEGER (0..255),
    callStopTimeValue [1] DateAndTime,
    callConnectedElapsedTimeValue [2] Integer4,

```

```
releaseCauseValue          [30] Cause {bound}
}
```

```
-- The callAttemptElapsedTimeValue is specified in seconds. The unit for the
-- callConnectedElapsedTimeValue is 100 milliseconds
```

```
RPCause                    ::= OCTET STRING (SIZE (1))
-- RP cause according to 3G TS 24.011.
-- GsmSCF shall send this cause in the ReleaseSMS operation.
-- The received cause is sent to the originating MS by the VMSC/SGSN.
```

```

ScfID {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE
    (bound.&minScfIDLength..bound.&maxScfIDLength))
-- defined by network operator.
-- Indicates the gsmSCF identity.

SCIBillingChargingCharacteristics {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE (
    bound.&minSCIBillingChargingLength..
    bound.&maxSCIBillingChargingLength)) (CONSTRAINED BY {-- shall be the result of the BER-
encoded value of type CAMEL-SCIBillingChargingCharacteristics --})
-- Indicates AOC information to be sent to a Mobile Station
-- The violation of the UserDefinedConstraint shall be handled as an ASN.1 syntax error.

SCIGPRSBillingChargingCharacteristics {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE (
    bound.&minSCIBillingChargingLength..
    bound.&maxSCIBillingChargingLength)) (CONSTRAINED BY {-- shall be the result of the BER-
encoded value of type CAMEL-SCIGPRSBillingChargingCharacteristics --})
-- Indicates AOC information to be sent to a Mobile Station
-- The violation of the UserDefinedConstraint shall be handled as an ASN.1 syntax error.

SendingSideID ::= CHOICE {sendingSideID [0] LegType}

-- used to identify LegID in operations sent from gsmSCF to gsmSSF

ServiceInteractionIndicatorsTwo ::= SEQUENCE {
    forwardServiceInteractionInd [0] forwardServiceInteractionInd OPTIONAL,
    -- applicable to operations IDP, CON.
    backwardServiceInteractionsInd [1] BackwardServiceInteractionInd OPTIONAL,
    -- applicable to operations IDP, CON.
    bothwayThroughConnectionInd [2] BothwayThroughConnectionInd OPTIONAL
    holdTreatmentIndicator [50] OCTET STRING (SIZE(1)) OPTIONAL,
    -- acceptHoldRequest 'xxxx xx01'B
    -- rejectHoldRequest 'xxxx xx10'B
    -- network default is accept hold request
    cwTreatmentIndicator [51] OCTET STRING (SIZE(1)) OPTIONAL,
    -- acceptCw 'xxxx xx01'B
    -- rejectCw 'xxxx xx10'B
    -- network default is accept cw
    ectTreatmentIndicator [52] OCTET STRING (SIZE(1)) OPTIONAL,
    -- acceptEctRequest 'xxxx xx01'B
    -- rejectEctRequest 'xxxx xx10'B
    -- network default is accept ect request
}

ServiceKey ::= Integer4
-- Information that allows the gsmSCF to choose the appropriate service logic.

SGSNCapabilities ::= OCTET STRING (SIZE (1))

-- Indicates the SGSN capabilities. The coding of the parameter is as follows:
-- Bit Value Meaning
-- 0 0 AoC not supported by SGSN
-- 1 1 AoC supported by SGSN
-- 2 - This bit is reserved in CAP V.3
-- 3 - This bit is reserved in CAP V.3
-- 4 - This bit is reserved in CAP V.3
-- 5 - This bit is reserved in CAP V.3
-- 6 - This bit is reserved in CAP V.3
-- 7 - This bit is reserved in CAP V.3

SMSCause ::= ENUMERATED {
    SystemFailure (0),
    UnexpectedDataValue (1),
    FacilityNotSupported (2),
    SM-DeliveryFailure (3),
    ReleaseFromRadioInterface (4)
}
-- MO SMS error values which are reported to gsmSCF.
-- Most of these values are received from the SMSC as a response to
-- MO-ForwardSM operation.

SMSEvent ::= SEQUENCE {
    eventTypeSMS [0] EventTypeSMS,
    monitorMode [1] MonitorMode
}

TPDataCodingScheme ::= OCTET STRING (SIZE (1))
-- TP Data Coding Scheme according to 3G TS 23.040

```

```

TimeInformation ::= CHOICE {
    timeIfNoTariffSwitch [0] TimeIfNoTariffSwitch,
    timeIfTariffSwitch   [1] TimeIfTariffSwitch
}

-- Indicates call duration information

TimeIfNoTariffSwitch ::= INTEGER(0..864000)

-- TimeIfNoTariffSwitch is measured in 100 millisecond intervals

TimeIfTariffSwitch ::= SEQUENCE {
    timeSinceTariffSwitch [0] INTEGER(0..864000),
    tariffSwitchInterval [1] INTEGER(1..864000) OPTIONAL
}

-- timeSinceTariffSwitch and tariffSwitchInterval are measured in 100 millisecond intervals

TimerID ::= ENUMERATED {
    tssf (0)
}

-- Indicates the timer to be reset.

TimerValue ::= Integer4

-- Indicates the timer value (in seconds).

TimeAndTimezone {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE(bound.&minTimeAndTimezoneLength..
    Bound.&maxTimeAndTimezoneLength))

-- Indicates the time and timezone, relative to GMT. This parameter BCD encoded.
-- The year digit indicating millenium occupies bits 0-3 of the first octet, and the year
-- digit indicating century occupies bits 4-7 of the first octet.
-- The year digit indicating decade occupies bits 0-3 of the second octet, whilst the digit
-- indicating the year within the decade occupies bits 4-7 of the second octet.
-- The most significant month digit occupies bits 0-3 of the third octet, and the least
-- significant month digit occupies bits 4-7 of the third octet.
-- The most significant day digit occupies bits 0-3 of the fourth octet, and the least
-- significant day digit occupies bits 4-7 of the fourth octet.
-- The most significant hours digit occupies bits 0-3 of the fifth octet, and the least
-- significant hours digit occupies bits 4-7 of the fifth octet.
-- The most significant minutes digit occupies bits 0-3 of the sixth octet, and the least
-- significant minutes digit occupies bits 4-7 of the sixth octet.
-- The most significant seconds digit occupies bits 0-3 of the seventh octet, and the least
-- significant seconds digit occupies bits 4-7 of the seventh octet.
--
-- The timezone information occupies the eighth octet. For the encoding of Timezone refer to
-- Reference [29], 3G TS 23.040.
--
-- The BCD digits are packed and encoded as follows:
--
-- Bit 7 6 5 4 | 3 2 1 0
-- 2nd digit | 1st digit Octet 1
-- 3rd digit | 4th digit Octet 2
-- ..
-- nth digit | n-1th digit Octet m
--
-- 0000 digit 0
-- 0001 digit 1
-- 0010 digit 2
-- 0011 digit 3
-- 0100 digit 4
-- 0101 digit 5
-- 0110 digit 6
-- 0111 digit 7
-- 1000 digit 8
-- 1001 digit 9
-- 1010 spare
-- 1011 spare
-- 1100 spare
-- 1101 spare
-- 1110 spare
-- 1101 spare
--
-- where the leftmost bit of the digit is either bit 7 or bit 3 of the octet.

Tone ::= SEQUENCE {
    toneID [0] Integer4,
    duration [1] Integer4 OPTIONAL,
    ...
}

-- The duration specifies the length of the tone in seconds, value 0 indicates infinite duration.

TPDataCodingScheme ::= OCTET STRING (SIZE (1))

```

```

-- TP Data Coding Scheme according to 3G TS 23.040

TPProtocolIdentifier ::= OCTET STRING (SIZE (1))
-- indicates the protocol used above SM-Transfer Layer as specified in 3G TS 23.040

TPShortMessageSubmissionInfo ::= OCTET STRING (SIZE (1))
-- contains the 1st octet of the SMS-SUBMIT TPDU as specified in 3G TS 23.040

TPValidityPeriod ::= OCTET STRING (SIZE (1..7))
-- indicates the length of the validity period or the absolute time of the validity
-- period termination as specified in 3G TS 23.040
-- the length of ValidityPeriod is either 1 octet or 7 octets

TransferredVolume ::= CHOICE {
    volumeIfNoTariffSwitch ::= INTEGER (0..4294967295),
    volumeTariffSwitchInterval ::= SEQUENCE {
        volumeSinceLastTariffSwitch ::= INTEGER (0..4294967295),
        volumeTariffSwitchInterval ::= INTEGER (0..4294967295)
    }
}

-- volumeSinceLastTariffSwitch and volumeTariffSwitchInterval are measured in bytes.

VariablePart {PARAMETERS-BOUND : bound} ::= CHOICE {
    integer [0] Integer4,
    number [1] Digits {bound}, -- Generic digits
    time [2] OCTET STRING (SIZE(2)), -- HH: MM, BCD coded
    date [3] OCTET STRING (SIZE(4)), -- YYYYMMDD, BCD coded
    price [4] OCTET STRING (SIZE(4))
}
-- Indicates the variable part of the message. Time is BCD encoded.
-- The most significant hours digit occupies bits 0-3 of the first octet, and the least
-- significant digit occupies bits 4-7 of the first octet. The most significant minutes digit
-- occupies bits 0-3 of the second octet, and the least significant digit occupies bits 4-7
-- of the second octet.
--
-- Date is BCD encoded. The year digit indicating millenium occupies bits 0-3 of the first octet,
-- and the year digit indicating century occupies bits 4-7 of the first octet. The year digit
-- indicating decade occupies bits 0-3 of the second octet, whilst the digit indicating the year
-- within the decade occupies bits 4-7 of the second octet.
-- The most significant month digit occupies bits 0-3 of the third octet, and the least
-- significant month digit occupies bits 4-7 of the third octet. The most significant day digit
-- occupies bits 0-3 of the fourth octet, and the least significant day digit occupies bits 4-7
-- of the fourth octet.
-- Price is BCD encoded. The digit indicating hundreds of thousands occupies bits 0-3 of the
-- first octet, and the digit indicating tens of thousands occupies bits 4-7 of the first octet.
-- The digit indicating thousands occupies bits 0-3 of the second octet, whilst the digit
-- indicating hundreds occupies bits 4-7 of the second octet. The digit indicating tens occupies
-- bits 0-3 of the third octet, and the digit indicating 0 to 9 occupies bits 4-7 of the third
-- octet. The tenths digit occupies bits 0-3 of the fourth octet, and the hundredths digit
-- occupies bits 4-7 of the fourth octet.
--
-- For the encoding of digits in an octet, refer to the timeAndtimezone parameter

END

```

## 5.2 Error types

```

CAP-errorTypes {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(3)
CAP-errorTypes (1) version3(0)}
-- This module contains the type definitions for the IN CS2 errors.
-- Where a parameter of type CHOICE is tagged with a specific tag value, the tag is automatically
-- replaced with an EXPLICIT tag of the same value.

DEFINITIONS IMPLICIT TAGS ::=
BEGIN
IMPORTS
ros-InformationObjects, datatypes, errorCodes FROM CAP-object-identifiers
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) module(0) CAP-
object-identifiers(17) version3(0)}
    ERROR
FROM Remote-Operations-Information-Objects ros-InformationObjects
    InvokeID,
    UnavailableNetworkResource
FROM CAP-datatypes datatypes
    errcode-canceled,
    errcode-cancelFailed,
    errcode-eTCFailed,

```

```

errcode-improperCallerResponse,
errcode-missingCustomerRecord,
errcode-missingParameter,
errcode-parameterOutOfRange,
errcode-requestedInfoError,
errcode-systemFailure,
errcode-taskRefused,
errcode-unavailableResource,
errcode-unexpectedComponentSequence,
errcode-unexpectedDataValue,
errcode-unexpectedParameter,
errcode-unknownLegID,
errcode-unknownPDPID
FROM CAP-errorcodes errorcodes;

-- TYPE DEFINITION FOR CAP ERRORS FOLLOWS

canceled ERROR ::= {
  CODE errcode-canceled
}
-- The operation has been canceled.

cancelFailed ERROR ::= {
  PARAMETER SEQUENCE {
    problem [0] ENUMERATED {
      unknownOperation (0),
      tooLate (1),
      operationNotCancellable (2)
    },
    operation [1] InvokeID,
    ...
  }
  CODE errcode-cancelFailed
}
-- The operation failed to be canceled.

eTCFailed ERROR ::= {
  CODE errcode-eTCFailed
}
-- The establish temporary connection failed.

improperCallerResponse ERROR ::= {
  CODE errcode-improperCallerResponse
}
-- The caller response was not as expected.

missingCustomerRecord ERROR ::= {
  CODE errcode-missingCustomerRecord
}
-- The Service Logic Program could not be found in the gsmSCF.

missingParameter ERROR ::= {
  CODE errcode-missingParameter
}
-- An expected optional parameter was not received.

parameterOutOfRange ERROR ::= {
  CODE errcode-parameterOutOfRange
}
-- The parameter was not as expected (e.g. missing or out of range).

requestedInfoError ERROR ::= {
  PARAMETER ENUMERATED {
    unknownRequestedInfo (1),
    requestedInfoNotAvailable (2)
    -- other values FOR FURTHER STUDY
  }
  CODE errcode-requestedInfoError
}
-- The requested information cannot be found.

systemFailure ERROR ::= {
  PARAMETER UnavailableNetworkResource
  CODE errcode-systemFailure
}
-- The operation could not be completed due to a system failure at the serving physical entity.

taskRefused ERROR ::= {
  PARAMETER ENUMERATED {
    generic (0),
    unobtainable (1),
    congestion (2)
    --other values FOR FURTHER STUDY

```

```

    }
    CODE    errcode-taskRefused
}
-- An entity normally capable of the task requested cannot or chooses not to perform the task at
-- this time. This includes error situations like congestion and unobtainable address as used in
-- e.g. the connect operation.)

unavailableResource ERROR ::= {
    CODE    errcode-unavailableResource
}
-- A requested resource is not available at the serving entity.

unexpectedComponentSequence ERROR ::= {
    CODE    errcode-unexpectedComponentSequence
}
-- An incorrect sequence of Components was received (e.g."DisconnectForwardConnection"
-- followed by"PlayAnnouncement").

unexpectedDataValue ERROR ::= {
    CODE    errcode-unexpectedDataValue
}
-- The data value was not as expected (e.g. routing number expected but billing number received)

unexpectedParameter ERROR ::= {
    CODE    errcode-unexpectedParameter
}
-- A parameter received was not expected.

unknownLegID ERROR ::= {
    CODE    errcode-unknownLegID
}
-- Leg not known to the gsmSSF.

unknownPDPID ERROR ::= {
    CODE    errcode-unknownPDPID
}
-- PDPID not known by the receiving entity.

END

```

## 5.3 Operation codes

```

CAP-operationcodes {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1)
modules(0) CAP-operationcodes (2) version3(0)}
DEFINITIONS ::=
BEGIN

IMPORTS
ros-InformationObjects FROM CAP-object-identifiers
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-
object-identifiers(17) version3(0)}
    Code
FROM Remote-Operations-Information-Objects ros-InformationObjects
;

-- the operations are grouped by the identified operation packages.

-- gsmSCF activation Package
opcode-initialDP                               Code ::= local: 0
-- gsmSCF/gsmSRF activation of assist Package
opcode-assistRequestInstructions               Code ::= local: 16
-- Assist connection establishment Package
opcode-establishTemporaryConnection           Code ::= local: 17
-- Generic disconnect resource Package
opcode-disconnectForwardConnection            Code ::= local: 18
-- Non-assisted connection establishment Package
opcode-connectToResource                       Code ::= local: 19
-- Connect Package (elementary gsmSSF function)
opcode-connect                                 Code ::= local: 20
-- Call handling Package (elementary gsmSSF function)
opcode-releaseCall                             Code ::= local: 22
-- BCSM Event handling Package
opcode-requestReportBCSMEvent                 Code ::= local: 23
opcode-eventReportBCSM                       Code ::= local: 24
-- gsmSSF call processing Package
opcode-continue                               Code ::= local: 31
opcode-continueWithArgument                   Code ::= local: xx
-- Timer Package
opcode-resetTimer                             Code ::= local: 33
-- Billing Package
opcode-furnishChargingInformation             Code ::= local: 34

```

```

-- Charging Package
  opcode-applyCharging                Code ::= local: 35
  opcode-applyChargingReport          Code ::= local: 36
-- Call report Package
  opcode-callInformationReport         Code ::= local: 44
  opcode-callInformationRequest        Code ::= local: 45
-- Signalling control Package
  opcode-sendChargingInformation       Code ::= local: 46
-- Specialized resource control Package
  opcode-playAnnouncement              Code ::= local: 47
  opcode-promptAndCollectUserInformation Code ::= local: 48
  opcode-specializedResourceReport     Code ::= local: 49
-- Cancel Package
  opcode-cancel                        Code ::= local: 53
-- Activity Test Package
  opcode-activityTest                  Code ::= local: 55

```

END

## 5.4 Error codes

```

CAP-errorcodes {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0)
CAP-errorcodes (3) version3(0)}
DEFINITIONS ::=
BEGIN
IMPORTS
ros-InformationObjects FROM CAP-object-identifiers
  {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-
object-identifiers(17) version3(0)}
  Code
FROM Remote-Operations-Information-Objects ros-InformationObjects
;
  errcode-canceled                    Code ::= local: 0
  errcode-cancelFailed                 Code ::= local: 1
  errcode-eTCFailed                   Code ::= local: 3
  errcode-improperCallerResponse       Code ::= local: 4
  errcode-missingCustomerRecord        Code ::= local: 6
  errcode-missingParameter             Code ::= local: 7
  errcode-parameterOutOfRange          Code ::= local: 8
  errcode-requestedInfoError           Code ::= local: 10
  errcode-systemFailure                Code ::= local: 11
  errcode-taskRefused                  Code ::= local: 12
  errcode-unavailableResource          Code ::= local: 13
  errcode-unexpectedComponentSequence  Code ::= local: 14
  errcode-unexpectedDataValue         Code ::= local: 15
  errcode-unexpectedParameter         Code ::= local: 16
  errcode-unknownLegID                 Code ::= local: 17
  errcode-unknownPDPID                 Code ::= local: 18

```

END

## 5.5 Classes

```

CAP-classes {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-
classes (4) version3(0)}
DEFINITIONS ::=
BEGIN
IMPORTS
  ROS-OBJECT-CLASS, CONTRACT, OPERATION-PACKAGE, Code, OPERATION,
CONNECTION-PACKAGE
FROM Remote-Operations-Information-Objects ros-InformationObjects
  emptyBind, emptyUnbind
FROM Remote-Operations-Useful-Definitions ros-UsefulDefinitions
  id-package-emptyConnection,
id-rosObject-gsmSCF,
id-rosObject-gsmSRF,
id-rosObject-gsmSSF,
ros-InformationObjects,
ros-UsefulDefinitions,
gsmSSF-gsmSCF-Protocol,
gsmSCF-gsmSRF-Protocol,
datatypes
FROM CAP-object-identifiers {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1)
modules(0) CAP-object-identifiers (17) version3(0)}

```



```

    inCs2AssistHandoffssfToScf,
    inCs2ScfToSsfGeneric,
    inCs2SsfToScfGeneric
FROM CAP-gsmSSF-gsmSCF-pkgs-contracts-acsgsmSSF-gsmSCF-Protocol

    gsmSRF-gsmSCF-contract
FROM CAP-gsmSCF-gsmSRF-pkgs-contracts-acsgsmSCF-gsmSRF-Protocol

    CriticalityType
FROM CAP-datatypes datatypes
;

gsmSSF ROS-OBJECT-CLASS ::= {
    INITIATES    {capSsfToScfGeneric|
                  capAssistHandoffssfToScf}
    RESPONDS    {capScfToSsfGeneric
    ID          id-rosObject-gsmSSF}

gsmSRF ROS-OBJECT-CLASS ::= {
    INITIATES    {gsmSRF-gsmSCF-contract}
    ID          id-rosObject-gsmSRF
    }

gsmSCF ROS-OBJECT-CLASS ::= {
    INITIATES    {capScfToSsfGeneric
    RESPONDS    {capSsfToScfGeneric|
                  capAssistHandoffssfToScf|
-- gsmSRF to gsmSCF contracts
                  gsmSRF-gsmSCF-contract |
    ID          id-rosObject-gsmSCF}

EXTENSION ::= CLASS {
    &ExtensionType,
    &criticality    CriticalityType DEFAULT ignore,
    &id Code
    }
WITH SYNTAX {
    EXTENSION-SYNTAX    &ExtensionType
    CRITICALITY        &criticality
    IDENTIFIED BY      &id
    }

-- Example of addition of an extension named 'Some Network Specific Indicator' of type
-- BOOLEAN, with criticality 'abort' and to be identified as extension number 1
-- Example of definition using the above information object class:
--
-- SomeNetworkSpecificIndicator EXTENSION ::= {
--     EXTENSION-SYNTAX    BOOLEAN
--     CRITICALITY        abort
--     IDENTIFIED BY      local: 1
-- }

-- Example of transfer syntax, using the ExtensionField datatype as specified in subclause 4.1.
-- Assuming the value of the extension is set to TRUE, the extensions parameter
-- becomes a Sequence of type INTEGER ::= 1, criticality ENUMERATED ::= 1 and value [1]
-- EXPLICIT BOOLEAN ::= TRUE.
--
-- Use of Q.1400 defined Extension is for further study.
-- In addition the extension mechanism marker is used to identify the future minor additions
-- to CAP.
firstExtension EXTENSION ::= {
    EXTENSION-SYNTAX    NULL
    CRITICALITY        ignore
    IDENTIFIED BY      local: 1
    }
-- firstExtension is just an example.
SupportedExtensions {PARAMETERS-BOUND : bound} EXTENSION ::= {firstExtension, ...
-- full set of network operator extensions -
}
-- SupportedExtension is the full set of the network operator extensions.

inEmptyUnbind OPERATION ::= {
    RETURN RESULT    FALSE
    ALWAYS RESPONDS FALSE}
emptyConnectionPackage CONNECTION-PACKAGE ::= {
    BIND            emptyBind
    UNBIND          inEmptyUnbind
    RESPONDER UNBIND    TRUE
    ID              id-package-emptyConnection
    }
PARAMETERS-BOUND ::= CLASS

```

```

{
&minAchBillingChargingLength          INTEGER,
&maxAchBillingChargingLength          INTEGER,
&minAttributesLength                  INTEGER,
&maxAttributesLength                  INTEGER,
&maxBearerCapabilityLength            INTEGER,
&minCalledPartyBCDNumberLength        INTEGER,
&maxCalledPartyBCDNumberLength        INTEGER,
&minCalledPartyNumberLength           INTEGER,
&maxCalledPartyNumberLength           INTEGER,
&minCallingPartyNumberLength          INTEGER,
&maxCallingPartyNumberLength          INTEGER,
&minCallResultLength                  INTEGER,
&maxCallResultLength                  INTEGER,
&minCarrierLength                     INTEGER,
&maxCarrierLength                     INTEGER,
&maxCauseLength                       INTEGER,
&minDigitsLength                      INTEGER,
&maxDigitsLength                      INTEGER,
&minFCIBillingChargingLengthLength    INTEGER,
&maxFCIBillingChargingLengthLength    INTEGER,
&minGenericNumberLength               INTEGER,
&maxGenericNumberLength               INTEGER,
&minIPSSPCapabilitiesLength           INTEGER,
&maxIPSSPCapabilitiesLength           INTEGER,
&minLocationNumberLength              INTEGER,
&maxLocationNumberLength              INTEGER,
&minMessageContentLength              INTEGER,
&maxMessageContentLength              INTEGER,
&minOriginalCalledPartyIDLength       INTEGER,
&maxOriginalCalledPartyIDLength       INTEGER,
&minReceivedInformationLength          INTEGER,
&maxReceivedInformationLength          INTEGER,
&minRedirectingPartyIDLength           INTEGER,
&maxRedirectingPartyIDLength           INTEGER,
&minScfIDLength                       INTEGER,
&maxScfIDLength                       INTEGER,
&minSCIBillingChargingLength           INTEGER,
&maxSCIBillingChargingLength           INTEGER,
&numOfBCSMEvents                      INTEGER,
&numOfExtensions                      INTEGER,
&numOfGenericNumbers                  INTEGER,
&numOfMessageIDs                      INTEGER,
}
WITH SYNTAX
{
MINIMUM-FOR-ACH-BILLING-CHARGING      &minAchBillingChargingLength
MAXIMUM-FOR-ACH-BILLING-CHARGING      &maxAchBillingChargingLength
MINIMUM-FOR-ATTRIBUTES                 &minAttributesLength
MAXIMUM-FOR-ATTRIBUTES                 &maxAttributesLength
MAXIMUM-FOR-BEARER-CAPABILITY           &maxBearerCapabilityLength
MINIMUM-FOR-CALLED-PARTY-BCD-NUMBER    &minCalledPartyBCDNumberLength
MAXIMUM-FOR-CALLED-PARTY-BCD-NUMBER    &maxCalledPartyBCDNumberLength
MINIMUM-FOR-CALLED-PARTY-NUMBER        &minCalledPartyNumberLength
MAXIMUM-FOR-CALLED-PARTY-NUMBER        &maxCalledPartyNumberLength
MINIMUM-FOR-CALLING-PARTY-NUMBER       &minCallingPartyNumberLength
MAXIMUM-FOR-CALLING-PARTY-NUMBER       &maxCallingPartyNumberLength
MINIMUM-FOR-CALL-RESULT                 &minCallResultLength
MAXIMUM-FOR-CALL-RESULT                 &maxCallResultLength
MINIMUM-FOR-CARRIER                     &minCarrierLength
MAXIMUM-FOR-CARRIER                     &maxCarrierLength
MAXIMUM-FOR-CAUSE                       &maxCauseLength
MINIMUM-FOR-DIGITS                      &minDigitsLength
MAXIMUM-FOR-DIGITS                      &maxDigitsLength
MINIMUM-FOR-FCI-BILLING-CHARGING        &minFCIBillingChargingLength
MAXIMUM-FOR-FCI-BILLING-CHARGING        &maxFCIBillingChargingLength
MINIMUM-FOR-GENERIC-NUMBER              &minGenericNumberLength
MAXIMUM-FOR-GENERIC-NUMBER              &maxGenericNumberLength
MINIMUM-FOR-IP-SSP-CAPABILITIES         &minIPSSPCapabilitiesLength
MAXIMUM-FOR-IP-SSP-CAPABILITIES         &maxIPSSPCapabilitiesLength
MINIMUM-FOR-LOCATION-NUMBER              &minLocationNumberLength
MAXIMUM-FOR-LOCATION-NUMBER              &maxLocationNumberLength
MINIMUM-FOR-MESSAGE-CONTENT             &minMessageContentLength
MAXIMUM-FOR-MESSAGE-CONTENT             &maxMessageContentLength
MINIMUM-FOR-ORIGINAL-CALLED-PARTY-ID    &minOriginalCalledPartyIDLength
MAXIMUM-FOR-ORIGINAL-CALLED-PARTY-ID    &maxOriginalCalledPartyIDLength
MINIMUM-FOR-RECEIVED-INFORMATION        &minReceivedInformationLength
MAXIMUM-FOR-RECEIVED-INFORMATION        &maxReceivedInformationLength
MINIMUM-FOR-REDIRECTING-ID              &minRedirectingPartyIDLength
MAXIMUM-FOR-REDIRECTING-ID              &maxRedirectingPartyIDLength
MINIMUM-FOR-gsmSCF-ID                   &minScfIDLength
MAXIMUM-FOR-gsmSCF-ID                   &maxScfIDLength
MINIMUM-FOR-SCI-BILLING-CHARGING        &minSCIBillingChargingLength

```

```

MAXIMUM-FOR-SCI-BILLING-CHARGING          &maxSCIBillingChargingLength
NUM-OF-BCSM-EVENT                        &numOfBCSMEvents
NUM-OF-EXTENSIONS                         &numOfExtensions
NUM-OF-GENERIC-NUMBERS                   &numOfGenericNumbers
NUM-OF-MESSAGE-IDS                       &numOfMessageIDs
}

-- The following instance of the parameter bound is just an example
networkSpecificBoundSet PARAMETERS-BOUND ::=
{
  MINIMUM-FOR-ACH-BILLING-CHARGING        5
  MAXIMUM-FOR-ACH-BILLING-CHARGING       177
  MINIMUM-FOR-ATTRIBUTES                  2
  MAXIMUM-FOR-ATTRIBUTES                  10
  MAXIMUM-FOR-BEARER-CAPABILITY           11
  MINIMUM-FOR-CALLED-PARTY-BCD-NUMBER    1
  MAXIMUM-FOR-CALLED-PARTY-BCD-NUMBER    41
  MINIMUM-FOR-CALLED-PARTY-NUMBER        3
  MAXIMUM-FOR-CALLED-PARTY-NUMBER        12
  MINIMUM-FOR-CALLING-PARTY-NUMBER       2
  MAXIMUM-FOR-CALLING-PARTY-NUMBER       10
  MINIMUM-FOR-CALL-RESULT                  12  MAXIMUM-FOR-CALL-RESULT          24
  MINIMUM-FOR-CARRIER                     1
  MAXIMUM-FOR-CARRIER                     5
  MINIMUM-FOR-CAUSE                        2
  MAXIMUM-FOR-CAUSE                        2
  MINIMUM-FOR-DIGITS                       2
  MAXIMUM-FOR-DIGITS                       11
  MINIMUM-FOR-FCI-BILLING-CHARGING        5
  MAXIMUM-FOR-FCI-BILLING-CHARGING       49
  MINIMUM-FOR-FCI-BILLING-CHARGING        1
  MAXIMUM-FOR-FCI-BILLING-CHARGING       40
  MINIMUM-FOR-GENERIC-NUMBER              3
  MAXIMUM-FOR-GENERIC-NUMBER             11
  MINIMUM-FOR-IP-SSP-CAPABILITIES         1
  MAXIMUM-FOR-IP-SSP-CAPABILITIES         4
  MINIMUM-FOR-LOCATION-NUMBER              2
  MAXIMUM-FOR-LOCATION-NUMBER              10
  MINIMUM-FOR-MESSAGE-CONTENT             1
  MAXIMUM-FOR-MESSAGE-CONTENT            127
  MINIMUM-FOR-ORIGINAL-CALLED-PARTY-ID    2
  MAXIMUM-FOR-ORIGINAL-CALLED-PARTY-ID   10
  MINIMUM-FOR-REDIRECTING-ID             2
  MAXIMUM-FOR-REDIRECTING-ID             10
  MINIMUM-FOR-gsmSCF-ID                   2
  MAXIMUM-FOR-gsmSCF-ID                   10  MINIMUM-FOR-SCI-BILLING-CHARGING    4
  MAXIMUM-FOR-SCI-BILLING-CHARGING       69
  MINIMUM-FOR-TIME-AND-TIME-ZONE          8
  MAXIMUM-FOR-TIME-AND-TIME-ZONE          8
  NUM-OF-BCSM-EVENT                       10
  NUM-OF-EXTENSIONS                       10
  NUM-OF-GENERIC-NUMBERS                  5
  NUM-OF-INFO-ITEMS                       4
  NUM-OF-MESSAGE-IDS                      5
}
END

```

## 5.6 Object Identifiers (IDs)

```

CAP-object-identifiers {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1)
modules(0) CAP-object-identifiers(17) version3(0)}
DEFINITIONS ::=
BEGIN
-- This module assigns object identifiers for Modules, Packages, Contracts and AC
-- for CAP

-- For Modules from TCAP, ROS,
tc-Messages          OBJECT IDENTIFIER ::=
  {ccitt recommendation q 773 modules(2) messages(1) version3(3)}
tc-NotationExtensions OBJECT IDENTIFIER ::=
  {ccitt recommendation q 775 modules(2) notation-extension (4) version1(1)}
ros-InformationObjects OBJECT IDENTIFIER ::=
  {joint-iso-ccitt remote-operations(4) informationObjects(5) version3(0)}
ros-genericPDUs      OBJECT IDENTIFIER ::=
  {joint-iso-ccitt remote-operations(4) generic-ROS-PDUs(6) version3(0)}
ros-UsefulDefinitions OBJECT IDENTIFIER ::=
  {joint-iso-ccitt remote-operations(4) useful-definitions(7) version3(0)}
sese-APDUs           OBJECT IDENTIFIER ::=
  {joint-iso-ccitt genericULS(20) modules(1) seseAPDUs(6)}

```

```

guls-Notation                OBJECT IDENTIFIER ::=
    {joint-iso-ccitt genericULS (20) modules (1) notation (1)}
guls-SecurityTransformations OBJECT IDENTIFIER ::=
    {joint-iso-ccitt genericULS (20) modules (1) gulsSecurityTransformations (3)}
ds-UsefulDefinitions        OBJECT IDENTIFIER ::=
    {joint-iso-ccitt ds(5) module(1) usefulDefinitions(0) 3}
spkmGssTokens               OBJECT IDENTIFIER ::=
    {iso(1) identified-organization(3) dod(6) internet(1) security(5) mechanisms(5) spkm(1)
    spkmGssTokens(10)}

-- For IN-CS1 Modules
contexts                    OBJECT IDENTIFIER ::=
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules (0) contexts (8)
    selectedContexts (1) version3(1)}

-- For CAP Modules
datatypes                  OBJECT IDENTIFIER ::=
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-datatypes
    (0) version3(0)}
errortypes                 OBJECT IDENTIFIER ::=
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-
    errortypes (1) version3(0)}
operationcodes             OBJECT IDENTIFIER ::=
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-
    operationcodes (2) version3(0)}
errorcodes                 OBJECT IDENTIFIER ::=
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-
    errorcodes (3) version3(0)}
classes                    OBJECT IDENTIFIER ::=
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-classes
    (4) version3(0)}
gsmSSF-gsmSCF-Operations  OBJECT IDENTIFIER ::=
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-gsmSSF-
    gsmSCF-ops-args (5) version3(0)}
gsmSSF-gsmSCF-Protocol    OBJECT IDENTIFIER ::=
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-gsmSSF-
    gsmSCF-pkgs-contracts-ac (6) version3(0)}
gsmSCF-gsmSRF-Operations  OBJECT IDENTIFIER ::=
    {???}
gsmSCF-gsmSRF-Protocol    OBJECT IDENTIFIER ::=
    {???}
object-identifiers        OBJECT IDENTIFIER ::=
    {???}

id-CAP                     OBJECT IDENTIFIER ::= {???}
id-CAP0E                   OBJECT IDENTIFIER ::=
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) CS2(20)}

id-ac                      OBJECT IDENTIFIER ::= {id-CAP      ac(3)}
id-acE                     OBJECT IDENTIFIER ::= {id-CAP0E   ac(3)}
id-as                      OBJECT IDENTIFIER ::= {id-CAP      as(5)}
id-asE                     OBJECT IDENTIFIER ::= {id-CAP0E   as(5)}
id-rosObject               OBJECT IDENTIFIER ::= {id-CAP      rosObject(25)}
id-contract                OBJECT IDENTIFIER ::= {id-CAP      contract(26)}
id-contractE               OBJECT IDENTIFIER ::= {id-CAP0E   contract(26)}
id-package                 OBJECT IDENTIFIER ::= {id-CAP      package(27)}
id-packageE                OBJECT IDENTIFIER ::= {id-CAP0E   package(27)}

-- for ac, as, rosObject, contract and package, the values are identical to Q1218

-- ROS Objects
id-rosObject-gsmSCF        OBJECT IDENTIFIER ::= {id-rosObject 4}
id-rosObject-gsmSSF        OBJECT IDENTIFIER ::= {id-rosObject 5}
id-rosObject-gsmSRF        OBJECT IDENTIFIER ::= {id-rosObject 6}

-- gsmSSF/gsmSCF AC
id-ac-CAP-gsmSSF-scfGenericAC    OBJECT IDENTIFIER ::= {id-acE 4}
id-ac-CAP-gsmSSF-scfAssistHandoffAC OBJECT IDENTIFIER ::= {id-acE 6}
id-ac-CAP-gsmSCF-ssfGenericAC    OBJECT IDENTIFIER ::= {id-acE 8}

-- gsmSRF/gsmSCF AC
id-ac-gsmSRF-gsmSCF          OBJECT IDENTIFIER ::= {id-ac 14}

-- gprsSSF/gsmSCF AC
id-ac-CAP-gprsSSF-gsmSCF-AC    OBJECT IDENTIFIER ::= {id-acE 50}
id-ac-CAP-gsmSCF-gprsSSF-AC    OBJECT IDENTIFIER ::= {id-acE 51}

-- gsmSSF/gsmSCF Contracts

```

```

id-CAPSsfToScfGeneric          OBJECT IDENTIFIER ::= {id-contractE 3}
id-CAPAssistHandoffssfToScf   OBJECT IDENTIFIER ::= {id-contractE 5}
id-CAPScfToSsfGeneric         OBJECT IDENTIFIER ::= {id-contractE 6}

-- gsmSRF/gsmSCF Contracts
id-contract-gsmSRF-gsmSCF      OBJECT IDENTIFIER ::= {id-contract 13}

-- gsmSSF/gsmSCF Operation Packages
id-package-scfActivation       OBJECT IDENTIFIER ::= {id-package 11}
id-package-gsmSRF-scfActivationOfAssist OBJECT IDENTIFIER ::= {id-package 15}
id-package-assistConnectionEstablishment OBJECT IDENTIFIER ::= {id-package 16}
id-package-genericDisconnectResource OBJECT IDENTIFIER ::= {id-package 17}
id-package-nonAssistedConnectionEstablishment OBJECT IDENTIFIER ::= {id-package 18}
id-package-connect            OBJECT IDENTIFIER ::= {id-package 19}
id-package-callHandling       OBJECT IDENTIFIER ::= {id-packageE 20}
id-package-bcsmEventHandling  OBJECT IDENTIFIER ::= {id-package 21}
id-package-ssfCallProcessing  OBJECT IDENTIFIER ::= {id-packageE 24}
id-package-timer              OBJECT IDENTIFIER ::= {id-package 26}
id-package-billing            OBJECT IDENTIFIER ::= {id-package 27}
id-package-charging           OBJECT IDENTIFIER ::= {id-package 28}
id-package-callReport         OBJECT IDENTIFIER ::= {id-package 32}
id-package-signallingControl  OBJECT IDENTIFIER ::= {id-package 33}
id-package-activityTest       OBJECT IDENTIFIER ::= {id-package 34}
id-package-cancel             OBJECT IDENTIFIER ::= {id-packageE 36}

-- gsmSRF/gsmSCF Operation Packages
id-package-specializedResourceControl OBJECT IDENTIFIER ::= {id-package 42}
id-package-gsmSRF-scfCancel          OBJECT IDENTIFIER ::= {id-package 43}

-- gprsSSF/gsmSCF Operation Packages
id-package-gprsSCFActivationPackage OBJECT IDENTIFIER ::= {id-package 50}
id-package-gprsConnectPackage       OBJECT IDENTIFIER ::= {id-package 51}
id-package-gprsReleasePackage       OBJECT IDENTIFIER ::= {id-package 52}
id-package-gprsEventHandlingPackage OBJECT IDENTIFIER ::= {id-package 53}
id-package-gprsSCFTimerPackage      OBJECT IDENTIFIER ::= {id-package 54}
id-package-gprsSCFBillingPackage    OBJECT IDENTIFIER ::= {id-package 55}
id-package-gprsSCFChargingPackage   OBJECT IDENTIFIER ::= {id-package 56}
id-package-gprsSCFActivityTestPackage OBJECT IDENTIFIER ::= {id-package 57}
id-package-gprsSCFCancelPackage     OBJECT IDENTIFIER ::= {id-package 58}
id-package-gprsSCFChargeAdvicePackage OBJECT IDENTIFIER ::= {id-package 59}
id-package-gprsSCFChargeAdvicePackage OBJECT IDENTIFIER ::= {id-package 60}

-- gsmSSF/gsmSCF Abstract Syntaxes
id-as-gsmSSF-scfGenericAS          OBJECT IDENTIFIER ::= {id-asE 4}
id-as-assistHandoff-gsmSSF-scfAS  OBJECT IDENTIFIER ::= {id-asE 6}
id-as-gsmSCF-ssfGenericAS         OBJECT IDENTIFIER ::= {id-asE 7}

-- gsmSRF/gsmSCF Abstract Syntaxes
id-as-basic-gsmSRF-gsmSCF         OBJECT IDENTIFIER ::= {id-as 14}
id-as-basic-gsmSCF-gsmSRF         OBJECT IDENTIFIER ::= {id-as 15}

-- gprsSSF/gsmSCF Abstract Syntaxes
id-as-gprsSSF-gsmSCF-AS           OBJECT IDENTIFIER ::= {id-as 50}
id-as-gsmSCF-gprsSSF-AS           OBJECT IDENTIFIER ::= {id-as 51}

END

```

---

## 6 Circuit Switched Call Control

### 6.1 gsmSSF/CCF - gsmSCF Interface

#### 6.1.1 Operations and arguments

```

CAP-gsmSSF-gsmSCF-ops-args {ccitt(0) identified-organization(4) 3GPP(???) mobileDomain(1) ???3g-
network(1) modules(3) CAP-gsmSSF-gsmSCF-ops-args (5) version3(1)}
DEFINITIONS IMPLICIT TAGS::=
BEGIN
IMPORTS

    errortypes, datatypes, operationcodes, classes, ros-InformationObjects
FROM CAP-object-identifiers

    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-object-
identifiers(17) version3(0)}

```

## OPERATION

FROM Remote-Operations-Information-Objects ros-InformationObjects

tc-Messages, classes FROM CAP-object-identifiers  
 {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) module(0) CAP-  
 object-identifiers(17) version3(0)}  
 InvokeIdType  
 FROM TCAPMessages tc-Messages

IMSI,

Ext-BasicServiceCode

FROM MAP-CommonDataTypes {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0)  
 gsm-Network(1) modules(3) map-CommonDataTypes(18) version6(6)}

LocationInformation,

SubscriberState

FROM MAP-MS-DataTypes {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0)  
 gsm-Network(1) modules(3) map-MS-DataTypes(11) version6(6)}

CallReferenceNumber,

SuppressionOfAnnouncement

FROM MAP-CH-DataTypes {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0)  
 gsm-Network(1) modules(3) map-CH-DataTypes(13) version6(6)}

ISDN-AddressString

FROM MAP-CommonDataTypes {ccitt identified-organization(4) etsi(0) mobileDomain(0)  
 gsm-Network (1) modules (3) map-CommonDataTypes (18) version6(6)}

## PARAMETERS-BOUND

FROM CAP-classes classes

opcode-activityTest,  
 opcode-applyCharging,  
 opcode-applyChargingReport,  
 opcode-assistRequestInstructions,  
 opcode-callInformationReport,  
 opcode-callInformationRequest,  
 opcode-cancel,  
 opcode-connect,  
 opcode-connectToResource,  
 opcode-continue,  
 opcode-continueWithArgument,  
 opcode-disconnectForwardConnection,  
 opcode-establishTemporaryConnection,  
 opcode-eventReportBCSM,  
 opcode-furnishChargingInformation,  
 opcode-initialDP,  
 opcode-releaseCall,  
 opcode-requestReportBCSMEvent,  
 opcode-resetTimer,  
 opcode-sendChargingInformation,  
 FROM CAP-operationcodes operationcodes

AChBillingChargingCharacteristics {},  
 AdditionalCallingPartyNumber {},  
 AlertingPattern,  
 AssistingSSPIPRoutingAddress {},  
 BCSMEvent {},  
 BearerCapability {},  
 CalledPartyNumber {},  
 CallingPartyNumber {},  
 CallingPartysCategory,  
 CallResult {},  
 CallSegmentID {},  
 Carrier {},  
 Cause {},  
 CGEncountered,  
 CorrelationID {},  
 CountersValue,  
 DateAndTime,  
 DestinationRoutingAddress {},  
 Digits {},  
 EventSpecificInformationBCSM {},  
 EventTypeBCSM,  
 ExtensionField {},  
 FCIBillingChargingCharacteristics {},  
 GenericNumbers {},  
 HighLayerCompatibility,  
 initialCallSegment,  
 InvokeID,  
 IPRoutingAddress {},  
 IPSSPCapabilities {},

```

    leg1,
    LocationNumber {},
    MiscCallInfo,
    MonitorMode,
    OriginalCalledPartyID {},
    ReceivingSideID,
    RedirectingPartyID {},
    RedirectionInformation,
    RequestedInformationList {},
    RequestedInformationTypeList,
    ScfID {},
    SCIBillingChargingCharacteristics {},
    SendingSideId,
    ServiceInteractionIndicatorsTwo,
    ServiceKey,
    TimerID,
    TimerValue
FROM CAP-datatypes datatypes

    cancelFailed,
    eTCFailed,
    improperCallerResponse,
    missingCustomerRecord,
    missingParameter,
    parameterOutOfRange,
    requestedInfoError,
    systemFailure,
    taskRefused,
    unavailableResource,
    unexpectedComponentSequence,
    unexpectedDataValue,
    unexpectedParameter,
    unknownLegID
FROM CAP-erroratypes erroratypes
;

activityTest OPERATION ::= {
    RETURN RESULT TRUE
    CODE    opcode-activityTest
}

-- Direction: gsmSCF → gsmSSF, Timer: Tat
-- This operation is used to check for the continued existence of a relationship between the gsmSCF
-- and gsmSSF, assistSSF or gsmSRF. 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, assistSSF or grmSRF has failed in some
-- way.

applyCharging {PARAMETERS-BOUND : bound} OPERATION ::= {
    ARGUMENT    ApplyChargingArg {bound}
    RETURN RESULT    FALSE
    ERRORS        {missingParameter |
                  unexpectedComponentSequence |
                  unexpectedParameter |
                  unexpectedDataValue |
                  parameterOutOfRange |
                  systemFailure |
                  taskRefused |
                  unknownLegID}
    CODE          opcode-applyCharging
}

-- Direction: gsmSCF → gsmSSF, Timer: Tac
-- This operation is used for interacting from the gsmSCF with the gsmSSF charging mechanisms.
-- The ApplyChargingReport operation provides the feedback from the gsmSSF to the gsmSCF.

ApplyChargingArg {PARAMETERS-BOUND : bound} ::= SEQUENCE {
    aChBillingChargingCharacteristics [0] AChBillingChargingCharacteristics {bound},
    partyToCharge                      [2] SendingSideID    DEFAULT sendingSideID : leg1,
    extensions                          [3] SEQUENCE SIZE (1..bound.&numOfExtensions) OF
                                         ExtensionField {bound}    OPTIONAL,
    ...
}

-- The partyToCharge parameter indicates the party in the call to which the ApplyCharging operation
-- shall be applied.

applyChargingReport {PARAMETERS-BOUND : bound} OPERATION ::= {
    ARGUMENT    ApplyChargingReportArg {bound}
    RETURN RESULT    FALSE
    ERRORS        {missingParameter |
                  unexpectedComponentSequence |
                  unexpectedParameter |
                  unexpectedDataValue |
                  parameterOutOfRange |

```





```

legID                                     [3] ReceivingSideID
OPTIONAL,
...
}
-- OPTIONAL denotes network operator optional.

cancel {PARAMETERS-BOUND : bound} OPERATION ::= {
  ARGUMENT      CancelArg {bound}
  RETURN RESULT FALSE
  ERRORS        {cancelFailed |
                 missingParameter |
                 taskRefused}
  CODE          opcode-cancel
}
-- Direction: gsmSCF → gsmSSF, or gsmSCF → gsmSRF, Timer: Tcan
-- This operation cancels the correlated previous operation or all previous requests. The following
-- operations can be canceled: PlayAnnouncement, PromptAndCollectUserInformation.

CancelArg {PARAMETERS-BOUND : bound} ::= CHOICE {
  invokeID      [0] InvokeID,
  allRequests   [1] NULL
}
-- The InvokeID has the same value as that which was used for the operation to be cancelled.

connect {PARAMETERS-BOUND : bound} OPERATION ::= {
  ARGUMENT      ConnectArg {bound}
  RETURN RESULT FALSE
  ERRORS        {missingParameter |
                 parameterOutOfRange |
                 systemFailure |
                 taskRefused |
                 unexpectedComponentSequence |
                 unexpectedDataValue |
                 unexpectedParameter}
  CODE          opcode-connect
}
-- 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. dialed digits), depending on the information provided by
the gsmSCF.
-- - Call processing resumes at
--   the Analyzed_Information PIC in the O-BCSM.

ConnectArg {PARAMETERS-BOUND : bound} ::= SEQUENCE {
  destinationRoutingAddress [0] DestinationRoutingAddress {bound},
  alertingPattern           [1] AlertingPattern                               OPTIONAL,
  originalCalledPartyID    [6] OriginalCalledPartyID {bound}                OPTIONAL,
  extensions                [10] SEQUENCE SIZE(1..bound.&numOfExtensions) OF
      ExtensionField {bound}        OPTIONAL,
  serviceInteractionIndicatorsTwo [15] ServiceInteractionIndicatorsTwo    OPTIONAL,
  callingPartysCategory    [28] CallingPartysCategory                      OPTIONAL,
  redirectingPartyID       [29] RedirectingPartyID {bound}                 OPTIONAL,
  redirectionInformation   [30] RedirectionInformation                    OPTIONAL,
  genericNumbers           [14] GenericNumbers {bound}                    OPTIONAL,
  suppressionOfAnnouncement [55] SuppressionOfAnnouncement                OPTIONAL,
  oCSIApplicable           [56] OCSIApplicable                             OPTIONAL,
  na-Info                  [57] NA-Info                                    OPTIONAL,
  cliPresentationIndicator [58] CliPresentationIndicator                  OPTIONAL,
  connectArgExtension      [59] ConnectArgExtension                       OPTIONAL,
  ...,
}
-- na-Info is included at the discretion of the gsmSCF operator.

ConnectArgExtension ::= SEQUENCE {
  cug-Interlock [0] Cug-Interlock                               OPTIONAL,
  cug-OutgoingAccess [1] NULL                                    OPTIONAL,
  ...
}

connectToResource {PARAMETERS-BOUND : bound} OPERATION ::= {
  ARGUMENT      ConnectToResourceArg {bound}
  RETURN RESULT FALSE
  ERRORS        {missingParameter |
                 systemFailure |
                 taskRefused |
                 unexpectedComponentSequence |
                 unexpectedDataValue |
                 unexpectedParameter |
                 unknownLegID}
  CODE          opcode-connectToResource
}

```

-- Direction: gsmSCF → gsmSSF, Timer: T<sub>ctr</sub>  
 -- This operation is used to connect a call from the SSP to the physical entity containing the gsmSRF.  
 -- Refer to clause 18 for a description of the procedures associated with this operation.

```
ConnectToResourceArg {PARAMETERS-BOUND : bound} ::= SEQUENCE {
  resourceAddress CHOICE {
    ipRoutingAddress      [0] IPRoutingAddress {bound},
    none                  [3] NULL,
  },
  extensions              [4] SEQUENCE SIZE(1..bound.&numOfExtensions) OF
                           ExtensionField {bound} OPTIONAL,
  serviceInteractionIndicatorsTwo [7] ServiceInteractionIndicatorsTwo OPTIONAL,
  ...
}
```

```
continue OPERATION ::= {
  RETURN RESULT FALSE
  ALWAYS RESPONDS FALSE
  CODE          opcode-continue
}
```

-- Direction: gsmSCF → gsmSSF, Timer: T<sub>cue</sub>  
 -- 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.

```
continueWithArgument {PARAMETERS-BOUND : bound} OPERATION ::= {
  ARGUMENT      ContinueWithArgumentArg {bound}
  RETURN RESULT FALSE
  ERRORS        {missingParameter |
                parameterOutOfRange |
                unexpectedComponentSequence |
                unexpectedDataValue |
                unexpectedParameter}
  CODE          opcode-continueWithArgument
}
```

-- Direction: gsmSCF → gsmSSF, Timer: T<sub>cwa</sub>  
 -- 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 with the modified call setup information as received from the gsmSCF.

```
ContinueWithArgumentArg {PARAMETERS-BOUND : bound} ::= SEQUENCE {
  alertingPattern      [1] AlertingPattern OPTIONAL,
  extensions           [6] SEQUENCE SIZE(1..bound.&numOfExtensions) OF
                           ExtensionField {bound} OPTIONAL,
  serviceInteractionIndicatorsTwo [7] ServiceInteractionIndicatorsTwo OPTIONAL,
  originalCalledPartyID [50] OriginalCalledPartyID {bound} OPTIONAL,
  callingPartysCategory [51] CallingPartysCategory OPTIONAL,
  redirectingPartyID [52] RedirectingPartyID {bound} OPTIONAL,
  redirectionInformation [53] RedirectionInformation OPTIONAL,
  genericNumbers [54] GenericNumbers {bound} OPTIONAL,
  suppressionOfAnnouncement [55] SuppressionOfAnnouncement OPTIONAL,
  na-Info [56] NA-Info OPTIONAL,
  cug-Interlock [57] Cug-Interlock OPTIONAL,
  cug-OutgoingAccess [58] NULL OPTIONAL,
  ...
}
```

```
disconnectForwardConnection OPERATION ::= {
  RETURN RESULT FALSE
  ERRORS        {systemFailure |
                taskRefused |
                unexpectedComponentSequence}
  CODE          opcode-disconnectForwardConnection
}
```

-- Direction: gsmSCF → gsmSSF, Timer: T<sub>dfc</sub>  
 -- This operation is used to disconnect a forward temporary connection or a connection to a  
 -- resource. Refer to clause 18 for a description of the procedures associated with this operation.  
 -- This operation is not valid for a multi call segment CSA.

```
establishTemporaryConnection {PARAMETERS-BOUND : bound} OPERATION ::= {
  ARGUMENT      EstablishTemporaryConnectionArg {bound}
  RETURN RESULT FALSE
  ERRORS        {eTCFailed |
                missingParameter |
                systemFailure |
}
```

```

        taskRefused |
        unexpectedComponentSequence |
        unexpectedDataValue |
        unexpectedParameter |
        unknownLegID}
    CODE          opcode-establishTemporaryConnection
}
-- Direction: gsmSCF → gsmSSF, Timer: Tetc
-- This operation is used to create a connection to a resource for a limited period of time
-- (e.g. to play an announcement, to collect user information); it implies the use of the assist
-- procedure. Refer to clause 18 for a description of the procedures associated with this operation.

EstablishTemporaryConnectionArg {PARAMETERS-BOUND : bound} ::= SEQUENCE {
    assistingSSPIPRoutingAddress [0] AssistingSSPIPRoutingAddress {bound},
    correlationID [1] CorrelationID {bound} OPTIONAL,
    scfID [3] ScfID {bound} OPTIONAL,
    extensions [4] SEQUENCE SIZE(1..bound.&numOfExtensions) OF
        ExtensionField {bound} OPTIONAL,
    serviceInteractionIndicatorsTwo [6] ServiceInteractionIndicatorsTwo OPTIONAL,
    na-Info [50] NA-Info OPTIONAL
    ...
}
-- na-info is included at the discretion of the
-- gsmSCF operator.

eventReportBCSM {PARAMETERS-BOUND : bound} OPERATION ::= {
    ARGUMENT          EventReportBCSMArg {bound}
    RETURN RESULT     FALSE
    ALWAYS RESPONDS  FALSE
    CODE              opcode-eventReportBCSM
}
-- Direction: gsmSSF → gsmSCF, Timer: Terb
-- This operation is used to notify the gsmSCF of a call-related event (e.g. BCSM events such as
-- busy
-- or no answer) previously requested by the gsmSCF in a RequestReportBCSMEvent operation.

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

furnishChargingInformation {PARAMETERS-BOUND : bound} OPERATION ::= {
    ARGUMENT          FurnishChargingInformationArg {bound}
    RETURN RESULT     FALSE
    ERRORS            {missingParameter |
        taskRefused |
        unexpectedComponentSequence |
        unexpectedDataValue |
        unexpectedParameter}
    CODE              opcode-furnishChargingInformation
}
-- Direction: gsmSCF → gsmSSF, Timer: Tfci
-- This operation is used to request the gsmSSF to generate, register a call record or to include
-- some
-- information in the default call record.
-- The registered call record is intended for off line charging of the call.

FurnishChargingInformationArg {PARAMETERS-BOUND : bound} ::=
FCIBillingChargingCharacteristics{bound}

initialDP {PARAMETERS-BOUND : bound} OPERATION ::= {
    ARGUMENT          InitialDPArg {bound}
    RETURN RESULT     FALSE
    ERRORS            {missingCustomerRecord |
        missingParameter |
        parameterOutOfRange |
        systemFailure |
        taskRefused |
        unexpectedComponentSequence |
        unexpectedDataValue |
        unexpectedParameter}
    CODE              opcode-initialDP
}
-- Direction: gsmSSF → gsmSCF, Timer: T_idp
-- This operation is used after a TDP to indicate request for service.

InitialDPArg {PARAMETERS-BOUND : bound} ::= SEQUENCE {

```

```

serviceKey [0] ServiceKey ,
calledPartyNumber [2] CalledPartyNumber {bound} OPTIONAL,
callingPartyNumber [3] CallingPartyNumber {bound} OPTIONAL,
callingPartysCategory [5] CallingPartysCategory OPTIONAL,
ipSSPCapabilities [8] IPSSPCapabilities {bound} OPTIONAL,
locationNumber [10] LocationNumber {bound} OPTIONAL,
originalCalledPartyID [12] OriginalCalledPartyID {bound} OPTIONAL,
extensions [15] SEQUENCE SIZE(1..bound.&numOfExtensions) OF
    ExtensionField {bound} OPTIONAL,
highLayerCompatibility [23] HighLayerCompatibility OPTIONAL,
additionalCallingPartyNumber [25] AdditionalCallingPartyNumber {bound} OPTIONAL,
bearerCapability [27] BearerCapability {bound} OPTIONAL,
eventTypeBCSM [28] EventTypeBCSM OPTIONAL,
redirectingPartyID [29] RedirectingPartyID {bound} OPTIONAL,
redirectionInformation [30] RedirectionInformation OPTIONAL,
serviceInteractionIndicatorsTwo [32] ServiceInteractionIndicatorsTwo 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,
timeAndTimezone [57] TimeAndTimezone OPTIONAL,
gsm-ForwardingPending [58] NULL OPTIONAL,
initialDPArgExtension [59] InitialDPArgExtension OPTIONAL,
...
}

InitialDPArgExtension ::= SEQUENCE {
    naCarrierInformation [0] NACarrierInformation OPTIONAL,
    gsmcAddress [1] ISDN-AddressString OPTIONAL,
    cause [2] Cause OPTIONAL,
    cug-Info [5] CUG-Info OPTIONAL,
    cug-Index [6] CUG-Index OPTIONAL,
    ...
}

```

```

-- If ipSSPCapabilities is not present then this denotes that a colocated gsmSRF is not
-- supported by the gsmSSF. If present, then the gsmSSF supports a colocated gsmSRF capable
-- of playing announcements via elementaryMessageIDs and variableMessages, the playing of
-- tones and the collection of DTMF digits. Other supported capabilities are explicitly
-- detailed in the IPSSPCapabilities parameter itself.
-- naCarrierInformation is included at the discretion of the gsmSSF operator.

```

```

releaseCall {PARAMETERS-BOUND : bound} OPERATION ::= {
    ARGUMENT ReleaseCallArg {bound}
    RETURN RESULT FALSE
    ALWAYS RESPONDS FALSE
    CODE opcode-releaseCall
}

```

```

-- 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.

```

```

ReleaseCallArg {PARAMETERS-BOUND : bound} ::= Cause {bound}
-- A default value of decimal 31 (normal unspecified) shall be given .

```

```

requestReportBCSMEvent {PARAMETERS-BOUND : bound} OPERATION ::= {
    ARGUMENT RequestReportBCSMEventArg {bound}
    RETURN RESULT FALSE
    ERRORS {missingParameter |
        parameterOutOfRange |
        systemFailure |
        taskRefused |
        unexpectedComponentSequence |
        unexpectedDataValue |
        unexpectedParameter |
        unknownLegID}
    CODE opcode-requestReportBCSMEvent
}

```

```

-- 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 busy or no answer), then send a notification back to the gsmSCF when
-- the event is detected.

```

```

-- NOTE:

```

```

-- Every EDP must be explicitly armed by the gsmSCF via a RequestReportBCSMEvent operation. No
-- implicit arming of EDPs at the gsmSSF after reception of any operation (different from
-- RequestReportBCSMEvent) from the gsmSCF is allowed.

```

```

RequestReportBCSMEEventArg {PARAMETERS-BOUND : bound} ::= SEQUENCE {
    bcsmeEvents [0] SEQUENCE SIZE(1..bound.&numOfBCSMEEvents) OF BCSMEEvent {bound},
    extensions [2] SEQUENCE SIZE(1..bound.&numOfExtensions) OF ExtensionField {bound} OPTIONAL,
    ...
}
-- Indicates the BCSM related events for notification.

resetTimer {PARAMETERS-BOUND : bound} OPERATION ::= {
    ARGUMENT      ResetTimerArg {bound}
    RETURN RESULT FALSE
    ERRORS        {missingParameter |
                  parameterOutOfRange |
                  taskRefused |
                  unexpectedComponentSequence |
                  unexpectedDataValue |
                  unexpectedParameter}
    CODE          opcode-resetTimer
}
-- Direction: gsmSCF→gsmSSF, Timer: Trt
-- This operation is used to request the gsmSSF to refresh an application timer in the gsmSSF.

ResetTimerArg {PARAMETERS-BOUND : bound} ::= SEQUENCE {
    timerID       [0] TimerID DEFAULT tssf,
    timervalue    [1] TimerValue,
    extensions    [2] SEQUENCE SIZE(1..bound.&numOfExtensions) OF
                                     ExtensionField {bound} OPTIONAL,
    ...
}

sendChargingInformation {PARAMETERS-BOUND : bound} OPERATION ::= {
    ARGUMENT      SendChargingInformationArg {bound}
    RETURN RESULT FALSE
    ERRORS        {missingParameter |
                  unexpectedComponentSequence |
                  unexpectedParameter |
                  parameterOutOfRange |
                  systemFailure |
                  taskRefused |
                  unexpectedDataValue |
                  unknownLegID}
    CODE          opcode-sendChargingInformation
}
-- Direction: gsmSCF → gsmSSF, Timer: Tsci
-- This operation is used to instruct the gsmSSF on the charging information to send by the gsmSSF.
-- The charging information can either be sent back by means of signalling or internal
-- if the gsmSSF is located in the local exchange. In the local exchange
-- this information may be used to update the charge meter or to create a standard call record.

SendChargingInformationArg {PARAMETERS-BOUND : bound} ::= SEQUENCE {
    sCIBillingChargingCharacteristics [0] SCIBillingChargingCharacteristics {bound},
    partyToCharge                     [1] SendingSideID,
    extensions                         [2] SEQUENCE SIZE(1..bound.&numOfExtensions) OF
                                     ExtensionField {bound} OPTIONAL,
    ...
}

```

END

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

short:	1 s - 10 s
medium:	1 s - 60 s
long:	1 s - 30 minutes

Table 6-1 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 6-1: Timer value ranges

Operation Name	Timer	value range
ActivityTest	T <sub>at</sub>	short
ApplyCharging	T <sub>ac</sub>	short
ApplyChargingReport	T <sub>acr</sub>	short
AssistRequestInstructions	T <sub>ari</sub>	short
CallInformationReport	T <sub>cirp</sub>	short
CallInformationRequest	T <sub>cirq</sub>	short
Cancel	T <sub>can</sub>	short
Connect	T <sub>con</sub>	short
ConnectToResource	T <sub>ctr</sub>	short
Continue	T <sub>cue</sub>	short
ContinueWithArgument	T <sub>cwa</sub>	short
DisconnectForwardConnection	T <sub>dfc</sub>	short
EstablishTemporaryConnection	T <sub>etc</sub>	medium
EventReportBCSM	T <sub>erb</sub>	short
FurnishChargingInformation	T <sub>fci</sub>	short
InitialDP	T <sub>idp</sub>	short
ReleaseCall	T <sub>rc</sub>	short
RequestReportBCSMEvent	T <sub>rrb</sub>	short
ResetTimer	T <sub>rt</sub>	short
SendChargingInformation	T <sub>sci</sub>	short

## 6.1.2 gsmSSF/gsmSCF packages, contracts and ACs

### 6.1.2.1 gsmSSF/gsmSCF ASN.1 module

```

CAP-gsmSSF-gsmSCF-pkgs-contracts-acs {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-
network(1) modules(0) CAP-gsmSSF-gsmSCF-pkgs-contracts-acs (6) version3(0)}
DEFINITIONS ::=
BEGIN

-- This module describes the operation-packages, contracts and application-contexts used
-- over the gsmSSF-gsmSCF interface.

IMPORTS

    PARAMETERS-BOUND,
    networkSpecificBoundSet
FROM CAP-classes classes

    ROS-OBJECT-CLASS, CONTRACT, OPERATION-PACKAGE, OPERATION
FROM Remote-Operations-Information-Objects ros-InformationObjects

    TCMessage {}
FROM TCAPMessages tc-Messages

    APPLICATION-CONTEXT, dialogue-abstract-syntax
FROM TC-Notation-Extensions tc-NotationExtensions

    activityTest,
    applyCharging {},

```

```

    applyChargingReport {},
    assistRequestInstructions {},
    callInformationReport {},
    callInformationRequest {},
    cancel {},
    connect {},
    connectToResource {},
    continue,
    continueWithArgument,
    disconnectForwardConnection,
    establishTemporaryConnection {},
    eventReportBCSM {},
    furnishChargingInformation {},
    initialDP {},
    releaseCall {},
    requestReportBCSMEvent {},
    resetTimer {},
    sendChargingInformation {},
FROM CAP-gsmSSF-gsmSCF-ops-args gsmSSF-gsmSCF-Operations

    playAnnouncement {},
    promptAndCollectUserInformation {},
    specializedResourceReport
FROM CAP-gsmSCF-gsmSRF-ops-args gsmSCF-gsmSRF-Operations

    specializedResourceControlPackage {},
FROM CAP-gsmSCF-gsmSRF-pkgs-contracts-acs gsmSCF-gsmSRF-Protocol

    id-ac-cs2-gsmSSF-scfGenericAC,
    id-ac-cs2-gsmSSF-scfAssistHandoffAC,
    id-inCs2AssistHandoffssfToScf,
    id-as-gsmSSF-scfGenericAS,
    id-as-assistHandoff-gsmSSF-scfAS,
    id-package-scfActivation,
    id-package-gsmSRF-scfActivationOfAssist,
    id-package-assistConnectionEstablishment,
    id-package-genericDisconnectResource,
    id-package-nonAssistedConnectionEstablishment,
    id-package-connect,
    id-package-callHandling,
    id-package-bcsmEventHandling,
    id-package-ssfCallProcessing,
    id-package-scfCallInitiation,
    id-package-timer,
    id-package-billing,
    id-package-charging,
    id-package-callReport,
    id-package-signallingControl,
    id-package-activityTest,
    id-package-cancel,
    classes, ros-InformationObjects, tc-Messages, tc-NotationExtensions,
    gsmSSF-gsmSCF-Operations, gsmSCF-gsmSRF-Operations, gsmSCF-gsmSRF-Protocol
FROM CAP-object-identifiers {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1)
modules(0) CAP-object-identifiers (17) version3(0)}

;
-- Application Contexts

cs2ssf-scfGenericAC APPLICATION-CONTEXT ::= {
    CONTRACT                inCs2SsfToScfGeneric
    DIALOGUE MODE           structured
    ABSTRACT SYNTAXES       {dialogue-abstract-syntax |
                             gsmSSF-scfGenericAbstractSyntax}
    APPLICATION CONTEXT NAME id-ac-cs2-gsmSSF-scfGenericAC}

cs2ssf-scfAssistHandoffAC APPLICATION-CONTEXT ::= {
    CONTRACT                inCs2AssistHandoffssfToScf
    DIALOGUE MODE           structured
    ABSTRACT SYNTAXES       {dialogue-abstract-syntax |
                             assistHandoff-gsmSSF-scfAbstractSyntax}
    APPLICATION CONTEXT NAME id-ac-cs2-gsmSSF-scfAssistHandoffAC}

-- Contracts

inCs2SsfToScfGeneric CONTRACT ::= {
-- dialogue initiated by gsmSSF with InitialDP Operation
    INITIATOR CONSUMER OF
        {
            scfActivationPackage {networkSpecificBoundSet}}
    RESPONDER CONSUMER OF
        {activityTestPackage|
         assistConnectionEstablishmentPackage {networkSpecificBoundSet} |
         bcsmEventHandlingPackage {networkSpecificBoundSet} |

```

```

        billingPackage {networkSpecificBoundSet} |
        callHandlingPackage {networkSpecificBoundSet} |
        callReportPackage {networkSpecificBoundSet} |
        cancelPackage {networkSpecificBoundSet} |
        chargingPackage {networkSpecificBoundSet} |
        connectPackage {networkSpecificBoundSet} |
        genericDisconnectResourcePackage {networkSpecificBoundSet} |
        nonAssistedConnectionEstablishmentPackage {networkSpecificBoundSet} |
        signallingControlPackage {networkSpecificBoundSet} |
        specializedResourceControlPackage {networkSpecificBoundSet} |
        ssfCallProcessingPackage {networkSpecificBoundSet} |
        timerPackage {networkSpecificBoundSet} |
    }
    ID      id-inCs2SsfToScfGeneric
}

inCs2AssistHandoffssfToScf CONTRACT ::= {
-- dialogue initiated by gsmSSF with AssistRequestInstructions
    INITIATOR CONSUMER OF
        {gsmSRF-scfActivationOfAssistPackage {networkSpecificBoundSet}}
    RESPONDER CONSUMER OF
        {activityTestPackage|
        callHandlingPackage {networkSpecificBoundSet} |
        cancelPackage {networkSpecificBoundSet} |
        genericDisconnectResourcePackage {networkSpecificBoundSet} |
        nonAssistedConnectionEstablishmentPackage {networkSpecificBoundSet} |
        specializedResourceControlPackage {networkSpecificBoundSet} |
        timerPackage {networkSpecificBoundSet}
        }
    ID      id-inCs2AssistHandoffssfToScf
}

-- Operation Packages

scfActivationPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {initialDP {bound}}
    ID                  id-package-scfActivation}
gsmSRF-scfActivationOfAssistPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {assistRequestInstructions {bound}}
    ID                  id-package-gsmSRF-scfActivationOfAssist}
assistConnectionEstablishmentPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {establishTemporaryConnection {bound}}
    ID                  id-package-assistConnectionEstablishment}
genericDisconnectResourcePackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {disconnectForwardConnection |
                        disconnectForwardConnectionWithArgument {bound}}
    ID                  id-package-genericDisconnectResource}
nonAssistedConnectionEstablishmentPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {connectToResource {bound}}
    ID                  id-package-nonAssistedConnectionEstablishment}
connectPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {connect {bound}}
    ID                  id-package-connect}
callHandlingPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {releaseCall {bound}}
    ID                  id-package-callHandling}
bcsmEventHandlingPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {requestReportBCSMEvent {bound}}
    SUPPLIER INVOKES    {eventReportBCSM {bound}}
    ID                  id-package-bcsmEventHandling}
ssfCallProcessingPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {collectInformation {bound} | continue}
    ID                  id-package-ssfCallProcessing}
timerPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {resetTimer {bound}}
    ID                  id-package-timer}
billingPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {furnishChargingInformation {bound}}
    ID                  id-package-billing}
chargingPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {applyCharging {bound}}
    SUPPLIER INVOKES    {applyChargingReport {bound}}
    ID                  id-package-charging}
callReportPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {callInformationRequest {bound}}
    SUPPLIER INVOKES    {callInformationReport {bound}}
    ID                  id-package-callReport}
signallingControlPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {sendChargingInformation {bound}}
    ID                  id-package-signallingControl}

```



```

activityTestPackage OPERATION-PACKAGE ::= = {
  CONSUMER INVOKES    {activityTest}
  ID                   id-package-activityTest
  cancelPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= = {
  CONSUMER INVOKES    {cancel {bound}}
  ID                   id-package-cancel
  }
}

-- Abstract Syntaxes

gsmSSF-scfGenericAbstractSyntax ABSTRACT-SYNTAX ::= = {
  GenericSSF-gsmSCF-PDUs
  IDENTIFIED BY id-as-gsmSSF-scfGenericAS}
GenericSSF-gsmSCF-PDUs ::= = TCMesssage {{SsfToScfGenericInvokable},
  {SsfToScfGenericReturnable}}
SsfScfGenericInvokable OPERATION ::= = {
  activityTest |
  applyCharging {networkSpecificBoundSet} |
  applyChargingReport {networkSpecificBoundSet} |
  callInformationReport {networkSpecificBoundSet} |
  callInformationRequest {networkSpecificBoundSet} |
  cancel {networkSpecificBoundSet} |
  connect {networkSpecificBoundSet} |
  connectToResource {networkSpecificBoundSet} |
  disconnectForwardConnection |
  establishTemporaryConnection {networkSpecificBoundSet} |
  eventReportBCSM {networkSpecificBoundSet} |
  furnishChargingInformation {networkSpecificBoundSet} |
  initialDP {networkSpecificBoundSet} |
  releaseCall {networkSpecificBoundSet} |
  requestReportBCSMEEvent {networkSpecificBoundSet} |
  resetTimer {networkSpecificBoundSet} |
  sendChargingInformation {networkSpecificBoundSet} |
  playAnnouncement {networkSpecificBoundSet} |
  promptAndCollectUserInformation {networkSpecificBoundSet} |
  specializedResourceReport |
  }
SsfScfGenericReturnable OPERATION ::= = {
  activityTest |
  applyCharging {networkSpecificBoundSet} |
  applyChargingReport {networkSpecificBoundSet} |
  callInformationRequest {networkSpecificBoundSet} |
  cancel {networkSpecificBoundSet} |
  connect {networkSpecificBoundSet} |
  connectToResource {networkSpecificBoundSet} |
  continue |
  disconnectForwardConnection |
  establishTemporaryConnection {networkSpecificBoundSet}|
  furnishChargingInformation {networkSpecificBoundSet}|
  initialDP {networkSpecificBoundSet}|
  releaseCall {networkSpecificBoundSet}|
  requestReportBCSMEEvent {networkSpecificBoundSet}|
  resetTimer {networkSpecificBoundSet}|
  sendChargingInformation {networkSpecificBoundSet}|
  playAnnouncement {networkSpecificBoundSet}|
  promptAndCollectUserInformation {networkSpecificBoundSet}|
  }

assistHandoff-gsmSSF-scfAbstractSyntax ABSTRACT-SYNTAX ::= = {
  AssistHandoffssf-gsmSCF-PDUs
  IDENTIFIED BY id-as-assistHandoff-gsmSSF-scfAS}
AssistHandoffssf-gsmSCF-PDUs ::= = TCMesssage {{AssistHandoffssfToScfInvokable},
  {AssistHandoffssfToScfReturnable}}
AssistHandoffssfToScfInvokable OPERATION ::= = {
  activityTest |
  assistRequestInstructions {networkSpecificBoundSet}|
  cancel {networkSpecificBoundSet}|
  connectToResource {networkSpecificBoundSet}|
  disconnectForwardConnection |
  playAnnouncement {networkSpecificBoundSet}|
  promptAndCollectUserInformation {networkSpecificBoundSet}|
  resetTimer {networkSpecificBoundSet}|
  specializedResourceReport |
  }
AssistHandoffssfToScfReturnable OPERATION ::= = {
  activityTest |
  assistRequestInstructions {networkSpecificBoundSet}|
  cancel {networkSpecificBoundSet}|
  connectToResource {networkSpecificBoundSet}|
  disconnectForwardConnection |
  playAnnouncement {networkSpecificBoundSet}|
  }

```

```

    promptAndCollectUserInformation {networkSpecificBoundSet}|
    resetTimer {networkSpecificBoundSet}|
  }

gsmSCF-ssfGenericAbstractSyntax ABSTRACT-SYNTAX ::= {
  GenericSCF-gsmSSF-PDUs
  IDENTIFIED BY id-as-gsmSCF-ssfGenericAS}
GenericSCF-gsmSSF-PDUs ::= TCMesssage {{ScfToSsfGenericInvokable}, {ScfToSsfGenericReturnable}}
ScfSsfGenericInvokable OPERATION ::= {
  activityTest |
  applyCharging {networkSpecificBoundSet}|
  applyChargingReport {networkSpecificBoundSet}|
  callInformationRequest {networkSpecificBoundSet}|
  cancel {networkSpecificBoundSet}|
  connect {networkSpecificBoundSet}|
  connectToResource {networkSpecificBoundSet}|
  continue |
  disconnectForwardConnection |
  establishTemporaryConnection {networkSpecificBoundSet}|
  furnishChargingInformation {networkSpecificBoundSet}|
  releaseCall {networkSpecificBoundSet}|
  requestReportBCSMEEvent {networkSpecificBoundSet}|
  resetTimer {networkSpecificBoundSet}|
  sendChargingInformation {networkSpecificBoundSet}|
  playAnnouncement {networkSpecificBoundSet}|
  promptAndCollectUserInformation {networkSpecificBoundSet}|
}
ScfSsfGenericReturnable OPERATION ::= {
  activityTest |
  applyCharging {networkSpecificBoundSet}|
  applyChargingReport {networkSpecificBoundSet}|
  callInformationReport {networkSpecificBoundSet}|
  callInformationRequest {networkSpecificBoundSet}|
  cancel {networkSpecificBoundSet}|
  connect {networkSpecificBoundSet}|
  connectToResource {networkSpecificBoundSet}|
  disconnectForwardConnection |
  establishTemporaryConnection {networkSpecificBoundSet}|
  resetTimer {networkSpecificBoundSet}|
  eventReportBCSM {networkSpecificBoundSet}|
  furnishChargingInformation {networkSpecificBoundSet}|
  requestReportBCSMEEvent {networkSpecificBoundSet}|
  sendChargingInformation {networkSpecificBoundSet}|
  playAnnouncement {networkSpecificBoundSet}|
  promptAndCollectUserInformation {networkSpecificBoundSet}|
  specializedResourceReport
}

END

```

## 6.2 gsmSCF/gsmSRF interface

### 6.2.1 gsmSCF/gsmSRF operations and arguments

```

CAP-gsmSCF-gsmSRF-ops-args {ccitt recommendation q 1228 modules(0) CAP-gsmSCF-gsmSRF-ops-args (7)
version3(0)}

```

```

DEFINITIONS IMPLICIT TAGS ::=

```

```

BEGIN

```

```

IMPORTS

```

```

  OPERATION

```

```

FROM Remote-Operations-Information-Objects ros-InformationObjects

```

```

  opcode-playAnnouncement,
  opcode-promptAndCollectUserInformation,
  opcode-specializedResourceReport,
  opcode-cancel,
  opcode-assistRequest,
  opcode-activityTest

```

```

FROM CAP-operationcodes operationcodes

```

```

  CollectedInfo,
  Digits {},

```

```

ExtensionField {},
InformationToSend {},
GenericNumber {},
ReceivedStatus,

SendingSideID
FROM CAP-datatypes datatypes

    canceled,
    improperCallerResponse,
    missingParameter,
    parameterOutOfRange,
    systemFailure,
    taskRefused,
    unavailableResource,
    unexpectedComponentSequence,
    unexpectedDataValue,
    unexpectedParameter
FROM CAP-errortypes errortypes

PARAMETERS-BOUND
FROM CAP-classes classes

    ros-InformationObjects, operationcodes, datatypes, errortypes, classes
FROM CAP-object-identifiers
{ccitt recommendation q 1228 modules(0) CAP-object-identifiers(17) version3(0)}
;

playAnnouncement {PARAMETERS-BOUND : bound} OPERATION ::= = {
    ARGUMENT      PlayAnnouncementArg {bound}
    RETURN RESULT FALSE
    ERRORS        {canceled |
                  missingParameter |
                  parameterOutOfRange |
                  systemFailure |
                  taskRefused |
                  unexpectedComponentSequence |
                  unexpectedDataValue |
                  unexpectedParameter |
                  unavailableResource |
                  unknownLegId}
    LINKED        {specializedResourceReport}
    CODE          opcode-playAnnouncement
}

-- Direction: gsmSCF → gsmSRF, Timer: Tpa
-- This operation is to be used after Establish Temporary Connection (assist procedure with a second
-- SSP) or a Connect to Resource (no assist) operation. It may be used for inband interaction with
-- an analog user, or for interaction with an ISDN user. In the former case, the gsmSRF is usually
-- collocated with the gsmSSF for standard tones (congestion tone...) or standard announcements. In
the
-- latter case, the gsmSRF is always collocated with the gsmSSF in the switch. Any error is returned
to
-- the gsmSCF. The timer associated with this operation must be of a sufficient duration to allow its
-- linked operation to be correctly correlated.

PlayAnnouncementArg {PARAMETERS-BOUND : bound} ::= SEQUENCE {
    informationToSend [0] InformationToSend {bound},
    disconnectFromIPForbidden [1] BOOLEAN DEFAULT TRUE,
    requestAnnouncementComplete [2] BOOLEAN DEFAULT TRUE,
    extensions [3] SEQUENCE SIZE(1..bound.&numOfExtensions) OF
    ExtensionField {bound} OPTIONAL,
    legID [4] SendingSideID,
    callSegmentID [5] CallSegmentID {bound}
} OPTIONAL,
...
}

promptAndCollectUserInformation {PARAMETERS-BOUND : bound} OPERATION ::= = {
    ARGUMENT      PromptAndCollectUserInformationArg {bound}
    RESULT        ReceivedInformationArg {bound}
    ERRORS        {canceled |
                  improperCallerResponse |
                  missingParameter |
                  parameterOutOfRange |
                  systemFailure |
                  taskRefused |
                  unexpectedComponentSequence |
                  unavailableResource |
                  unexpectedDataValue |
                  unexpectedParameter
}

```

```

CODE          opcode-promptAndCollectUserInformation
}
-- Direction: gsmSCF → gsmSRF, Timer: Tpc
-- This operation is used to interact with a user to collect information.

PromptAndCollectUserInformationArg {PARAMETERS-BOUND : bound} ::= SEQUENCE {
  collectedInfo          [0] CollectedInfo,
  disconnectFromIPForbidden [1] BOOLEAN DEFAULT TRUE,
  informationToSend      [2] InformationToSend {bound} OPTIONAL,
  extensions             [3] SEQUENCE SIZE(1..bound.&numOfExtensions) OF
                               ExtensionField {bound} OPTIONAL,
  ...
}

ReceivedInformationArg {PARAMETERS-BOUND : bound} ::= CHOICE {
  digitsResponse        [0] Digits {bound}
}

specializedResourceReport OPERATION ::= {
  ARGUMENT          SpecializedResourceReportArg
  RETURN RESULT    FALSE
  ALWAYS RESPONDS  FALSE
  CODE             opcode-specializedResourceReport
}
-- Direction: gsmSRF → gsmSCF, Timer: Tsrr
-- This operation is used as the response to a PlayAnnouncement operation when the announcement
-- completed report indication is set.

SpecializedResourceReportArg ::= NULL

END

```

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

```

short:      1 s - 10 s
medium:    1 s - 60 s
long:      1 s - 30 minutes

```

Table 7-1 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 7-1: Operation timers and their value range**

Operation Name	Timer	value range
PlayAnnouncement	T <sub>pa</sub>	long
PromptAndCollectUserInformation	T <sub>pc</sub>	long
SpecializedResourceReport	T <sub>srr</sub>	short

## 6.2.2 gsmSRF/gsmSCF contracts, packages and ACs

### 6.2.2.1 gsmSRF/gsmSCF ASN.1 modules

```

CAP-gsmSCF-gsmSRF-pkgs-contracts-ac {ccitt recommendation q 1228 modules(0)
                                     CAP-gsmSCF-gsmSRF-pkgs-contracts-ac(8) version3(0)}

DEFINITIONS ::=

BEGIN

-- This module describes the operation-packages, contracts and application-contexts used
-- over the gsmSCF-gsmSRF interface.

IMPORTS

  PARAMETERS-BOUND,
  networkSpecificBoundSet,
  emptyConnectionPackage
FROM CAP-classes classes

  ROS-OBJECT-CLASS, CONTRACT, OPERATION-PACKAGE, OPERATION
FROM Remote-Operations-Information-Objects ros-InformationObjects

```

```

TCMessage {}
FROM TCAPMessages tc-Messages

APPLICATION-CONTEXT, dialogue-abstract-syntax
FROM TC-Notation-Extensions tc-NotationExtensions

playAnnouncement {},
promptAndCollectUserInformation {},
specializedResourceReport
FROM CAP-gsmSCF-gsmSRF-ops-args gsmSCF-gsmSRF-Operations

cancel {},
assistRequestInstructions {}
FROM CAP-gsmSSF-gsmSCF-ops-args gsmSSF-gsmSCF-Operations

gsmSRF-scfActivationOfAssistPackage {}
FROM CAP-gsmSSF-gsmSCF-pkgs-contracts-acs gsmSSF-gsmSCF-Protocol

id-package-specializedResourceControl,
id-ac-gsmSRF-gsmSCF,
id-contract-gsmSRF-gsmSCF,
id-package-gsmSRF-scfCancel,
id-as-basic-gsmSRF-gsmSCF,
classes, ros-InformationObjects, tc-Messages, tc-NotationExtensions,
gsmSCF-gsmSRF-Operations, gsmSSF-gsmSCF-Operations, gsmSSF-gsmSCF-Protocol
FROM CAP-object-identifiers {ccitt ecommendation q 1228 modules(0)
                                CAP-object-identifiers (17) version3(0)}
;

-- Application Contexts

gsmSRF-gsmSCF-ac APPLICATION-CONTEXT ::= {
  CONTRACT          gsmSRF-gsmSCF-contract
  DIALOGUE MODE     structured
  TERMINATION       basic
  ABSTRACT SYNTAXES {dialogue-abstract-syntax |
                    gsmSRF-gsmSCF-abstract-syntax}
  APPLICATION CONTEXT NAME id-ac-gsmSRF-gsmSCF}

-- Contracts

gsmSRF-gsmSCF-contract CONTRACT ::= {
  CONNECTION          emptyConnectionPackage
  INITIATOR CONSUMER OF {gsmSRF-scfActivationOfAssistPackage {networkSpecificBoundSet} }
  RESPONDER CONSUMER OF {specializedResourceControlPackage {networkSpecificBoundSet}|
                        gsmSRF-scfCancelPackage {networkSpecificBoundSet}}
  ID                 id-contract-gsmSRF-gsmSCF}

-- specializedResourceControl package

specializedResourceControlPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
  CONSUMER INVOKES {playAnnouncement {bound} |
                  promptAndCollectUserInformation {bound}
  }
  SUPPLIER INVOKES {specializedResourceReport}
  ID               id-package-specializedResourceControl}

-- gsmSRF-scfCancel package

gsmSRF-scfCancelPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
  CONSUMER INVOKES {cancel {bound}}
  ID               id-package-gsmSRF-scfCancel}

-- Abstract Syntaxes

gsmSRF-gsmSCF-abstract-syntax ABSTRACT-SYNTAX ::= {
  BASIC-gsmSRF-gsmSCF-PDUs
  IDENTIFIED BY id-as-basic-gsmSRF-gsmSCF}

BASIC-gsmSRF-gsmSCF-PDUs ::= TCMessage {{gsmSRF-gsmSCF-Invokable}, {gsmSRF-gsmSCF-Returnable}}

gsmSRF-gsmSCF-Invokable OPERATION ::= {
  assistRequestInstructions {networkSpecificBoundSet}|
  cancel {networkSpecificBoundSet}|
  playAnnouncement {networkSpecificBoundSet}|
  promptAndCollectUserInformation {networkSpecificBoundSet}|
  specializedResourceReport |
  }

gsmSRF-gsmSCF-Returnable OPERATION ::= {
  assistRequestInstructions {networkSpecificBoundSet}|
  cancel {networkSpecificBoundSet}|
  playAnnouncement {networkSpecificBoundSet}|

```

```

    promptAndCollectUserInformation {networkSpecificBoundSet}|
  }

```

END

## 7 MO SMS Control

This section defines the operations, arguments, packages and application contexts used for CSE control of MO SMS over the gsmSCF – gprsSSF and gsmSCF – gsmSSF interfaces.

### 7.1 SMS operations and arguments

```

CAP-SMS-ops-args {ccitt(0) identified-organization(4) 3GPP(???) mobileDomain(1) ???3g-network(1)
modules(3) CAP-SMS-ops-args (5) version3(1)}
DEFINITIONS IMPLICIT TAGS ::=
BEGIN
IMPORTS

    errortypes, datatypes, operationcodes, classes, ros-InformationObjects
FROM CAP-object-identifiers

    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-object-
identifiers(17) version3(0)}
OPERATION
FROM Remote-Operations-Information-Objects ros-InformationObjects

tc-Messages, classes FROM CAP-object-identifiers
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) module(0) CAP-
object-identifiers(17) version3(0)}
    InvokeIdType
FROM TCAPMessages tc-Messages

    IMSI,
FROM MAP-CommonDataTypes {ccitt(0) identified-organization(4) ???(0) mobileDomain(0)
gsm-Network(1) modules(3) map-CommonDataTypes(18) version6(6)}

PARAMETERS-BOUND
FROM CAP-classes classes

    opcode-activityTest,
    opcode-connectSMS,
    opcode-continueSMS,
    opcode-eventReportSMS,
    opcode-furnishChargingInformationSMS,
    opcode-initialSMSEvent,
    opcode-releasesSMS,
    opcode-requestReportSMSEvent,
    opcode-resetTimerSMS
FROM CAP-operationcodes operationcodes

...
FROM CAP-datatypes datatypes

...
FROM CAP-errortypes errortypes
;

activityTestSMS OPERATION ::= {
    RETURN RESULT TRUE
    CODE opcode-activityTestSMS
}
-- Direction: gsmSCF → gsmSSF/gprsSSF, Timer: Tatsms
-- This operation is used to check for the continued existence of a relationship between the gsmSCF
-- and gsmSSF/gprsSSF. If the relationship is still in existence, then the gsmSSF/gprsSSF will
respond. If no reply is
-- received, then the gsmSCF will assume that the gsmSSF/gprsSSF has failed in some way.

ConnectSMS ::= OPERATION
ARGUMENT
    ConnectSMSArg
ERRORS {
    MissingParameter,
    ParameterOutOfRange,
    SystemFailure,
    TaskRefused,
    UnexpectedComponentSequence,
    UnexpectedDataValue,

```

```

    UnexpectedParameter
  }

-- Direction: gsmSCF -> gsmSSF or gprsSSF, Timer: Tconsms
-- This operation is used to request the gsmSSF/gprsSSF to perform the SMS processing
-- actions to route
-- or forward a short message to a specified destination.

ConnectSMSArg ::= SEQUENCE {
  callingPartysNumber [0] ISDN-AddressString OPTIONAL,
  destinationSubscriberNumber [1] CalledPartyBCDNumber OPTIONAL,
  SMSCAddress [2] ISDN-AddressString OPTIONAL,
  extensions [10] SEQUENCE SIZE(1..numOfExtensions) OF
    ExtensionField OPTIONAL
  ...
}

-- .

continuesSMS OPERATION ::= {
  RETURN RESULT FALSE
  ALWAYS RESPONDS FALSE
  CODE opcode-continuesSMS
}

-- Direction: gsmSCF -> gsmSSF/gprsSMS, Timer: Tcuesms
-- This operation is used to request the gsmSSF/gprsSSF 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 Association in the SMS FSM). The gsmSSF/gprsSSF continues SMS processing without substituting new
-- data from gsmSCF.

EventReportSMS ::= OPERATION
  ARGUMENT
    EventReportSMSArg

-- Direction: gsmSSF or gprsSSF -> gsmSCF, Timer: Terbsms
-- This operation is used to notify the gsmSCF of a SM related event (e.g., FSM events such
-- as submission or failure) previously requested by the gsmSCF in a RequestReportSMSEvent
-- operation.

EventReportSMSArg ::= SEQUENCE {
  eventTypeSMS [0] EventTypeSMS,
  eventSpecificInformationSMS [1] EventSpecificInformationSMS OPTIONAL,
  miscCallInfo [2] MiscCallInfo DEFAULT {messageType request },
  extensions [10] SEQUENCE SIZE(1..numOfExtensions) OF
    ExtensionField OPTIONAL
  ...
}

FurnishChargingInformationSMS ::= OPERATION
  ARGUMENT
    FurnishChargingInformationSMSArg
  ERRORS {
    MissingParameter,
    TaskRefused,
    UnexpectedComponentSequence,
    UnexpectedDataValue,
    UnexpectedParameter
  }

-- Direction: gsmSCF -> gsmSSF or gprsSSF, Timer: Tfcisms
-- This operation is used to request the gsmSSF to generate, register a charging record or to
-- include some information in the default SM record. The registered charging record is intended
-- for off line charging of the SM.

FurnishChargingInformationSMSArg ::= FCISMSBillingChargingCharacteristics

InitialDPSMS ::= OPERATION
  ARGUMENT
    InitialDPSMSArg
  ERRORS {
    MissingCustomerRecord,
    MissingParameter,
    ParameterOutOfRange,
    SystemFailure,
    TaskRefused,
    UnexpectedComponentSequence,
    UnexpectedDataValue,
    UnexpectedParameter
  }

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

```

```

InitialDPSMSArg ::= SEQUENCE {
    serviceKey [0] ServiceKey,
    destinationSubscriberNumber [1] CalledPartyBCDNumber OPTIONAL,
    callingPartyNumber [2] ISDN-AddressString OPTIONAL,
    eventTypeSMS [3] EventTypeSMS OPTIONAL,
    IMSI [4] IMSI OPTIONAL,
    locationInformationMSC [5] LocationInformation OPTIONAL,
    locationInformationGPRS [6] LocationInformationGPRS OPTIONAL,
    SMSCAddress [7] ISDN-AddressString OPTIONAL,
    timeAndTimezone [8] TimeAndTimezone OPTIONAL,
    TPShortMessageSubmissionSpecificInfo [9] TPShortMessageSubmissionInfo OPTIONAL,
    TPProtocolIdentifier [10] TPProtocolIdentifier OPTIONAL,
    TPDataCodingScheme [9] TPDataCodingScheme OPTIONAL,
    TPValidityPeriod [12] TPValidityPeriod OPTIONAL,
    extensions [10] SEQUENCE SIZE(1..numOfExtensions) OF
        ExtensionField OPTIONAL
    ...
}

ReleaseSMS ::= OPERATION
    ARGUMENT
        ReleaseSMSArg

-- Direction: gsmSCF -> gsmSSF or gprsSSF, Timer: Trcsms
-- This operation is used to prevent an attempt to submit a short message.

ReleaseSMSArg ::= RPCause

RequestReportSMSEvent ::= OPERATION
    ARGUMENT
        RequestReportSMSEventArg
    ERRORS {
        MissingParameter,
        ParameterOutOfRange,
        SystemFailure,
        TaskRefused,
        UnexpectedComponentSequence,
        UnexpectedDataValue,
        UnexpectedParameter
    }

-- Direction: gsmSCF -> gsmSSF or gprsSSF, Timer: Trrbsms
-- This operation is used to request the gsmSSF or gprsSSF to monitor for a SM related event (e.g.,
FSM
-- events such as submission or failure), then send a notification back to the gsmSCF when the
-- event is detected.

RequestReportSMSEventArg ::= SEQUENCE {
    SMSEvents [0] SEQUENCE SIZE (1..numOfSMSEvents) OF SMSEvent,
    extensions [10] SEQUENCE SIZE (1..numOfExtensions) OF
        ExtensionField OPTIONAL,
    ...
}

-- Indicates the SM related events for notification.

resetTimerSMS {PARAMETERS-BOUND : bound} OPERATION ::= {
    ARGUMENT ResetTimerSMSArg {bound}
    RETURN RESULT FALSE
    ERRORS {missingParameter |
        parameterOutOfRange |
        taskRefused |
        unexpectedComponentSequence |
        unexpectedDataValue |
        unexpectedParameter}
    CODE opcode-resetTimer
}

-- Direction: gsmSCF->gsmSSF/gprsSSF, Timer: Trtsms
-- This operation is used to request the gsmSSF/gprsSSF to refresh an application timer in the
gsmSSF.

ResetTimerSMSArg {PARAMETERS-BOUND : bound} ::= SEQUENCE {
    timerID [0] TimerID DEFAULT tssf,
    timervalue [1] TimerValue,
    extensions [2] SEQUENCE SIZE(1..bound.&numOfExtensions) OF
        ExtensionField {bound} OPTIONAL,
    callSegmentID [3] CallSegmentID {bound} OPTIONAL,
    ...
}

-- END

```



Table 7-1: Operation timers and their value range

Operation Name	Timer	value range
ActivityTestSMS	T <sub>atsms</sub>	short
ConnectSMS	T <sub>consms</sub>	Short
ContinueSMS	T <sub>uesms</sub>	short
EventReportSMS	T <sub>erbsms</sub>	Long
FurnishChargingInformationSMS	T <sub>fcisms</sub>	Short
InitialDPSMS	T <sub>idpsms</sub>	Short
ReleaseSMS	T <sub>rcsms</sub>	Short
RequestReportSMSEvent	T <sub>rrbsms</sub>	Short
ResetTimerSMS	T <sub>rtsms</sub>	short

## 7.2 SMS contracts, packages and ACs

### 7.2.1.1 6.2.2SMS ASN.1 module

```

CAP-gprsSSF-gsmSCF-pkgs-contracts-acs {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-
network(1) modules(0) CAP-SSF-gsmSCF-pkgs-contracts-acs (6) version3(0)}
DEFINITIONS ::=
BEGIN

-- This module describes the operation-packages, contracts and application-contexts used
-- over the gsmSSF/gprsSSF-gsmSCF interface.

IMPORTS

    PARAMETERS-BOUND,
    networkSpecificBoundSet
FROM CAP-classes classes

    ROS-OBJECT-CLASS, CONTRACT, OPERATION-PACKAGE, OPERATION
FROM Remote-Operations-Information-Objects ros-InformationObjects

    TCMessage {}
FROM TCAPMessages tc-Messages

    APPLICATION-CONTEXT, dialogue-abstract-syntax
FROM TC-Notation-Extensions tc-NotationExtensions

    activityTest,
    connectSMS,
    continueSMS,
    eventReportSMS,
    furnishChargingInformationSMS,
    initialSMSEvent,
    releaseSMS,
    requestReportSMSEvent,
    resetTimerSMS
FROM CAP-gsmSSF-gsmSCF-ops-args

...
FROM CAP-object-identifiers {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1)
modules(0) CAP-object-identifiers (17) version3(0)}

;
-- Application Contexts

cap3-sms-AC APPLICATION-CONTEXT ::= {
    CONTRACT                cap3SMS
    DIALOGUE MODE            structured
    ABSTRACT SYNTAXES       {dialogue-abstract-syntax |
                             gprsSSF-scfAbstractSyntax}
    APPLICATION CONTEXT NAME id-ac-cap3-sms-AC}

-- Contracts

cap3SMS CONTRACT ::= {
-- dialogue initiated by gprsSSF or gsmSSF with InitialSMSEvent Operation
    INITIATOR CONSUMER OF
        {
            smsActivationPackage {networkSpecificBoundSet}}
    RESPONDER CONSUMER OF

```

```

    {gprsConnectPackage {networkSpecificBoundSet} |
    gprsReleasePackage {networkSpecificBoundSet} |
    gprsEventHandlingPackage {networkSpecificBoundSet} |
    gprsTimerPackage {networkSpecificBoundSet} |
    gprsBillingPackage {networkSpecificBoundSet} |
    gprsChargingPackage {networkSpecificBoundSet} |
    gprsActivityTestPackage {networkSpecificBoundSet} |
    gprsCancelPackage {networkSpecificBoundSet} |
    gprsChargeAdvicePackage {networkSpecificBoundSet}
    }
ID      id-cap3GprsSsfToScf
}

-- Operation Packages

smsActivationPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {initialSMSEvent {bound}}
    ID                  id-package-smsActivation}
smsConnectPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {connectSMS {bound}}
    ID                  id-package-smsConnect}
smsReleasePackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {releaseSMS {bound}}
    ID                  id-package-smsRelease}
smsEventHandlingPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {requestReportSMSEvent {bound}}
    SUPPLIER INVOKES    {eventReportSMS {bound}}
    ID                  id-package-smsEventHandling}
smsBillingPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {furnishChargingInformationSMS {bound}}
    ID                  id-package-smsBilling}
smsActivityTestPackage OPERATION-PACKAGE ::= {
    CONSUMER INVOKES    {activityTestSMS}
    ID                  id-package-smsActivityTest}
}

-- Abstract Syntaxes

sms-AbstractSyntax ABSTRACT-SYNTAX ::= {
    Generic-sms-PDUs
    IDENTIFIED BY    id-as-sms-AS}

Generic-sms-PDUs ::= TCMMessage {{SmsInvokable},
    {SmsReturnable}}

SmsInvokable OPERATION ::= {
    activityTestSMS |
    connectSMS {networkSpecificBoundSet} |
    eventReportSMS {networkSpecificBoundSet} |
    furnishChargingInformationSMS {networkSpecificBoundSet} |
    initialSMSEvent {networkSpecificBoundSet} |
    releaseSMS {networkSpecificBoundSet} |
    requestReportSMSEvent {networkSpecificBoundSet} |
    resetTimerSMS {networkSpecificBoundSet} |
    }

SmsReturnable OPERATION ::= {
    activityTestSMS |
    connectSMS {networkSpecificBoundSet} |
    continueSMS |
    furnishChargingInformationSMS {networkSpecificBoundSet}|
    initialSMSEvent {networkSpecificBoundSet}|
    releaseSMS {networkSpecificBoundSet}|
    requestReportSMSEvent {networkSpecificBoundSet}|
    }

END

```

---

## 8 GPRS Control

### 8.1 gsmSCF/gprsSSF operations and arguments

```

CAP-gprsSSF-gsmSCF-ops-args {ccitt(0) identified-organization(4) 3GPP(???) mobileDomain(1) ???3g-
network(1) modules(3) CAP-GPRS-ops-args (5) version3(1)}
DEFINITIONS IMPLICIT TAGS::=
BEGIN

```

```

IMPORTS

    errortypes, datatypes, operationcodes, classes, ros-InformationObjects
FROM CAP-object-identifiers

    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) modules(0) CAP-object-
identifiers(17) version3(0)}
OPERATION
FROM Remote-Operations-Information-Objects ros-InformationObjects

tc-Messages, classes FROM CAP-object-identifiers
    {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1) module(0) CAP-
object-identifiers(17) version3(0)}
    InvokeIdType
FROM TCAPMessages tc-Messages

    IMSI,
    MSISDN
FROM MAP-CommonDataTypes {ccitt(0) identified-organization(4) ???(0) mobileDomain(0)
gsm-Network(1) modules(3) map-CommonDataTypes(18) version6(6)}

PARAMETERS-BOUND
FROM CAP-classes classes

    opcode-activityTestGPRS,
    opcode-applyChargingGPRS,
    opcode-applyChargingReportGPRS,
    opcode-cancelGPRS,
    opcode-connectGPRS,
    opcode-continueGPRS,
    opcode-furnishChargingInformationGPRS,
    opcode-initialDPGPRS,
    opcode-releaseGPRS,
    opcode-eventreportGPRS,
    opcode-requestReportGPRSEvent,
    opcode-resetTimerGPRS,
    opcode-sendChargingInformationGPRS
FROM CAP-operationcodes operationcodes

    AccessPointName,
    GPRSCause,
    ChargingCharacteristics,
    ChargingResult,
    GPRSChargingID,
    GPRSEventSpecificInformation,
    GPRSEventType,
    GPRSBillingChargingCharacteristics,
    MiscGPRSInfo,
    PDPId,
    PDPTType,
    QualityOfService,
    RAIdentity,
    ServiceKey,
    SGSNCapabilities,
    TimeAndTimeZone,
    TimerID,
    TimerValue,
FROM CAP-datatypes datatypes

    cancelFailed,
    missingCustomerRecord,
    missingParameter,
    parameterOutOfRange,
    systemFailure,
    taskRefused,
    unexpectedComonentSequence,
    unexpectedDataValue,
    unexpectedParameter,
    unknownPDPId
FROM CAP-errortypes errortypes
;

activityTest OPERATION ::= {
    RETURN RESULT TRUE
    CODE    opcode-activityTest
}

-- Direction: gsmSCF → gprsSSF, Timer: Tatg
-- This operation is used to check for the continued existence of a relationship between the gsmSCF
-- and gprsSSF. If the relationship is still in existence, then the gprsSSF 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.

```

```

ApplyChargingGPRS ::= OPERATION
  ARGUMENT
    ApplyChargingGPRSArg
  ERRORS {
    MissingParameter |
    UnexpectedComponentSequence |
    UnexpectedParameter |
    UnexpectedDataValue |
    ParameterOutOfRange |
    SystemFailure |
    TaskRefused |
    UnknownPDPID
  }

-- Direction gsmSSF -> gprsSCF, Timer Tacg
-- This operation is used for interacting from the gsmSCF with the gprsSSF CSE-controlled
-- session or PDP context charging mechanism.

ApplyChargingGPRSArg ::= SEQUENCE {
  chargingCharacteristics [0] ChargingCharacteristics,
  tariffSwitchInterval [1] INTEGER (1..86400) OPTIONAL,
  pDPID [2] PDPID OPTIONAL
}

-- tariffSwitchInterval is measured in 1 second units.

ApplyChargingReportGPRS ::= OPERATION
  ARGUMENT
    ApplyChargingReportGPRSArg
  ERRORS {
    MissingParameter |
    UnexpectedComponentSequence |
    UnexpectedParameter |
    UnexpectedDataValue |
    ParameterOutOfRange |
    SystemFailure |
    TaskRefused |
    UnknownPDPID
  }

-- Direction gprsSSF -> gsmSSF, Timer Tagcr
-- The ApplyChargingReportGPRS operation provides the feedback from the gprsSCF to the gsmSCF
-- CSE-controlled session charging mechanism.

ApplyChargingReportGPRSArg ::= SEQUENCE {
  chargingResult [0] ChargingResult,
  qualityOfService [1] QualityOfService OPTIONAL,
  active [2] BOOLEAN DEFAULT TRUE,
  pDPID [3] PDPID OPTIONAL
}

-- For the encoding of qualityOfService refer to 3G TS 24.008

CancelGPRS ::= OPERATION
  ARGUMENT
    CancelGPRSArg
  ERRORS {
    CancelFailed |
    MissingParameter |
    TaskRefused |
    UnknownPDPID
  }

-- Direction: gsmSCF -> gprsSSF, Timer: Tcag
-- This generic operation cancels the correlated previous operation or all previous requests,
-- i.e. all EDPs and reports can be cancelled by the gsmSCF.

CancelGPRSArg ::= CHOICE {
  allRequests [0] NULL,
  pDPID [1] PDPID OPTIONAL,
}

connectGPRS {PARAMETERS-BOUND: bound} OPERATION ::= {
  ARGUMENT ConnectGPRSArg {bound}
  RETURN RESULT FALSE
  ERRORS {missingParameter |
    parameterOutOfRange |
    unknownPDPID |
    systemFailure |

```

```

        taskRefused |
        unexpectedComponentSequence |
        unexpectedDataValue |
        unexpectedParameter}
CODE      opcode-connect
}
-- Direction: gsmSCF -> gprsSSF, Timer: Tcon
-- This operation is used to modify the Access Point Name used when establishing a PDP Context.

ConnectGPRSArg {PARAMETERS-BOUND: bound} ::= SEQUENCE {
    accessPointName      [0] AccessPointName {bound},
    pdpID                [1] PDPid                OPTIONAL,
    ...
}

ContinueGPRS ::= OPERATION
ARGUMENT
    ContinueGPRSArg
ERRORS {
    MissingParameter |
    UnknownPDPID |
    UnexpectedDataValue
}

-- Direction: gsmSCF -> gprsSSF, Timer: Tcue
-- This operation is used to request the gprsSSF to proceed with processing at the DP at
-- which it previously suspended processing to await gsmSCF instructions (i.e., proceed to
-- the next point in processing in the Attach/Detach FSM or PDP Context FSM) without
-- substituting new data from the gsmSCF.

ContinueGPRSArg ::= SEQUENCE {
    pdPID [0] PDPID
}

EntityReleasedGPRS ::= OPERATION
ARGUMENT
    EntityReleasedGPRSArg
ERRORS {
    CancelFailed |
    MissingParameter |
    TaskRefused |
    UnknownPDPID
}

-- Direction: gprsSSF -> gsmSCF, Timer: Terg
-- This operation is used to notify the gsmSCF that a PDP context has been terminated abnormally in
-- the SGSN.

EntityReleasedGPRSArg ::= SEQUENCE {
    gPRSCause [0] GPRSCause,
    pdPID [1] PDPID
}

furnishChargingInformationGPRS {PARAMETERS-BOUND : bound} OPERATION ::= {
    ARGUMENT      FurnishChargingInformationGPRSArg {bound}
    RETURN RESULT FALSE
    ERRORS        {missingParameter |
                    taskRefused |
                    unexpectedComponentSequence |
                    unexpectedDataValue |
                    unexpectedParameter}
    CODE          opcode-furnishChargingInformationGPRS
}

-- Direction: gsmSCF -> gprsSSF, Timer: Tfcig
-- This operation is used to request the gprsSSF to generate, register a logical record or to
-- include some information in the default logical GPRS record.
-- The registered logical record is intended for off line charging of the GPRS session.

FurnishChargingInformationArg {PARAMETERS-BOUND : bound} ::=
FCIGPRSBillingChargingCharacteristics{bound}

InitialDPGPRS ::= OPERATION
ARGUMENT
    InitialDPGPRSArg
ERRORS {
    MissingCustomerRecord |
    MissingParameter |
    ParameterOutOfRange |
    SystemFailure |
    TaskRefused |
    UnexpectedComponentSequence |
    UnexpectedDataValue |
    UnexpectedParameter
}

```

```

    }

-- Direction gprsSSF -> gsmSCF,Timer Tdpg
-- This operation is used by the gprsSSF when a trigger is detected at a DP in the GPRS state
-- machines to request instructions from the gsmSCF

InitialGPRSEventArg ::= SEQUENCE {
    serviceKey           [0] ServiceKey,
    gPRSEventType       [1] GPRSEventType,
    mSISDN              [2] MSISDN,
    iMSI                [2] IMSI,
    timeAndTimeZone     [3] TimeAndTimeZone,
    gPRSMSCClass        [4] GPRSMSCClass OPTIONAL,
    pDPType             [5] PDPTYPE OPTIONAL,
    qualityOfService    [1] QualityOfService OPTIONAL,
    accessPointName     [7] AccessPointName OPTIONAL,
    routingAreaIdentity [8] RAIdentity OPTIONAL,
    chargingID          [9] GPRSChargingId OPTIONAL,
    sGSNCapabilities    [10]SGSNCapabilities OPTIONAL
}

ReleaseGPRS ::= OPERATION
    ARGUMENT
        ReleaseGPRSArg
    ERRORS {
        CancelFailed |
        MissingParameter |
        TaskRefused |
        UnknownPDPID
    }

-- Direction: gsmSCF -> gprsSSF, Timer: Trg
-- This operation is used to tear down an existing GPRS session or PDP Context at any phase.

ReleaseGPRSArg ::= SEQUENCE {
    gprsCause           [0] GPRSCause,
    pDPID              [1] PDPid OPTIONAL
}

EventReportGPRS ::= OPERATION
    ARGUMENT
        EventReportGPRSArg

-- Direction gprsSSF -> gsmSCF,Timer Trge
-- This operation is used to notify the gsmSCF of a GPRS session or PDP context related
-- events (e.g. attach,PDP context activation) previously requested by the gsmSCF in a
-- RequestGPRSReportDataEvent operation.

EventReportGPRSArg ::= SEQUENCE {
    gPRSEventType       [0] GPRSEventType,
    miscGPRSInfo        [1] MiscGPRSInfo DEFAULT {messageType request},
    gPRSEventSpecificInformation [2] GPRSEventSpecificInformation OPTIONAL,
    pDPID              [3] PDPid OPTIONAL
}

RequestReportGRSEvent ::= OPERATION
    ARGUMENT
        RequestReportGPRSEvent
    ERRORS {
        MissingParameter |
        ParameterOutOfRange |
        SystemFailure |
        TaskRefused |
        UnexpectedComponentSequence |
        UnexpectedDataValue |
        UnexpectedParameter |
        UnknownPDPID
    }

-- Direction: gsmSCF -> gprsSSF, Timer: Trrge
-- This operation is used to request the gprsSSF to monitor for an event (e.g., GPRS events
-- such as -- attach or PDP context activation), then send a notification back to the
-- gsmSCF when the event is detected.

RequestReportGPRSEventArg ::= SEQUENCE
    gPRSEvent           [0] SEQUENCE SIZE (1..numOfGPRSEvents) OF GPRSEvent,

```

```

        pDPID                [1] PDPid        OPTIONAL
    }

-- Indicates the GPRS related events for notification.

ResetTimerGPRS                ::= OPERATION
    ARGUMENT
        ResetTimerGPRSArg
    ERRORS {
        MissingParameter |
        ParameterOutOfRange |
        TaskRefused |
        UnexpectedComponentSequence |
        UnexpectedDataValue |
        UnexpectedParameter |
        UnknownPDPID
    }

-- Direction: gsmSCF -> gprsSSF, Timer: Trtg
-- This operation is used to request the gprsSSF to refresh an application timer in the gprsSSF.

ResetTimerGPRSArg            ::= SEQUENCE {
    timerID                    [0] TimerID        DEFAULT tssf,
    timervalue                 [1] TimerValue,
    pDPID                      [2] PDPid OPTIONAL
}

sendChargingInformationGPRS {PARAMETERS-BOUND: bound} OPERATION ::= {
    ARGUMENT    SendChargingInformationGPRSArg { bound}
    RETURN RESULT    FALSE
    ERRORS    {missingParameter |
        unexpectedComponentSequence |
        unexpectedParameter |
        parameterOutOfRange |
        systemFailure |
        taskRefused |
        unexpectedDataValue |
        unknownPDPID
    }
    CODE    opcode-sendChargingInformationGPRS
}

-- Direction: gsmSCF -> gprsSSF, Timer: Tscig
-- This operation is used to instruct the gprsSSF on the charging information which the
-- gprsSSF shall send to the Mobile Station by means of GSM access signalling.

SendChargingInformationGPRSArg {PARAMETERS-BOUND: bound} ::= SEQUENCE {
    scIGPRSBillingChargingCharacteristics [0] SCIGPRSBillingChargingCharacteristics { bound},
    ...
}

END

```

#### 8.1.1.1.1 Operation timers

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

short: 1 to 20 seconds;  
 medium: 1 to 60 seconds;  
 long: 1 second to 30 minutes

Table 2 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 2

Operation Name	Timer	value
ActivityTestGPRS	Tatg	short
ApplyChargingGPRS	Tacg	short
ApplyChargingReportGPRS	Tacrg	short
CancelGPRS	Tcag	short
ConnectGPRS	Tcong	short
ContinueGPRS	Tcueg	short
EntityReleasedGPRS	Terg	short
FurnishChargingInformationGPRS	Tfcig	short
InitialDPGPRS	Tidpg	short
ReleaseGPRS	Trg	short
EventReportGPRS	Terg	short
RequestReportGPRSEvent	Trrge	short
ResetTimerGPRS	Trtg	Short
SendChargingInformationGPRS	Tscig	short

## 8.2 gsmSCF/gprsSSF contracts, packages and ACs

### 8.2.1.1 gprsSSF/gsmSCF ASN.1 module

```
CAP-gprsSSF-gsmSCF-pkgs-contracts-ac {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-
network(1) modules(0) CAP-gprsSSF-gsmSCF-pkgs-contracts-ac (6) version3(0)}
```

```
DEFINITIONS ::=
BEGIN
```

```
-- This module describes the operation-packages, contracts and application-contexts used
-- over the gprsSSF-gsmSCF interface.
```

```
IMPORTS
```

```
PARAMETERS-BOUND,
networkSpecificBoundSet
FROM CAP-classes classes
```

```
ROS-OBJECT-CLASS, CONTRACT, OPERATION-PACKAGE, OPERATION
FROM Remote-Operations-Information-Objects ros-InformationObjects
```

```
TCMessage {}
FROM TCAPMessages tc-Messages
```

```
APPLICATION-CONTEXT, dialogue-abstract-syntax
FROM TC-Notation-Extensions tc-NotationExtensions
```

```
activityTest,
applyChargingGPRS {},
applyChargingReportGPRS {},
cancelGPRS {},
connectGPRS {},
continueGPRS {},
initialDPGPRS {},
releaseGPRS {},
eventReportGPRS {},
requestReportGRRSEvent,
resetTimerGPRS,
sendChargingInformationGPRS {}
FROM CAP-gsmSSF-gsmSCF-ops-args
```

```
...
FROM CAP-object-identifiers {ccitt(0) identified-organization(4) ???(0) ???Domain(1) ???-network(1)
modules(0) CAP-object-identifiers (17) version3(0)}
```

```
;
-- Application Contexts
```

```
cap3-gprssf-scfAC APPLICATION-CONTEXT ::= {
CONTRACT cap3GprsSsfToScf
```



```

DIALOGUE MODE          structured
ABSTRACT SYNTAXES     {dialogue-abstract-syntax |
                      gprsSSF-scfAbstractSyntax}
APPLICATION CONTEXT NAME id-ac-cap3-gprsSSF-scfAC}

```

-- Contracts

```

cap3GprsSsfToScf CONTRACT ::= {
-- dialogue initiated by gprsSSF with InitialDPGPRS Operation
  INITIATOR CONSUMER OF
    {
      gprSscfActivationPackage {networkSpecificBoundSet}}
  RESPONDER CONSUMER OF
    {gprsConnectPackage {networkSpecificBoundSet} |
     gprsReleasePackage {networkSpecificBoundSet} |
     gprsEventHandlingPackage {networkSpecificBoundSet} |
     gprsTimerPackage {networkSpecificBoundSet} |
     gprsBillingPackage {networkSpecificBoundSet} |
     gprsChargingPackage {networkSpecificBoundSet} |
     gprsActivityTestPackage {networkSpecificBoundSet} |
     gprsCancelPackage {networkSpecificBoundSet} |
     gprsChargeAdvicePackage {networkSpecificBoundSet}
    }
  ID
    id-cap3GprsSsfToScf
}

```

-- Operation Packages

```

gprsScfActivationPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
  CONSUMER INVOKES {initialDPGPRS {bound}}
  ID
    id-package-gprsScfActivation}
gprsConnectPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
  CONSUMER INVOKES {connectGPRS {bound}}
  ID
    id-package-gprsConnect}
gprsReleasePackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
  CONSUMER INVOKES {releaseGPRS {bound}}
  ID
    id-package-gprsRelease}
gprsEventHandlingPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
  CONSUMER INVOKES {requestReportGPRSEvent {bound}}
  SUPPLIER INVOKES {eventReportGPRS {bound}}
  ID
    id-package-gprsEventHandling}
gprsTimerPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
  CONSUMER INVOKES {resetTimerGPRS {bound}}
  ID
    id-package-gprsTimer}
gprsBillingPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
  CONSUMER INVOKES {furnishChargingInformationGPRS {bound}}
  ID
    id-package-gprsBilling}
gprsChargingPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
  CONSUMER INVOKES {applyChargingGPRS {bound}}
  SUPPLIER INVOKES {applyChargingReportGPRS {bound}}
  ID
    id-package-gprsCharging}
gprsChargeAdvicePackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
  CONSUMER INVOKES {sendChargingInformationGPRS {bound}}
  ID
    id-package-gprsChargeAdvice}
gprsActivityTestPackage OPERATION-PACKAGE ::= {
  CONSUMER INVOKES {activityTestGPRS}
  ID
    id-package-gprsActivityTest}
gprsCancelPackage {PARAMETERS-BOUND : bound} OPERATION-PACKAGE ::= {
  CONSUMER INVOKES {cancelGPRS {bound}}
  ID
    id-package-gprsCancel}
}

```

-- Abstract Syntaxes

```

gprsSSF-gsmSCFAbstractSyntax ABSTRACT-SYNTAX ::= {
  GenericPprsSSF-gsmSCF-PDUs
  IDENTIFIED BY id-as-gprsSSF-gsmSCF-AS}

GenericSSF-gsmSCF-PDUs ::= TCMMessage {{GprsSsfToGsmScfInvokable},
                                         {GprsSsfToGsmScfReturnable}}

GprsSsfToGsmScfGenericInvokable OPERATION ::= {
  activityTestGPRS |
  applyChargingGPRS {networkSpecificBoundSet} |
  applyChargingReportGPRS {networkSpecificBoundSet} |
  cancelGPRS {networkSpecificBoundSet} |
  connectGPRS {networkSpecificBoundSet} |
  eventReportGPRS {networkSpecificBoundSet} |
  furnishChargingInformationGPRS {networkSpecificBoundSet} |
  initialDPGPRS {networkSpecificBoundSet} |
}

```

```

releaseGPRS {networkSpecificBoundSet} |
requestReportGPRSEvent {networkSpecificBoundSet} |
resetTimerGPRS {networkSpecificBoundSet} |
sendChargingInformationGPRS {networkSpecificBoundSet} |
}

GprsSsfToGsmScfReturnable OPERATION ::= {
activityTestGPRS |
applyChargingGPRS {networkSpecificBoundSet} |
applyChargingReportGPRS {networkSpecificBoundSet} |
cancelGPRS {networkSpecificBoundSet} |
connectGPRS {networkSpecificBoundSet} |
continueGPRS |
furnishChargingInformationGPRS {networkSpecificBoundSet}|
initialDPGPRS {networkSpecificBoundSet}|
releaseGPRS {networkSpecificBoundSet}|
requestReportGPRSEvent {networkSpecificBoundSet}|
resetTimerGPRS {networkSpecificBoundSet}|
sendChargingInformationGPRS {networkSpecificBoundSet}|
}

gsmSCF-gprsSSFGenericAbstractSyntax ABSTRACT-SYNTAX ::= {
GenericGsmSCF-gprsSSF-PDUs
IDENTIFIED BY id-as-gsmSCF-gprsSSF-AS}

GenericSCF-gprsSSF-PDUs ::= TCMessag {GsmScfToGprsSsfInvokable}, {GsmScfToGprsSsfReturnable}}

GsmScfToGprsSsfInvokable OPERATION ::= {
activityTestGPRS |
applyChargingGPRS {networkSpecificBoundSet}|
applyChargingReportGPRS {networkSpecificBoundSet}|
cancelGPRS {networkSpecificBoundSet}|
connectGPRS {networkSpecificBoundSet}|
continueGPRS |
furnishChargingInformationGPRS {networkSpecificBoundSet}|
releaseGPRS {networkSpecificBoundSet}|
requestReportGPRSEvent {networkSpecificBoundSet}|
resetTimerGPRS {networkSpecificBoundSet}|
sendChargingInformationGPRS {networkSpecificBoundSet}|
}

GsmScfToGprsSsfReturnable OPERATION ::= {
activityTestGPRS |
applyChargingGPRS {networkSpecificBoundSet}|
applyChargingReportGPRS {networkSpecificBoundSet}|
cancelGPRS {networkSpecificBoundSet}|
connectGPRS {networkSpecificBoundSet}|
resetTimerGPRS {networkSpecificBoundSet}|
eventReportGPRS {networkSpecificBoundSet}|
furnishChargingInformationGPRS {networkSpecificBoundSet}|
requestReportGPRSEvent {networkSpecificBoundSet}|
sendChargingInformationGPRS {networkSpecificBoundSet}|
}

END

```

---

## 9 Application Entity procedures

The description of the application entity procedures for CAMEL Phase 3 can be found in 3G TS 23.078 [16].

---

## 10 Error procedures

This clause defines the generic error procedures for the CAP. The error procedure descriptions have been divided in two subclauses, subclause 17.1 listing the errors related to CAP operations and subclause 17.2 listing the errors related to error conditions in the different FEs which are not directly related to the CAP operations.

### 10.1 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 subclauses 4-10. The TCAP services which are used for reporting operation errors are described in subclause 19.1.

Errors which have a specific procedure for an operation are described in subclauses 12-16 with the detailed procedure of the related operation.

All errors, which can be detected by the ASN.1 decoder, already may be detected during the decoding of the TCAP message and indicated by the TC error indication "MistypedParameter" in the TC-U-Reject.

## 10.1.1 Canceled

### 10.1.1.1 General Description

#### 10.1.1.1.1 11.1.2.1.1 Error description

The Error "Canceled" gives an indication to the gsmSCF that the cancellation, as it was requested by the gsmSCF, of a specific Operation, has been successful. The gsmSCF is only able to cancel certain predefined gsmSCF→gsmSRF Operations.

### 10.1.1.2 Operations gsmSCF→gsmSRF

PlayAnnouncement

PromptAndCollectUserInformation

#### **Procedures at responding entity (gsmSRF)**

##### A) Receiving Cancel

Precondition: SRSM state 3 User Interaction.

Postcondition: SRSM state 3 User Interaction.

The indicated PlayAnnouncement or PromptAndCollectUserInformation is terminated if it is presently executing or deleted from the buffer. If the indicated PlayAnnouncement or PromptAndCollectUserInformation is already executed this causes a failure ("CancelFailed").

##### B) Sending Cancel Error

Precondition: SRSM state 3 User Interaction.

Postcondition: SRSM state 3 User Interaction.

After returning the "Canceled" Error the gsmSRF stays in the same state. The execution of the indicated PlayAnnouncement or PromptAndCollectUserInformation is aborted, i.e., the gsmSRF remains connected and the next PlayAnnouncement or PromptAndCollectUserInformation is executed if available.

## 10.1.2 CancelFailed

### 10.1.2.1 General description

#### 10.1.2.1.1 11.1.3.1.1 Error description

This Error is returned by Cancel if the canceling of an Operation, as requested by the gsmSCF, was not successful. Possible failure reasons are:

- 0 unknownOperation, when the InvokeID of the operation to cancel is not known to gsmSRF (this may also happen in case the operation has already been completed);
- 1 tooLate, when the invokeID is known but the execution of the operation is in a state that it cannot be canceled anymore. For instance the announcement is finished but the SpecializedResourceReport has not been sent to the gsmSCF yet. The conditions for the occurrence of failure reason "tooLate" may be implementation dependent;
- 2 operationNotCancellable, when the invokeID points to an Operation that the gsmSCF is not allowed to cancel.

### 10.1.2.1.1.2 11.1.3.1.2 Argument description

```
PARAMETER SEQUENCE {
  problem      [0] ENUMERATED {
    unknownOperation (0),
    tooLate (1),
    operationNotCancellable (2)},
  operation    [1] InvokeID
}
-- The operation failed to be canceled.
```

### 10.1.2.2 Operations gsmSCF→gsmSSF

Cancel

### 10.1.2.3 Operations gsmSCF→gsmSRF

Cancel

#### Procedures at responding entity (gsmSRF)

A) Receiving Cancel. However, the indicated PlayAnnouncement or PromptAndCollectUserInformation is not known, or already executed. This causes a failure, CancelFailed.

Precondition: SRSM state 3 User Interaction.

Postcondition: SRSM state 3 User Interaction or  
SRSM state 1 Idle.

B) Sending CancelFailed Error

Precondition: SRSM state 3 User Interaction or  
SRSM state 1 Idle.

Postcondition: SRSM state 3 User Interaction or  
SRSM state 1 Idle.

After returning the CancelFailed the gsmSRF stays in the same state.

## 10.1.3 ETCFailed

### 10.1.3.1 General description

#### 10.1.3.1.1.1 11.1.5.1.1 Error description

ETCFailed is an error from gsmSSF to gsmSCF, indicating the fact that the establishment of a temporary connection to an assisting gsmSSF or gsmSRF was not successful (e.g., receiving a "Backwards Release" after sending an IAM).

### 10.1.3.2 Operations gsmSCF→gsmSSF

EstablishTemporaryConnection

#### Procedures at responding entity (gsmSSF)

A gsmSSF receives EstablishTemporaryConnection from a gsmSCF but the establishment of the connection fails, results in returning an ETCFailed Error to the gsmSCF.

Precondition: gsmSSF FSM state c    Waiting for Instructions.

Postcondition: gsmSSF FSM state c    Waiting for Instructions.

No further error treatment.

## 10.1.4 Spare

## 10.1.5 ImproperCallerResponse

### 10.1.5.1 General description

#### 10.1.5.1.1.1 11.1.7.1.1 Error description

The format of the user input has been checked by the gsmSRF and does not correspond to the required format as it was defined in the initiating Operation.

### 10.1.5.2 Operations gsmSCF→gsmSRF

PromptAndCollectUserInformation

#### **Procedures at responding entity (gsmSRF)**

A) gsmSRF receives PromptAndCollectUserInformation

Precondition: SRSM state 2 Connected or  
SRSM state 3 User Interaction.

Postcondition: SRSM state 3 User Interaction.

B) response from caller is not correct, gsmSRF returns ImproperCallerResponse to gsmSCF

Precondition: SRSM state 3 User Interaction.

Postcondition: SRSM state 3 User Interaction.

gsmSRF waits for a new Operation from gsmSCF. This may be a new PromptAndCollectUserInformation or PlayAnnouncement.

## 10.1.6 MissingCustomerRecord

### 10.1.6.1 General description

#### 10.1.6.1.1.1 11.1.8.1.1 Error description

This error is sent by the gsmSSF to the gsmSCF, in order to report the lack of the required user record within the SSP.

This error is also sent by the gsmSCF to the gsmSSF or the gsmSRF, if the SLP could not be found in the gsmSCF, because the required customer record does not exist, or the requested SLPI, indicated by the correlationID in "AssistRequestInstructions" does not exist anymore. These two cases should be distinguished as two different error situations, because the error procedure shows that the occurrence of the MissingCustomerRecord error is reported to the maintenance function, but the report to the maintenance function for the occurrence of the former case should be optional because it occurs not only in extraordinary situation but in ordinary situation. For example, the former may occur when the end user dials a missing free-phone number.

### 10.1.6.2 Operations gsmSSF→gsmSCF

AssistRequestInstructions

InitialDP

#### **Procedures at invoking entity (gsmSSF)**

A) Sending Operation

Precondition: gsmSSF FSM state b Trigger processing or  
gsmSSF FSM state b' Waiting for Instructions; in case of assist/hand-off.

Postcondition: gsmSSF FSM state c Waiting for Instructions.  
gsmSSF FSM state b' Waiting for Instructions; in case of assist/hand-off.

B) gsmSSF receives Error"MissingCustomerRecord"

Precondition: gsmSSF FSM state c Waiting for Instructions or  
gsmSSF FSM state b' Waiting for Instructions; in case of assist/hand-off.

Postcondition: gsmSSF FSM state a Idle or  
gsmSSF FSM state a' Idle; in case of assist/hand-off.

The CCF routes the call if necessary (e.g., default routing to a terminating announcement).

### 10.1.6.3 Operations gsmSRF→gsmSCF

AssistRequestInstructions

#### Procedures at invoking entity (gsmSRF)

A) Sending Operation

Precondition: SRSM state 2 Connected.

Postcondition: SRSM state 2 Connected.

B) gsmSRF receives Error"MissingCustomerRecord"

Precondition: SRSM state 2 Connected.

Postcondition: SRSM state 1 Idle.

gsmSRF initiated Disconnect.

### 10.1.7 MissingParameter

#### 10.1.7.1 General description

##### 10.1.7.1.1.1 11.1.9.1.1 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: a mandatory parameter (the application shall always return this error in case it is not detected by the ASN.1 decoder) or an expected optional parameter which is essential for the application is not included in the Operation argument.

#### 10.1.7.2 Operations gsmSCF→gsmSSF

##### Call Associated/Non Call Processing

ApplyCharging

CallInformationRequest

Cancel

FurnishChargingInformation

RequestReportBCSMEvent

ResetTimer

SendChargingInformation

### Call Associated/Call Processing

Connect

ConnectToResource

ContinueWithArgument

EstablishTemporaryConnection

#### Procedures at responding entity (gsmSSF)

Precondition: (1) gsmSSF FSM appropriate state  
 (2) gsmSSF FSM Call associated operation received, appropriate event occurred  
 (3) SSME appropriate state  
 (4) SSME Non call associated operation received, appropriate event

Postcondition: (1) gsmSSF FSM transition to the same state  
 (2) SSME transition to the initial state (i.e., before receiving the erroneous operation)

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

### 10.1.7.3 Operations gsmSSF→gsmSCF

ApplyChargingReport

AssistRequestInstructions

InitialDP

#### Procedures at invoking entity (gsmSSF)

A) Sending Operation

Precondition: gsmSSF FSM any state in which the above operations can be transferred

Postcondition: gsmSSF FSM any state as result of the transfer of any of the above operations

B) gsmSSF receives Error"MissingParameter"

Precondition: gsmSSF FSM any state as result of the transfer of any of the above operations

Postcondition: gsmSSF FSM state a Idle

After receiving this Error, the gsmSSF FSM returns to the state Idle. The CCF routes the call if necessary (default routing to a terminating announcement). If the call is already established (i.e., mid-call trigger or ApplyChargingReport), the CCF may maintain the call or disconnect it. The choice between these two options is network operator specific. In case of an assisting gsmSSF, the temporary connection is released by the assisting gsmSSF.

### 10.1.7.4 Operations gsmSCF→gsmSRF

Cancel

PlayAnnouncement

PromptAndCollectUserInformation

#### Procedures at responding entity (gsmSRF)

Precondition: SRSM state 2 Connected or  
 SRSM state 3 User Interaction

Postcondition: SRSM state 3 User Interaction

The SRSM detects that a required parameter is not present in the Operation argument. The Error parameter MissingParameter is used to inform the gsmSCF of this situation. The gsmSCF should take the appropriate actions to treat this error.

### 10.1.7.5 Operations gsmSRF→gsmSCF

AssistRequestInstructions

#### Procedures at invoking entity (gsmSRF)

##### A) Sending Operation

Precondition: SRSM state 2 Connected.

Postcondition: SRSM state 2 Connected.

##### B) Receiving Error

Precondition: SRSM state 2 Connected.

Postcondition: SRSM state 1 Idle.

The gsmSCF detects the error in the received operation. The Error parameter is used to inform the gsmSRF of this situation. The SL and maintenance functions are informed. The gsmSCF might try another gsmSRF, route the call or release the call (SL dependent).

## 10.1.8 ParameterOutOfRange

### 10.1.8.1 General description

#### 10.1.8.1.1.1 11.1.11.1.1 Error description

The responding entity cannot start the processing of the requested Operation because an Error in a parameter of the Operation argument is detected: a parameter value is out of range. This error is applied for the following two cases (when the error is determined by the application):

- (1) For the parameter which type is defined with the range of its size, such as INTEGER(x..y), SEQUENCE SIZE(x..y) OF Type. This error is applied when the parameter value is z or the parameter size is z where  $z < x$  or  $z > y$ .
- (2) For the parameter which type is defined as list of ENUMERATED value, the ParameterOutOfRange error is applied when the parameter value is not equal to any of the ENUMERATED values in the list.

### 10.1.8.2 Operations gsmSCF→gsmSSF

#### Call Associated/Non Call Processing

ApplyCharging

CallInformationRequest

#### Call Associated/Call Processing

Connect

ContinueWithArgument

RequestReportBCSMEEvent

ResetTimer



SendChargingInformation

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

### 10.1.8.3 Operations gsmSSF→gsmSCF

ApplyChargingReport

InitialDP

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

### 10.1.8.4 Operations gsmSCF→gsmSRF

PlayAnnouncement

PromptAndCollectUserInformation

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

## 10.1.9 RequestedInfoError

### 10.1.9.1 General description

#### 10.1.9.1.1 11.1.13.1.1 Error description

The RequestedInfoError is an immediate response to the CallInformationRequest operation, indicating that the requested information is not known to the gsmSSF or is not available. RequestedInfoError is used when a specific gsmSSF/CCF can not offer the information specified with RequestedInformationType but there exists other gsmSSF/CCF that can offer the information.

#### 10.1.9.1.2 11.1.13.1.2 Argument description

```
PARAMETER ENUMERATED {
    unknownRequestedInfo(1),
    requestedInfoNotAvailable(2)
    -- other values not specified
}
```

### 10.1.9.2 Operations gsmSCF→gsmSSF

CallInformationRequest

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

## 10.1.10 11.1.18 SystemFailure

### 10.1.10.1 General description

#### 10.1.10.1.1 11.1.18.1.1 Error description

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

#### 10.1.10.2 Argument description

PARAMETER

UnavailableNetworkResource

UnavailableNetworkResource:: = ENUMERATED {  
    unavailableResources (0),  
    componentFailure (1),  
    basicCallProcessingException (2),  
    resourceStatusFailure (3),  
    endUserFailure (4)}

### 10.1.10.3 Operations gsmSCF→gsmSSF

#### **Call Associated/Non Call Processing**

ApplyCharging

CallInformationRequest

RequestReportBCSMEvent

SendChargingInformation

#### **Call Associated/Call Processing**

Connect

ConnectToResource

DisconnectForwardConnection

DisconnectForwardConnectionWithArgument

EstablishTemporaryConnection

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

### 10.1.10.4 Operations gsmSSF→gsmSCF

ApplyChargingReport

AssistRequestInstructions

InitialDP

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

### 10.1.10.5 Operations gsmSCF→gsmSRF

PlayAnnouncement

PromptAndCollectUserInformation

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

### 10.1.10.6 Operations gsmSRF→gsmSCF

AssistRequestInstructions

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

## 10.1.11 TaskRefused

### 10.1.11.1 General introduction

#### 10.1.11.1.1 11.1.19.1.1 Error description

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

#### 10.1.11.1.2 11.1.19.1.2 Argument description

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

### 10.1.11.2 Operations gsmSCF→gsmSSF

#### Call Associated/Non Call Processing

ApplyCharging

CallInformationRequest

Cancel

FurnishChargingInformation

RequestReportBCSMEEvent

ResetTimer

SendChargingInformation

#### Call Associated/Call Processing

Connect

ConnectToResource

DisconnectForwardConnection

EstablishTemporaryConnection

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

### 10.1.11.3 Operations gsmSSF→gsmSCF

ApplyChargingReport

AssistRequestInstructions

InitialDP

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

### 10.1.11.4 Operations gsmSCF→gsmSRF

Cancel

PlayAnnouncement

PromptAndCollectUserInformation

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

### 10.1.11.5 Operations gsmSRF→gsmSCF

AssistRequestInstructions

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

## 10.1.12 UnavailableResource

### 10.1.12.1 General description

#### 10.1.12.1.1 11.1.20.1.1 Error description

The gsmSRF is not able to perform its function (i.e., play a certain announcement and/or collect specific user information), and cannot be replaced. A reattempt is not possible.

### 10.1.12.2 Operations gsmSCF→gsmSRF

PlayAnnouncement

PromptAndCollectUserInformation

#### **Procedures at responding entity (gsmSRF)**

##### A) gsmSRF receiving PlayAnnouncement or PromptAndCollectUserInformation

Precondition: SRSM state 2 Connected; if initial PlayAnnouncement or PromptAndCollectUserInformation. Or SRSM state 3 User Interaction; if not initial PlayAnnouncement or PromptAndCollectUserInformation.

##### B) gsmSRF is not able to perform its function (and cannot be replaced). gsmSRF sends UnavailableResource.

Precondition: SRSM state 3 User Interaction.

Postcondition: SRSM state 3 User Interaction.

## 10.1.13 UnexpectedComponentSequence

### 10.1.13.1 General description

#### 10.1.13.1.1 11.1.21.1.1 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 FSM.

### 10.1.13.2 Operations gsmSCF→gsmSSF

#### **Call Associated/Non Call Processing**

ApplyCharging

CallInformationRequest

FurnishChargingInformation

RequestReportBCSMEvent

ResetTimer

SendChargingInformation

## Call Associated/Call Processing

Connect

ConnectToResource

ContinueWithArgument

DisconnectForwardConnection

DisconnectForwardConnectionWithArgument

EstablishTemporaryConnection

In this case the gsmSSF detects the erroneous situation, sends the UnexpectedComponentSequence error and remains in the same state. In the gsmSCF the SL and maintenance functions are informed and the SL decides about error treatment.

### 10.1.13.3 Operations gsmSSF→gsmSCF

ApplyChargingReport

AssistRequestInstructions

InitialDP

In case of assisting gsmSSF an error occurs in case an AssistRequestInstructions is sent while a relationship between gsmSCF and assisting gsmSSF has already been established, the gsmSCF returns the error parameter. SL and maintenance are informed. On receiving the error the assisting gsmSSF moves to Idle and the temporary connection is released.

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

### 10.1.13.4 Operations gsmSCF→gsmSRF (only applicable for direct gsmSCF-gsmSRF case)

PlayAnnouncement

PromptAndCollectUserInformation

In this case the gsmSRF detects the erroneous situation, sends the UnexpectedComponentSequence error and remains in the same state. In the gsmSCF, the SL and maintenance functions are informed and the SL decides about error treatment. Possible error treatment is to send the DisconnectForwardConnection operation to the gsmSSF.

### 10.1.13.5 Operations gsmSRF→gsmSCF

AssistRequestInstructions

In this case, an error occurs if the gsmSRF has already an established relationship with the gsmSCF and sends an AssistRequestInstructions. The gsmSCF detects the erroneous situation, informs SL and maintenance functions and returns the error parameter. On receiving the parameter the gsmSRF moves to idle and releases the temporary connection.

## 10.1.14 UnexpectedDataValue

### 10.1.14.1 General description

#### 10.1.14.1.1 11.1.22.1.1 Error description

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

Note that this error does not overlap with "ParameterOutOfRange"

EXAMPLE:     startTime DateAndTime :: = -- value indicating January 32 1993, 12: 15: 01

          The responding entity does not expect this value and responds with "UnexpectedDataValue".

#### 10.1.14.2 Operations gsmSCF→gsmSSF

##### **Call Associated/Non Call Processing**

ApplyCharging

CallInformationRequest

FurnishChargingInformation

RequestReportBCSMEvent

ResetTimer

SendChargingInformation

##### **Call Associated/Call Processing**

Connect

ConnectToResource

ContinueWithArgument

DisconnectForwardConnectionWithArgument

EstablishTemporaryConnection

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

#### 10.1.14.3 Operations gsmSSF→gsmSCF

ApplyChargingReport

AssistRequestInstructions

InitialDP

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

#### 10.1.14.4 Operations gsmSCF→gsmSRF

PlayAnnouncement

PromptAndCollectUserInformation

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

#### 10.1.14.5 Operations gsmSRF→gsmSCF

AssistRequestInstructions

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

## 10.1.15 UnexpectedParameter

### 10.1.15.1 General description

#### 10.1.15.1.1 11.1.23.1.1 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.

### 10.1.15.2 Operations gsmSCF→gsmSSF

#### **Call Associated/Non Call Processing**

ApplyCharging

CallInformationRequest

FurnishChargingInformation

RequestReportBCSMEvent

ResetTimer

SendChargingInformation

#### **Call Associated/Call Processing**

Connect

ConnectToResource

ContinueWithArgument

EstablishTemporaryConnection

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

### 10.1.15.3 Operations gsmSSF→gsmSCF

ApplyChargingReport

AssistRequestInstructions

InitialDP

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

### 10.1.15.4 Operations gsmSCF→gsmSRF

PlayAnnouncement

PromptAndCollectUserInformation

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

### 10.1.15.5 Operations gsmSRF→gsmSCF

AssistRequestInstructions

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

## 10.1.16 UnknownLegID

### 10.1.16.1 General description

#### 10.1.16.1.1 11.1.24.1.1 Error description

This error is used to indicate to the gsmSCF that a specific leg, indicated by the LegID parameter value in the operation, is unknown to the gsmSSF.

### 10.1.16.2 Operations gsmSCF→gsmSSF

#### Call Associated/Non Call Processing

ApplyCharging

CallInformationRequest

RequestReportBCSMEEvent

SendChargingInformation

#### Call Associated/Call Processing

ConnectToResource

ContinueWithArgument

EstablishTemporaryConnection

PlayAnnouncement

Refer to subclause 17.1.9 MissingParameter for the appropriate error procedures.

## 10.2 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 19.

### 10.2.1 Expiration of $T_{SSF}$

#### 10.2.1.1 General description

##### 10.2.1.1.1 11.2.1.1.1 Error description

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

#### 10.2.1.2 Procedures gsmSSF→gsmSCF

##### Procedure at the invoking entity (gsmSSF)

Timeout occurs in gsmSSF on  $T_{SSF}$

Precondition: gsmSSF FSM state c Waiting for instructions or  
gsmSSF FSM state d Waiting for end of User Interaction or  
gsmSSF FSM state e Waiting for end of Temporary connection.

Postcondition: gsmSSF FSM state a Idle.



The gsmSSF FSM aborts the dialogue and moves to the Idle state, the CCF routes the call if necessary (e.g., default routing to a terminating announcement). The abort is reported to the maintenance functions.

## 10.2.2 Expiration of $T_{\text{SRF}}$

### 10.2.2.1 General Description

#### 10.2.2.1.1.1 Error description

A timeout occurred in the gsmSRF on the response from the gsmSCF. This procedure concerns only the direct gsmSCF-gsmSRF case.

### 10.2.2.2 Procedures gsmSRF→gsmSCF

#### Procedure at the invoking entity (gsmSRF)

Timeout occurs in gsmSRF on  $T_{\text{SRF}}$

Precondition: SRSM state 2 Connected or  
SRSM state 3 User Interaction.

Postcondition: SRSM state 1 Idle

The gsmSRF aborts the dialogue and moves to the Idle state, all allocated resources are de-allocated. The abort is reported to the maintenance functions.

## 11 Detailed operation procedures

NOTE: The detailed operation procedures in this subclause which cross reference the gsmSCF FSMs for the pre- and post-conditions are for information only; refer to the note at the beginning of clause 13.

### 11.1 ActivityTest procedure

#### 11.1.1 General description

This operation is used to check for the continued existence of a relationship between the gsmSCF and gsmSSF or between the gsmSRF. If the relationship is still in existence, then the receiving entity will respond. If no reply is received within a given time period, then the gsmSCF which sent this operation will assume that the receiving entity has failed in some way and will take the appropriate action.

##### 11.1.1.1 Parameters

None.

#### 11.1.2 Responding entity (gsmSSF)

##### 11.1.2.1 Normal procedure

gsmSSF precondition:

- (1) A relationship exists between the gsmSCF and the gsmSSF
- (2) The SSME FSM is in the state "Idle Management"

gsmSSF postcondition:

- (1) The SSME-FSM stays in the state "Idle Management"

- (2) If the Dialogue ID is active and if there is a gsmSSF-FSM using the dialogue, the SSME sends a Return Result "ActivityTest" to the gsmSCF. The SSME-FSM returns to the state "Idle Management".

If the Dialogue ID is not active, the TC in the gsmSSF will issue a P-Abort, the SSME will in that case never receive the "ActivityTest" req.ind and thus will not be able to reply.

### 11.1.2.2 Error handling

Operation related error handling is not applicable, due to class 3 operation.

## 11.2 ActivityTestGPRS procedure

### 11.2.1 General description

This operation is used to check for the continued existence of a relationship between the gsmSCF and gprsSSF. If the relationship is still in existence, then the gprsSSF will respond. If no reply is received within a given time period, then the gsmSCF which sent this operation will assume that the receiving entity has failed in some way and will take the appropriate action.

#### 11.2.1.1 Parameters

None.

### 11.2.2 Responding entity (gprsSSF)

#### 11.2.2.1 Normal procedure

gprsSSF precondition:

- (1) A relationship exists between the gsmSCF and the gprsSSF

gprsSSF postcondition:

- (1) The SSME-FSM stays in the state "Idle Management"
- (2) If the Dialogue ID is active and if there is a gprsSSF using the dialogue, the SSME sends a Return Result "ActivityTestGPRS" to the gsmSCF. The SSME-FSM returns to the state "Idle Management".

If the Dialogue ID is not active, the TC in the gprsSSF will issue a P-Abort, the SSME will in that case never receive the "ActivityTestGPRS" req.ind and thus will not be able to reply.

#### 11.2.2.2 Error handling

Operation related error handling is not applicable, due to class 3 operation.

## 11.3 ActivityTestSMS procedure

### 11.3.1 General description

This operation is used to check for the continued existence of a relationship between the gsmSCF and gprsSSF/gsmSSF for SMS. If the relationship is still in existence, then the gprsSSF/gsmSSF will respond. If no reply is received within a given time period, then the gsmSCF which sent this operation will assume that the receiving entity has failed in some way and will take the appropriate action.

### 11.3.1.1 Parameters

None.

## 11.3.2 Responding entity (gprsSSF or gsmSSF)

### 11.3.2.1 Normal procedure

SSF precondition:

- (1) A relationship exists between the gsmSCF and the SSF

SSF postcondition:

- (1) The SSME-FSM stays in the state "Idle Management"
- (2) If the Dialogue ID is active and if there is a gprsSSF using the dialogue, the SSME sends a Return Result "ActivityTestGPRS" to the gsmSCF. The SSME-FSM returns to the state "Idle Management".

If the Dialogue ID is not active, the TC in the SSF will issue a P-Abort, the SSME will in that case never receive the "ActivityTestGPRS" req.ind and thus will not be able to reply.

### 11.3.2.2 Error handling

Operation related error handling is not applicable, due to class 3 operation.

## 11.4 ApplyCharging procedure

### 11.4.1 General description

This operation is used for interacting from the gsmSCF with the gsmSSF function: CSE control of call duration. The ApplyChargingReport operation provides the feedback from the gsmSSF to the gsmSCF.

As several connection configurations may be established during a call, a possibility exists for the "ApplyCharging" to be invoked at the beginning of each connection configuration, for each party.

#### 11.4.1.1 Parameters

- aChBillingChargingCharacteristics:  
This parameter specifies a list of parameters required for CSE control of call duration:

The list may contain:

- timeDurationCharging:

This list contains the following parameters:

- maxCallPeriodDuration:  
This parameter specifies the period of time for which a call can progress before an ApplyChargingReport shall be sent to the gsmSCF.
- releaseIfdurationExceeded:  
This parameter specifies the action to be taken at the gsmSSF when the duration specified above has been reached. If the parameter is present, then the call is released.
- Tone  
If the parameter is present, then a warning tone is played when the warning tone timer expires.
- tariffSwitchInterval:  
This parameter indicates to the gsmSSF the time duration until the next tariff switch. The

measurement of the elapsed tariff switch period commences immediately upon successful execution of this operation.

- partyToCharge:  
This parameter indicates the party in the call to which the "ApplyCharging" operation should be applied. If it is not present, then it is applied to the calling party (A-party).

- CallReleasedAtTcpExpiry

This present indicates that the gsmSSF has released the call and terminated the dialogue.

It shall be present when ACR is sent due to Tcp expiry and the gsmSSF has released the call (because ReleaseIfExceeded was present in ACH) and terminated the dialogue.

In all other instances, this parameter shall be absent.

## 11.4.2 Responding entity (gsmSSF)

### 11.4.2.1 Normal procedure

gsmSSF precondition:

- (1) The FSM for CS is in one of the following states:  
"Waiting for Instructions"  
"Waiting for End of User Interaction(WFI)" ,  
"Waiting for End of User Interaction(MON)" ,  
"Waiting for End of Temporary Connection(WFI)" ,  
"Waiting for End of Temporary Connection(MON)" ,  
"Monitoring" , or  
the assisting/hand-off gsmSSF-FSM is in state:  
"Waiting for Instructions"

gsmSSF postcondition:

- (1) No FSM state transition

On receipt of this operation, the gsmSSF sets the charging data using the information elements included in the operation and acts accordingly. In addition, the gsmSSF will start the monitoring of the end of the connection configuration and other charging events, if requested.

The gsmSSF will start monitoring for the Answer event upon receipt of the ApplyCharging operation if Answer has not already been received on an outgoing connection to a Called Party, a Temporary Connection or a connection to a gsmSRF. Upon subsequent detection of the Answer event on the outgoing connection charging is started. If the Answer event has been received from an outgoing connection already when the ApplyCharging operation is received then charging starts immediately.

Upon release of an outgoing connection to the Called Party, the Temporary Connection or the gsmSRF connection any indication of Answer event receipt on the outgoing connection is cleared i.e. set to Answer event not received.

### 11.4.2.2 Error handling

TaskRefused: In addition to the generic error handling noted below, this error shall be indicated when:

- a previously received call period duration is pending,
- a tariffSwitchInterval is indicated when a previously received tariffSwitchInterval is pending.

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

## 11.5 ApplyChargingGPRS procedure

### 11.5.1 General description

This operation is used for interacting from the gsmSCF with the gprsSSF function: CSE control of GPRS session or PDP context duration and volume. The ApplyChargingGPRSReport operation provides the feedback from the gprsSSF to the gsmSCF. The charging scenarios supported by this operation are those given in 3G TS 22.078 for CSE control of GPRS session and PDP context duration and volume.

#### 11.5.1.1 Parameters

- chargingCharacteristics:

This parameter specifies a choice between parameters required for CSE control of a GPRS session or a PDP context:

- maxTransferredVolume:

This parameter specifies the maximum volume to be transferred in number of bytes.

- maxElapsedTime:

This parameter specifies the period of time for which a GPRS session or a PDP context can exist before a ApplyChargingReportGPRS shall be sent to the gsmSCF.

- tariffSwitchInterval:

This parameter indicates to the gprsSSF the time duration until the next tariff switch. The measurement of the elapsed tariff switch period commences immediately upon successful execution of this operation.

- pDPID:

This parameter if present specifies the identifier of a PDP context within a control relationship.

### 11.5.2 Responding entity (gprsSSF)

#### 11.5.2.1 Normal procedure

gprsSSF preconditions:

- (1) A control relationship exists between the gprsSSF and the gsmSCF.
- (2) The gprsSSF is in one of the following states:

"Waiting for Instructions"; or

"Monitoring"

SSF postcondition:

- (1) No gprsSSF state transition

On receipt of this operation, the gprsSSF sets the charging data using the information elements included in the operation.

The gprsSSF will start monitoring for the "PDP Context Establishment Acknowledge", "PDP context deactivation" "Detach", "Change of Position session" or "Change of Position Context" event upon receipt of the ApplyChargingGPRS operation.

#### 11.5.2.2 Error handling

TaskRefused: In addition to the generic error handling noted below, this error shall be indicated when:

- a previously received GPRS session or PDP context period or volume duration is pending,
- a tariffSwitchInterval is indicated when a previously received tariffSwitchInterval is pending.

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

## 11.6 ApplyChargingReport procedure

### 11.6.1 General description

This operation is used by the gsmSSF to report charging related information to the gsmSCF as requested by the gsmSCF using the "ApplyCharging" operation.

During a connection configuration the "ApplyChargingReport" operation may be invoked on multiple occasions. For each call party and each connection configuration, the "ApplyChargingReport" operation may be used several times. Note that at least one "ApplyChargingReport" operation is to be sent at the end of the connection configuration charging process.

The charging scenarios supported by this operation are 4.1 and 4.2 (refer to to EN 301 140-5 , annex B).

#### 11.6.1.1 Parameters

- CallResult:  
This parameter provides the gsmSCF with the charging related information previously requested using the ApplyCharging operation. The "CallResult" is a list, and can contain the following parameters:
  - timeDurationChargingResult:  
This is a list, and can contain the following parameters:
    - timeInformation  
This is a choice of the following parameters:
      - timeIfNoTariffSwitch  
This parameter will be present if no tariff switch has occurred since the detection of Answer for the connection to the Called Party, Temporary Connection or gsmSRF connection, otherwise it will be absent.  
If present, then the elapsed time since detection of Answer is reported.
      - timeIfTariffSwitch  
This parameter will be present if a tariff switch has occurred since the detection of Answer for the connection to the Called Party, Temporary Connection or gsmSRF connection, otherwise it will be absent.  
If present, then the parameter may contain the following information:
        - timeSinceLastTariffSwitch  
The elapsed time since detection of the last tariff switch is reported.
        - tariffSwitchInterval  
This parameter is present only if a tariff switch was detected for the connection to the Called Party, the temporary connection or the gsmSRF connection in the reported call period.  
If present the time interval between either the detection of the Answer event or the previous tariff switch (whichever of these events was last detected) and the last tariff switch is reported.
- partyToCharge:  
The "partyToCharge" parameter as received in the related ApplyCharging operation or deduced from the default value, to correlate the result to the request.
- CallActive:  
This parameter indicates whether the call is still active or has been released.

## 11.6.2 Invoking entity (gsmSSF)

### 11.6.2.1 Normal procedure

gsmSSF preconditions:

- (1) A relationship exists between the gsmSSF and the gsmSCF.
- (2) A charging event has been detected that was requested by the gsmSCF via an ApplyCharging operation or a Called Party, Temporary Connection or gsmSRF disconnection event has occurred.

gsmSSF postconditions:

- (1) If release of the call has occurred because the allowed call duration has been reached:
  - All outstanding EDPs shall be disarmed,
  - ApplyChargingReport shall be sent to gsmSCF followed by any outstanding CallInformationReports, if applicable,
  - The gsmSSF shall transit to the 'Idle' state
- (2) If release of the call has occurred but not because the allowed call duration has been reached:
  - If there are any outstanding EDPs or other reports then the gsmSSF shall remain in the same state, else
  - The gsmSSF shall transit to the 'Idle' state

This operation is invoked if a charging event has been detected that was requested by the gsmSCF.

### 11.6.2.2 Error handling

Generic error handling for the operation related errors are described in clause 17 and the TC services used for reporting operation errors are described in clause 19.

## 11.7 ApplyChargingReportGPRS procedure

### 11.7.1 General description

This operation is used by the gprsSSF to report charging related information to the gsmSCF as requested by the gsmSCF using the ApplyChargingGPRS operation. A report shall be made either when a PDP context deactivation, Change of Position Session, Change of Position Context, Detach event or Change in QoS is detected by the gprsSSF or when the gprsSSF detects that the transferred volume or elapsed time duration indicated in parameter transferredVolume or elapsedTime (received in ApplyChargingGPRS operation) has been reached. Note that sending of ApplyChargingReportGPRS shall only be made on chargeable QoS changes, i.e. normally upon MS initiated QoS changes.

#### 11.7.1.1 Parameters

- ChargingResult:  
This parameter provides the SCF with the charging related information previously requested using the ApplyChargingGPRS operation. The "ChargingResult" is a choice, and can contain either of the following parameters:
  - transferredVolume:  
This is a choice of the following parameters:
    - volumeIfNoTariffSwitch

This parameter will be present if no tariff switch has occurred since the detection of the event that triggered volume count (i.g. PDP context activation) occurred. If present, then the volume transferred since the tariff switch will be reported.

- volumeIfTariffSwitch

This parameter will be present if a tariff switch has occurred since the detection of the event that triggered volume count (e.g. PDP context activation) occurred. If present then the parameter may contain the following information:

- volumeSinceLastTariffSwitch

The volume since the last tariffSwitch is reported.

- volumeTariffSwitchInterval

This parameter is present only if a tariff switch was detected between the start of volume count for the current volume count period. If present, the volume between either the detection of the event that triggered volume count or the previous tariff switch (whichever is first) and the last tariff switch is reported.

- elapsedTime:

This is a choice of the following parameters:

- timeGPRSIfNoTariffSwitch

This parameter will be present if no tariff switch has occurred since the detection of the event that triggered time count (e.g. attach) occurred. If present then the elapsed time since that event will be present.

- timeGPRSIfTariffSwitch

This parameter will be present if a tariff switch has occurred since the detection of the event that triggered time count (e.g. attach) occurred. If present then the parameter may contain the following information:

- timeGPRSSinceLastTariffSwitch

The time since the last tariffSwitch is reported.

- timeGPRSTariffSwitchInterval

This parameter is present only if a tariff switch was detected between the start of time count for the current time count period. If present, the time between either the detection of the event that triggered time count or the previous tariff switch (whichever is first) and the last tariff switch is reported.

- qualityOfService:

This parameter provides the SCF with the quality of service negotiated with the subscriber.

- active:

This parameter indicates whether the session or PDP context is still established

- pDPID:

This parameter if present specifies the identifier of a PDP context within a control relationship for which the charging report is valid.



## 11.7.2 Invoking entity (gprsSSF)

### 11.7.2.1 Normal procedure

gprsSSF preconditions:

- (1) A relationship exists between the gprsSSF and the gsmSCF.
  - (2) A charging event has been detected that was requested by the gsmSCF via an ApplyChargingGPRS operation
- gprsSSF postconditions:

- (1) If termination of the GPRS session or PDP context has occurred because the allowed duration or volume has been reached:
  - All outstanding EDPs shall be disarmed,
    - ApplyChargingReportGPRS shall be sent to gsmSCF,
    - The gprsSSF shall transit to the 'Idle' state if no more PDP contexts are pending.
- (2) If termination of the GPRS session or a PDP context has occurred but not because the allowed duration or volume has been reached:
  - If there are any outstanding EDPs or other reports then the gprsSSF shall remain in the same state, else
  - The gprsSSF shall transit to the 'Idle' state in case there are no more PDP contexts pending.

This operation is invoked if a charging event has been detected that was requested by the gsmSCF.

### 11.7.2.2 Error handling

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

## 11.8 AssistRequestInstructions procedure

### 11.8.1 General description

This operation is sent to the gsmSCF by an gsmSSF, which is acting as the assisting gsmSSF in an assist or hand-off procedure, or by a gsmSRF. The operation is sent when the assisting gsmSSF or gsmSRF receives an indication from an initiating gsmSSF containing information indicating an assist or hand-off procedure.

#### 11.8.1.1 Parameters

- correlationID:  
This parameter is used by the gsmSCF to associate the "AssistRequestInstructions" from the assisting gsmSSF or by a gsmSRF with the request from the initiating gsmSSF. The value of the "correlationID" may be extracted from the digits received from the initiating gsmSSF or be all of the digits.
- iPSSPCapabilities:  
See ITU-T Recommendation Q.1290 . This parameter is applicable to this operation only in the physical scenarios corresponding to assist with relay or hand-off. The use of this parameter is network operator dependent.

### 11.8.2 Invoking entity (gsmSSF/gsmSRF)

#### 11.8.2.1 Normal procedure

gsmSSF precondition:

- (1) An assist indication is detected by the assisting or Hand-off gsmSSF

gsmSSF postcondition:

- (1) The assisting or Hand-off gsmSSF waits for instructions

On receipt of an assist indication from the initiating gsmSSF, the gsmSSF or gsmSRF shall assure that the required resources are available to invoke an "AssistRequestInstructions" operation in the gsmSSF/gsmSRF and indicate to the initiating gsmSSF that the call is accepted (refer to ITU-T Recommendation Q.71 ). The "AssistRequestInstructions" operation is invoked by the gsmSSF or gsmSRF after the call, which initiated the assist indication, is accepted. The assisting gsmSSF FSM transitions to state "Waiting For Instructions".

### 11.8.2.2 Error handling

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.9 CallInformationReport procedure

### 11.9.1 General description

This operation is used to send specific call information for a single call/call party to the gsmSCF as requested by the gsmSCF in previous "CallInformationRequest" operation. The report is sent at the end of a call/call party connection which is indicated by one of the events specified below. This operation is not backwards-compatible with core CAP CS1 in the case where the A-party is released and the B-party is kept (e.g. A-party DP-Disconnect armed in the interrupted mode).

#### 11.9.1.1 Parameters

- requestedInformationList:  
According to the requested information the gsmSSF sends the appropriate types and values to the gsmSCF.
- legID:  
This parameter indicates the party in the call for which the information has been collected. When absent, it indicates the "outgoing" leg, this can be a leg created by Connect/Continue/ContinueWithArgument.

### 11.9.2 Invoking entity (gsmSSF)

#### 11.9.2.1 Normal procedure

gsmSSF precondition:

- (1) The indicated or default party is released from the call or call setup towards the indicated or default party is not completed.
- (2) Requested call information has been collected.
- (3) "CallInformationReport" is pending due to a previously received "CallInformationRequest" operation.
- (4) A control or a monitor relationship exists between the gsmSCF and the gsmSSF.

gsmSSF postcondition:

- (1) The FSM for CS in the gsmSSF shall move to the "Idle" state in the case where no other report requests are pending and no EDPs are armed otherwise the gsmSSF FSM shall remain in the same state.

If the gsmSSF FSM executes a state transition caused by one of the following events:

- release for the indicated or default leg,
- abandon for the indicated or default leg,
- busy for the indicated or default leg.
- gsmSSF no answer timer expiration for the indicated or default leg,
- route select failure indicated by the network for the indicated or default leg,
- release of call initiated by the gsmSCF (ReleaseCall),

and "CallInformationRequest" is pending for the indicated or default legs then one "CallInformationReport" operation is sent for each such leg to the gsmSCF containing all information requested.

If a "CallInformationReport" has been sent to the gsmSCF then no "CallInformationReport" is pending, i.e. a further "CallInformationReport", for example in the case of follow-on, has to be explicitly requested by the gsmSCF.

If an event causing the "CallInformationReport" is also detected by an armed EDP-R then immediately after "CallInformationReport" the corresponding "EventReportBCSM" has to be sent.

If an event causing the "CallInformationReport" is also detected by an armed EDP-N then immediately before "CallInformationReport" the corresponding "EventReportBCSM" has to be sent.

### 11.9.2.2 Error handling

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

### 11.9.3 Error handling

If requested information is not available, a "CallInformationReport" will be sent, indicating the requested information type, but with "RequestedInformationValue" filled in with an appropriate default value as specified by the network operator.

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

## 11.10 CallInformationRequest procedure

### 11.10.1 General description

This operation is used to request the gsmSSF to record specific information about a single call / call party and report it to the gsmSCF using the "CallInformationReport" operation.

#### 11.10.1.1 Parameters

- requestedInformationTypeList:  
This parameter specifies a list of specific items of information which is requested.  
The list may contain:
  - callAttemptElapsedTime:  
This parameter indicates the duration between the end of CAP processing of operations initiating call setup ("Connect", "Continue") and the received answer indication from the indicated or default called party side.  
For a calling party leg this parameter has to be set to 0.  
  
In case of unsuccessful call setup the network event indicating the unsuccessful call setup stops the measurement of "callAttemptElapsedTime".
  - callStopTime:  
This parameter indicates the time stamp when the connection to the indicated or default party is released.

- callConnectedElapsedTime:  
This parameter indicates the duration between the received answer indication from the indicated or default called party side and the release of that connection or party. For a calling party it indicates the duration between the sending of IDP and the release of that party.
- calledAddress  
This parameter indicates the incoming called party address that was received by the gsmSSF (i.e., before translation by the gsmSCF) and is as available on the UNI or NNI and interpreted as per the numbering plan.
- releaseCause:  
See EN 300 356-1 . The release cause that applied to the indicated or default party.

Any set of these values can be requested.

- legID:  
This parameter indicates the party in the call for which the information shall be collected and at the end of connection of which the report shall be sent. When absent, it shall apply to the "outgoing" leg, this can be a leg created by Connect/Continue/ContinueWithArgument.

## 11.10.2 Responding entity (gsmSSF)

### 11.10.2.1 Normal procedure

gsmSSF precondition:

- (1) A control relationship exists between gsmSSF and gsmSCF.

gsmSSF postcondition:

- (1) Requested call information is retained by the gsmSSF.
- (2) The gsmSSF is waiting for further instructions.

The gsmSSF may receive the "CallInformationRequest" operation within an existing call associated (CA) dialogue only.

The "CallInformationRequest" operation is accepted by the gsmSSF Finite State Machine (gsmSSF-FSM) only in the state "Waiting for Instructions". The operation does not lead to any transition to another state.

The gsmSSF allocates a record for the indicated or default party and stores the requested information if already available and prepares the recording of information items, that will become available later like for example "callStopTimeValue".

Call information may be requested for any call party (identified by a legID). The indicated leg may be any controlling leg or passive leg.

### 11.10.2.2 Error handling

In any other than the "Waiting for Instruction" state the "CallInformationRequest" operation will be handled as an error with the error code "UnexpectedComponentSequence".

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.11 Cancel procedure

### 11.11.1 General description

The gsmSCF uses this class 2 operation to request the gsmSRF/gsmSSF to cancel a correlated previous operation.

The gsmSRF operation to be deleted can be either a "PlayAnnouncement" operation, a "PromptAndCollectUserInformation" operation or a .

The cancellation of an operation is indicated via a respective error indication, "Canceled", to the invoking entity of the cancelled "PlayAnnouncement" or "PromptAndCollectUserInformation" operation. The "Cancel" operation can also be used to cancel all outstanding requests and enable the state machine (gsmSSF) to go to idle. In this case the "Cancel" operation does not specify any specific operation to be cancelled.

### 11.11.1.1 Parameters

- invokeID:  
This parameter specifies which operation invocation is to be cancelled, i.e. PromptAndCollectUserInformation or PlayAnnouncement.
- allRequests:  
This parameter indicates that all active requests for EDP reports, "ApplyChargingReport" and "CallInformationReport" shall be cancelled.

NOTE: This cancellation is different from the invokeID based cancel mechanism described above.

### 11.11.2 Responding entity (gsmSRF)

In case of Cancel(invokeID) the gsmSRF is the responding entity.

#### 11.11.2.1 Normal procedure

gsmSRF precondition:

- (1) A PlayAnnouncement or PromptAndCollectUserInformation operation has been received and the gsmSRF is in the "User Interaction" state.

gsmSRF postcondition:

- (1) The execution of the PlayAnnouncement or PromptAndCollectUserInformation operation has been aborted and the gsmSRF remains in the "User Interaction" state.

#### 11.11.2.2 Error handling

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

### 11.11.3 Responding entity (gsmSSF)

In case of Cancel(allRequests) the gsmSSF is the responding entity.

#### 11.11.3.1 Normal procedure

gsmSSF precondition:

- (1) The gsmSSF-FSM is in the state "Waiting for Instructions" or "Monitoring".

gsmSSF postcondition:

- (1) All active requests for reports and notifications have been cancelled.
- (2) In case the gsmSSF-FSM was in state "Monitoring" it shall return to idle, or  
In case the gsmSSF-FSM was in state "Waiting for Instructions" it will remain in that state.  
A subsequent call-processing operation will move the gsmSSF-FSM state to "Idle". The call, if in active state, is further treated by gsmSSF autonomously as a normal (non-IN-) call.

### 11.11.3.2 Error handling

Sending of return error on cancel is not applicable in the cancel "allRequests" case. Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.12 CancelGPRS procedure

### 11.12.1 General description

The gsmSCF uses this class 2 operation to request the gprsSSF to cancel all outstanding requests for a session or a specific PDP context and enable the state machine in the gprsSSF to go to "Idle" if there are no further PDP contexts pending. The CancelGPRS operation does not specify any specific operation to be cancelled.

#### 11.12.1.1 Parameters

- allRequests:

This parameter indicates that all active requests for EventGPRSReport and ApplyGPRSChargingReport shall be cancelled.

- pDPID:

This parameter if present specifies for which PDP context the active requests for EventGPRSReport and ApplyGPRSChargingReport is to be cancelled.

### 11.12.2 Responding entity (gprsSSF)

#### 11.12.2.1 Normal procedure

gprsSSF precondition:

- 1) The gprsSSF is in the states "Waiting for Instructions" or "Monitoring".

gprsSSF postcondition:

- 1) All active requests for ApplyChargingReportGPRS have been cancelled. In case a pDPID was included only the ApplyChargingReportsGPRS and outstanding EDPs for the corresponding PDP context are cancelled.
- 2) In case the gprsSSF was in state "Monitoring" it shall return to idle if there are no other PDP contexts pending; or

In case the gprsSSF was in state "Waiting for Instructions" it will remain in that state. A subsequent GPRS session or PDP context processing operation will move the gprsSSF to state "Idle" if there are no other PDP contexts pending.

The session or PDP context, if in active state, is further treated by gprsSSF autonomously as a normal (non-CSE controlled) session or PDP context.

All resources allocated to the dialogue are released in case there are no more PDP contexts pending.

#### 11.12.2.2 Error handling

Sending of return error on cancel is not applicable in the cancel "allRequests" case. Otherwise 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.

## 11.13 Connect procedure

### 11.13.1 General description

This operation is used to request the gsmSSF to perform the call processing actions to route a call to a specific destination. To do so, the gsmSSF may use destination information from the calling party (e.g. dialled digits) and existing call set-up information (e.g. route index to a list of trunk groups) depending on the information provided by the gsmSCF.

In general all parameters which are provided in a Connect operation to the gsmSSF shall replace the corresponding signalling parameter in the CCF in O-BCSM, in accordance with **[Error! Bookmark not defined.]** and shall be used for subsequent call processing. The CCF of the T-BCSM shall send corresponding signalling parameters to new call leg without using them in subsequent call processing. Parameters which are not provided by the Connect operation shall retain their value (if already assigned) in the CCF for subsequent call processing.

Refer to subclause 12.5.

#### 11.13.1.1 Parameters

- destinationRoutingAddress:  
This parameter contains the called party numbers (see EN 300 356-1 **[Error! Bookmark not defined.]**) towards which the call is to be routed. The encoding of the parameter is defined in ITU-T Recommendation Q.763 **[Error! Bookmark not defined.]**. The "destinationRoutingAddress" may include the "correlationID" and "scfID" if used in the context of a hand-off procedure, but only if "correlationID" and "scfID" are not specified separately.
- alertingPattern:  
See ITU-T Recommendation Q.1290 **[Error! Bookmark not defined.]** It only applies if the network signalling support this parameter or if gsmSSF is the terminating local exchange for the subscriber.
- serviceInteractionIndicatorsTwo:  
This parameter contains indicators which are exchanged between the gsmSSF and the gsmSCF to resolve interactions between IN based services and network based services.
- callingPartysCategory:  
This parameter indicates the type of calling party (e.g., operator, pay phone, ordinary subscriber).
- originalCalledPartyID:  
See EN 300 356-1 **[Error! Bookmark not defined.]** Original Called Number signalling information. The use of this parameter in the context of the "Connect" operation is to be specified by the network operator. For CAMEL this parameter carries the dialled digits if the call is forwarded by the gsmSCF.
- redirectingPartyID:  
This parameter, if present, indicates the last directory number the call was redirected from.
- redirectionInformation:  
See ITU-T Recommendation Q.763 **[Error! Bookmark not defined.]** Redirection Information signalling information.
- genericNumbers:  
This parameter allows the gsmSCF to modify the GenericNumber information received from the gsmSSF, if any. Also, it allows the gsmSCF to precise a Generic Number information to the gsmSSF if the gsmSSF has not preciously done so.
- suppressionOfAnnouncement:  
This parameter indicates that announcements and tones which are played in the exchange at non-successful call set-up attempts shall be suppressed.
- oCSIAplicable:  
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 3G TS 23.078 [16].

- cliPresentationIndicator  
This parameter indicates the Presentation Indicator to be used in the Calling Party number.
- naCarrierInformation:  
This parameter contains carrier identification code and carrier selection type to be used by gsmSSF for routing a call to a carrier.
- naOliInfo:  
This parameter contains originating line information which identifies the charged party number type to the carrier.
- naChargeNumber:  
This parameter identifies the chargeable number for the usage of a carrier.
- cug-Info  
This parameter contains the CUG information, altered by the gsmSCF, for the call.
- cug-Index  
This parameter contains the CUG index passed between the user and the network. This is only significant within the context of a users subscription.

## 11.13.2 Responding entity (gsmSSF)

### 11.13.2.1 Normal procedure

gsmSSF precondition:

- (1) A control relationship exists between the gsmSSF and the gsmSCF
- (2) BCSM: Basic call processing has been suspended at a DP.
- (3) The FSM for CS is in state "Waiting for Instructions".

gsmSSF postcondition:

- (1) The gsmSSF performs the call processing actions to route the call to the specified destination.
- (2) In the O-BCSM, call processing resumes at PIC Analyze\_Information.

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

- The gsmSSF cancels  $T_{SSF}$
- If the "callingPartyNumber" is supplied, this value may be used for all subsequent gsmSSF processing.
- If no EDPs have been armed and neither a CallInformationReport nor an ApplyChargingReport has been requested, the FSM goes to state "Idle". Otherwise, the FSM goes to state "Monitoring".

No implicit activation or deactivation of DPs occurs.

Statistic counter(s) are not affected.

Connect completes when the CAP processing of the operation is complete and before the SSP starts the processing necessary to select a circuit.

### 11.13.2.2 Error handling

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.



## 11.14 ConnectGPRS procedure

### 11.14.1 General description

This operation is used to request the gprsSSF to modify the APN used when establishing a PDP context.

#### 11.14.1.1 Parameters

- AccessPointName:

This parameter contains the Access Point Name (see 3G TS 29.060) towards which the PDP context shall be established. The encoding of this parameter is defined in 3G TS 24.008.

- PDPIId:

This parameter identifies the PDP context for which the modified Access Point Name shall be used.

### 11.14.2 Responding entity (gprsSSF)

#### 11.14.2.1 Normal procedure

gprsSSF preconditions:

- 1) A control relationship exists between the gprsSSF and the gsmSCF.
- 2) The GPRS PDP context FSM identified by the PDPIId is suspended at DP PDP\_Context\_Establishment.
- 3) The gprsSSF is in state "Waiting for Instructions".

gprsSSF postcondition:

- 1) The gprsSSF performs the actions to establish the PDP context identified by PDPIId using the given Access Point Name.
  - the gprsSSF cancels  $T_{SSP}$ ;
  - if no EDPs are armed, the gprsSSF transits to state "Idle". Otherwise the gprsSSF transits to state "Monitoring".

No implicit activation or deactivation of DPs occurs.

#### 11.14.2.2 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.

## 11.15 ConnectSMS procedure

### 11.15.1 General description

This operation is used to request the gsmSSF/gprsSSF to perform the Short Message processing actions to route a SM to a specific destination or to influence other SM set-up information, e.g. the Calling Party Number.

### 11.15.1.1 Parameters

- callingPartysNumber:

This parameter allows the gsmSCF to set the Calling Party Number parameter used in the network. It is used for showing the sending party's id to the receiving party.

- destinationSubscriberNumber:

This parameter contains the receiving party number towards which the SM is to be routed by the SMSC.

- smscAddress:

This parameter contains the Short Message Service Centre address towards which the SM is to be routed. The SMSC forwards the SM to the indicated destinationSubscriberNumber.

## 11.15.2 Responding entity (gsmSSF or gprsSSF)

### 11.15.2.1 Normal procedure

gsmSSF or gprsSSF preconditions:

- 1) Mobile originating SM submission attempt has been initiated.
- 2) SM processing has been suspended at the DP SMS\_Collected\_Info.
- 3) The gsmSSF/gprsSSF waits for instructions.

gsmSSF/gprsSSF postcondition:

- 1) The gsmSSF/gprsSSF performs the SM processing actions to route the SM to the specified destination.

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

- the gsmSSF/gprsSSF cancels  $T_{SSF}$ ;
- if the "callingPartysNumber" is supplied, this value may be used for all subsequent gsmSSF/gprsSSF processing;
- if no EDPs have been armed the gsmSSF/gprsSSF goes to state "Idle". Otherwise, the gsmSSF/gprsSSF goes to state "Monitoring".

No implicit activation or deactivation of DPs occurs.

Statistic counter(s) are not affected.

### 11.15.2.2 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.

## 11.16 ConnectToResource procedure

### 11.16.1 General description

This operation is used to connect a call from the gsmSSF to a specialized resource. After successful connection to the gsmSRF, the interaction with the caller can take place. The gsmSSF relays all operations for the gsmSRF and all responses from the gsmSRF.

### 11.16.1.1 Parameters

- resourceAddress:  
This parameter identifies the physical location of the gsmSRF.
- iPRoutingAddress:  
This parameter indicates the routeing address to set up a connection towards the gsmSRF.  
It is only valid when used in a single call segment CSA.
- legID:  
This parameter indicates to which party in the call the subsequent interaction shall apply while maintaining the speech connection between that leg and any other legs connected to the same CS.
- callSegmentID:  
This parameter indicates to which call segment the subsequent user interaction shall apply, i.e. to all parties connected to the call segment.
- iPAddressAndLegID:  
This parameter indicates that both legID and iPRoutingAddress shall be used..
- none:  
This parameter indicates that the call party is to be connected to a predefined gsmSRF in the initial CS.  
It is only valid when used in a single call segment CSA.
- iPAddressAndCallSegment:  
This parameter indicates that both Call Segment ID and iPRoutingAddress shall be used..
- serviceInteractionIndicatorsTwo  
This parameter contains indicators which are exchanged between SSP and SCP to resolve interactions between IN based services and network based services, respectively between different IN based services.

### 11.16.2 Responding entity (gsmSSF)

#### 11.16.2.1 Normal procedure

gsmSSF precondition:

- (1) A control relationship has been established.
- (2) The FSM for CS is in the state "Waiting for Instructions" or in the state "Monitoring".

gsmSSF postcondition:

- (1) The call is switched to the gsmSRF.
- (2) A control relationship to the gsmSRF is established.
- (3) If in state "Waiting for Instructions" the FSM for the CS moves to the state "Waiting for End of User Interaction (WFI)". If necessary,  $T_{SSF}$  is set.
- (4) If in state "Monitoring" the FSM for the CS moves to the state "Waiting for End of User Interaction (MON)". If necessary, a guard timer  $T_{SSF}$  is set.

NOTE 1: Whether the  $T_{SSF}$  is used or not in this case is network operator dependent. But it must be synchronized with  $T_{SCF-gsmSSF}$  in the SCSM.

NOTE 2: The successful connection to the gsmSRF causes a state transition in the gsmSRF FSM from "Idle" to "Connected".

#### 11.16.2.2 Error handling

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.17 Continue procedure

### 11.17.1 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.

#### 11.17.1.1 Parameters

none

### 11.17.2 Responding entity (gsmSSF)

#### 11.17.2.1 Normal procedure

gsmSSF precondition:

- (1) A control relationship exists between the gsmSSF and the gsmSCF
- (2) BCSM: Basic call processing has been suspended at any DP.
- (3) FSM for CS is in the state either
  - "Waiting for Instructions" or
  - "Waiting for End of User Interaction (WFI)" or "Waiting for End of Temporary Connection (WFI)" while being suspended at the answer DP.

NOTE: The only applicable gsmSCF-gsmSRF user interaction operation is PlayAnnouncement.

gsmSSF postcondition:

- (1) BCSM: Basic call processing continues, if all required resumptions have been received, otherwise the only action is to decrement the resumption counter(s). (For details refer to 3G TS 23.078.)
- (2) The gsmSSF remains in the same state if all resumptions have not been received; or
  - The gsmSSF transits to the state "Monitoring", because at least one EDP was armed, or a "CallInformationReport" or "ApplyChargingReport" was requested and no user interaction is ongoing; or
  - The gsmSSF transits to the state "Idle", because no EDPs were armed and neither the "CallInformationReport" nor the "ApplyChargingReport" was requested.
- (3) If in state "Waiting for End of User Interaction (WFI)" the FSM for the CS moves to the state "Waiting for End of User Interaction (MON)". If necessary, a guard timer  $T_{SSF}$  is set.
- (4) If in state "Waiting for End of Temporary Connection (WFI)", the FSM for the CS moves to the state "Waiting for End of Temporary Connection (MON)" and  $T_{SSF}$  is set.

#### 11.17.2.2 Error handling

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

## 11.18 ContinueGPRS procedure

### 11.18.1 General description

This operation is used to request the gprsSSF to proceed with session or PDP context processing at the DP at which it previously suspended processing to await gsmSCF instructions. The gprsSSF continues processing without substituting new data from the gsmSCF.

#### 11.18.1.1 Parameters

- pDPID:

This parameter if present identifies the PDP context within the control relationship for which the processing shall continue

### 11.18.2 Responding entity (gprsSSF)

#### 11.18.2.1 Normal procedure

gprsSSF precondition:

- 1) GPRS session or PDP context processing has been suspended at any DP.
- 2) gprsSSF is in state "Waiting for Instructions".

gsmSSF postcondition:

- 1) GPRS session or PDP context processing continues.
- 2) gprsSSF is in one of the following states:
  - State "Monitoring" because at least one EDP was armed or an ApplyChargingReportGPRS was requested;  
or
  - State "Idle" because no EDPs were armed and no ApplyChargingReportGPRS was requested.

The gprsSSF is in state "Waiting for instructions". The gprsSSF transits to state "Idle" in case no EDPs are armed and no outstanding report requests are present. The gprsSSF transits to state "Monitoring" if at least one EDP is armed, or if there is at least one outstanding ApplyChargingReportGPRS request. GPRS session or PDP context processing is resumed.

#### 11.18.2.2 Error handling

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

## 11.19 ContinueSMS procedure

### 11.19.1 General description

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

#### 11.19.1.1 Parameters

none

## 11.19.2 Responding entity (gprsSSF or gsmSSF)

### 11.19.2.1 Normal procedure

SSF precondition:

- 1) processing has been suspended at any DP.
- 2) SSF is in state "Waiting for Instructions".

SSF postcondition:

- 1) processing continues.
- 2) SSF is in one of the following states:
  - State "Monitoring" because at least one EDP was armed; or
  - State "Idle" because no EDPs were armed.

### 11.19.2.2 Error handling

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

## 11.19.3 ContinueWithArgument Procedure

### 11.19.4 General description

This operation is used to request the SSF to proceed with call processing at the DP at which it previously suspended call processing to await SCF instructions. It is also used to provide additional service related information to a User (Called Party or Calling Party) whilst the call processing proceeds.

In general all parameters which are provided in a ContinueWithArgument operation to the gsmSSF shall replace the corresponding signalling parameter in the CCF, in accordance with **[Error! Bookmark not defined.]** and shall be used for subsequent call processing. Parameters which are not provided by the ContinueWithArgument operation shall retain their value (if already assigned) in the CCF for subsequent call processing.

#### 11.19.4.1 Parameters

- alertingPattern:  
See ITU-T Recommendation Q.1290 **[Error! Bookmark not defined.]** It only applies if the network signalling support this parameter or if gsmSSF is the terminating local exchange for the subscriber.
- callingPartysCategory:  
This parameter indicates the type of calling party (e.g., operator, pay phone, ordinary subscriber).
- originalCalledPartyID:  
See EN 300 356-1 **[Error! Bookmark not defined.]** Original Called Number signalling information. The use of this parameter in the context of the "Connect" operation is to be specified by the network operator. For CAMEL this parameter carries the dialled digits if the call is forwarded by the gsmSCF.
- redirectingPartyID:  
This parameter, if present, indicates the last directory number the call was redirected from.
- redirectionInformation:  
See ITU-T Recommendation Q.763 **[Error! Bookmark not defined.]** Redirection Information signalling information.
- genericNumbers:  
This parameter allows the gsmSCF to modify the GenericNumber information received from the gsmSSF, if

any. Also, it allows the gsmSCF to precise a Generic Number information to the gsmSSF if the gsmSSF has not preciously done so.

- suppressionOfAnnouncement:  
This parameter indicates that announcements and tones which are played in the exchange at non-successful call set-up attempts shall be suppressed.
- naCarrierInformation:  
This parameter contains carrier identification code and carrier selection type to be used by gsmSSF for routing a call to a carrier.
- naOliInfo:  
This parameter contains originating line information which identifies the charged party number type to the carrier.
- naChargeNumber:  
This parameter identifies the chargeable number for the usage of a carrier.
- cug-Interlock  
This parameter uniquely identifies a CUG within a network.
- cug-OutgoingAccess  
This parameter indicates if the calling user has subscribed to the outgoing access inter-CUG accessibility subscription option.

## 11.19.5 Responding entity (SSF)

### 11.19.5.1 Normal procedure

SSF precondition:

- (1) A control relationship exists between the SSF and the SCF
- (2) BCSM: Basic call processing has been suspended at DP Collected\_Info, DP Analysed\_Info or DP Terminating\_Attempt\_Authorised.
- (3) SSF-FSM is in the state "Waiting for Instructions"

SSF postcondition:

- (1) BCSM: Basic call processing continues with modified information.
- (2) The SSF-FSM moves to the state "Monitoring" if there exist armed EDPs or outstanding reports, otherwise the SSF-FSM transits to "Idle".

### 11.19.5.2 Error handling

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.20 DisconnectForwardConnection procedure

### 11.20.1 General Description

This operation is used in the following two cases:

- 1) To clear a connection to a gsmSRF

This operation is used to explicitly disconnect a connection to a resource (gsmSRF) established previously with a "ConnectToResource" or an "EstablishTemporaryConnection" operation. It is used for a forward disconnection from the gsmSSF. An alternative solution is the backward disconnect from the gsmSRF, controlled by the "DisconnectFromIPForbidden" parameter in the "PlayAnnouncement" and "PromptAndCollectUserInformation" operations.

2) To clear a connection to an assisting gsmSSF

This operation is sent to the non-assisting gsmSSF of a pair of SSFs involved in an assist procedure. It is used to disconnect the temporary connection between the initiating gsmSSF and the assisting gsmSSF, and the assisting gsmSSF and its associated gsmSRF.

### 11.20.1.1 Parameters

none

## 11.20.2 Responding entity (gsmSSF)

### 11.20.2.1 Normal procedure

gsmSSF precondition:

- (1) (void)
- (2) If basic call processing has been suspended at a DP, then the FSM for CS in the initiating gsmSSF is in the state "Waiting for End of User Interaction (WFI)" or "Waiting for End of Temporary Connection (WFI)".
- (3) If basic call processing has not been suspended at a DP, then the FSM for CS in the initiating gsmSSF is in the state "Waiting for End of User Interaction (MON)" or in the state "Waiting for End of Temporary Connection (MON)".

gsmSSF postcondition:

- (1) The connection to the gsmSRF or assisting gsmSSF is released.
- (2) The FSM for CS is in state "Waiting for Instructions" if basic call processing has been suspended at a DP, otherwise in state "Monitoring".

The receipt of "DisconnectForwardConnection" results in disconnecting the assisting gsmSSF or the PE containing the gsmSRF from the concerned call. It does not release the connection from the gsmSSF back to the end user.

This operation is accepted in the FSM for CS states "Waiting for End of Temporary Connection (WFI)" or "Waiting for End of Temporary Connection (MON)" or "Waiting for End of User Interaction (WFI)" or "Waiting for End of User Interaction (MON)". On receipt of this operation in these states, the gsmSSF must perform the following actions:

- The initiating gsmSSF releases the connection to the assisting gsmSSF or the relay gsmSRF.
- The gsmSSF resets  $T_{SSF}$ .
- The gsmSSF FSM goes to state "Waiting for Instructions" or "Monitoring".

NOTE: The successful disconnection to the gsmSRF causes a state transition in the gsmSRF FSM to "Idle". A current order (e.g. "PlayAnnouncement" or "PromptAndCollectUserInformation") is cancelled and any queued order (e.g. "PlayAnnouncement" or "PromptAndCollectUserInformation") is discarded.

### 11.20.2.2 Error handling

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.



## 11.21 EntityReleasedGPRS procedure

### 11.21.1 General description

This operation is used by the gprsSSF to inform the gsmSCF that a PDP context has terminated abnormally. The operation can only be sent within a control relationship and is not allowed in a monitor relationship.

#### 11.21.1.1 Parameters

- GPRSCause

A number giving an indication to the gprsSCF about the reason for discontinuing the PDP context. This may be used by gsmSCF if FurnishChargingInformationGPRS is to be sent to the gprsSSF.

- pDPID:

This parameter identifies the PDP context within the control relationship for which the processing shall be terminated.

### 11.21.2 Invoking entity (gprsSSF)

#### 11.21.2.1 Normal procedure

gprsSSF preconditions:

- 1) State "Waiting for Instructions"; or State "Monitoring".

gprsSSF postcondition:

- 1) No state transition. Possible armed EDPs are ignored for the indicated PDP context. All connections and resources related to the specific PDP is released.

#### 11.21.2.2 Error handling

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

## 11.22 EstablishTemporaryConnection procedure

### 11.22.1 General Description

This operation is used to create a connection between an initiating gsmSSF and an assisting gsmSSF as part of a service assist procedure. It can also be used to create a connection between a gsmSSF and a gsmSRF, for the case where the gsmSRF exists in a separately addressable PE.

#### 11.22.1.1 Parameters

- assistingSSPIPRoutingAddress:

This parameter indicates the destination address of the gsmSRF for assist procedure.

The "assistingSSPIPRoutingAddress" may contain embedded within it, a "correlationID" and "scfID", but only if "correlationID" and "scfID" are not specified separately.

- correlationID:

This parameter is used by the gsmSCF to associate the "AssistRequestInstructions" from the assisting gsmSSF (or the gsmSRF) with the Request from the initiating gsmSSF. The "correlationID" is used only if the correlation id is not embedded in the "assistingSSPIPRoutingAddress". The network operators has to decide about the actual mapping of this parameter on the used signalling system.

- scfID:  
See ITU-T Recommendation Q.1290 [**Error! Bookmark not defined.**]. The "scfID" is used only if the gsmSCF id is not embedded in the "assistingSSPIPRoutingAddress". The network operators has to decide about the actual mapping of this parameter on the used signalling system.
- serviceInteractionIndicatorsTwo  
Indicators which are exchanged between SSP and SCP to resolve interactions between IN based services and network based services, respectively between different IN based services.

## 11.22.2 Responding entity (gsmSSF)

### 11.22.2.1 Normal procedure

gsmSSF precondition:

- (2) The FSM for CS is in state "Waiting for Instructions" or in state "Monitoring".
- (3) The gsmSSF is not an assisting gsmSSF.

gsmSSF postcondition:

- (1) The gsmSSF performs the call processing actions to route the call to the assisting gsmSSF or gsmSRF according to the "assistingSSPIPRoutingAddress" requested by the gsmSCF.
- (2) The CS waits for end of temporary connection.
- (3) If in state "Waiting for Instructions" the FSM for the CS moves to the state "Waiting for End of Temporary Connection (WFI)". If necessary,  $T_{\text{SSF}}$  is set.
- (4) If in state "Monitoring" the FSM for the CS moves to the state "Waiting for End of Temporary Connection (MON)". If necessary, a guard timer  $T_{\text{SSF}}$  is set.

On receipt of this operation in the FSM for CS state "Waiting for Instructions" or "Monitoring", the SSP has to perform the following actions:

- Reset the  $T_{\text{SSF}}$  (optional)

NOTE: This "optional" means that the application timer  $T_{\text{SSF}}$  is optionally set. Whether it is used or not is network operator dependent. But it must be synchronized with  $T_{\text{SCF-gsmSSF}}$  in the SCSM.

- Route the call to assisting gsmSSF or gsmSRF using "assistingSSPIPRoutingAddress".
- The gsmSSF FSM goes to state "Waiting for End of Temporary Connection (WFI)" (e7).

On receipt of this operation in the gsmSSF FSM state "Monitoring", the SSP has to perform the following actions:

- Route the call to assisting gsmSSF or gsmSRF using "assistingSSPIPRoutingAddress".

### 11.22.2.2 Error handling

Until the connection setup has been accepted (refer to ITU-T Recommendation Q.71 [**Error! Bookmark not defined.**]) by the assisting gsmSSF/gsmSRF, all received failure indications from the network on the ETC establishment shall be reported to the gsmSCF as ETC error ETCFailed (e.g., busy, congestion). Note that the operation timer for ETC shall be longer than the maximum allowed time for the signalling procedures to accept the connection.

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.23 EventReportBCSM procedure

### 11.23.1 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.

#### 11.23.1.1 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 "RouteSelectFailure" it will contain the "FailureCause", if available.  
  
For O- or T-Busy it will contain the "BusyCause" (for T-Busy also 'call forwarded'), if available.  
  
For O- NoAnswer it will be empty, for T-NoAnswer it will contain 'call forwarded' if applicable.  
  
For O-Answer it will contain the "BackwardGVNS", if available,  
  
For T-Answer it will be empty.  
  
For O- or T-Disconnect it will contain the "releaseCause" and/or "connectTime", if available.  
  
The connect time, if available, indicates the duration between the received answer indication from the called party side and the release of the connection in units of 100 ms.
- legID:  
This parameter indicates the party in the call for which the event is reported. gsmSSF will use the option "ReceivingSideID" only. Refer to RequestReportBCSMEvent for the applied leg numbering.  
  
The "legID" parameter shall always be included for the events O-MidCall, O-Disconnect, T-MidCall and T-Disconnect.
- miscCallInfo:  
This parameter indicates Detection Point (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".

### 11.23.2 Invoking entity (gsmSSF)

#### 11.23.2.1 Normal procedure

gsmSSF precondition:

- (1) A control or a monitoring relationship exists between the gsmSSF and the gsmSCF.
- (2) The FSM for CS is in the state "Monitoring", or in a User Interaction monitoring state (WfEoUI(MON)/WfEoTC(MON)); or  
The FSM for CS may be in state "Waiting for Instructions" (if the O/TDisconnect DP, O/TAnswer DP or O\_Term\_Seized DP is armed and encountered); or  
The FSM for CS is in any state, except Idle (if the O/TAbandon DP or MidCall DP immediate report is armed and encountered).
- (3) The BCSM proceeds to an EDP that is armed.

gsmSSF postcondition:

- (1) The FSM for CS stays in the state "Monitoring" if the message type was notification and there are still EDPs armed or a "CallInformationReport" or "ApplyChargingReport" requested.
- (2) The gsmSSF for CS moves to the state "idle" if the message type was notification and there are no more EDPs armed, no "CallInformationReport" or "ApplyChargingReport" are requested..
- (3) If the message type was request, the FSM for CS moves to the state "Waiting for Instructions" if the FSM for CS was in the state "Monitoring". If user interaction is ongoing the FSM for CS moves to a User Interaction waiting for instructions state (WfEoUI(WFI)/WfEoTC(WFI)). Call processing is interrupted.

### 11.23.2.2 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 the call is given final treatment, e.g. a final announcement.

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

## 11.24 EventReportGPRS procedure

### 11.24.1 General description

This operation is used to notify the gsmSCF of a GPRS session or PDP context event previously requested by the gsmSCF in a RequestGPRSReportGPRSEvent operation. The monitoring of more than one event could be requested with a RequestReportGPRSEvent operation, but each of these requested events is reported in a separate EventReportGPRS operation.

#### 11.24.1.1 Parameters

- gPRSEventType:  
This parameter specifies the type of event that is reported.
- gPRSEventSpecificInformation:  
This parameter indicates the session or PDP context related information specific to the event.  
  
For Change of Position it will contain the "newRoutingAreaIdentity", if available.  
  
For Detach and Disconnect it will contain the "initiatingEntity".  
  
For PDP context establishment it will contain the "accessPointName".  
  
For PDP context establishment acknowledge it will contain the "chargingID".
- miscGPRSInfo:  
This parameter indicates DP related information.
- messageType:  
This parameter indicates whether the message is a request, i.e. resulting from a RequestReportGPRSEvent with "monitorMode" = "interrupted", or a notification, i.e. resulting from a RequestReportGPRSEvent with "monitorMode" = "notifyAndContinue".
- pDPID:  
  
This parameter if present identifies the PDP context within the control relationship for which the event is reported.

## 11.24.2 Invoking entity (gprsSSF)

### 11.24.2.1 Normal procedure

gprsSSF preconditions:

- (1) The gprsSSF shall be in the state "Monitoring"; or the gprsSSF may be in state "Waiting for Instructions" if the PDP context deactivate or Detach DP is armed and encountered.
- (2) The GPRS session or PDP context SM proceeds to an EDP that is armed.

gprsSSF postconditions:

- (1) The gprsSSF stays in the state "Monitoring" if the message type was notification and there are still EDPs armed or an ApplyChargingReportGPRS is requested.
- (2) The gprsSSF moves to the state "Idle" if the message type was notification and there are no more EDPs armed, or no more ApplyChargingReportGPRS is requested or no more PDP contexts pending.
- (3) The gprsSSF moves to the state "Waiting for Instructions" if the message type was request. GPRS session or PDP context processing is interrupted.

If a EDP-R is met that causes the release of a GPRS session or PDP context , all EDPs related to the session including all PDP contexts are disarmed and the event is reported via EventReportGPRS.

### 11.24.2.2 Error handling

In case the message type is request, on expiration of  $T_{SSF}$  before receiving any operation, the gprsSSF aborts the interaction with the gsmSCF and instructs the SGSN to handle the session or PDP context according to the default session and PDP context handling parameters of the valid CSI.

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

## 11.25 EventReportSMS procedure

### 11.25.1 General description

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

#### 11.25.1.1 Parameters

- eventTypeSMS:  
This parameter specifies the type of event that is reported.
- eventSpecificInformationSMS:  
This parameter indicates the SM related information specific to the event.  
  
For OSMSFailure it will contain the "FailureCause", if available.  
  
For OSMSSubmission it will be empty.
- miscCallInfo:  
This parameter indicates DP related information.
- messageType:  
This parameter indicates whether the message is a request, i.e. resulting from a RequestReportSMSEvent with "monitorMode" = "interrupted", or a notification, i.e. resulting from a RequestReportSMSEvent with "monitorMode" = "notifyAndContinue".

## 11.25.2 Invoking entity (gsmSSF or gprsSSF)

### 11.25.2.1 Normal procedure

gsmSSF/gprsSSF preconditions:

- (1) The gsmSSF or gprsSSF shall be in the state "Monitoring";
- (2) The FSM proceeds to an EDP that is armed.

gsmSSF/gprsSSF postconditions:

- (1) The gsmSSF or gprsSSF moves to the state "Idle" if the message type was notification and there are no more EDPs armed which could be met.

### 11.25.2.2 Error handling

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

## 11.26 FurnishChargingInformation procedure

### 11.26.1 General description

This operation is used to send charge related information to a logical call record. This logical call record is CAMEL specific. The first FCI of a call leg leads to the generation of a logical call record. The handling of subsequent FCI's for a call leg depends on the presence of the *append free format data* parameter in the FCI operation.

- if this parameter is present, then the newly received free format data shall be appended to the free format data in the existing logical call record
- if this parameter is absent, then all data in the existing logical call record shall be replaced by the newly received free format data.

If an FCI operation is received for the called party when the gsmSSF is in state 'Monitoring', or is suspended in one of the following DPs then the charging information shall be included in the logical call record for the leg that has been or is to be established:

- Collected\_Info,
- O\_Answer,
- Terminating\_Attempt\_Authorised, or
- T\_Answer

If an FCI operation is received for the called party when the gsmSSF is suspended in any other DP then the charging information shall be included in the logical call record created for the last failed or disconnected called party.

#### 11.26.1.1 Parameters

- FCIBillingChargingCharacteristics:  
This parameter contains the following sub-parameters;
- FCIBCCAMELsequence1:  
This parameter contains the following sub-parameters;
- FreeFormatData:  
This parameter contains free-format billing and/or charging characteristics.

- PartyToCharge:  
This parameter indicates the party to bill and/or charge.
- AppendFreeFormatData:  
This parameter indicates that the free format data in the FCI operation shall be appended to the data in the logical call record.

## 11.26.2 Responding entity (gsmSSF)

### 11.26.2.1 Normal procedure

### 11.26.2.2 Normal procedure

gsmSSF preconditions:

- (1) gsmSSF State "Waiting for Instructions" or  
gsmSSF State "Waiting for End of User Interaction" or  
gsmSSF State "Waiting for End of Temporary Connection" or  
gsmSSF state "Monitoring"

gsmSSF postcondition:

- (1) No FSM state transition.

On receipt of this operation the gsmSSF performs actions to create the call record if necessary, and writes the free-format information carried in the operation into the call record. An FCI operation will create a Logical Call Data Record (CDR) if such a record does not already exist for the indicated leg. Refer to sect. 18.49.1 for the handling in the case of successive FCI's for a call leg.

The Logical CDRs will be associated for a given call into one or more physical CDRs, as specified in 3G TS 22.105.

A logical CDR is output when a disconnection event is propagated to the Leg associated with it, or when a Connect operation to create a connection to a Follow-on Called Party is received. Successive FCIs indicating the calling leg (leg1) may overwrite data from previously received FCI(s) indicating that calling leg during that entire call or call attempt. Successive FCIs indicating the called leg (leg2) may overwrite any previously received data from FCI(s) indicating that called leg until the called leg representing that particular called party number is released from or releases the call. When a new called party is created as a result of a follow-on call, and an FCI indicating the called leg is received, then a new CAMEL Logical CDR is created for that portion of the call. From then on, any subsequent FCIs for the called party may overwrite the data from any previous FCI(s) for the called leg presenting that particular called party number; however, CAMEL Logical CDR(s) that have been output already are not affected.

It should be noted that no CAMEL Logical CDR is output at the end of a user interaction.

### 11.26.2.3 Error handling

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.27 FurnishChargingInformationGPRS procedure

### 11.27.1 General description

This operation is used to send charge related information to a logical GPRS record. This logical GPRS record is CAMEL specific. The first GPRS FCI leads to the generation of a logical GPRS record. Receipt of subsequent FCIs shall overwrite or append the contents of the logical record.

### 11.27.1.1 Parameters

- FCIGPRSBillingChargingCharacteristics:  
This parameter contains the following sub-parameters;
- FCIBCCCAMELsequence1:  
This parameter contains the following sub-parameters;
  - FreeFormatData  
This parameter contains free-format billing and/or charging characteristics.
  - AppendFreeFormatData  
This parameter indicates that the free-format in the FCI operation shall be appended to the data in the logical GPRS context record.
  - PDPIId  
This parameter if present, indicates the PDP context's logical call record to which the free format data belongs to.

## 11.27.2 Responding entity (gprsSSF)

### 11.27.2.1 Normal procedure

gprsSSF preconditions:

- 1) gprsSSF State "Waiting for Instructions"

gprsSSF postcondition:

- (1) No FSM state transition.

On receipt of this operation the SSF performs actions to create the GPRS charging record if necessary, and writes the free-format information carried in the operation into the GPRS record. Note that an FCI operation will create a Logical GPRS Data Record (CDR) if such a record does not already exist. Subsequent FCI operations received, will either overwrite or append the data previously written in the free-format CDR field depending on the presence of the IE Append Free Format Data

The Logical CDRs will be associated for a given session or PDP context into one or more physical CDRs, as specified in 3G TS 22.105.

### 11.27.2.2 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.

## 11.28 FurnishChargingInformationSMS procedure

### 11.28.1 General description

This operation is used to send charge related information to a logical SM record. This logical SM record is CAMEL specific. The first SMS FCI leads to the generation of a logical SM record. Receipt of subsequent FCIs shall overwrite the contents of the logical SM record.

#### 11.28.1.1 Parameters

- FCISMSBillingChargingCharacteristics:  
This parameter contains the following sub-parameters;



- FCIBCCCAMELsequence1:  
This parameter contains the following sub-parameters;
- FreeFormatData  
This parameter contains free-format billing and/or charging characteristics.
- AppendFreeFormatData  
This parameter indicates whether previous FCI free format data is appended or overwritten. See 3G TS 23.078.

## 11.28.2 Responding entity (gsmSSF or gprsSSF)

### 11.28.2.1 Normal procedure

gsmSSF or gprsSSF preconditions:

- (1) gsmSSF/gprsSSF State "Waiting for Instructions"

gsmSSF or gprsSSF postcondition:

- (1) No FSM state transition.

On receipt of this operation the SSF performs actions to create the SM charging record if necessary, and writes the free-format information carried in the operation into the SM record. An FCI operation will create a Logical SM Data Record (CDR) if such a record does not already exist. Subsequent FCI operations received, by default, will overwrite the data previously written in the free-format CDR field, as specified in 3G TS 23.078. It is also possible to append free format data with consequent FCI operations.

The Logical CDRs will be associated for a given SMS submission into one or more physical CDRs, as specified in 3G TS 22.005 and 22.015.

### 11.28.2.2 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.

## 11.29 InitialDP procedure

### 11.29.1 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.

#### 11.29.1.1 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 SCP addressing).
- calledPartyNumber:  
This parameter contains the number used to identify the called party in the forward direction, i.e. see EN 300 356-1.
- callingPartyNumber:  
See EN 300 356-1 Calling Party Number signalling information.

- callingPartysCategory:  
See EN 300 356-1 Calling Party Category signalling information.
- locationNumber:  
This parameter is used to convey the geographical area address for mobility services, see ITU-T Recommendation Q.762 . It is used when "callingPartyNumber" does not contain any information about the geographical location of the calling party (e.g., origin dependent routeing when the calling party is a mobile subscriber).
- originalCalledPartyID:  
See EN 300 356-1 Original Called Number signalling information.
- 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 (EN 300 403-1 [**Error! Bookmark not defined.**]) is used. The highlayerCompatibility can also be transported by ISUP (e.g. within the ATP (see ITU-T Recommendation Q.763 [**Error! Bookmark not defined.**]) parameter).
- additionalCallingPartyNumber:  
The calling party number provided by the access signalling system of the calling user, e.g. provided by a PBX.
- bearerCapability:  
This parameter indicates the type of the bearer capability connection or the transmission medium requirements to the user. It is a network option to select which of the two parameters to be used:
  - bearerCap:  
This parameter contains the value of the DSS1 Bearer Capability parameter (EN 300 403-1 [**Error! Bookmark not defined.**]) in case the gsmSSF is at local exchange level or the value of the ISUP User Service Information parameter (ITU-T Recommendation Q.763 [**Error! Bookmark not defined.**]) in case the gsmSSF is at transit exchange level.  
  
The parameter "bearerCapability" shall only be included in the "InitialDP" operation in case the DSS1 Bearer Capability parameter or the ISUP User Service Information parameter is available at the SSP.  
  
If two values for bearer capability are available at the gsmSSF or if User Service Information and User Service Information Prime are available at the gsmSSF the "bearerCap" shall contain the value of the preferred bearer capability respectively 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 last directory number the call was redirected from.
- redirectionInformation:  
See ITU-T Recommendation Q.763 [**Error! Bookmark not defined.**] Redirection Information signalling information.
- serviceInteractionIndicatorsTwo:  
This parameter contains indicators which are exchanged between the gsmSSF and the gsmSCF to resolve interactions between IN based services and network based services.
- iMSI:  
IMSI of the mobile subscriber for which the service is invoked. For encoding see 3G TS 29.002 [**Error! Bookmark not defined.**].
- subscriberState:  
The state of the mobile subscriber for which the service is invoked. The possible states are busy, idle and not reachable. For encoding see 3G TS 29.002 [**Error! Bookmark not defined.**].
- locationInformation:  
This parameter indicates the whereabouts of the MS, and the age of the information defining the whereabouts. For encoding see 3G TS 29.002 [**Error! Bookmark not defined.**].

- ext-BasicServiceCode:  
Indicates the Basic Service Code. For encoding see 3G TS 29.002 [**Error! Bookmark not defined.**].
- callReferenceNumber:  
This parameter gives the call reference number assigned to the call by the CCF. For encoding see 3G TS 29.002 [**Error! Bookmark not defined.**].

mscAddress:

This parameter gives the mscId assigned to the MSC. For encoding see 3G TS 29.002 [**Error! Bookmark not defined.**].

- gsmcAddress:  
This parameter gives the gsmcId assigned to the GMSC. For encoding see 3G TS 29.002 [**Error! Bookmark not defined.**].

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 # characters.

- time&Timezone:  
This parameter contains the time that the gsmSSF was triggered, and the time zone that the invoking gsmSSF resides in.
- gsm-ForwardingPending:  
This parameter indicates that a forwarded-to-number was received and the call will be forwarded due to GSM supplementary service call forwarding in the GMSC.

naCarrierInformation:

This parameter contains the carrier identification code and carrier selection type associated with the calling subscriber of a mobile originating call, the called subscriber of a mobile terminating call or the forwarding subscriber of a mobile forwarded call.

- cug-Interlock  
This parameter uniquely identifies a CUG within a network.
- cug-OutgoingAccess  
This parameter indicates if the calling user has subscribed to the outgoing access inter-CUG accessibility subscription option.

-

## 11.29.2 Invoking entity (gsmSSF)

### 11.29.2.1 Normal procedure

gsmSSF precondition:

- (1) An event fulfilling the criteria for the DP being executed has been detected.

gsmSSF postcondition:

- (1) A control relationship has been established if the DP was armed as a TDP-R. The FSM for CS moves to the State"Waiting for Instructions".

Following a trigger detection (due to the DP criteria assigned being met) related to an armed TDP in the BCSM caused by a call origination attempt, the gsmSSF checks if call gapping, SS7 overload or service filtering are not in effect for the related call segment.

If these conditions are met, then the "InitialDP" operation is invoked by the gsmSSF. The address of the gsmSCF the "InitialDP" operation has to be sent to is determined on the base of trigger related data. The gsmSSF provide as many parameters as available. In some cases, some parameters must be available (such as "callingPartyNumber" or "callingPartyCategory").

Otherwise, the call control is given back to the underlying network.

The gsmSSF application timer  $T_{\text{SSF}}$  is set when the gsmSSF sends "InitialDP" for requesting instructions from the gsmSCF. It is used to prevent excessive call suspension time.

### 11.29.2.2 Error handling

If the destination gsmSCF is not accessible then the call proceeds according to the 'default call handling' parameter in the CSI..

On expiration of  $T_{\text{SSF}}$  before receiving any operation, the gsmSSF aborts the interaction with the gsmSCF and the call continues according to the 'default call handling' parameter in the CSI.

If the calling party abandons after the sending of "InitialDP", then the gsmSSF aborts the control relationship by means of an abort to TC. Note that TC will wait until the first response message from the gsmSCF has been received before it sends an abort to the gsmSCF (see also clause 17).

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.30 InitialDPGPRS procedure

### 11.30.1 General description

This operation is sent by the gprsSSF after detection of a TDP-R in the GPRS session or PDP context state machine, to request the gsmSCF for instructions to complete the session or PDP context.

#### 11.30.1.1 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 SCP addressing).

- gPRSEventType:

This parameter indicates the armed GPRS Attach/Detach SM or PDP Context SM DP event, resulting in the InitialDPGPRS operation.

- mSISDN:

MSISDN of the mobile subscriber for which the CAMEL service is invoked. For encoding see 3G TS 29.002 [15].

- iMSI:

IMSI of the mobile subscriber for which the CAMEL service is invoked. For encoding see 3G TS 29.002 [15].

- timeAndTimezone:

This parameter contains the time that the gprsSSF was triggered, and the time zone that the invoking gprsSSF resides in.

- gPRSMSCClass:

This parameter contains the MS Station capabilities of the mobile subscriber for which the CAMEL service is invoked.

- mSNetworkCapabilities

This parameter contains the Network Capabilities for the session.

- mSRadioAccessCapabilities

This parameter contains the Radio Access Capabilities of the MS.

- pDPTType:

This parameter identifies the PDP type and the actual PDP address.

- pDPTTypeOrganization:

This parameter contains the type of PDP address, e.g. ETSI or an IETF type of address. For encoding see GSM 29.060.

- pDPTTypeNumber:

This parameter is the address that the PDP context of the MS for which the CAMEL service is invoked for, that identifies the MS from the external packet data network. For encoding see 3G TS 29.060.

- qualityOfService:

This parameter contains the negotiated quality of service for the PDP current PDP context. For encoding see 3G TS 24.008.

- accessPointName:

This parameter contains the requested address that the MS for which the CAMEL service is invoked for wants to connect to. For encoding see 3G TS 29.060 [X].

- routingAreaIdentity:

This parameter contains the location information of the MS for which the CAMEL service is invoked from. For encoding see 3G TS 29.060.

- chargingID:

This parameter contains the charging ID that uniquely identifies the PDP context for the MS for which the CAMEL service is invoked from. For encoding see 3G TS 32.015.

- sGSNcapabilities:

This parameter specifies the capabilities which the SGSN node can provide for the CAMEL service control.

## 11.30.2 Invoking entity (gprsSSF)

### 11.30.2.1 Normal procedure

gprsSSF preconditions:

- 1) An attach or PDP context activation attempt has been initiated and the event was armed as a TDP

gprsSSF postcondition:

- 1) A control relationship has been established and the gprsSSF is in state "waiting for instructions".

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

A control relationship is established to the gsmSCF. The gprsSSF application timer  $T_{SSF}$  is set when the gprsSSF sends InitialDPGPRS for requesting instructions from the gsmSCF. It is used to prevent from excessive session or PDP context duration or volume usage.

### 11.30.2.2 Error handling

If the destination gsmSCF is not accessible then the gprsSSF instructs the SGSN to handle the session or PDP context according to the Default session or PDP context handling parameter of the valid CSI.

On expiration of  $T_{SSF}$  before receiving any operation, the gprsSSF aborts the interaction with the gsmSCF and instructs the SGSN to handle the call according to the Default session or PDP context handling parameter of the valid CSI.

If the MS abandons the establishment of a session or PDP context after the sending of InitialGPRSEvent, then the gprsSSF aborts the control relationship after the first response 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.

## 11.31 InitialDPSMS procedure

### 11.31.1 General description

This operation is sent by the gsmSSF or gprsSSF after detection of a TDP-R in the FSM, to request the gsmSCF for instructions to complete the MO SMS submission.

#### 11.31.1.1 Parameters

- 
- DestinationSubscriberNumber.  
This IE contains a number to identify the Destination short message entity.
- CallingPartyNumber.  
This parameter carries the MSISDN of the sending MS.
- EventType.  
This parameter indicates the armed FSM DP event, resulting in the InitialDPSMS operation.
- IMSI.  
IMSI of the mobile subscriber for which the CAMEL service is invoked. For encoding see 3G TS 29.002 [15].
- LocationInformationInMSC.  
This parameter indicates the location of the sending MS when the SM is sent via MSC.
- LocationInformationInSGSN.  
This parameter indicates the location of the sending MS when the SM is sent via GPRS SGSN.
- 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).
- TimeAndTimeZone.  
This parameter contains the time that the gsmSSF/gprsSSF was triggered, and the time zone that the invoking gsmSSF/gprsSSF resides in.
- TPDataCodingScheme.
- SMSCAddress.  
This I.E defines the address of the SMSC to which the MO short message is intended to be submitted.

## 11.31.2 Invoking entity (gsmSSF or gprsSSF)

### 11.31.2.1 Normal procedure

gsmSSF/gprsSSF preconditions:

- 1) A MO SMS submission attempt has been initiated.
- 2) An event has been detected at a DP.

gsmSSF/gprsSSF postcondition:

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

The address of the gsmSCF the InitialSMSEvent operation shall be sent to is fetched from the SMS-CSI. The gsmSSF or gprsSSF provides all available parameters.

A control relationship is established to the gsmSCF. The gsmSSF/gprsSSF application timer  $T_{SSF}$  is set when the gsmSSF/gprsSSF sends InitialSMSEvent for requesting instructions from the gsmSCF. It is used to prevent from excessive SMS delivery suspension time.

### 11.31.2.2 Error handling

If the destination gsmSCF is not accessible then the gsmSSF/gprsSSF instructs the MSC/SGSN to handle the SM according to the Default SMS Handling parameter of the SMS-CSI.

On expiration of  $T_{SSF}$  before receiving any operation, the gsmSSF/gprsSSF aborts the interaction with the gsmSCF and instructs the VMSC/SGSN to handle the SM according to the Default SMS Handling parameter of the SMS-CSI.

If the sending mobile party abandons after the sending of InitialSMSEvent, then the gsmSSF/gprsSSF 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.

## 11.32 PlayAnnouncement procedure

### 11.32.1 General description

This operation is used for inband interaction with a GSMuser. When used to apply user treatment to the indicated leg, the user treatment can be audible (e.g. inband tone) or visual (e.g. text displayed).

#### 11.32.1.1 Parameters

- informationToSend:  
This parameter indicates an announcement, a tone or display information to be sent to the end user by the gsmSRF.
- inbandInfo:  
This parameter specifies the inband information to be sent.
- messageID:  
This parameter indicates the message(s) to be sent, this can be one of the following:
  - elementaryMessageID:  
This parameter indicates a single announcement.
  - text:  
This parameter indicates a text to be sent. The text shall be transformed to inband information (speech) by the gsmSRF. This parameter consist of two subparameters, messageContent and attributes. The attributes of text may consist of items such as language.

- elementaryMessageIDs:  
This parameter specifies a sequence of announcements.
- variableMessage:  
This specifies an announcement with one or more variable parts.
- numberOfRepetitions:  
This parameter indicates the maximum number of times the message shall be sent to the end-user.
- duration:  
This parameter indicates the maximum time duration in seconds that the message shall be played/repeated. ZERO indicates endless repetition.
- interval:  
This parameter indicates the time interval in seconds between repetitions, i.e. the time between the end of the announcement and the start of the next repetition. This parameter can only be used when the number of repetitions is > 1.
- tone:  
This parameter specifies a tone to be sent to the end-user.
  - toneID:  
This parameter indicates the tone to be sent.
  - duration:  
This parameter indicates the time duration in seconds of the tone to be sent. ZERO indicates infinite duration.
- displayInformation:  
This parameter indicates a text string to be sent to the end-user. This information can not be received by a PSTN end-user.

NOTE: As the current signalling systems (DSS1/ISUP) do not provide an indication whether or not information can be displayed by the user's terminal, in case of user interaction with an ISDN user two consecutive "PlayAnnouncement" operations are sent. The first contains the display information, the second contains the inband information to be sent to the user. Since the execution of the display information by the gsmSRF should take a limited amount of time, the inband information will be immediately sent by the gsmSRF to the user, in sequence with the display information.

- disconnectFromIPForbidden:  
This parameter indicates whether or not the gsmSRF should be disconnected from the user when all information has been sent.
- requestAnnouncementComplete:  
This parameter indicates whether or not a "SpecializedResourceReport" shall be sent to the gsmSCF when all information has been sent.
- connectedParty:  
This parameter shall be present when applied in a multi call segment CSA.  
When not present in a single call segment CSA it implies that user interaction shall apply to the call segment, i.e. to all parties connected to the call segment.
  - legID:  
This parameter indicates to which party in the call the interaction shall apply while maintaining the speech connection between that leg and any other legs connected to the same CS.
  - callSegmentIdentifier:  
This parameter indicates to which call segment the user interaction shall apply, i.e. to all parties connected to the call segment.



## 11.32.2 Responding entity (gsmSRF)

### 11.32.2.1 Normal procedure

gsmSRF precondition:

- (1) The SRSM-FSM is in the state "Connected", or in the state "User Interaction" if the gsmSRF received previously an operation from the gsmSCF..

gsmSRF postcondition:

- (1) The gsmSRF sends the information to the user as indicated by "informationToSend".
- (2) The SRSM-FSM moves to the state "User Interaction", or remains in the same state.
- (3) If all information has been sent and "RequestAnnouncementComplete" was set TRUE, the SRSM sends a "SpecializedResourceReport" operation to the gsmSCF.
- (4) If all information has been sent and "disconnectFromIPForbidden" was set FALSE, the SRSM disconnects the gsmSRF from the user.

The announcement sent to the end-user is ended in the following conditions:

- if neither "duration" or "numberOfRepetitions" is specified, then the network specific announcement ending conditions shall apply; or
- if "numberOfRepetitions" is specified, when all repetitions have been sent, or
- if duration is specified, when the duration has expired. The announcement is repeated until this condition is met, or
- if "duration" and "numberOfRepetitions" is specified, when one of both conditions is satisfied (whatever comes first).

### 11.32.2.2 Error handling

If a Cancel operation is received before or during the processing of the operation then the operation is immediately cancelled and the error "Canceled" is reported to the invoking entity.

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.33 PromptAndCollectUserInformation procedure

### 11.33.1 General description

This operation is used to interact with a call party in order to collect information.

#### 11.33.1.1 Parameters

- collectedInfo
- collectedDigits
- minimumNbOfDigits:  
If this parameter is missing, the default value used is 1. The "minimumNbOfDigits" specifies the minimum number of valid digits to be collected.

- maximumNbOfDigits:

This parameter should always be present and specifies the maximum number of valid digits to be collected. The following applies: "maximumNbOfDigits" >="minimumNbOfDigits".

- endOfReplyDigit:

This parameter indicates the digit used to signal the end of input.

In case the "maximumNbOfDigits" = "minimumNbOfDigits", the "endOfReplyDigit" (could be present but) has no further meaning. This parameter can be one or two digits.

In case the "maximumNbOfDigits" > "minimumNbOfDigits" the following applies:

If "endOfReplyDigit" is not present, the end of input is indicated:

- when the inter-digit timer expires, or
- when the number of valid digits received equals the "maximumNbOfDigits".

If "endOfReplyDigit" is present, the end of input is indicated:

- when the inter-digit timer expires, or
- when the end of reply digit is received, or
- when the number of valid digits received equals the "maximumNbOfDigits".

When the end of input is attained, the collected digits are sent from gsmSRF to the gsmSCF, including the "endOfReplyDigit" if received by the gsmSRF.

In the case the number of valid digits received is less than the "minimumNbOfDigits" when the inter-digit timer expires or when the end of reply digit is received, the input is specified as being erroneous.

- cancelDigit:

If this parameter is present, the cancel digit can be entered by the user to request a possible retry. All digits already received by the gsmSRF are discarded and the same "PromptAndCollectInformation" procedure is performed again, thus e.g. the same announcement to request user information is given to the user and information is collected. This parameter can be one or two digits .

If this parameter is not present, the user is not able to request a possible retry.

- startDigit:

If this parameter is present, the start digit indicates the start of the valid digits to be collected. The digits that are received by the gsmSRF before this start digit is received, are discarded and are not considered to be valid. This parameter can be one or two digits.

If this parameter is not present, all received digits are considered to be valid.

When the end of input is attained, the collected digits are sent from gsmSRF to the gsmSCF, including the "startDigit" if received by the gsmSRF.

- firstDigitTimeout:

If this parameter is present, the first digit should be received by the gsmSRF before the first-digit timer expiration. In case the first digit is not received before first-digit timer expiration, the input is regarded to be erroneous. After receipt of the first valid or non-valid input digit, the corresponding first-digit timer is stopped.

If this parameter is not present, then the gsmSRF uses a default value (network operator specific) for the first-digit timer in which the first valid or non-valid input digit is received.

If "startDigit" is present, the first-digit timer is stopped after the start digit is received.

- interDigitTimeOut:

If this parameter is present any subsequent valid or non-valid digit, should be received by the gsmSRF before the inter-digit timer expires. As result the inter-digit timer is reset and restarted.

In case a subsequent valid or non-valid digit is not received before the inter-digit timer expires and the number of received valid digits is less than the "minimumNbOfDigits", the input is regarded to be unsuccessful.

In case a subsequent valid or non-valid digit is not received before the inter-digit timer expires and the number of received valid digits is greater than the "minimumNbOfDigits", and less than or equal to the "maximumNbOfDigits", the input is regarded to be successful.

If the "interDigitTimeOut" is not present, then the gsmSRF uses a default value for the inter-digit time.

- **errorTreatment:**

This optional parameter defines what specific action should be taken by the gsmSRF in the event of error conditions occurring. The default value is reportErrorToSCF.

- **interruptableAnnInd:**

This parameter is optional, where the default value is specified being TRUE.

If this parameter is TRUE, the announcement is interrupted after the first valid or non-valid digit is received by the gsmSRF. If the announcement is interrupted, a possible start-digit timer will not apply anymore. However, if the announcement has not been interrupted, a possible start-digit timer is started after the announcement has been finished.

If this parameter is present and explicitly set to FALSE, the announcement will not be interrupted after the first digit is received by the gsmSRF. The received digits during the announcement are discarded and considered to be non-valid. All other specified parameters ("minimumNbOfDigits", "maximumNbOfDigits", "endOfReplyDigit", etc.) do not apply before the announcement has been finished. The possible start-digit timer is started after the announcement has been finished.

- **voiceInformation:**

This parameter is optional, where the default value is specified being FALSE. If the "voiceInformation" parameter is FALSE, all valid or non-valid digits are entered by DTMF.

If this parameter is present and explicitly set to TRUE, calling user is required to provide all valid or non-valid information by speech. The gsmSRF will perform voice recognition and translation of the provided information into digits. A possible end of reply digit will also have to be provided by speech.

- **voiceBack:**

This parameter is optional, where the default value is specified being FALSE. If the "voiceBack" parameter is FALSE, no voice back information is given by the gsmSRF.

If this parameter is present and explicitly set to TRUE, the valid input digits received by the gsmSRF will be announced back to the calling user immediately after the end of input is received. The non-valid input digits will not be announced back to the calling user.

A possible end of reply digit is not voiced back.

- **iA5Information**

This parameter indicates that IA5 information is expected.

- **disconnectFromIPForbidden:**

This parameter indicates whether the gsmSRF should initiate disconnection to the gsmSSF/CCF after the interaction has been completed. If the parameter is not present or set to TRUE, the gsmSRF shall not initiate disconnection.

- **informationToSend:**

This parameter indicates an announcement, a tone or display information to be sent to the end user by the gsmSRF.

- **inbandInfo:**

This parameter specifies the inband information to be sent.

- **messageID:**

This parameter indicates the message(s) to be sent, this can be one of the following:

- elementaryMessageID:  
This parameter indicates a single announcement.
- text:  
This parameter indicates a text to be sent. The text shall be transformed to inband information (speech) by the gsmSRF. This parameter consist of two subparameters, messageContent and attributes. The attributes of text may consist of items such as language.
- elementaryMessageIDs:  
This parameter specifies a sequence of announcements.
- variableMessage:  
This parameter specifies an announcement with one or more variable parts.
- numberOfRepetitions:  
This parameter indicates the maximum number of times the message shall be sent to the end-user.
- duration:  
This parameter indicates the maximum time duration in seconds that the message shall be played/repeated. ZERO indicates endless repetition.
- interval:  
This parameter indicates the time interval in seconds between repetitions, i.e. the time between the end of the announcement and the start of the next repetition. This parameter can only be used when the number of repetitions is > 1.
- tone:  
This parameter specifies a tone to be sent to the end-user.
- toneID:  
This parameter indicates the tone to be sent.
- duration:  
  
This parameter indicates the time duration in seconds of the tone to be sent. ZERO indicates infinite duration.
- displayInformation:  
This parameter indicates a text string to be sent to the end-user. This information can not be received by a PSTN end-user.

NOTE: As the current signalling systems (DSS1/ISUP) do not provide an indication whether or not information can be displayed by the user's terminal, in case of user interaction with an ISDN user, the "displayInformation" parameter is not used in the "PromptAndCollectUserInformation" operation. Instead a "PlayAnnouncement" operation containing the "displayInformation" parameter followed by a "PromptAndCollectUserInformation" operation containing inband information are sent to the user. Since the execution of the displayed information by the gsmSRF should take a limited amount of time, the inband information will be immediately sent after by the gsmSRF to the user, in sequence with the displayed information.

- callSegmentIdentifier:  
This parameter indicates to which call segment the user interaction shall apply.  
When not present in a single call segment CSA it implies that user interaction shall apply to the call segment.  
This parameter shall be present when applied in a multi call segment CSA.

Result Parameters:

- digitsResponse:  
This parameter contains the information collected from the end-user.
- iA5Response:  
This parameter contains the received IA5 information.

## 11.33.2 Responding entity (gsmSRF)

### 11.33.2.1 Normal procedure

gsmSRF precondition:

- (1) The SRSM-FSM is in the state "Connected", or in state "User Interaction" if the gsmSRF received previously an operation from the gsmSCF.

gsmSRF postcondition:

- (1) The gsmSRF has sent the information to the end-user as indicated by "informationToSend".
- (2) The collected information from the end-user is sent to the gsmSCF as RETURN RESULT of the "PromptAndCollectUserInformation".
- (3) If the "disconnectFromIPForbidden" was set to FALSE, the gsmSRF initiates a bearer channel disconnect to the gsmSSF and the SRSM FSM moves to the state "Idle".
- (4) Otherwise the SRSM FSM moves to the state "User Interaction", or remains in the same state..

The announcement send to the end-user is ended in the following conditions:

- if neither "duration" or "numberOfRepetitions" is specified, then the network specific announcement ending conditions shall apply; or
- if "numberOfRepetitions" is specified, when all repetitions have been sent, or
- if duration is specified, when the duration has expired. The announcement is repeated until this condition is met, or
- if "duration" and "numberOfRepetitions" is specified, when one of both conditions is satisfied (whatever comes first).

The above conditions are overruled if the parameter "interruptableAnnInd" is not set to FALSE and the end-user has responded with a digit during the sending of the announcement. In this case the announcement is ended immediately. The above procedures apply only to inband information and tones send to the end-user, for "displayInformation" the end conditions are met upon sending, i.e. no interruption can occur.

The parameter "errorTreatment" specifies how the gsmSRF shall treat the error. The default value "reportErrorToSCF" means that the error shall be reported to gsmSCF by means of Return Error with "ImproperCallerResponse". The value "help" indicates that no error shall be reported to gsmSCF but assistance shall be given to the end-user in form of a network dependent default announcement (which may dependent on the context, i.e. the send message). The value "repeatPrompt" indicates that no error shall be reported to the gsmSCF but the prompt shall be repeated to the end-user. The last two procedures shall only be done once per "PromptAndCollectUserInformation" operation.

Note on processing "endOfInput"

The receipt of any "endOfInput" condition (e.g endOfReplyDigit, cancelDigit, firstDigitTimeout, interDigitTimeout) terminates immediately the ongoing input. In other words when e.g an endOfReplyDigit is received, the receipt of a subsequent cancelDigit will not be processed anymore.

### 11.33.2.2 Error handling

If a Cancel operation is received before or during the processing of the operation then the operation is immediately cancelled and the error "Canceled" is reported to the invoking entity.

Generic error handling for the operation related errors are described in clause 17, the TC services which are used for reporting operation errors are described in clause 19.

If any of the parameter restrictions are violated (e.g. minimumNbOfDigits > maximumNbOfDigits) then an operation error has occurred.

## 11.34 ReleaseCall procedure

### 11.34.1 General description

This operation is used by the gsmSCF to tear down a call at any phase . This operation may not be sent to an assisting gsmSSF, except in the case of hand-off procedure.

#### 11.34.1.1 Parameters

- releaseCause:  
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.

### 11.34.2 Responding entity (gsmSSF)

#### 11.34.2.1 Normal procedure

gsmSSF precondition:

- (1) A control or monitoring relationship exists between gsmSCF and gsmSSF.
- (2) The FSM for CS is in state "Waiting for Instructions" or state "Monitoring"

gsmSSF postcondition:

- (1) The FSM for CS changes to state "Idle" after sending any outstanding "CallInformationReport" or "ApplyChargingReport". Possible armed EDPs are ignored. All connections and resources related to the call are released.

#### 11.34.2.2 Error handling

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

## 11.35 ReleaseGPRS procedure

### 11.35.1 General description

This operation is used to tear down by the gsmSCF an existing GPRS session or PDP context at any phase. The operation can only be sent within a control relationship and is not allowed in a monitor relationship.

#### 11.35.1.1 Parameters

- GPRSCause

A number giving an indication to the gprsSSF about the reason of releasing the session or a specific PDP context. This may be used by gprsSSF for generating specific indications to the MS or to fill in the "cause" in the release message.

- pDPID:

This parameter if present identifies the PDP context within the control relationship for which the processing shall be released.

## 11.35.2 Responding entity (gprsSSF)

### 11.35.2.1 Normal procedure

gprsSSF preconditions:

- 1) State "Waiting for Instructions"; or State "Monitoring".

gprsSSF postcondition:

- 1) "Idle", after sending any outstanding ApplyGPRSCargingReport and no more PDP contexts are pending. Possible armed EDPs are ignored. All connections and resources related to the session or PDP context for the corresponding pDPID are released.

### 11.35.2.2 Error handling

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

## 11.36 ReleaseSMS procedure

### 11.36.1 General description

This operation is used to tear down by the gsmSCF an MO SMS submission attempt. The operation can only be sent within a control relationship and is not allowed in a monitor relationship.

#### 11.36.1.1 Parameters

- RPCause

A number giving an indication to the gsmSSF or gprsSSF about the reason of releasing this specific SM. This may be used by gsmSSF/gprsSSF; it may forward the cause to the originating MS.

### 11.36.2 Responding entity (gsmSSF or gprsSSF)

#### 11.36.2.1 Normal procedure

gsmSSF/gprsSSF preconditions:

- 1) State "Waiting for Instructions".
- 2) FSM is in the DP SMS\_Collected\_Info.

gsmSSF/gprsSSF postcondition:

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

### 11.36.2.2 Error handling

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

## 11.37 RequestReportBCSMEvent procedure

### 11.37.1 General description

This operation is used to request the gsmSSF to monitor for a call-related event (e.g., BCSM events such as busy or no answer), then send a notification back to the gsmSCF when the event is detected.

**NOTE:** If the RequestReportBCSMEvent requests arming of the current DP from which the call processing was suspended, the next occurrence of the DP encountered during BCSM processing will be detected (i.e. not the current one from which the call was suspended).

The DP arming principle is as follows:

- The DPs O\_Disconnect and T\_Disconnect can be armed as well as for leg1 as leg2 depending on what direction (either from the A-party which is connected to leg1 or from the B-party connected to the passive leg) events have to be captured. As an example the Disconnect DP can be armed as well as for leg1 and leg2, in that case if a release request is received from the A-party it will be detected by the Disconnect DP armed for leg1, while a release request from the B-party shall be detected by arming the leg2 Disconnect DP.
- The O\_Abandon DP can only be armed for leg1 in the O\_BCSM and the T\_Abandon can only be armed for leg2 in the T\_BCSM.

**Table 18-9: DP Arming Table for O-BCSM:**

O_BCSM	leg1	leg2	Default leg ID
Analysed_Information DP	X	X	1
Route_Select_Failure DP	-	X	2
O_Called_Party_Busy DP	-	X	2
O_No_Answer DP	-	X	2
O_Answer DP	-	X	2
O_Disconnect DP	X	X	- <sup>o2</sup>
O_Abandon DP	X	-	1
o1) Only applicable as TDP, because first DP that can be encountered cannot be armed as EDP.			
o2) The "legID" parameter shall be included			
Nomenclature: X = Arming Applicable			
- = Not Applicable			



Table 18-10: DP Arming Table for T-BCSM:

T_BCSM	Controlling leg	Passive leg	Default Leg ID
T_Busy DP	X	-	2
T_No_Answer DP	X	-	2
T_Answer DP	X	-	2
T_Disconnect DP	X	X	- t <sup>2</sup>
T_Abandon DP	-	X t <sup>3</sup>	1
t1) Only applicable as TDP, because first DP that can be encountered cannot be armed as EDP. t2) The "legID" parameter shall be included t3) T_Abandon can only be armed for the passive leg. Nomenclature: X = Arming Applicable - = Not Applicable			

### 11.37.1.1 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, analyzedInformation and termAttemptAuthorized are not valid for the eventTypeBCSM parameter.
- monitorMode:  
This parameter indicates how the event shall 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, if the "monitorMode" is "transparent", the event shall not be reported.
- legID:  
This parameter indicates the party in the call for which the event shall be reported. gsmSCF will use the option "sendingSideID" only.
- sendingSideID:  
If not included, the following defaults are assumed for LegID:  
"legID" = 1 for the events O-Abandon and T-Abandon,  
"legID" = 2 for the events RouteSelectFailure, O-Busy, O-NoAnswer, O-Answer, , T-Busy, T-NoAnswer, and T-Answer.  
The "legID" parameter shall always be included for the events O-Disconnect and T-Disconnect.
- dPSpecificCriteria:  
This parameter indicates information specific to the EDP to be armed.
- applicationTimer:  
This parameter indicates the NoAnswer timer value for the NoAnswer event. If the user does not answer the call within the allotted time, the gsmSSF reports the event to the gsmSCF. This timer shall be shorter than the network no-answer timer.

## 11.37.2 Responding entity (gsmSSF)

### 11.37.2.1 Normal procedure

gsmSSF precondition:

- (1) A control relationship exists between the gsmSSF and the gsmSRF.
- (2) The gsmSSF is in either the state "Waiting for Instructions" or the state "Monitoring".

NOTE: In state "monitoring" only requests to disarm detection points (with MonitorMode set to "Transparent") or send notifications of events (with MonitorMode set to "NotifyAndContinue") shall be accepted.

gsmSSF postcondition:

- (1) The requested EDPs have been armed or disarmed as indicated.
- (2) Previously requested events are monitored until ended by a transparent monitor mode, 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, unless all EDPs have been disarmed and no CallInformationReport or ApplyChargingReport has been requested; in the latter case the gsmSSF moves to the state "Idle".

### 11.37.2.2 Error handling

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.38 RequestReportGPRSEvent procedure

### 11.38.1 General description

This operation is used to request the gprsSSF to monitor for a session or PDP context related event (e.g., events such as PDP context establishment or detach), then send a notification back to the gsmSCF when the event is detected.

#### 11.38.1.1 Parameters

- gPRSEvent:

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

- gPRSEventType:

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

- 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, if the "monitorMode" is "transparent", the event shall not be reported.

- pDPID:

This parameter if present identifies the PDP context within the control relationship for which the event reporting is requested.

## 11.38.2 Responding entity (gprsSSF)

### 11.38.2.1 Normal procedure

gprsSSF precondition:

- 1) A control relationship exists between the gprsSSF and the gsmSCF.
- 2) The gprsSSF is in either the state "Waiting for Instructions" or the state "Monitoring".

NOTE: In state "monitoring" only requests to disarm detection points (with MonitorMode set to "Transparent") or send notifications of events (with MonitorMode set to "NotifyAndContinue") shall be accepted.

gprsSSF postconditions:

- 1) The requested EDPs have been armed as indicated.
- 2) Previously requested events are monitored until ended by a transparent monitor mode, until the end of the session or PDP context or until the EDPs are detected.
- 3) The gprsSSF remains in the same state, unless all EDPs have been disarmed and no more ApplyChargingReportGPRS has been requested. If no more PDP contexts are pending the gprsSSF moves to the state "Idle".

### 11.38.2.2 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.

## 11.39 RequestReportSMSEvent procedure

### 11.39.1 General description

This operation is used to request the gsmSSF or gprsSSF to monitor for a SM related event (e.g., FSM events such as failure or successful delivery), then send a notification back to the gsmSCF when the event is detected.

#### 11.39.1.1 Parameters

- smsEvents:

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

- eventTypeSMS:

This parameter specifies the type of event of which a report is requested. Value SMSCollectedInfo is not valid for the RequestReportSMSEvent 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, if the "monitorMode" is "transparent", the event shall not be reported..

## 11.39.2 Responding entity (gsmSSF or gprsSSF)

### 11.39.2.1 Normal procedure

gsmSSF/gprsSSF precondition:

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

2) The gsmSSF/gprsSSF is in either the state "Waiting for Instructions".

NOTE: In state "monitoring" only requests to disarm detection points (with MonitorMode set to "Transparent") or send notifications of events (with MonitorMode set to "NotifyAndContinue") shall be accepted.

gsmSSF/gprsSSF postconditions:

- 1) The requested EDPs have been armed as indicated.
- 2) Previously requested events are monitored until ended by a transparent monitor mode, until the end of the SM submission, until the EDPs are detected or until the SM submission fails.
- 3) The gsmSSF/gprsSSF remains in the same state. If no EDPs are armed after the operation, then the gsmSSF/gprsSSF transits to state IDLE.

### 11.39.2.2 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.

## 11.40 ResetTimer procedure

### 11.40.1 General description

This class 2 operation is used by the gsmSCF to refresh the  $T_{\text{Ssf}}$  application timer, in order to avoid the  $T_{\text{Ssf}}$  time-out at the gsmSSF.

#### 11.40.1.1 Parameters

- timerID:  
This parameter has a default value identifying the  $T_{\text{Ssf}}$  timer.
- timerValue:  
This parameter specifies the value to which the  $T_{\text{Ssf}}$  is to be set.

### 11.40.2 Responding entity (gsmSSF)

#### 11.40.2.1 Normal procedure

gsmSSF precondition:

- (1) (void)
- (2) Basic call processing has been suspended at a DP.
- (3) The FSM for the CS is in the "Waiting for Instruction" state or in the "Waiting for End of User Interaction" state or in the "Waiting for End of Temporary Connection" state.

NOTE: Whether the  $T_{\text{Ssf}}$  is used or not in the state "Waiting for End of User Interaction" or in the state "Waiting for End of Temporary Connection" is network operator dependent.

gsmSSF postcondition:

- (1) The  $T_{\text{Ssf}}$  timer has been reset.
- (2) The FSM for the CS remains in the same state.

### 11.40.2.2 Error handling

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.41 ResetTimerGPRS procedure

### 11.41.1 General description

This class 2 operation is used by the gsmSCF to refresh the  $T_{SSF}$  application timer, in order to avoid the  $T_{SSF}$  time-out at the gprsSSF.

#### 11.41.1.1 Parameters

- timerValue:

This parameter specifies the value to which the  $T_{SSF}$  timer is to be set.

- timerID:

This parameter has a default value identifying the  $T_{SSF}$  timer.

- pDPID:

This parameter if present specifies the identifier of a PDP context within a control relationship.

### 11.41.2 Responding entity (gprsSSF)

#### 11.41.2.1 Normal procedure

gprsSSF preconditions:

- 1) Session or PDP context establishment attempt has been initiated.
- 2) Session or PDP context processing has been suspended at a DP.
- 3) The gprsSSF is in the "Waiting for Instruction" state.

gprsSSF postconditions:

- 1) The  $T_{SSF}$  timer has been reset.
- 2) The gprsSSF remains in the same state.

#### 11.41.2.2 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.

## 11.42 ResetTimerSMS procedure

### 11.42.1 General description

This class 2 operation is used by the gsmSCF to refresh the  $T_{SSf}$  application timer, in order to avoid the  $T_{SSf}$  time-out at the gsmSSF or gprsSSF.

### 11.42.1.1 Parameters

- timerID:  
This parameter has a default value identifying the T<sub>SSF</sub> timer.
- timerValue:  
This parameter specifies the value to which the T<sub>SSF</sub> is to be set.

## 11.42.2 Responding entity (gsmSSF or gprsSSF)

### 11.42.2.1 Normal procedure

SSF precondition:

- 1) Basic call processing has been suspended at a DP.
- 2) The FSM for the CS is in the "Waiting for Instruction" state.

SSF postcondition:

- (1) The T<sub>SSF</sub> timer has been reset.
- (2) The SSF remains in the same state.

### 11.42.2.2 Error handling

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.43 SendChargingInformation procedure

### 11.43.1 General description

This operation is used to instruct the gsmSSF on the advice of charge information to be sent by the gsmSSF. The SCI operation may be invoked on multiple occasions.

The SCI operation can be used for MO and MT calls in the VMSC. In the case of a MT call the CSE provided e-parameters are not used by mobile if a call forwarding or follow-on call occurs.

#### 11.43.1.1 Parameters

- sCIBillingChargingCharacteristics:

This parameter is a choice between two lists of information.

The first list shall only be sent before an answer event has been detected from the current Called Party, Temporary Connection or connection to an gsmSRF. It contains the following parameters:

- aOCBeforeAnswer:  
This is a list of the following information:

- aOCInitial:

This is a set of GSM Charge Advice Information elements, as defined in GSM 22.024 [26], and these CAI elements are sent by the gsmSSF to the MS when an ANSWER is received and a tariff switch has not yet occurred.

- aOCSubsequent:

This list may indicate the following information:

- CAIElements

This is a set of GSM Charge Advice Information elements, as defined in 3G TS 22.024 [26], and these CAI elements are sent to the MS when Answer is detected and a tariff switch has occurred previously, or when Answer has previously been detected and a tariff switch occurs.

- tariffSwitchInterval:

This parameter indicates to the gsmSSF the time duration until the next tariff switch. The measurement of the elapsed tariff switch period commences immediately upon successful execution of this operation.

The second list in the Choice shall only be sent after an answer event has been detected from the current Called Party, Temporary Connection or connection to an gsmSRF. It contains the following parameters:

- aOCAfterAnswer:

This list may indicate the following information:

- cAIElements:

This is a set of GSM Charge Advice Information elements, as defined in 3G TS 22.024 [26], and these CAI elements are sent to the MS by the gsmSSF when Answer is detected and a tariff switch has occurred previously, or when Answer has previously been detected and a tariff switch occurs in the call..

- tariffSwitchInterval:

This parameter indicates to the gsmSSF the time duration until the next tariff switch. The measurement of the elapsed tariff switch period commences immediately upon successful execution of this operation.

- legID:

This parameter indicates where the charging information shall be sent, but for CAP only leg1 is allowed.

## 11.43.2 Responding entity (gsmSSF)

### 11.43.2.1 Normal procedure

gsmSSF precondition:

- (1) FSM: for CS State"Waiting for Instructions", or  
FSM for CS State"Waiting for End of User Interaction", or  
FSM for CS State"Waiting for End of Temporary Connection", or  
FSM for CS State"Monitoring", or  
Assisting/hand-off gsmSSF-FSM State b:"Waiting for Instructions".

gsmSSF postcondition:

- (1) No FSM state transition

On receipt of this operation the gsmSSF performs actions to send the advice of charge information to the indicated Call Party's MS.

If advice of charge is to be provided to a GSM MS in conjunction with CSE control of call duration then the following sequence of operations shall be sent from the gsmSCF to the gsmSSF in the following order, in the same TCAP TC-CONTINUE component;

ApplyCharging; SendChargingInformation

These operations will be processed sequentially by the gsmSSF, in the order that they are sent by the gsmSCF. Note also that in this case parameter TariffSwitchInterval may be present in either in the ApplyCharging operation or the SendChargingInformation operation, but not in both operations. It is recommended that it shall be transported in the ApplyCharging operation.

The TariffSwitchInterval information received with either of these operations shall set the same tariff switch timer in the gsmSSF, and this duration timer shall run from the time of successful operation execution.

### 11.43.2.2 Error handling

Generic error handling for the operation related errors are described in clause 17 and the TC services which are used for reporting operation errors are described in clause 19.

## 11.44 SendChargingInformationGPRS Procedure

This operation is used to instruct the gprsSSF on the advice of charge information to be sent by the gprsSSF, provided the SGSN supports Advice Of Charge. The operation may be invoked on multiple occasions.

### 11.44.1 Parameters

- SCIGPRSBillingChargingCharacteristics:

This parameter contains the Advice of Charge information:

- aOCGPRS:

This parameter specifies the Advice of Charge information that shall be forwarded to the MS. It may contain one or more of the following parameters:

- aOCInitial:

This is a set of GSM Charge Advice Information elements, as defined in 3G TS 22.024. These CAI elements are sent by the gprsSSF to the MS when an Activate PDP Context Accept or Attach Accept is sent to MS and a tariff switch has not yet occurred. It may also be sent at any other time e.g. upon change of QoS or RAI.

- aOCSubsequent:

This parameter may indicate the following information:

- CAIElements

This is a set of GSM Charge Advice Information elements, as defined in 3G TS 22.024. These CAI elements are sent to the MS when an Activate PDP Context Accept or Attach Accept is detected and a tariff switch has occurred previously, or when Activate PDP Context Accept or Attach Accept has previously been detected and a tariff switch occurs.

- tariffSwitchInterval:

This parameter indicates to the gprsSSF the time duration until the next tariff switch. The measurement of the elapsed tariff switch period commences immediately upon successful execution of this operation.

### 11.44.2 Responding Entity (gprsSSF)

#### 11.44.2.1 Normal Procedure

gprsSSF preconditions:

A control relationship exist between the gprsSSF and the gsmSCF.

The gprsSSF FSM is in state "Waiting for Instructions" or in state "Monitoring".

gprsSSF postconditions:

No state transition.



On receipt of this operation the gprsSSF performs actions to send the advice of charge information to the MS, provided Advice Of Charge is supported by the SGSN.

If advice of charge is to be provided to a GSM MS in conjunction with CSE control of session or PDP context duration or volume , then the following sequence of operations shall be sent from the gsmSCF to the gprsSSF in the following order and in the same TCAP TC-CONTINUE component:

ApplyChargingGPRS; SendChargingInformationGPRS.

These operations will be processed sequentially by the gprsSSF, in the order that they are sent by the gsmSCF. Note also that in this case parameter TariffSwitchInterval may be present in either in the ApplyChargingGPRS operation or the SendChargingInformationGPRS operation, but not in both operations. It is recommended that it shall be transported in the ApplyGPRSCharging operation.

The TariffSwitchInterval information received with either of these operations shall set the same tariff switch timer in the gprsSSF, and this duration timer shall run from the time of successful operation execution.

### 11.44.2.2 Error handling

TaskRefused: In addition to the generic error handling noted below, this error shall be indicated when:

- a tariffSwitchInterval is indicated when a previously received tariffSwitchInterval is pending.

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

## 11.45 SpecializedResourceReport procedure

### 11.45.1 General description

This operation is used as the response to a "PlayAnnouncement" operation when the announcement completed indication is set.

#### 11.45.1.1 Parameters

none

### 11.45.2 Invoking entity (gsmSRF)

#### 11.45.2.1 Normal procedure

gsmSRF precondition:

- (1) The SCSM-FSM is in the state C3.2.1"User Interaction", R2,"Controlling gsmSRF", A3"User Interaction" or H3"User Interaction".
- (2) A "PlayAnnouncement" operation is being executed for which the parameter"RequestAnnouncementComplete" was set TRUE.
- (3) All information has been sent to the user.

gsmSRF postcondition:

- (1) The SRSF FSM remains in the same state.
- (2) If the"DisconnectFromIPForbidden" parameter was set FALSE, the SRSF initiates a bearer channel disconnect sequence to the gsmSSF using the applicable bearer channel signalling system after sending the"SpecializedResourceReport" operation to the gsmSCF. The SRSF FSM moves to the state"Idle".

## 11.45.2.2 Error handling

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

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# 12 Services assumed from lower layers

## 12.1 Services assumed from TCAP

The SS7 application layer protocol defined in this 3G TS, is a protocol to provide communication between a pair of application processes. In the SS7 environment this is represented as communication between a pair of application-entities (AEs) using the TC. The function of an AE is provided by a set of application-service-elements (ASEs). The interaction between AEs is described in terms of their use of the services provided by the ASEs.

If AC are to be used for FE differentiation within a physical node then the version of TC used must support the dialogue portion of TC (ie ETS 300 287-1 [**Error! Bookmark not defined.**]).

This requirement applies to all interfaces, not just those used for internetworking.

Table 19-1 defines which versions of TC are the minimum versions required to support the defined IN interfaces:

**Table 19-1: Minimum TC requirements for CAP interfaces**

Interface	IN CS2
gsmSSF - gsmSCF	Blue Book (note)
gsmSCF - gsmSRF	Blue Book (note)
Note:	If the AC name needs to be indicated, then ETS 300 287-1 [ <b>Error! Bookmark not defined.</b> ] is the minimum version required.

### 12.1.1 Common procedures

This subclause defines the procedures and mapping which apply between CAP and TC to be used in the absence of specific procedures and mapping instructions for the specific CAP interfaces as defined in subsequent subclauses.

#### 12.1.1.1 Normal procedures

This subclause describes the procedures and TCAP primitives that shall be used for transmitting messages between AEs 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 PE:

- 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
    - In the case the dialogue is established, operations, leading to a termination of the relationship, can be transmitted by the FE with a TC-END request primitive (basic) in case the FE is not interested in the reception of any ERROR or REJECT components for these sent operations. Once the FE dialogue resources have been released, any ERROR or REJECT components received for these operations will be discarded by TC as described in ETS 300 287-1 [**Error! Bookmark not defined.**].

- In case the dialogue is established and the FE has received an operation, leading to the termination of the relationship, does not wish to continue dialogue and there is no operation to be sent, a TC-END request primitive (basic) with zero components can be sent from the FE.
- Pre-arranged End
  - Where an entity is interested in possible ERROR or REJECT messages on response to sent operations leading to a termination of the relationship, the dialogue is ended with a TC-END request primitive (pre-arranged end) after the last associated operation timer expires. The receiving entity can end the dialogue with a TC-END request primitive (pre-arranged end) after successful processing of these operations (i.e. the relationship is terminated).
- in general, the use of prearranged end shall be limited to the case for both communicating entities clearly recognizable that peer entity applies prearranged end. In all other cases, basic end shall be used.
- a dialogue shall not be established: for class 2 or 4 operations only the sending TC-user issues a TC-BEGIN request primitive and ends the dialogue locally after operation timeout by means of a prearranged end. Upon reception of the TC-BEGIN indication primitive the receiving TC-user shall end the dialogue locally.

### 12.1.1.2 Abnormal procedures

This subclause describes the procedures and TCAP primitives that shall be used for reporting abnormal situations between AEs. The error cases are defined in clause 17.

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.
- when the FE detecting error or rejecting operation decides the termination of TC dialogue, TC-END request primitive (basic) with error or reject can be used for the termination of TC dialogue.
- when the gsmSSF, the gsmSRF, or the CUSF detecting error or rejecting operation recognizes the possibility to continue dialogue, TC-CONTINUE request primitive with error or reject can be used for the continuation of TC dialogue.
- a dialogue shall be aborted by the TC-user with a TC-U-ABORT request primitive.
- on expiration of application timer TSSF or TSRF or TCUSF, dialogue shall be terminated by means of by TC-U-ABORT primitive with an Abort reason, regardless of TCAP dialogue is established or not.

For abnormal situations detected by TCAP the same rules shall apply for reception 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.

The following rules shall be applied to terminate the TCAP dialogue under abnormal situations:

- in the case that abort condition is detected and TCAP dialogue is established, TCAP dialogue is terminated by TC-U-ABORT primitive with an Abort reason.
- in the case that abort condition is detected and TCAP dialogue is not established, TCAP dialogue is locally terminated by TC-U-ABORT primitive. (in the case such as application time out).

In error situations prearranged end shall not be used to terminate the TCAP dialogue. 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 FSM is not in a state to terminate the 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 300 287-1 [**Error! Bookmark not defined.**](ETS 300 287-1 [**Error! Bookmark not defined.**]).

### 12.1.1.3 Dialogue handling

#### 12.1.1.3.1 19.1.1.3.1 Dialogue establishment

The establishment of an CAP dialogue involves two application processes as described in clause 1, one that is the dialogue-initiator and one that is the dialogue-responder.

AC negotiation may not be supported in all PE 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

#### *Sending of a TC-BEGIN request*

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

TC-USER shall request the invocation of the associated operations using the TC-INVOKE service. See subclause 19.1.1.4.1 for a description of the invocation procedure.

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

The initiator TC-USER 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".

If no TC indication primitive is expected because no dialogue is to be established according to the rules as stated in subclauses 19.1.2.1.1 and 19.1.2.1.2, TC-USER will wait for the last associated TCAP operation timer to expire and issue a TC-END request with the release method parameter set to "pre-arranged release".

#### *Receipt of a TC-BEGIN indication*

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

- Analyse the application-context-name if included in the primitive. If it is supported, process any other indication primitives received from TC as described in clause 19.1.1.4.1.
- If no dialogue is to be established according to the rules as stated in subclauses 19.1.2.1.1 and 19.1.2.1.2, TC-USER will wait for the last indication primitive from TC and issue a TC-END request with the release method parameter set to "pre-arranged release".
- 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.

It is for further study whether or not the application-context-negotiation is limited only for using the TC-U ABORT primitive.

*Receipt of the first TC-CONTINUE indication*

On receipt of the first TC-CONTINUE indication primitive for a dialogue, TC-USER shall check the value of the application-context-name parameter. If this value matches the one used in the TC-BEGIN request primitive, TC-USER shall process the following TC component handling indication primitives as described in subclause 19.1.1.4.1, otherwise it shall issue a TC-U-ABORT request primitive.

It is for further study whether or not the application-context-negotiation is limited only for using the TC-U ABORT primitive.

*Receipt of a TC-END indication*

On receipt of a TC-END indication primitive in the dialogue initiated state, TC-USER shall check the value of the application-context-name parameter. If this value match the one used in the TC-BEGIN request primitive, then the TC-USER shall process the following TC component handling indication primitives as described in subclause 19.1.1.4.1.

*Receipt of a TC-U-ABORT indication*

Receipt of a TC-U-ABORT indication primitive is described as part of user abort procedure (see 19.1.1.3.4.) If the abort reason is AC name not supported, the responding side may propose an alternative AC name in the TC-U-ABORT indication. If an alternative AC is proposed the receiving entity shall check this name and if it can be supported a new dialogue may be established.

*Receipt of a TC-P-ABORT indication*

Receipt of a TC-P-ABORT indication primitive is described as part of provider abort procedure (see 19.1.1.3.5.)

**12.1.1.3.2 19.1.1.3.2 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.

*Sending entity*

TC-USER shall process any component handling request primitives as described in subclause 19.1.1.4.1.

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

*Receiving entity*

On receipt of a TC-CONTINUE indication primitive TC-USER shall accept zero, one or several TC component handling indication primitives and process them as described in subclause 19.1.1.4.1.

**12.1.1.3.3 19.1.1.3.3 Dialogue termination**

Both the dialogue-initiator and the dialogue-responder have the ability to request the termination of a dialogue after it has been established 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 19.1.2.1.1 and 19.1.2.1.2.

The dialogue termination procedure is driven by the following events:

- A TC-END request primitive
- A TC-END indication primitive

*Sending of TC-END request*

When the dialogue shall no longer be maintained, TC-USER shall process any component handling request primitives as described in subclause 19.1.1.4.1

After processing the last component handling request primitive (if any), TC-USER shall issue a TC-END request primitive with the release method parameter set to "basic end" or "prearranged release", according to the rules as stated in subclauses 19.1.2.1.1 and 19.1.2.1.2.

When no dialogue is to be established, refer to subclauses 19.1.1.3.1.

#### *Receipt of a TC-END indication*

On receipt of a TC-END indication primitive, the TC-USER shall accept any component handling indication primitives and process them as described in subclause 19.1.1.4.1.

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

### 12.1.1.3.4 19.1.1.3.4 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

#### *Sending of TC-U-ABORT request*

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

#### *Receipt of a TC-U-ABORT indication*

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

### 12.1.1.3.5 19.1.1.3.5 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

#### *Receipt of a TC-P-ABORT indication*

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

### 12.1.1.3.6 19.1.1.3.6 Mapping to TC dialogue primitives

The TC-UNI service is not used by CAP.

The mapping of parameters onto the TC Dialogue services is as follows:

The use of parameters of the TC-BEGIN service is as defined in subclause 19.1.1.3.7 with the following qualifications:

- The Destination Address parameter of the TC-BEGIN service shall be set to the CAP address of the AE which is to respond to the TC-BEGIN service.

NOTE 1: The address used in this parameter may be mapped by SCCP address translation to one of a number of alternative AEs.

- The AC Name parameter of the TC-BEGIN service shall be set according to the specific interface being used between the initiating AE and the responding AE.
- The Originating Address parameter of the TC-BEGIN service shall be set to the unambiguous CAP address of the AE initiating the TC-BEGIN service.

The use of parameters of the TC-CONTINUE service is as defined in subclause 19.1.1.3.7 with the following qualifications:

- The AC Name parameter of the TC-CONTINUE service shall be set to the value of the AC Name parameter of the TC-BEGIN service for the same Dialogue ID parameter value.
- If present, the Originating Address parameter of the TC-CONTINUE service shall be set to the unambiguous CAP address of the AE initiating the TC-CONTINUE service. This parameter is only present in the first TC-CONTINUE service after a TC-BEGIN service with the same Dialogue ID parameter value.

The use of parameters of the TC-END service is as defined in subclause 19.1.1.3.7 with the following qualifications:

- The AC Name parameter of the TC-END service shall be set to the value of the AC Name parameter of the TC-BEGIN service for the same Dialogue ID parameter value. This parameter is only present if the TC-END service is used immediately after the TC-BEGIN service.

The use of parameters of the TC-U-ABORT service is as defined in subclause 19.1.1.3.7 with the following qualifications:

- The Abort Reason parameter of the TC-U-ABORT service shall be used as specified in ETS 300 287-1 [**Error! Bookmark not defined.**].
- The AC Name parameter of the TC-U-ABORT service shall be set to either the value used in the TC-BEGIN service or an alternative value which can be used to establish the dialogue between the initiating AE and the responding AE.

NOTE 2: This parameter is only present if the TC-U-ABORT is the immediate response to a TC-BEGIN indication.

The use of parameters of the TC-P-ABORT service is as defined in subclause 19.1.1.3.7 with the following qualifications:

- The P-Abort parameter of the TC-P-ABORT service is set by TC to indicate the reason why TC aborted the dialogue. It shall take the values as defined in ETS 300 287-1 [**Error! Bookmark not defined.**].

### 12.1.1.3.7 19.1.1.3.7 Default mapping to TC dialogue parameters

#### *Dialogue Id*

The value of this parameter is associated with the CAP invocation in an implementation dependent manner. This parameter uniquely identifies a specific TC dialogue to a remote CAP AE for an CAP AE.

#### *Application-context-name*

The application-context-name parameter is set according to the set of operations which need to be supported by the TC dialogue. The defined AC Names can be found in clauses 6 to 11.

#### *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:

- a size (1..10) constraint of SEQUENCE OF EXTERNAL;
- an Object Identifier shall always be present to identify the user information and the entity which sent it;
- a single-ASN-1-type is used for encoding.

For the use of CAP defined TC-U-Abort reason, the following ASN.1 notation applies:

```
CAP-U-ABORT-Data {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1) modules(3) cap-u-abort-data(56) version1(0)}
```

DEFINITION ::=

BEGIN

id-CAP-U-ABORT-Reason OBJECT IDENTIFIER ::= {ccitt(0) identified-organization(4) etsi(0) mobileDomain(0) gsm-Network(1) AS(1) cap-u-abort-reason(2) version1(0)}

cCAP-U-ABORT-Reason-Abstract-Syntax ABSTRACT-SYNTAX ::= {CAP-U-ABORT-REASON IDENTIFIED BY id-CAP-U-ABORT-Reason}

CAP-U-ABORT-REASON ::= ENUMERATED {

no-reason-given(1),

application-timer-expired(2),

not-allowed-procedures(3),

abnormal-processing(4),

congestion(5)

}

-- application-timer-expired shall be set when application timer (e.g. Tssf ) is expired.

-- not-allowed-fsm-procedures shall be set when received signal is not allowed in CAP procedures.

-- For example, when class4 operation is received from SCF and the operation is not allowed in SSF FSM

-- (SSF FSM cannot continue state transition). (e.g. ReleaseCall operation received in Waiting for End of

-- Temporary Connection state.)

-- abnormal-processing shall be set when abnormal procedures occur at entity action.

-- congestion shall be set when requested resource is unavailable due to congestion at TC user (CAP) level.

-- no-reason-given shall be set when any other reasons above do not apply

END -- of CAP-U-ABORT-Data

#### *Component present*

This parameter is used by TC-USER as described in ETS 300 287-1 [**Error! Bookmark not defined.**].

#### *Termination*

The value of the release method parameter of the TC-END request primitive is set by TC-USER according to the rules as stated in subclauses 19.1.2.1.1 and 19.1.2.1.2.

#### *Quality of service*

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

- Sequencing requested
- return option, this parameter is set by TC-USER in an implementation dependent manner

### 12.1.1.4 Component handling

#### 12.1.1.4.1 19.1.1.4.1 Procedures for CAP operations

This subclause describes the procedures for CAP operations.



*Operation invocation*

TC-USER shall build an operation argument from the parameters received and request the invocation of the associated operation using the TC-INVOKE procedure. If a linked ID parameter is inserted in the primitive this indicates a child operation and implies that the operation is linked to a parent operation.

*Operation invocation receipt*

On receipt of a TC-INVOKE indication primitive, TC-USER shall

- 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 a linked ID is included, perform the following checks: If the operation referred to by the linked ID does not allow linked operations or if the operation code does not correspond to a permitted linked operation, or if the parent operation invocation is not active, issue a TC-U-REJECT request primitive with the appropriate problem code (linked response unexpected or unexpected linked 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 CAP related dialogue is about to be released, requests the transfer of the 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, TC-USER waits for the corresponding response.

*Operation Response*

For user confirmed operations, TC-USER 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.

*Receipt of a response*

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

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

On receipt of a TC-RESULT-L indication, TC-USER 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.

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

- if the error code is not defined for the TC-USER or is not one associated with the operation referred to by the invoke ID, 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.

On receipt of a TC-U-REJECT indication primitive which affects a pending operation, TC-USER shall:

- accept the TC-U-REJECT indication primitive.

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

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

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

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 TC-USER in such a case is described in the subclause headed "other events" ..

On receipt of a TC-L-CANCEL indication, the TC-USER 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;

#### *Other events*

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

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 19.1.2.1.2. This is also applicable for invoke problems related to a class 4 linked operation.

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 19.1.2.1.2.

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.

On receipt of a TC-NOTICE indication primitive, which informs the TC-USER that a message cannot be delivered by the Network Layer, it is for the application process to decide whether to terminate the dialogue or retry.

This primitive can only occur if the Return Option has been set (see clause 19.1.1.3.6).

#### 12.1.1.4.2 19.1.1.4.2 Mapping to TC component primitives

The mapping of parameters onto the TC Component services is as follows:

The TC-U-CANCEL service is not used.

The TC-RESULT-NL service is not used.

The use of parameters of the TC-INVOKE service is as defined in subclause 19.1.1.4.3 with the following qualifications:

- The Operation parameter of the TC-INVOKE service shall contain the *operation.&operationCode* value of the CAP operation to be invoked. The operation must be one of the valid operations supported by the negotiated AC for the TC dialogue and must be invocable by the local AE.
- The Parameters parameter of the TC-INVOKE service shall contain a value of the *operation.&ArgumentType* value for the operation being invoked, as specified by the Operation parameter.

The use of parameters of the TC-RESULT-L service is as defined in subclause 19.1.1.4.3 with the following qualifications:

- The Invoke Id parameter of the TC-RESULT-L service shall be set to the value of the Invoke Id parameter of the TC-INVOKE service from the remote AE to which a result is being sent.
- The Operation parameter of the TC-RESULT-L service be set to the value of the Operation parameter of the TC-INVOKE service from the remote AE which contains the same Invoke Id Parameter value.
- The Parameters parameter of the TC-RESULT-L service shall contain the *operation.&ResultType* value for the operation result, as specified by the Operation parameter.

The use of parameters of the TC-U-ERROR service is as defined in subclause 19.1.1.4.3 with the following qualifications:

- The Invoke Id parameter of the TC-U-ERROR service shall be set to the value of the Invoke Id parameter of the TC-INVOKE service from the remote AE to which an error is being sent.
- The Error parameter of the TC-U-ERROR service shall be set to the value of the *error.&errorCode* of the error to be sent. It must be one of the errors which is expected for the invoked operation as defined in the *operation.&Errors* specification
- The Parameters parameter of the TC-U-ERROR service shall be set to the value of the *error.&ParameterType* of the error to be sent, as identified by the Error parameter.

The use of parameters of the TC-U-REJECT service is as defined in subclause 19.1.1.4.3 with the following qualifications:

- The Invoke Id parameter of the TC-U-REJECT service shall be set to the Invoke Id Parameter of the TC component service from the remote AE which is being rejected.

The use of parameters of the TC-L-CANCEL service is as defined in subclause 19.1.1.4.3.

#### 12.1.1.4.3 19.1.1.4.3 Default mapping to TC component parameters

##### *Invoke Id*

This parameter is set by the sending application process. It represents the unique identity of an instance of an operation which is invoked by a AE within a specific TC dialogue. The TC dialogue is identified by the Dialogue Id parameter.

##### *Linked Id*

This parameter is set by the sending application process. It represents the Invoke Id of an operation which was received from the remote AE for a specific TC dialogue to which the operation being invoked by the local AE is to be linked. This parameter is only present if the original operation invoked by the remote AE is defined as having linked operations. The type of local operation invoked must be the same type as one of the operations defined as being linked.

##### *Dialogue Id*

The value of this parameter is associated with the CAP invocation in an implementation dependent manner. It represents the identity of the established TC dialogue which will carry the component services between the local AE and the remote AE.

*Class*

The value of this parameter is set according to the type of the operation to be invoked according to the operation definitions in clauses 5 through 10.

*Time out*

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

*Last component*

This parameter is used as described in ETS 300 287-1 [**Error! Bookmark not defined.**].

*Problem code*

This parameter is used as described in subclause 19.1.1.4.1.

*Abort reason*

This parameter is used by TC-USER, and attributes and coding are specified by network operator.

## 12.1.2 gsmSSF-gsmSCF and gprsSSF-gsmSCF interfaces

### 12.1.2.1 Normal procedures

#### 12.1.2.1.1 19.1.2.1.1 gsmSSF-to-gsmSCF messages

This subclause defines the normal procedures for TC messages from the gsmSSF to the gsmSCF.

*gsmSSF-FSM related messages*

A dialogue shall be established when the gsmSSF-FSM moves from the state **Idle** to the state **Active**. The InitialDP operation shall be transmitted in the same message.

The CAP operation InitialDP shall be sent with a TC-BEGIN request primitive.

For all other operations sent from the gsmSSF-FSM, the dialogue shall be maintained except for the following cases.

When the gsmSSF-FSM makes a non-error case state transition to the state **Idle** and there is one or more pending operation and TCAP dialogue is established, TCAP dialogue can be terminated by TC-END primitive with component(s). When the gsmSSF sends the last EventReportBCSM, ApplyChargingReport or CallInformationReport the dialogue may be ended from the gsmSSF by a TC-END request primitive with basic end.

In the case that there is no pending operation and TCAP dialogue is established, TCAP dialogue can be terminated by TC-END primitive with zero component or prearranged end. When the gsmSSF-FSM makes a non-error case state transition to the state **Idle** and there is no operation to be sent, the dialogue is ended by means of a TC-END request primitive (basic) with zero components, or the dialogue is locally ended by means of a TC-END request primitive with prearranged end.

In the case where a call release is initiated by any other entity than an gsmSCF, the gsmSSF can end a dialogue with a TC-END request primitive with zero component or prearranged end if a TCAP dialogue is established and the gsmSSF has no pending call information requests (or pending requests which should be treated in the same way, see subclause 19.1.1.1) nor any armed EDP.

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

*Assisting/Hand-off gsmSSF FSM related messages*

A dialogue shall be established when the Assisting/Hand-off gsmSSF-FSM moves from the state **Idle** to the state **Active**. The AssistRequestInstructions operation shall be transmitted with a TC-BEGIN request primitive.

For all other operations sent from the Assisting/Hand-off gsmSSF-FSM, the dialogue shall be maintained except for the following cases.

When the gsmSSF-FSM makes a non-error case state transition to the state **Idle** and there is one or more pending operation and TCAP dialogue is established, TCAP dialogue can be terminated by TC-END primitive with component(s). When the gsmSSF sends the last ApplyChargingReport, the dialogue may be ended from the gsmSSF by a TC-END request primitive with basic end.

In the case that there is no pending operation and TCAP dialogue is established, TCAP dialogue can be terminated by TC-END primitive with zero component or prearranged end. When the gsmSSF-FSM makes a non-error case state transition to the state **Idle** and there is no operation to be sent, the dialogue is ended by means of a TC-END request primitive (basic) with zero components, or the dialogue is locally ended by means of a TC-END request primitive with prearranged end.

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

#### *SSME-FSM related messages*

The following procedures shall be followed:

- The dialogue shall be maintained when the ActivityTest Return Result is sent.
- No dialogue shall be established when the ServiceFilteringResponse operation is sent. The operation is sent with a TC-BEGIN request primitive and the dialogue is ended by means of a TC-END request primitive with prearranged end.
- A dialogue shall no longer be maintained when the Return Result of the ActivateServiceFiltering operation is sent. The dialogue is ended by means of a TC-END request primitive with basic end, the Return Result is transmitted with the same request.
- The dialogue is locally terminated by means of a TC-END request primitive with prearranged end, upon reception of a TC-BEGIN indication primitive with a CallGap operation.

#### 12.1.2.1.2 19.1.2.1.2 gsmSCF-to-gsmSSF messages

This subclause defines the normal procedures for TC messages from the gsmSCF to the gsmSSF.

#### *SCSM-FSM related messages*

No dialogue shall be established when the SCSM-FSM moves from state **Idle** to state **Idle** upon receipt of InitialDP operation. The operation is received with a TC-BEGIN indication primitive and the dialogue is locally terminated by means of a TC-END request primitive with prearranged end.

A dialogue shall be established when the SCSM-FSM moves from state **Idle** to state **Preparing gsmSSF Instructions** upon the receipt of InitialDP operation for TDP-R or AssistRequestInstructions operation.

For subsequent operations sent from the SCSM-FSM, the dialogue shall be maintained except for the following cases, 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 or an AssistRequestInstructions 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 relationship, by means of a TC-END request primitive (basic end) is possible.

#### *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.
- A dialogue shall not be established when a CallGap operation is sent without using a SCSM associated dialogue. The operation is sent using a TC-BEGIN request primitive and the dialogue is terminated with a prearranged end.

- For sending one or more CallGap operations, the SCME FSM may use an existing SCSM FSM associated dialogue which was initiated by a gsmSSF-FSM (i.e. established for the transmission of the InitialDP operation). The dialogue shall be maintained and the CallGap operation(s) shall be sent with the first response of the SCSM FSM to the InitialDP operation.
- A dialogue shall be established when an ActivateServiceFiltering operation is sent. The operation shall be transmitted with a TC-BEGIN request primitive.
- The dialogue is locally terminated upon reception of a ServiceFilteringResponse operation using a TC-END request primitive with prearranged end.

### 12.1.3 gsmSSF/gprsSSF-to-gsmSCF SMS related messages

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

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

The dialogue shall no longer be maintained when the prearranged end condition is met in the gsmSSF/gprsSSF. When the gsmSSF/gprsSSF 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/gprsSSF has sent the last EventReportSMS operation the dialogue may be ended from the gsmSCF by a TC-END request primitive with basic end.

### 12.1.4 gsmSCF-to-gsmSSF/gprsSSF SMS related messages

All operations are sent after a dialogue was established from the gsmSSF/gprsSSF (the gsmSCF has previously received a TC-BEGIN indication primitive with an InitialSMSEvent 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.

#### 12.1.4.1.1 19.1.2.1.3 Use of dialogue handling services

Dialogue handling services are used to trigger the sending of the APDUs associated with the operations involved in the CAP packages.

Component grouping is performed under the control of the application-process through an appropriate usage of the TC-BEGIN and TC-CONTINUE service.

The TC-END service is solely used to support the dialogue closing procedure (i.e it is never used to trigger the sending of components).

On receipt of an empty TC-CONTINUE.req primitive, the FE should ignore the primitive.

On receipt of an TC-END.req with a CAP request, the FE should not perform the request and consider the requested TC-END service as a dialogue closing procedure. The dialogue is then terminated (see clause 19.1.1.1).

It is an application-process responsibility to provide in the TC-BEGIN-req primitive a destination address which can be used by the underlying SCCP to route the message to the proper FE if this FE is addressed through the SS7 network.

The pre-arranged end can be used.

### 12.1.4.2 Abnormal procedures

The following procedures also apply to the gsmSCF-gsmSRF and gsmSCF-CUSF interfaces.

#### 12.1.4.2.1 19.1.2.2.1 gsmSCF-to-gsmSSF/gsmSRF messages

Considering that gsmSSF, gsmSRF, and CUSF do not have the logic to recover from error cases detected on the gsmSCF-gsmSSF/gsmSRF/CUSF interface, the following shall apply:

- Operation errors and rejection of TCAP components shall be transmitted to the gsmSSF and, respectively, the gsmSRF, and the CUSF 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 and, respectively, the gsmSRF and the CUSF shall abort the dialogue with a TC-U-ABORT request primitive.

In the case of the gsmSSF relay, it is for further study how to map messages to ROSE capability of bearer signalling system between the gsmSSF and the gsmSRF, and what services are assumed from ROSE.

#### 12.1.4.2.2 19.1.2.2.2 gsmSSF/gsmSRF/ -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.
- In all other situations the dialogue shall no longer be maintained. I.e. the error or reject shall be transmitted with a TC-END request primitive, basic end, if the erroneous component was received with a TC-BEGIN indication primitive.
- on expiration of application timer TSSF or TSRF, dialogue shall be terminated by means of by TC-U-ABORT primitive with an Abort reason, regardless of TCAP dialogue is established or not.

If the error processing in the gsmSSF/gsmSRF/CUSF leads to the case where the gsmSSF/gsmSRF/CUSF is not able to process further gsmSCF operations while the dialogue is to be maintained, the gsmSSF/gsmSRF/CUSF aborts the dialogue with a TC-END request primitive with basic end or a TC-U-ABORT request primitive, depending on whether any pending ERROR or REJECT component is to be sent or not.

The gsmSSF can end 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 pending call information requests (or pending requests which should be treated in the same way, i.e., ApplyCharging nor any armed EDP to notify the gsmSCF of the call release (for alternative way, see subclause 19.1.2.1.1).

In the case of the gsmSSF relay, it is for further study how to map messages to ROSE capability of bearer signalling system between the gsmSSF and the gsmSRF, and what services are assumed from ROSE.

The CUSF can end a dialogue with a TC-U-ABORT request primitive in case the association release between the user and the network is initiated by any other entity.

### 12.1.5 gsmSCF-to-gsmSSF/gprsSSF SMS related messages

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

- operation errors and rejection of TCAP components shall be transmitted to the gsmSSF/gprsSSF 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/gprsSSF shall abort the dialogue with a TC-U-ABORT request primitive.

### 12.1.6 gsmSSF/gprsSSF-to-gsmSCF SMS related 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/gprsSSF leads to the case where the gsmSSF/gprsSSF is not able to process further gsmSCF operations while the dialogue is to be maintained, the gsmSSF/gprsSSF aborts the dialogue with a TC-U-ABORT request primitive.

The gsmSSF/gprsSSF aborts a dialogue with a TC-U-ABORT request primitive if release is initiated by any other entity than the gsmSCF and the gsmSSF/gprsSSF has no armed EDPs to notify the gsmSCF.

#### 12.1.6.1.1 19.1.2.2.3 Use of dialogue handling services

On receipt of a TC-U-REJECT.ind in the FE, this primitive should be ignored. 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 clause 19.1.1.2. This is also applicable for invoke problems related to a class 4 linked operation.

A TC-U-REJECT.req should be sent followed by a TC-CONTINUE.req.

On receipt of a TC-R-REJECT.ind in the FE, this primitive should be ignored. 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 clause 19.1.1.2. This is also applicable for invoke problems related to a class 4 linked operation.

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.

On receipt of a TC-NOTICE indication the TC-USER is informed that a message cannot be delivered by the Network Layer. It occurs if the Return Option has been set (see subclause 19.1.1.3.7). It is for the application process to decide whether to terminate the dialogue or retry.

The application-process is the sole user of the TC-P-ABORT service and TC-NOTICE service.

The receipt of a TC-U-ABORT-Ind or TC-P-ABORT-Ind on a dialogue terminates all request processing.



## 12.1.6.2 Dialogue handling

### 12.1.6.2.1 19.1.2.3.1 Dialogue establishment

### 12.1.6.2.2 19.1.2.3.2 Dialogue continuation

### 12.1.6.2.3 19.1.2.3.3 Dialogue termination

### 12.1.6.2.4 19.1.2.3.4 User abort

### 12.1.6.2.5 19.1.2.3.5 Provider abort

### 12.1.6.2.6 19.1.2.3.6 Mapping to TC dialogue primitives

The gsmSSF-gsmSCF IN services can be mapped onto TC services. This subclause defines the mapping of the gsmSSF-gsmSCF IN services onto the services of the TC dialogue handling services defined in ETS 300 287-1 [**Error! Bookmark not defined.**].

- a) The TC-BEGIN service is used to invoke the operations of the gsmSCF-gsmSSF connection packages as defined in clause 5. .
- b) The TC-CONTINUE service is used to report the success of the operations invoked in a TC-BEGIN service and to invoke or respond to any other operations.
- c) The TC-U-ABORT service is used to report the failure of operations of the connection packages as defined in clause 5.

The mapping of the parameters onto the TC-BEGIN primitive is defined in subclause 19.1.1.3.6 with the following qualifications:

- The AC Name parameter shall take the value of the application-context-name field of the **cs2ssf-scfGenericAC**, **cs2ssf-scfAssistHandoffAC** or **cs2ssf-scfServiceManagementAC** object if the initiating AE is a gsmSSF or the **cs2scf-ssfGenericAC**, **cs2scf-ssfTrafficManagementAC**, **cs2scf-ssfServiceManagementAC** or **cs2scf-ssfTriggerManagementAC** object if the originating AE is a gsmSCF.

The mapping of the parameters onto the TC-CONTINUE primitive is defined in subclause 19.1.1.3.6.

The mapping of the parameters onto the TC-U-ABORT primitive is defined in subclause 19.1.1.3.6 with the following qualifications:

- The Application-Context-Name parameter shall be used as specified in ETS 300 287-1 [**Error! Bookmark not defined.**]. When the responding AE refuses a dialogue because the application-context-name it receives is not supported, this parameter shall have the value of the application-context-name field of the **cs2ssf-scfGenericAC**, **cs2ssf-scfAssistHandoffAC**, **cs2ssf-scfServiceManagementAC** or **cs2scf-ssfGenericAC** object if the responding AE is a gsmSCF or the, **cs2scf-ssfTrafficManagementAC**, **cs2scf-ssfServiceManagementAC** or **cs2scf-ssfTriggerManagementAC** object if the responding AE is a gsmSSF.

The use of the parameters of the TC-END service is defined in subclause 19.1.1.3.6.

## 12.1.6.3 Component Handling

### 12.1.6.3.1 19.1.2.4.1 Procedures for CAP operations

The CAP ASEs are users of the TC component handling services except for the TC-L-REJECT and TC-L-CANCEL services which are used by the application-process. Receipt of a TC-L-REJECT-Ind leads the application-process to abandon the dialogue (i.e. it issues a TC-U-ABORT-Request primitive).

The TC-U-CANCEL service is never used.

### 12.1.6.3.2 19.1.2.4.2 Mapping to TC component parameters

The gsmSSF-gsmSCF IN ASE services are mapped onto the TC component handling services. The mapping of operations and errors onto TC services is defined in subclause 19.1.1.4.2 with the following qualifications:

The timeout parameter of the TC-INVOKE-Req primitives is set according to clause 6.

## 12.1.7 gsmSCF-gsmSRF interface

### 12.1.7.1 Normal procedures

#### 12.1.7.1.1 19.1.3.1.1 SCF-to/from-gsmSRF messages

A dialogue is established when the gsmSRF sends an AssistRequestInstructions operation to the gsmSCF. For all other operations sent to/from the gsmSRF, the dialogue shall be maintained.

In the case that there is no pending operation and TCAP dialogue is established, TCAP dialogue can be terminated by TC-END primitive with zero component. When the SCSM makes a non-error case state transition to end user interaction and there is no operation to be sent, the dialogue is ended by means of a TC-END request primitive (basic) with zero components.

The dialogue shall no longer be maintained when sending the SpecialisedResourceReport operation for PlayAnnouncement with disconnection from the gsmSRF set to true or Return Result of the PromptAndCollectUserInformation with disconnection from the gsmSRF set to true with disconnection from the gsmSRF set to true. The dialogues is ended by means of a TC-END request primitive with basic end, and the one of above operations is transmitted with the same request.

Regardless of whether pending operation exists or not, when the SRSM-FSM is informed of the disconnection of bearer connection (in the case of gsmSCF initiated disconnection or call abandon from call party) and dialogue is established, the dialogue is ended by means of a TC-END request primitive (basic) with zero components or TC-END request primitive (prearranged end).

The dialogue shall no longer be maintained when the prearranged end condition is met in the gsmSRF. When the SRSM-FSM is informed the disconnection of bearer connection and TCAP dialogue is not established, TCAP dialogue is locally terminated by TC-END primitive with prearranged end.

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 relationship, by means of a TC-END request primitive (basic end) is possible.

In the relay case, the gsmSRF-gsmSCF relationship uses the gsmSSF-gsmSCF TCAP dialogue. This is possible, because begin and end of the gsmSRF-gsmSCF relationship are embedded in the gsmSSF-gsmSCF relationship. gsmSRF-gsmSCF information shall be exchanged with TC-CONTINUE request primitives.

In the case of the gsmSSF relay, it is for further study how to map messages to ROSE capability of bearer signalling system between the gsmSSF and the gsmSRF, and what services are assumed from ROSE.

### 12.1.7.2 Abnormal procedures

### 12.1.7.3 Dialogue handling

#### 12.1.7.3.1 19.1.3.3.1 Dialogue establishment

#### 12.1.7.3.2 19.1.3.3.2 Dialogue continuation

#### 12.1.7.3.3 19.1.3.3.3 Dialogue termination

#### 12.1.7.3.4 19.1.3.3.4 User abort

#### 12.1.7.3.5 19.1.3.3.5 Provider abort

#### 12.1.7.3.6 19.1.3.3.6 Mapping to TC dialogue primitives

The **gsmSCF-gsmSRF** IN services can be mapped onto TC services. This subclause defines the mapping of the **gsmSCF-gsmSRF** IN services onto the services of the TC dialogue handling services defined in ETS 300 287-1 [**Error! Bookmark not defined.**].

- a) The TC-BEGIN service is used to invoke the operations of the **gsmSRF-gsmSCF** connection packages as defined in clause 7.
- b) The TC-CONTINUE service is used to report the success of the operations invoked in a TC-BEGIN service and to invoke or respond to any other operations.
- c) The TC-U-ABORT service is used to report the failure of operation of the **gsmSCF-gsmSRF** operations packages as defined in clause 7.

The mapping of parameters onto the TC Dialogue services is as defined in subclause 19.1.1.3.6 with the following qualifications:

The mapping of the parameters onto the TC-BEGIN primitive is defined in subclause 19.1.1.3.6 with the following qualifications:

- The AC Name parameter shall take the value of the application-context-name field of the **gsmSRF-gsmSCF-ac** object.

### 12.1.7.4 Component handling

#### 12.1.7.4.1 19.1.3.4.1 Procedures for CAP operations

#### 12.1.7.4.2 19.1.3.4.2 Mapping to TC component parameters

The mapping of parameters for the TC component services is defined in subclause 19.1.1.4.2 with the following qualifications.

The Timeout Parameter of the TC-INVOKE service is set according to clause 7.

## 12.2 Services assumed from SCCP

This clause describes the services required from the SCCP that may be used by the IN applications for the IN Application Protocol used between the **gsmSSF**, **gsmSCF** and **gsmSRF**, **SDF** and **CUSF**.

## 12.2.1 Normal procedures

The SCCP forms the link between the TC and the MTP and provides (in conjunction with the MTP) the network services for the IN applications. The network services provided allow the signalling messages sent by the application to the lower layers to be successfully delivered to the peer application.

## 12.2.2 Service functions from SCCP

### 12.2.2.1 SCCP connectionless services

The services described are those given in the SCCP [2] and ETS 300 009-1 (SCCP User Guide) [3] should be consulted to identify possible interworking and compatibility issues between the different SCCP versions.

The following Connection-less services are expected from the SCCP:

- (a) Network Addressing to enable signalling connections between SCCP users,
- (b) Sequence Control to enable the SCCP users to invoke "sequence guaranteed" or "sequence not guaranteed" options for a given stream of messages to the same destination,
- (c) Segmentation/reassembly of large user messages,
- (d) Return Option to enable the SCCP users to invoke "discard message on error" or "return message on error" for a given message not able to be delivered by the SCCP to the destination SCCP user, due to routing or segmentation/re-assembly failure.
- (e) Congestion control

The primitives used for the above services are given below.

The N-UNITDATA request and N-UNITDATA indication primitives are used to send and receive data. The parameters of these primitives include the Called and Calling Addresses, Sequence Control, Return Option and User Data with the addressing parameters always mandatory.

The N-NOTICE indication primitive is used to return undelivered data if return option is set and a routing/segmentation error occurs.

#### 12.2.2.1.1 19.2.2.1.1 Addressing

The addressing elements consist of information contained within the Calling and the Called Party Addresses which are sent by the application to the lower layers.

The application expects the SCCP to route messages by either (a) the use of the Destination Point Code (DPC) plus the Subsystem Number (SSN), or (b) the use of the GT plus optionally the SSN. The application also specifies to the lower layer whether to route the message on the DPC or the GT.

Method (a) above may be used when the application is aware of the destination point code and the destination SSN located at that point code to which the message is to be delivered. Within a national network different SSNs, according to ETS 300 009-1 [3], may be allocated for the different network specific applications, e.g. a SSN may be allocated for a gsmSCF functionality.

Method (b) above may be used when a message is to be delivered to a SCCP-user which can be identified by the combination of the elements within the GT. An example of the use of this method is when messages have to be delivered between different networks. This method may be used since the originating network is unaware of the point code and SSN's allocations within the destination network. The network that determines the end-node to which the message is to be delivered has to perform a GT Translation to derive the destination Point Code and the SSN. If optionally the original address contained the SSN, then this may be used as the destination SSN, or the translation may, if required, provide an appropriate new SSN. Where the destination node is in another network (and is not the gateway node) then the application populates the SSN field with either the SSN in use at the destination or zero.

When GT is used for addressing, the IN application expects that the SCCP supports the following elements as defined in ETS 300 009-1 [3]:

*Address Indicator:*

The application will set this indicator to indicate one or any combination of the elements "signalling point code, GT, subsystem number" in the address information octets.

*GT Indicator:*

This indicator specifies the method employed for the formatting of the address information. There are four values (1 to 4), for example, the value 4 indicates that the format includes the numbering plan, the nature of the address indicator and the translation type. The format with the indicator value 4 is always used for internet network connections.

*Translation Type:*

The Translation Types are defined within ETS 300 009-1 [3].

*Numbering Plan:*

- (1) The *proposed* "generic numbering plan" is described within the SCCP ETS 300 009-1 [3]. This numbering plan identifies the SCCP nodes or SCCP subsystems unambiguously such that messages may be efficiently routed within one or more networks, and is particularly useful when used in the Calling Address for the sending of a response message back to the originating node. This is achieved by having an international and a national part in the generic numbering plan. For response messages the responding node analyses the international part of the generic numbering plan to determine the gateway node to which the response is to be routed. Having routed to the gateway node, the national part (which was populated within the originating network) is analysed to determine the originating node within the originating network.
- (2) A numbering plan which would define particular nodes based specifically on services is *outside the scope of IN CS2*.
- (3) The SCCP caters for a number of other numbering plans (e.g. ISDN, Data, Telex, Mobile etc. numbering plans). The whole range catered for is shown in [2]. These may be used by IN applications if deemed suitable.

*Encoding Scheme:*

This identifies the encoding scheme employed by the application and is generally BCD encoded with odd or even number of digits.

*GT Address Information:*

These are the actual address digits supplied by the application and may be BCD digits or encoded as indicated by the encoding scheme.

The network provider must ensure that any change of GT value during translation preserves any CAP specific information contained in the initial GT value.

This requirement applies to all interfaces, not just those used for internetworking.

If *route on SSN* is to be supported from the originating node then a non-zero internationally standardized SSN is required for international internetworking.

In the absence of a standardized non-zero SSN for CAP services, the use of *route on GT* is mandatory from the origin node to the network containing the destination node.

The version of SCCP used to support CAP operations shall be at least ITU-T White Book 1992.

### 12.2.2.1.2 19.2.2.1.2 Sequence control

The application will specify whether SCCP protocol class 0 or 1 is required. Class 0 provides a basic connection-less service where the sequence of message delivery is not guaranteed. Class 1 connection-less service provides a guaranteed sequence delivery of messages (with the same called address) for a given stream of messages.

### 12.2.2.1.3 19.2.2.1.3 Return on error

Return on Error mechanism may be required by the IN applications such that the application is aware of messages that have not been delivered to the destination by the SCCP. The return option allows the return of the message that was not delivered due to routing or segmentation/re-assembly failure back to the issuing user. This return option may be required in all segments of a long message or only in the first segment by the IN applications.

If the return option is invoked by the application and the message is not delivered then the SCCP specifies the "return reason" as specified in [3]. The N-NOTICE primitive is used to return the undelivered message to the originating user.

### 12.2.2.1.4 20.2.2.1.4 Segmentation / reassembly

The application expects that since the SCCP can send up to 260 octets of user data (including the address information and TC-message) in a UDT message (248 octets in a XUDT message performing segmentation and congestion control), segmentation is available for long user messages.

Also the SCCP is expected to perform the reassembly function on received segmented messages and deliver the reassembled message to the user.

However, it should be noted that even though the theoretical maximum size of SCCP-user data and addresses that can be segmented by the SCCP is 3 968 octets, the SCCP-user would limit the length to about 2 560 octets to allow for the largest known addresses. Note that the application must also allow for the octets used for the TC-message in the 2 560 octets.

The IN application does not expect the SCCP to segment the long message into more than 16 segments.

### 12.2.2.1.5 19.2.2.1.5 Congestion control

To help control of possible congestion that might occur in the lower layers the application may assign a value to indicate the importance of the message. The use of this parameter requires the use of SCCP (1997) ITU-T Recommendations.

Also there exist other congestion control mechanisms as indicated below in SCCP Management.

## 12.2.2.2 SCCP connection oriented services

The use by IN applications for the Connection-oriented services is outside the scope of IN CS2.

### 12.2.2.3 SCCP management

The subsystems used within the IN scenario expect the SCCP to provide management procedures to maintain network performance by re-routing in the event of failure of a subsystem, and in case of network congestion by use of the congestion handling procedure. These procedures have appropriate interactions with the SCCP user as described in ETS 300 009-1 [3].

To achieve the above the SCCP is expected to perform the following procedures:

- Signalling point status management (which include the signalling point prohibited, signalling point allowed, signalling point congested, and local MTP availability sub procedures).
- Subsystem status management (which include the subsystem prohibited, subsystem allowed, and subsystem status test sub procedures).
- Co-ordinated state change (a procedure which allows a duplicated subsystem to be withdrawn from service without affecting the performance of the network).

## 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 (1 <sup>st</sup> priority)	highLayerCompatibility
High layer compatibility IE contained in access transport (2 <sup>nd</sup> priority) (Note 2)	
Generic number 'additional calling party number'	additionalCallingPartyNumber
User service information prime (1 <sup>st</sup> priority)	bearerCapability
User service information (2 <sup>nd</sup> priority)	
Redirecting number	redirectingPartyID
Redirection information	RedirectionInformation
Call diversion treatment indicators	ServiceInteractionIndicatorsTwo.Call diversion treatment indicators
Conference treatment indicators	ServiceInteractionIndicatorsTwo.Conference treatment indicators

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 ContinueWithArgument operation

Table A.2 illustrates the mapping of parameters received in the ContinueWithArgument 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**

<b>CAP operation ContinueWithArgument (Note 1)</b>	<b>ISUP message IAM</b>
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 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.3). 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 3G TS 29.012 [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.3**

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)
cliPresentationIndicator	Address presentation restricted indicator in Calling Party Number

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.

Table A.4– Mapping of the CAP Connect operation serviceInteractionIndicatorsTwo to ISUP

INAP ServiceInteractionIndicators	ISUP parameter in	
	ACM/CPG/CON/ANM	IAM
Call to be diverted indicator – call diversion allowed (default) – call diversion not allowed	---	<b>Call diversion treatment indicators parameter</b> Call to be diverted indicator – no indication – call diversion allowed – call diversion not allowed
Conference at DLE accept. ind. – accept conference request (default) – reject conference request	---	<b>Conference treatment indicators parameter</b> Conference acceptance ind. – no indication – accept conference request – reject conference request
Conference at OLE accept. ind. – accept conference request (default) – reject conference request	<b>Conference treatment indicators parameter</b> Conference acceptance ind. – no indication – accept conference request – reject conference request	---



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## A.4 AssistRequestInstructions operation

If an IAM is received at an assisting SSP containing a gsmSSF or an IP containing a gsmSRF then an AssistRequestInstructions operation is sent to the gsmSCF. The correlationID parameter in the AssistRequestInstructions operation can contain:

- a) the CorrelationID digits extracted from the IAM Called Party Number,
- b) the whole Called Party Number received in the ISUP IAM (CorrelationID digits extracted at gsmSCF),
- c) the contents of the ISUP IAM CorrelationID parameter

In the case where the gsmSCF and the assisting gsmSSF are both in the HPLMN and ISUP 97 is supported then any of these mechanisms may be used.

In the case where the gsmSCF and the assisting gsmSSF are both in the HPLMN and ISUP 97 is not supported then mechanisms a) and b) may be used.

In the case where the gsmSCF is in the HPLMN and the assisting gsmSSF is in the VPLMN then only mechanism b) may be used when an all-ISUP 97 signalling path cannot be guaranteed. Mechanism a) may be used if bilateral agreements on the format of the information transferred in the ISUP IAM Called Party Number are defined between the HPLMN and VPLMN.

In the case where the gsmSCF is in the HPLMN and the assisting gsmSSF is in the VPLMN then mechanism c) only may be used if an all-ISUP 97 signalling path can be guaranteed between the HPLMN and the VPLMN.

---

## A.5 ConnectToResource operation

On receipt of a ConnectToResource operation from the gsmSCF the IP is connected to the incoming call, to facilitate User Interactive dialogue with the user.

If the User Interactive dialogue is to be performed at a forwarding MSC or GMSC then an ACM message shall be sent to the preceding exchange. The encoding of the backward call indicators in the ACM is specified in 3G TS 29.012 [24], with the Optional Backward Call Indicators indicating 'in-band information or an appropriate pattern is now available'.

If the User Interactive dialogue is to be performed at a forwarding MSC or GMSC then when the IP indicates through-connection and the ConnectToResource operation indicates that a bothway throughconnection is required an ANM message shall be sent to the preceding exchange if answer has not previously been sent. As a network operator/equipment vendor option a CPG message may be sent if ANM has already been sent.

## A.6 EstablishTemporaryConnection operation

On receipt of an EstablishTemporaryConnection operation from the gsmSCF then 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 3G TS 29.012 [24]. In addition, an ISUP IAM shall be sent to the succeeding exchange.

Table A.5 illustrates the mapping of parameters received in the EstablishTemporaryConnection operation to parameters sent in the IAM message to the succeeding exchange. 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.5**

<b>CAP operation</b> <b>EstablishTemporaryConnection (Note 1)</b>	<b>ISUP message</b> <b>IAM</b>
assistingSSIPRoutingAddress	Called party number
correlationID	Correlation id (note 1)
scfld	gsmSCF id (note 1)

NOTE 1: These optional parameters may be absent, i.e. they are only mapped, if received. If they are received and cannot be mapped then an error is sent to the gsmSCF as detailed in Section 9.15

NOTE 2: The AssistingSSIPRoutingAddress parameter may also include a Hex B digit, in order to delineate the boundary between digits used for routing and digits forming part of the SCFiD and/or CorrelationID.

Except for the Called Party Number the remaining mandatory IAM parameters are set as follows:

a) Nature of connection indicators

Satellite indicator: set as in an Originating MSC,  
 Continuity check indicator: set as in Originating MSC,  
 Echo control device indicator: set as in Originating MSC

b) Forward Call Indicators

National/international call indicator: set as in Originating MSC,  
 End-to-end method indicator: 00 (no end-to-end method available),  
 Interworking indicator: 0 (no interworking encountered),  
 End-to-end information indicator: 0 (no end-to-end information available),  
 ISDN User Part indicator: 1 (ISDN User Part used all the way),  
 ISDN User Part preference indicator: 00 (ISDN User Part preferred all the way),  
 ISDN access indicator: 0 (originating access non-ISDN),  
 SCCP method indicator: 00 (no indication)

c) Calling Party's Category

00001010 (ordinary subscriber)

d) Transmission Medium Requirement

00000011 (3.1 kHz audio)

The ISUP IAM optional parameter Propagation Delay Counter is set as in an Originating MSC

---

## **A.7 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.

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**3GPP**

Postal address

---

3GPP support office address

---

650 Route des Lucioles - Sophia Antipolis  
Valbonne - FRANCE  
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

---

<http://www.3gpp.org>

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## Foreword

This Technical Specification (TS) has been produced by the 3GPP.

This TS specifies the stage 2 description for the third phase (see 3G TS 22.078 [2]) of the Customized Applications for Mobile network Enhanced Logic (CAMEL) feature within the 3GPP system.

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

Version x.y.z

where:

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

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# 1 Scope

This Technical Specification (TS) specifies the stage 2 description for the third phase (see 3G TS 22.078 [2]) of the Customized Applications for Mobile network Enhanced Logic (CAMEL) feature which provides the mechanisms to support services of operators which are not covered by standardized GSM services even when roaming outside the HPLMN.

The CAMEL feature is a network feature and not a supplementary service. It is a tool to help the network operator to provide the subscribers with the operator specific services even when roaming outside the HPLMN.

In this specification, the GSM Service Control Function (gsmSCF) is treated as being part of the HPLMN. The regulatory environment in some countries may require the possibility that the gsmSCF and the HPLMN are controlled by different operators, and the gsmSCF and the HPLMN are therefore distinct entities.

In the third phase the CAMEL feature supports:

- mobile originated and forwarded calls;
- mobile terminating calls;
- any time interrogation;
- active location information retrieval;
- suppression of announcements;
- announcements, in band user interaction;
- charging features;
- supplementary service invocation notifications;
- USSD interaction with the gsmSCF;
- North American carrier selection;
- Mobility Management event notifications;
- change of Calling Line Identification Presentation Indicator for an MO call to restricted;
- SoLSA;
- Subscribed dialled services;
- Serving network dialled services;
- MO SMS;
- GPRS data transmission;
- Mobility management;
- Notification to CSE of change of subscriber data;
- Any Time Modification;
- Any Time Interrogation of subscription Information
- T-BCSM in the VMSC and terminating AoC;
- Interworking with Location Services;
- Multiple Subscriber Profile;
- Active Location Retrieval;

- Call Gapping.

Note that CAMEL is not applicable to Emergency Setup (TS 12), i.e., in case an Emergency call has been requested the gsmSSF shall not be invoked.

The mechanism described in this standard addresses especially the need for information exchange between the VPLMN or IPLMN and the HPLMN for support of operator specific services. Any user procedures for the control of operator specific services are outside the scope of this standard. Subscribers who have subscribed to operator specific services and therefore need the functional support of the CAMEL feature shall be marked in the HPLMN and VPLMN. In case a subscriber is marked to need CAMEL support, the appropriate procedures which provide the necessary information to the VPLMN or the HPLMN are invoked. It is possible for the HPLMN to instruct the VPLMN or IPLMN to interact with a gsmSCF which is controlled by the HPLMN.

The specification of operator specific services is outside the scope of this standard.



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## 2 Normative 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] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".
  - [2] 3G TS 22.078: "Digital cellular telecommunications system (Phase 2+); Customized Applications for Mobile network Enhanced Logic (CAMEL) - Phase 3. Service description. Stage 1
  - [3] 3G TS 23.018: "Digital cellular telecommunications system (Phase 2+); Basic call handling ; Technical realisation".
  - [4] 3G TS 29.002: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".
  - [5] 3G TS 29.078: "Digital cellular telecommunications system (Phase 2+); CAMEL Application Part (CAP) specification - Phase 3".
  - [6] ITU-T Q.1214, May 1995: "Distributed Functional Plane for Intelligent Network CS-1"
  - [7] EN 301 070-1 (V1.1.1): "Integrated Services Digital Network (ISDN) ; Signalling System No.7 ; ISDN User Part (ISUP) version 3 interactions with the Intelligent Network Application Part (INAP) ; Part 1 : Protocol specification [ITU-T Recommendation Q.1600 (1997), modified]".
  - [8] 3G TS 23.090: "Digital cellular telecommunication system (Phase 2+); Unstructured Supplementary Service Data (USSD) - Stage 2".
  - [9] 3G TS 23.085: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 2".
  - [10] ANSI T1.113-1995 Signalling System No. 7(SS7) – Integrated Services Digital Network (ISDN) User Part.
  - [11] 3G TS 23.060: "Digital cellular telecommunication system (Phase 2+); General Packet Radio Service (GPRS); Service Description; Stage 2"
  - [12] ITU-T Q.1290, May 1998: "Glossary of terms used in the definition of intelligent networks"
  - [13] ITU-T Q.850, May 1998: "Usage of cause and location in the Digital Subscriber Signalling System No. 1 and the Signalling System No. 7 ISDN User Part"
  - [14] EN 300 403-1 (V1.3.?): "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Signalling network layer for circuit-mode basic call control; Part 1: Protocol specification [ITU-T Recommendation Q.931 (1993), modified] "
  - [15] ITU-T Q.762, September 1997: "Signalling System No. 7 – ISDN user part general functions of messages and signals"
  - [16] ITU-T Q.763, December 1999: "Signalling System No. 7 – ISDN user part formats and codes"

- [17] 3G TS 22.071: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Service description, Stage 1".
- [18] 3G TS 23.071: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Functional description, Stage 2".
- [19] 3G TS 27.001: "Digital cellular telecommunications system (Phase 2+); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".
- [20] EN 300 356-1 (V3.2.2): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 3 for the international interface; Part 1: Basic services[ITU-T Recommendations Q.761 to Q.764 (1997), modified]"
- [21] 3G TS 23.040: " Digital cellular telecommunications system (Phase 2+); Technical realization of the Short Message Service (SMS); Point-to-Point (PP) (3G TS 23.040 version 7.1.0 Release 1998)".
- [22] 3G TS 22.030: "Digital cellular telecommunications system (Phase 2+); Man-Machine Interface (MMI) of the Mobile Station (MS)"
- [23] 3G TS 23.073: "Digital cellular telecommunications system (Phase 2+); Support of Localised Service Area (SoLSA); Stage 2".
- [24] 3G TS 22.002: "Bearer Services supported by a GSM PLMN (3G TS 22.002 version 3.0.0 Release 1999)".
- [25] 3G TS 22.004: "General on supplementary services (3G TS 22.004 version 3.0.0 Release 1999)".
- [26] 3G TS 23.011: "Technical realization of supplementary services - General Aspects (3G TS 23.011 version 3.0.0 Release 1999)".
- [27] 3G TS 23.082: "Call Forwarding (CF) Supplementary Services - Stage2 (3G TS 23.082 version 3.0.0 Release 1999)".
- [28] 3G TS 23.084: "Digital cellular telecommunications system; Multi Party (MPTY) supplementary services - Stage 2".
- [29] 3G TS 23.091: "Digital cellular telecommunications system; Explicit Call Transfer (ECT) supplementary service – Stage 2"
- [30] ITU-T Q.1224, May 1999: "Distributed Functional Plane for Intelligent Network Capability Set 2"
- [31] 3G TS 22.024: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Description of Charge Advice Information (CAI)"
- [32] 3G TS 23.012: "3rd Generation Partnership Project; Technical Specification Group Core Network; Location management procedures"
- [33] 3G TS 24.008: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification"
- [34] 3G TS 23.032: "3rd Generation Partnership Project; Technical Specification Group Core Network; Universal Geographical Area Description (GAD)"

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## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of this TS, the following definitions apply:

**Basic Call State Model (BCSM):** The BCSM provides a high-level model of GMSC- or MSC/VLR-activities required to establish and maintain communication paths for users. As such, it identifies a set of basic call activities in a GMSC or MSC/VLR and shows how these activities are joined together to process a basic call.

**Call Control Function (CCF):** The CCF is the Call Control Function in the network that provides call/service processing and control (see ITU-T Q.1214 [6]).

**Detection Points (DP):** The points in processing at which notifications (to the service logic) can occur and transfer of control (to the gsmSCF) is possible are called Detection Points (DPs).

**Dialled Service CAMEL Subscription Information (D-CSI):** The D-CSI identifies the subscriber as having originating CAMEL dialled services.

**Forwarding MSC:** A MSC which is either an MSC invoking a GSM standardized call forwarding or call deflection service; or an MSC invoking a Camel based call forwarding service.

**Gateway MLC (GMLC):**

A functional entity that allows external LCS Clients to request real-time information about a Mobile Station. The information that can be requested from the GMLC is:

- location of Mobile Station

See [17] and [18] for information on the GMLC.

**Geodetic Information:** Information defining the location of a mobile station, coded according to [16]. The derivation of this information from other information defining the location of a mobile station is a network operator option. If an entity derives the geodetic information it shall also provide the equivalent geographical information.

**Geographical Information:** Information defining the location of a mobile station, coded according to [34].

**GPRS CAMEL Subscription Information (GPRS-CSI):** The GPRS-CSI identifies the subscriber as having GPRS CAMEL services.

**GSM Service Control Function (gsmSCF):** A functional entity that contains the CAMEL service logic to implement OSS. It interfaces with the gsmSSF, the gsmSRF, the GMLC and the HLR.

**GSM Service Switching Function (gsmSSF):** A functional entity that interfaces the MSC/GMSC to the gsmSCF. The concept of the gsmSSF is derived from the IN SSF, but uses different triggering mechanisms because of the nature of the mobile network.

**GSM Specialised Resource Function (gsmSRF):** A functional entity which provides various specialized resources. It interfaces with the gsmSCF and with the MSC. This entity is defined in ITU-T Q.1214 ([6]) with variations defined in the specification.

**Location Information:** Indicates the location of the Mobile Station. The provision of location information is independent of the MS status. As part of the location information, an indication of the age of this information may be delivered.

**Mobile Station State:** Similar to **Subscriber State**, but associated only with a Mobile Station, not with a subscriber.

**Mobility Management event CAMEL Subscription Information (M-CSI):** The M-CSI identifies the subscriber as having Mobility Management event notification CAMEL services.

**NA (North American):** A prefix attached to certain information items used by North American PLMNs in connection with routing a call to a preferred or dialled long distance carrier.

**Network CAMEL Service Information (N-CSI):** The N-CSI identifies services offered on a per-network basis by the serving PLMN operator for all subscribers.

**Originating Basic Call State Model (O-BCSM):** The originating half of the BCSM. The O-BCSM corresponds to that portion of the BCSM associated with the originating party.

**Originating CAMEL Subscription Information (O-CSI):** The O-CSI identifies the subscriber as having originating CAMEL services.

**Point In Association (PIA):** PIAs identify MSC/VLR/SGSN activities associated with one or more basic association/connection states of interest to OSS service logic instances.

**Point In Call (PIC):** PICs identify MSC/VLR (GMSC) activities associated with one or more basic call/connection states of interest to OSS service logic instances.

**Service Key:** The Service Key identifies to the gsmSCF the service logic. The Service Key is administered by the HPLMN, and is passed transparently by the VPLMN/IPLMN to the gsmSCF. The Service Key is a part of the T/O-CSI.

**Serving MLC:** functional entity that performs location information retrieval.

**Short Message Service CAMEL Subscription Information (SMS-CSI):** The SMS-CSI identifies the subscriber as having MO SMS CAMEL services.

**Short Message Service Centre (SMSC):** Also abbreviation SC is used for SMSC.

**Subscriber State:** See 3G TS 22.078 [2].

**Supplementary Service Notification CAMEL Subscription Information (SS-CSI):** The SS-CSI identifies the subscriber as having supplementary service invocation notification CAMEL services.

**Terminating Basic Call State Model (T-BCSM):** The terminating half of the BCSM. The T-BCSM corresponds to that portion of the BCSM associated with the terminating party.

**Terminating CAMEL Subscription Information (in the GMSC) (T-CSI):** The T-CSI identifies the subscriber as having terminating CAMEL services in the GMSC.

**VMSC Terminating CAMEL Subscription Information (VT-CSI):** The VT-CSI identifies the subscriber as having terminating CAMEL services in the VMSC.

**Translation Information Flag (TIF-CSI) :** The TIF-CSI is a flag in the CAMEL subscriber data which indicates that when the subscriber registers a forwarded-to number, that the HLR shall not attempt to perform any translation, number format checks, prohibited FTN checks, call barring checks.

**USSD CAMEL Subscription Information (U-CSI) :** The U-CSI identifies a set of subscriber specific mappings from a USSD service code to a gsmSCF address.

**USSD General CAMEL Service Information (UG-CSI) :** The UG-CSI globally identifies a set of mappings from a USSD service code to a gsmSCF address. The global mapping applies to all HPLMN subscribers. If, for a particular service code, both U-CSI and UG-CSI are applicable then the U-CSI shall take precedence.

## 3.2 Abbreviations

Abbreviations used in this specification are listed in GSM 01.04 [1].

For the purposes of this TS, the following abbreviations apply:

BCSM	Basic Call State Model
CAMEL	Customized Applications for Mobile network Enhanced Logic
DP	Detection Point
DTN	Deflected To Number
D-CSI	Dialled Services CAMEL Subscription Information
EDP	Event Detection Point
FTN	Forwarded To Number

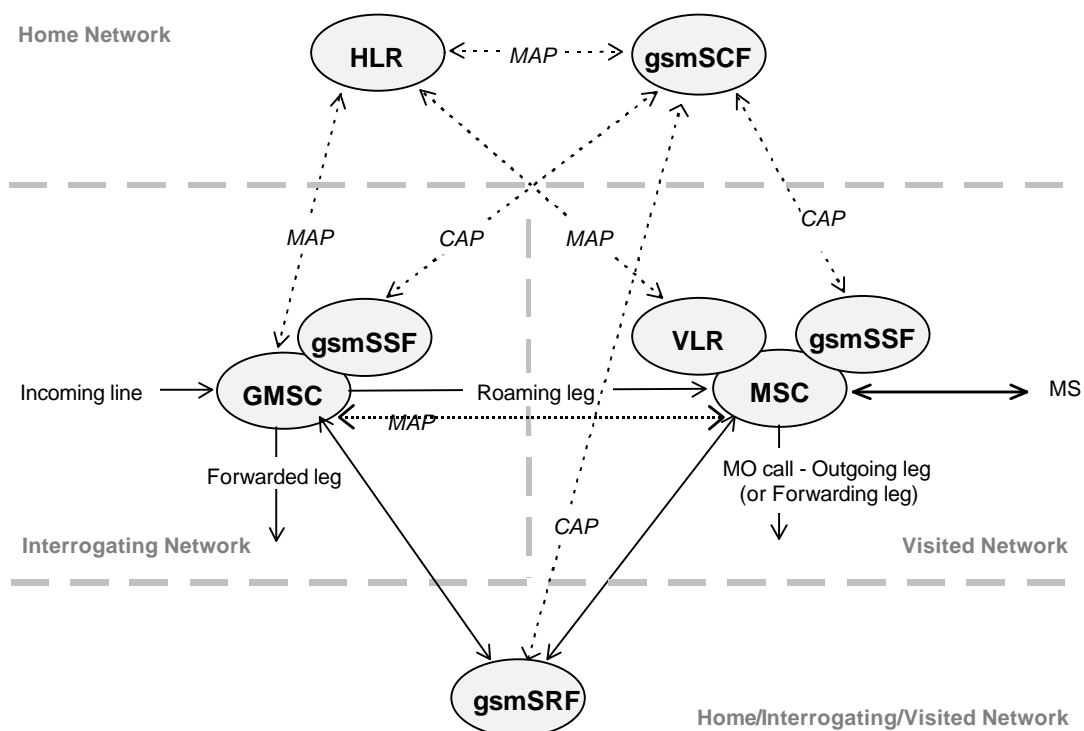
GMLC	Gateway MLC
GMSC	Gateway MSC
GPRS	General Packet Radio Service
gprsSSF	GPRS Service Switching Function
GPRS-CSI	GPRS CAMEL Subscription Information
gsmSCF	GSM Service Control Function
gsmSRF	GSM Specialised Resource Function
gsmSSF	GSM Service Switching Function
HLR	Home Location Register
HPLMN	Home PLMN
IE	Information Element
IF	Information Flow
IP	Intelligent Peripheral
IPLMN	Interrogating PLMN
LCS	Location Services
LSA	Localised Service Area
M-CSI	Mobility Management event Notification CAMEL Subscription Information
MF	Mobile Forwarding
MLC	Mobile Location Centre
MO	Mobile Originating
MSC	Mobile service Switching Centre
MT	Mobile Terminating in GMSC
N-CSI	Network CAMEL Service Information
NA	North American
NNI	Network Node Interface
O-BCSM	Originating Basic Call State Model
O-CSI	Originating CAMEL Subscription Information
ODB	Operator Determined Barring
OSS	Operator Specific Service
PDP	Packet Data Protocol
PIC	Point In Call
PLMN	Public Land Mobile Network
SGSN	Serving GPRS Support Node
SLPI	Service Logic Program Instance
SMF	Service Management Function
SMLC	Serving MLC
SMS-CSI	Short Message Service CAMEL Subscription Information
SS-CSI	Supplementary Service Notification CAMEL Subscription Information
T-BCSM	Terminating Basic Call State Model
T-CSI	Terminating CAMEL Subscription Information (in the GMSC)
TDP	Trigger Detection Point
TIF-CSI	Translation Information Flag
U-CSI	USSD CAMEL Subscription Information
UG-CSI	USSD General CAMEL Service Information
UNI	User Network Interface
VLR	Visitor Location Register
VPLMN	Visited PLMN
VT	Mobile Terminating in VMSC
VT-CSI	VMSC Terminating CAMEL Subscription Information

## 4 Circuit switched Call Control

### 4.1 Architecture

#### 4.1.1 Functional Entities used for CAMEL

This subclause describes the functional architecture needed to support CAMEL. Also the additions needed to the basic GSM functionality are described. Figure 4.1 shows the functional entities involved in calls requiring CAMEL support. The architecture is applicable to the third phase of CAMEL.



**Figure 4.1: Functional architecture for support of CAMEL**

**HLR:** The HLR stores for subscribers requiring CAMEL support the information relevant to the current subscription regarding O-CSI, D-CSI, T-CSI, VT-CSI, TIF-CSI and SS-CSI. The O-CSI is sent to the VLR at Location Update, on data restoration or if the O-CSI is updated. The D-CSI is sent to the VLR at Location Update, on data restoration or if the D-CSI is updated. The VT-CSI is sent to the VLR at Location Update, on data restoration or if the VT-CSI is updated. The SS-CSI is sent to the VLR at Location Update, on data restoration or if the SS-CSI is updated. The O/T-CSI is sent to the GMSC when the HLR responds to a request for routing information. When processing an invocation of the CCBS supplementary service, the HLR shall send a notification of the invocation of the supplementary service to the gsmSCF if required by the SS-CSI.

**GMSC:** When processing the calls for subscribers requiring CAMEL support, the GMSC receives a O/T-CSI from the HLR, indicating the GMSC to request instructions from the gsmSSF. The GMSC monitors on request the call states (events) and informs the gsmSSF of these states during processing, enabling the gsmSSF to control the execution of the call in the GMSC.

**MSC:** When processing the calls for subscribers requiring CAMEL support, the MSC receives a O-CSI and / or VT-CSI from the VLR indicating the MSC to request instructions from the gsmSSF. The MSC monitors on request the call states (events) and informs the gsmSSF of these states during processing, enabling the gsmSSF to control the execution of the call in the MSC. When processing an invocation of any of the supplementary services ECT, CD and MPTY, the MSC may receive a SS-CSI from the VLR, indicating that a notification of the invocation of the supplementary service shall be sent to the gsmSCF.

**VLR:** The VLR stores the O-CSI, VT-CSI, TIF-CSI and SS-CSI as a part of the subscriber data for subscribers roaming in the VLR area.

**gsmSSF:** see subclause 3.1.

**gsmSCF:** see subclause 3.1.

**gsmSRF:** see subclause 3.1.

## 4.1.2 Interfaces defined for CAMEL

This subclause describes the different interfaces applicable to CAMEL. It specifies on a high level the functions specific to CAMEL.

### 4.1.2.1 HLR - VLR interface

This interface is used to send the CAMEL related subscriber data to the visited PLMN and for provision of MSRN. The interface is also used to retrieve subscriber status and location information of the mobile subscriber or to indicate suppression of announcement for a CAMEL service.

### 4.1.2.2 GMSC - HLR interface

This interface is used at terminating calls to exchange routing information, subscriber status, location information, subscription information and suppression of announcements. The O/T-CSI that is passed to the IPLMN is sent over this interface.

### 4.1.2.3 GMSC - gsmSSF interface

This is an internal interface. The interface is described in the specification to make it easier to understand the handling of DPs (arming/disarming of DPs, DP processing etc.).

### 4.1.2.4 gsmSSF - gsmSCF interface

This interface is used by the gsmSCF to control a call in a certain gsmSSF and to request the gsmSSF to establish a connection with a gsmSRF. Relationships on this interface are opened as a result of the gsmSSF sending a request for instructions to the gsmSCF.

### 4.1.2.5 MSC - gsmSSF interface

This is an internal interface. The interface is described in the specification to make it easier to understand the handling of DPs (arming/disarming of DPs, DP processing etc.).

### 4.1.2.6 gsmSCF - HLR interface

This interface is used by the gsmSCF to request information from the HLR. As a network operator option the HLR may refuse to provide the information requested by the gsmSCF.

### 4.1.2.7 gsmSCF - gsmSRF interface

This interface is used by the gsmSCF to instruct the gsmSRF to play tones/announcements to the users.

### 4.1.2.8 GMSC - MSC interface

This interface is used to transfer control of a call from a VMSC back to a GMSC for optimal routing.

## 4.2 Detection Points (DPs)

### 4.2.1 Definition and description

Certain basic call events may be visible to the GSM Service Control Function (gsmSCF). The DPs are the points in call at which these events are detected. The DPs for Mobile Originated Calls and Mobile Terminated Calls are described in subclauses 4.4.2 and 4.4.3.

A DP can be armed in order to notify the gsmSCF that the DP was encountered, and potentially to allow the gsmSCF to influence subsequent handling of the call. If the DP is not armed, the processing entity continues the processing without gsmSCF involvement.

Three different types of DPs are identified:

- Trigger Detection Point - Request (TDP-R)

This detection point is statically armed and initiates a CAMEL control relationship when encountered and there is no existing relationship due to same CSI.. Processing is suspended when the DP is encountered.

- Event Detection Point - Request (EDP-R)

This detection point is dynamically armed within the context of a CAMEL control relationship. Processing is suspended when encountering the DP and the gsmSSF waits for instructions from the gsmSCF.

- Event Detection Point - Notification (EDP-N)

This detection point is dynamically armed within the context of a CAMEL control relationship. Processing is not suspended when encountering the DP.

The DPs are characterized in the following subclauses.

#### 4.2.1.1 Arming/disarming mechanism

The mechanism by which the DP is armed. A DP may be statically armed or dynamically armed.

The following arming rules apply:

- DP for mobile terminating call handling is statically armed in GMSC as result of T-CSI delivery from HLR. DP for mobile terminating call handling is statically armed in VMSC as result of VT-CSI delivery from VLR. DP for forwarding leg handling is statically armed in GMSC as result of O-CSI delivery from HLR. DP for mobile originating call or forwarded leg handling is statically armed in VMSC as result of O-CSI delivery from VLR.
- A DP is dynamically armed by the gsmSCF within the context of a CAMEL control relationship (between the gsmSSF and the gsmSCF).

The following disarming rules apply:

- A statically armed DP is disarmed when a O-CSI, T-CSI or VT-CSI is withdrawn in the HLR. Only TDP-Rs can be disarmed using this mechanism.
- If an armed EDP is met, then it is disarmed.
- If an EDP is met that causes the release of the related leg, then all EDPs related to that leg are disarmed.
- If a call is released, then all EDPs related to that call are disarmed.
- If an EDP is met, then other EDPS are disarmed, in accordance with the implicit disarming rule table (see section 4.4.4).
- If an EDP is armed, it can be explicitly disarmed by the gsmSCF by means of the RequestReportBCSMEvent information flow.



## 4.2.1.2 Criteria

Criteria are the conditions that must be met in order for the gsmSSF to request instructions from the gsmSCF.

### 4.2.1.2.1 Criteria at DP Collected\_Info

The criteria for an mobile originating call are checked in the originating MSC.

The criteria for an mobile forwarded call are checked in the forwarding MSC.

For early forwarded calls in the GMSC, the HLR may decide not to include the DP Collected\_Info trigger criteria in the subscriber data sent to the GMSC if the trigger criteria for the call are not met.

For optimally routed late forwarded calls, the MSC may decide not to include the DP Collected Info trigger criteria in the RCH message sent to the GMSC, if the trigger criteria for the call are not met.

The following criteria are applicable for DP Collected\_Info:

- Destination number triggering criterion: The HLR may store a list of up to 10 destination numbers and/or up to 3 number lengths. There is no restriction on the nature of address. There is no restriction on the numbering plan indicator. This criterion may be defined to be either "enabling" or "inhibiting".
- Basic service triggering criterion: The HLR may store a list of up to 5 basic service codes, each of which may represent an individual basic service or a basic service group. This list is a triggering list.
- Forwarding triggering criterion: The HLR may store an indicator that triggering shall occur only for a call which has been subject to GSM or CAMEL call forwarding. This criterion may be defined to be either "enabling" or "inhibiting".

For MO calls, triggering at DP Collected\_Info shall be strictly based on the number received over the access network. No service selection information, such as \* and # digits, or carrier selection information, dialled by the subscriber, shall be removed from the number before conditional triggering check takes place.

For MF calls at the VMSC, triggering at DP Collected\_Info shall be strictly based on the number received over the access network (the Deflected-to-Number in case of Call Deflection), the Forwarded-to-Number retained in the VLR or the Destination Routing Address received in the Connect operation from SCF during a Terminating CAMEL Service at the VMSC.

No service selection information or carrier selection information shall be removed from the number before conditional triggering check takes place.

For MF calls at the GMSC, triggering at DP Collected\_Info shall be strictly based on the Forwarded-to-Number received from HLR, on the Destination Routing Address received in the Connect operation from SCF during a Terminating CAMEL Service or on the Forwarded-to-Number received in the RCH message.

No service selection information or carrier selection information shall be removed from the number before conditional triggering check takes place.

One or more DP criteria may be applicable. All applicable triggering criteria must be satisfied before the dialogue is established with the gsmSCF.

If the destination number triggering criterion is enabling, then the gsmSSF may establish a dialogue with the gsmSCF if:

- the destination number matches one of the destination number strings defined in the list, or
- the length of the destination number matches one of the destination number lengths defined in the list.

In this test the destination number matches one of the destination number strings in the list if:

- the nature of address of destination number is the same as the nature of address of the destination number string
- the destination number is at least as long as the destination number string in the list, and
- all the digits in the destination number string in the list match the leading digits of the destination number.

If the destination number triggering criterion is inhibiting, then the gsmSSF may establish a dialogue with the gsmSCF if:

- the destination number does not match any of the destination number strings defined in the list, and
- the length of the destination number does not match any of the destination number lengths defined in the list.

In this test the destination number matches one of the destination number strings in the list if:

- the nature of address of destination number is the same as the nature of address of the destination number string
- the destination number is at least as long as the destination number string in the list, and
- all the digits in the destination number string in the list match the leading digits of the destination number.

The basic service triggering criterion is met if the basic service for the call matches a stored individual basic service code or is a member of the group defined by a stored basic service group code. For the purpose of this paragraph a general bearer service is a member of the corresponding bearer service group.

If the forwarding triggering criterion is enabling, then the gsmSSF may establish a dialogue with the gsmSCF only if the call has been subject to CAMEL or GSM call forwarding. If the forwarding triggering criterion is inhibiting, then the gsmSSF may establish a dialogue with the gsmSCF only if the call has not been subject to CAMEL or GSM call forwarding.

#### 4.2.1.2.2 Criteria at DP Analysed\_Information

The criteria for a mobile originating call are checked in the originating MSC. The criteria for a mobile forwarded call are checked in the forwarding MSC.

For early forwarded calls in the GMSC, the HLR shall always include the trigger criteria in the subscriber data sent to the GMSC. Reason is that the HLR can not check the criteria applicable at DP Analysed Info, since the number that the criteria check shall be based on, may be modified by a Mobile Terminating or Mobile Forwarding Service Logic for this call.

For optimally routed late forwarded calls, the MSC shall always include the trigger criteria in the RCH message sent to the GMSC. Reason is that the MSC can not check the criteria applicable at DP Analysed Info, since the number that the criteria check shall be based on, may be modified by a Mobile Terminating or Mobile Forwarding Service Logic for this call.

The following criteria are applicable for DP Analysed\_Information:

- Destination number triggering criterion: The HLR may store a list of up to 10 destination numbers. There is no restriction on the nature of address. There is no restriction on the number plan indicator.

For MO calls, triggering at DP Analysed\_Info shall be based on the number received over the access network.

Any service selection information, including \* and # digits, or carrier selection information, dialled by the subscriber, shall be removed from the number before conditional triggering check takes place. No translation shall be performed on the number for triggering purposes.

Refer to 3G TS 22.030 [22] for the codes and values for service feature codes.

For MF calls at the VMSC, triggering at DP Analysed\_Info shall be based on the number received over the access network (the Deflected-to-Number in case of Call Deflection), the Forwarded-to-Number retained in the VLR, or the Destination Routing Address in the Connect operation from the SCF during a Mobile Terminated or Mobile Forwarded CAMEL Service.

Any service selection information or carrier selection information shall be removed from the number before conditional triggering check takes place. No translation shall be performed on the number for triggering purposes.

For MF calls at the GMSC, triggering at DP Analysed\_Info shall be based on the Forwarded-to-Number received from HLR, on the Destination Routing Address received in the Connect operation from SCF during a Mobile Terminated or Mobile Forwarded CAMEL Service, or on the Forwarded-to-Number received in the RCH message.

Any service selection information or carrier selection information shall be removed from the number before conditional triggering check takes place. No translation shall be performed on the number for triggering purposes.

In this test the destination number matches one of the destination number strings in the list if:

- the nature of address of the destination number is the same as the nature of address of the destination number string

- the destination number is at least as long as the destination number string in the list, and
- all the digits in the destination number string in the list match the leading digits of the destination number.

#### 4.2.1.2.3 Criteria at DP Route\_Select\_Failure

The HLR may store a list of up to 5 cause values.

The criteria for a mobile originating call are checked in the originating MSC. The criteria for a mobile forwarded call are checked in the forwarding MSC.

For early forwarded calls in the GMSC, the HLR shall always include the trigger criteria in the subscriber data sent to the GMSC. Reason is that the cause code received from ISUP is used in the trigger criteria check. The cause code is not known at the time of sending the O-CSI to the GMSC.

For optimally routed late forwarded calls, the MSC shall always include the trigger criteria in the RCH message sent to the GMSC. Reason is that the cause code received from ISUP is used in the trigger criteria check. The cause code is not known at the time of sending the O-CSI to the GMSC.

The following criteria are applicable for DP Route\_Select\_Failure:

- Release cause code

The trigger criteria are met if the cause code received from ISUP is equal to at least one of the cause codes in the trigger criteria list.

#### 4.2.1.2.4 Criteria at DP Terminating\_Attempt\_Authorised

The HLR may store a list of up to 5 basic service codes, each of which may represent an individual basic service or a basic service group. This list is a triggering list.

The criteria for DP Terminating\_Attempt\_Authorised are checked in the HLR for the GMSC or in the VLR for the MSC. The HLR shall only include T-CSI in the CAMEL subscription information sent to the GMSC if the criteria are met. The VLR shall only include VT-CSI in the CAMEL subscription information sent to the MSC if the criteria are met.

The basic service criterion is met if the basic service for the call matches a stored individual basic service code or is a member of the group defined by a stored basic service group code. For the purpose of this paragraph a general bearer service is a member of the corresponding bearer service group.

#### 4.2.1.2.5 Criteria at DP T\_Busy and T\_No\_Answer

The HLR may store a list of up to 5 cause values.

The criteria for a mobile terminating call are checked in the GMSC or in MSC.

For mobile terminating calls in the GMSC, the HLR shall include the trigger criteria in the subscriber data sent to the GMSC. Reason is that the cause code received from ISUP is used in the trigger criteria check. The cause code is not known at the time of sending the T-CSI to the GMSC.

If SRI-Ack includes the Not Reachable FTN, then HLR may decide not to include the trigger criteria, if the HLR has identified that T-CSI includes DP T Busy with cause code Not Reachable.

If SRI-Ack includes the Not Reachable FTN and also T-CSI, including DP T Busy with cause code, then the not reachable condition shall be mapped to an ISUP release code, which shall be used for triggering check.

For Mobile terminating calls in the VMSC, the trigger criteria are received in the VT-CSI from the HLR in Insert Subscriber Data IF. The triggering is based on the ISUP release cause code (call set up result).

The following criteria are applicable for DP T\_Busy and T\_No\_Answer:

- Release cause code

The trigger criteria are met if the cause code received from ISUP or MAP is equal to at least one of the cause codes in the trigger criteria list.

If trigger criteria are satisfied, either in GMSC or VMSC, then the corresponding Service Logic shall be invoked. If a T-BCSM was already invoked and there is a control relationship at that moment, then no Service Logic shall be invoked.

When a RCH message is received in the GMSC and the subscriber has T-CSI then the forwarding reason in the RCH message shall be used to perform trigger criteria check for DP T Busy or DP T No Answer. If a match is found, then the corresponding Service Logic shall be invoked.

If a T-BCSM was already invoked and there is a control relationship at that moment, then no Service Logic shall be invoked.

#### 4.2.1.3 Relationship

Given that an armed DP was encountered, the gsmSSF provides an information flow via a relationship.

A relationship between the gsmSSF and the gsmSCF for the purpose of operator specific service processing is considered to be a CAMEL relationship. There are two types of CAMEL relationships:

- A CAMEL control relationship if the gsmSCF is able to influence the call processing via the relationship.
- A CAMEL monitor relationship if the gsmSCF is not able to influence the call processing via the relationship.

#### 4.2.2 DP processing rules

The gsmSSF shall apply the following set of rules during DP processing to ensure a single point of control:

- EDPs are disarmed by the gsmSSF as they are encountered and reported to the gsmSCF, when the occurrence of another EDP causes the implicit disarming of the EDP or when the leg clears.
- A control relationship persists as long as there is 1 or more EDP-R armed for this portion of the call or if the gsmSSF is in any state except Monitoring or Idle.
- A control relationship changes to a monitor relationship if the control relationship does not persist and :
  - 1 or more EDP-N armed, or
  - 1 or more Call information Report outstanding, or
  - an Apply Charging Report outstanding.
- A control relationship terminates if it does not persist and does not change to a monitor relationship. A monitor relationship terminates if there are neither EDP-Ns armed nor reports outstanding or if the call clears.

### 4.3 Description of CAMEL Subscriber Data

#### 4.3.1 Originating CAMEL Subscription Information (O -CSI)

This subclause defines the contents of the Originating CAMEL Subscription Information.

##### 4.3.1.1 TDP List

The TDP List indicates on which detection point triggering shall take place.

The following trigger detection points are possible: DP Collected\_Info and DP Route\_Select\_Failure.

##### 4.3.1.2 gsmSCF address

Address to be used to access the gsmSCF for a particular subscriber. The address shall be an E.164 number to be used for routing. Different gsmSCF addresses may be associated to different TDPs.

#### 4.3.1.3 Service Key

The Service Key identifies to the gsmSCF the service logic. Different Service Keys may be associated to different TDPs.

#### 4.3.1.4 Default Call Handling

The Default Call Handling indicates whether the call shall be released or continued as requested in case of error in the gsmSSF to gsmSCF dialogue. A default call handling shall be associated to each Service Key.

#### 4.3.1.5 DP criteria

The DP criteria indicate whether the gsmSSF shall request the gsmSCF for instructions.

#### 4.3.1.6 CAMEL Capability Handling

CAMEL Capability Handling indicates the phase of CAMEL which is asked by the gsmSCF for the service.

The HLR shall not include in a CSI which it sends to a VLR or GMSC any data for a CAMEL phase later than that which the CAMEL capability handling indicates. E.g. if the CAMEL Capability Handling indicates CAMEL phase 1 then the HLR shall not send triggering criteria to the VLR. Different CSIs may contain different values of CAMEL Capability Handling.

NOTE: If CAMEL is not supported or if a lower phase of CAMEL is supported in the VLR, the HLR can decide on a subscriber basis to apply ODB, perform normal call handling or perform operator specific handling (eventually support of a lower version of CSI).

#### 4.3.1.7 CSI state

The CSI state indicates whether the O-CSI is active or not.

#### 4.3.1.8 Notification flag

The notification flag indicates whether the change of the O-CSI shall trigger Notification on Change of Subscriber Data.

### 4.3.2 Dialed Service CAMEL Subscription Information (D-CSI)

This subclause defines the contents of the Dialed Service CAMEL Subscription Information.

#### 4.3.2.1 DP criteria

The DP criteria indicate whether the gsmSSF shall request the gsmSCF for instructions.

#### 4.3.2.2 gsmSCF address

Address to be used to access the gsmSCF for a particular subscriber. The address shall be an E.164 number to be used for routing.

For the D-CSI a gsmSCF address shall be associated to each DP criterion.

#### 4.3.2.3 Service Key

The Service Key identifies to the gsmSCF the service logic.

For the D-CSI a Service Key shall be associated to each DP criteria.

#### 4.3.2.4 Default Call Handling

The Default Call Handling indicates whether the call shall be released or continued as requested in case of error in the gsmSSF to gsmSCF dialogue. A default call handling shall be associated to each DP criteria.

#### 4.3.2.5 CAMEL Capability Handling

CAMEL Capability Handling indicates the phase of CAMEL which is asked by the gsmSCF for the service. It shall indicate CAMEL phase 3.

NOTE: If CAMEL is not supported or if a lower phase of CAMEL is supported in the VLR, the HLR can decide on a subscriber basis to apply ODB, perform normal call handling or perform operator specific handling (eventually support of a lower version of CSI).

#### 4.3.2.6 CSI state

The CSI state indicates whether the D-CSI is active or not.

#### 4.3.2.7 Notification flag

The notification flag indicates whether changes of the D-CSI shall trigger the Notification on Change of Subscriber Data.

### 4.3.3 Network Service CAMEL Subscription Information (N-CSI)

The N-CSI identifies services offered on a per-network basis by the serving PLMN operator for all subscribers.

### 4.3.4 Terminating CAMEL Subscription Information (in the GMSC) (T-CSI)

This subclause defines the contents of the Terminating CAMEL Subscription Information.

#### 4.3.4.1 TDP List

The TDP List indicates on which detection point triggering shall take place.

The following trigger detection points are possible: DP Terminating\_Attempt\_Authorised, DP T\_Busy, and DP T\_No\_Answer.

#### 4.3.4.2 gsmSCF address

Address to be used to access the gsmSCF for a particular subscriber. The address shall be an E.164 number to be used for routing. Different gsmSCF addresses may be associated to different TDPs.

#### 4.3.4.3 Service Key

The Service Key identifies to the gsmSCF the service logic. Different Service Keys may be associated to different TDPs.

#### 4.3.4.4 Default Call Handling

The Default Call Handling indicates whether the call shall be released or continued as requested in case of error in the gsmSSF to gsmSCF dialogue. A default call handling shall be associated to each Service Key.

#### 4.3.4.5 DP criteria

The DP criteria indicate whether the gsmSSF shall request the gsmSCF for instructions.

#### 4.3.4.6 CAMEL Capability Handling

CAMEL Capability Handling indicates the phase of CAMEL which is asked by the gsmSCF for the service.

The HLR shall not include in a CSI which it sends to a GMSC any data for a CAMEL phase later than that which the CAMEL capability handling indicates. Different CSIs may contain different values of CAMEL Capability Handling.

NOTE: If CAMEL is not supported or if a lower phase of CAMEL is supported in the GMSC, the HLR can decide on a subscriber basis to apply ODB, perform normal call handling or perform operator specific handling (e.g. support of a lower version of CSI).

#### 4.3.4.7 CSI state

The CSI state indicates whether the T-CSI is active or not.

#### 4.3.4.8 Notification flag

The notification flag indicates whether the change of the T-CSI shall trigger Notification on Change of Subscriber Data or not.

### 4.3.5 VMSC Terminating CAMEL Subscription Information (VT-CSI)

This subclause defines the contents of the Terminating CAMEL Subscription Information for the VMSC.

#### 4.3.5.1 TDP List

The TDP List indicates on which detection point triggering shall take place.

The following trigger detection points are possible: DP Terminating\_Attempt\_Authorised, DP T\_Busy, and DP T\_No\_Answer.

#### 4.3.5.2 gsmSCF address

Address to be used to access the gsmSCF for a particular subscriber. The address shall be an E.164 number to be used for routing. Different gsmSCF addresses may be associated to different TDPs.

#### 4.3.5.3 Service Key

The Service Key identifies to the gsmSCF the service logic. Different Service Keys may be associated to different TDPs.

#### 4.3.5.4 Default Call Handling

The Default Call Handling indicates whether the call shall be released or continued as requested in case of error in the gsmSSF to gsmSCF dialogue. A default call handling shall be associated to each Service Key.

#### 4.3.5.5 DP criteria

The DP criteria indicate whether the gsmSSF shall request the gsmSCF for instructions.

#### 4.3.5.6 CAMEL Capability Handling

CAMEL Capability Handling indicates the phase of CAMEL which is asked by the gsmSCF for the service.

The HLR shall not include in a CSI which it sends to a VLR any data for a CAMEL phase later than that which the CAMEL capability handling indicates.

NOTE: If CAMEL is not supported or if a lower phase of CAMEL is supported in the VLR, the HLR can decide on a subscriber basis to apply ODB, perform normal call handling or perform operator specific handling (eventually support of a lower version of CSI).

#### 4.3.5.7 CSI state

The CSI state indicates whether the VT-CSI is active or not.

#### 4.3.5.8 Notification flag

The notification flag indicates whether the change of the VT-CSI shall trigger Notification on Change of Subscriber Data or not.

### 4.3.6 Other CAMEL data

#### 4.3.6.1 Location information/Subscriber state Interrogation

This data indicates whether additional subscriber information shall be sent to the GMSC as part of the terminating call handling.

- an indication that the HLR shall send the location information of the called subscriber.
- an indication that the HLR shall send the subscriber state of the called subscriber.

#### 4.3.6.2 Translation Information Flag CAMEL Subscription Information (TIF-CSI)

##### 4.3.6.2.1 Translation Information Flag

A flag (TIF) in the CAMEL Subscriber data in the HLR indicates, when the subscriber registers a forwarded-to number, that the HLR shall not attempt to perform any translation, number format checks, prohibited FTN checks, call barring checks (cf. 4.7.2).

If the flag is absent, this indicates that a translation is needed in the HLR and the usual procedure applies as defined in the current version of TS GSM 03.82. In particular, the interaction with barring services shall be performed by the HLR at the registration of the FTN.

A flag (TIF) in the CAMEL Subscriber data in the VLR indicates, when the subscriber registers a forwarded-to number, that the VLR shall not attempt to perform any translation, number format checks, prohibited DTN checks, call barring checks (cf. 4.7.2).

If the flag is absent, this indicates that a translation is needed in the VLR and the usual procedure applies as defined in the current version of TS GSM 03.82. In particular, the interaction with barring services shall be performed by the VLR at the registration of the DTN.

##### 4.3.6.2.2 Notification flag

The notification flag indicates whether the change of the TIF-CSI is notified to the gsmSCF or not.

## 4.4 Description of CAMEL BCSMs

### 4.4.1 General Handling

The BCSM is used to describe the actions in an MSC/GMSC/VMSC during originating, forwarded or terminating calls.

The BCSM identifies the points in basic call processing when Operator Specific Service (OSS) logic instances (accessed through the gsmSCF) are permitted to interact with basic call control capabilities.

Figure 4.2 shows the components that have been identified to describe a BCSM.



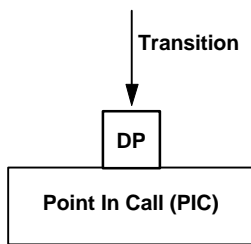


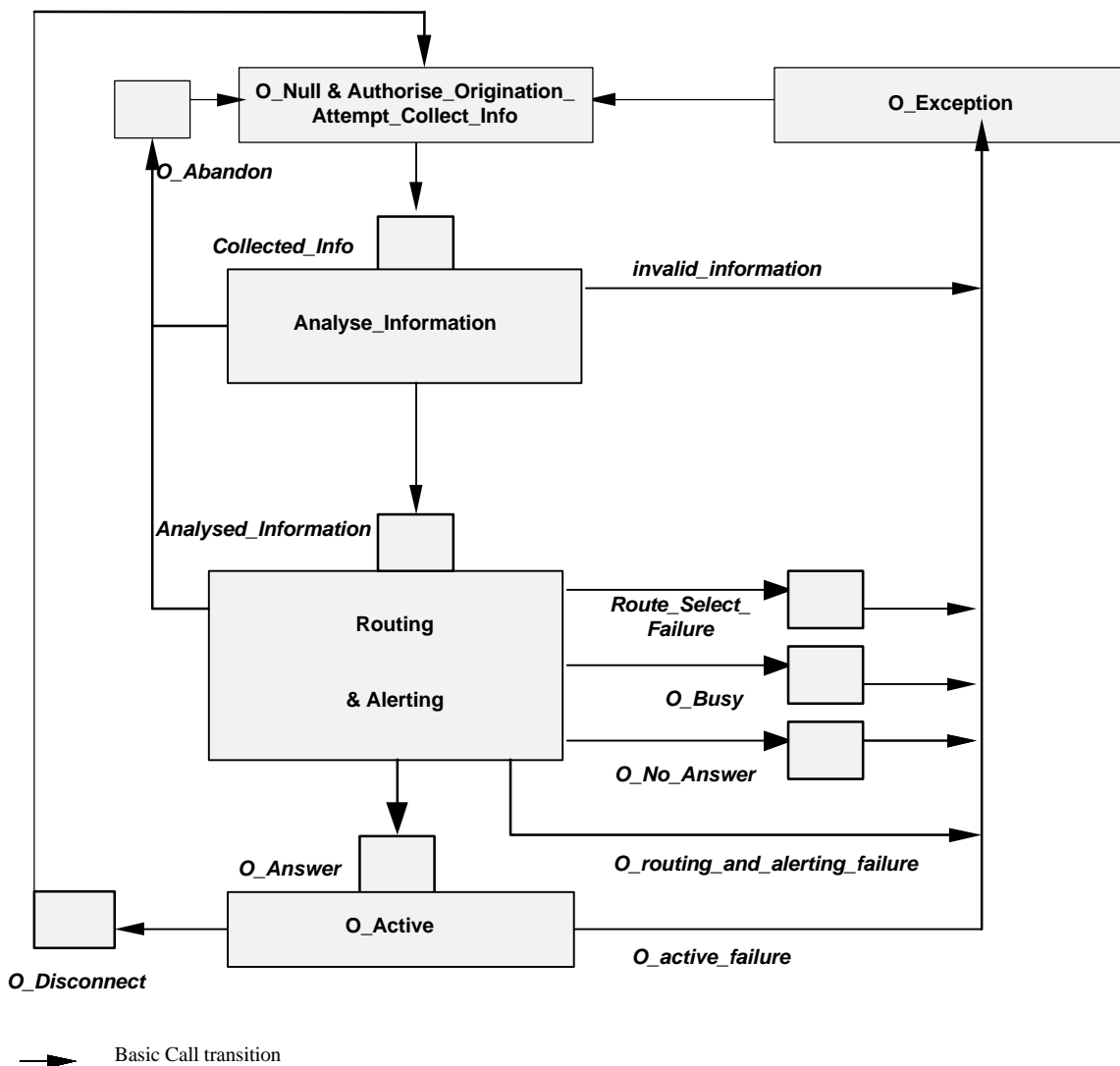
Figure 4.2: BCSM Components

### 4.4.2 Originating Basic Call State Model (O-BCSM)

#### 4.4.2.1 Description of O-BCSM

The O-BCSM is used to describe the actions in an MSC during originating (MSC) or forwarded (MSC or GMSC) calls.

When encountering a DP the O-BCSM processing is suspended at the DP and the MSC/GMSC indicates this to the gsmSSF which determines what action, if any, shall be taken in case the DP is armed.



NOTE: The O\_Busy DP includes also the 'not reachable' case.

Figure 4.3: Originating BCSM for CAMEL

The following table defines the different DPs which apply to mobile originating and forwarded calls.

**Table 4.1: Description of O-BCSM DPs in the MSC**

<b>CAMEL Detection Point:</b>	<b>DP Type</b>	<b>Description:</b>
DP Collected_Info	TDP-R	Indication that the O-CSI is analysed. This DP is also used for gsmSCF initiated call setup. In this case the DP is neither triggered nor reported.
DP Analysed_Information	TDP-R (note 2)	Availability of routing address and nature of address.
DP Route_Select_Failure	TDP-R (note 3), EDP-N, EDP-R	Indication that the call establishment failed
DP O_Busy	EDP-N, EDP-R	Indication that: - a busy indication is received from the terminating party, - a not reachable event is determined upon a cause IE in the ISUP release message.
DP O_No_Answer	EDP-N, EDP-R	Indication that an application timer associated with the O_No_Answer DP expires
DP O_Answer	EDP-N, EDP-R	Indication that the call is accepted and answered by the terminating party.
DP O_Disconnect	EDP-N, EDP-R	A disconnect indication is received from the originating party or from the terminating party.
DP O_Abandon	EDP-N, EDP-R	Indication that a disconnect indication is received from the originating party during the call establishment procedure
NOTE 1: The DPs are defined in ITU-T Q.1224 ([6]). NOTE 2: For TDP-R Analysed_Information new relationship to gsmSCF is opened. NOTE 3: DP Route_Select_Failure shall be reported as TDP-R when there is no relationship to gsmSCF. If a relationship to gsmSCF is already open, it shall be reported as EDP-R or EDP-N if armed so.		

#### 4.4.2.1.1 Description of the call model (PICs)

This subclause describes the call model for originating and forwarded calls. For each PIC a description can be found of the entry events, functions and exit events.

It should be noted that although the names used for PICs match those used in ITU-T Q.1214 [6] the specific descriptions differ.

##### 4.4.2.1.1.1 O\_Null & Authorise\_Origination\_Attempt\_Collect\_Info

Entry events:

- Disconnection and clearing of a previous call (DP O\_Disconnect) or default handling of exceptions by gsmSSF/(G)MSC completed.
- Abandon event is reported from Analyse\_Information or Routing and Alerting PIC.
- Exception event is reported.

Actions:

- Interface is idled.
- Originating call: SETUP message containing the dialled number is received from MS.
- Originating call: The supplementary service "barring of all outgoing calls" is checked and invoked if necessary.
- Originating call: The ODB category "barring of all outgoing calls" is checked and ODB is invoked if necessary.

NOTE: the ODB category "barring of all outgoing calls when roaming" causes the HLR to send the category "barring of all outgoing call" if the VLR is not in the HPLMN.

- Originating call: CUG checks done in the originating MSC/VLR are performed.
- Information being analysed e.g., O-CSI is analysed.

Exit events:

- Originating CSI is analysed.
- An exception condition is encountered. For this PIC, if the call encounters one of these exceptions during the PIC processing, the exception event is not visible because there is no corresponding DP. Example exception condition: Calling party abandons call.

#### 4.4.2.1.1.2 Analyse\_Information

Entry events:

- Originating CSI is analysed. (DP Collected Info).
- New routing information is received when Busy event, Route Select Failure event, Not Reachable event or No Answer event is reported from Routing and Alerting PIC.
- New routing information is received when Disconnect event is reported from O\_Active PIC.

Actions:

- Compare the called party number with the dialled services information.

Exit events:

- Availability of routing address and nature of address. (DP Analysed\_Information)
- An exception condition is encountered (e.g. wrong number)- this leads to the O\_Exception PIC.
- Calling party abandons the call- this leads to the O\_Abandon DP.

#### 4.4.2.1.1.3 Routing & Alerting

Entry events:

- Availability of routing address and nature of address. (DP Analysed\_Information).

Actions:

- Information is being analysed and/or translated according to dialling plan to determine routing address.
- Routing address being interpreted.
- Originating call: Outgoing barring services and ODB categories not already applied are checked and invoked if necessary.
- Call is being processed by the terminating half BCSM. Continued processing of call setup (e.g., ringing) is taking place. Waiting for indication from terminating half BCSM that the call has been answered by terminating party.

Exit events:

- Indication from the terminating half BCSM that the call is accepted and answered by terminating party. (DP O\_Answer)
- An exception condition is encountered - this leads to the O\_Exception PIC.
- Calling party abandons the call- this leads to the O\_Abandon DP.
- A busy indication is received from the terminating party - this leads to the O\_Busy DP.
- A not reachable indication is received from the terminating party - this leads to the O\_Busy DP.
- Attempt to select the route for the call fails - this leads to the Route\_Select\_Failure DP.
- If the no reply timer expires and DP O\_No\_Answer is armed - this leads to the O\_No\_Answer DP.

#### 4.4.2.1.1.4 O\_Active

##### Entry events:

- Indication from the terminating half BCSM that the call is accepted and answered by the terminating party. (DP O\_Answer)

##### Actions:

- Connection established between originating party and terminating party. Call supervision is provided.
- Call release is awaited.

##### Exit events:

- A disconnection indication is received from the originating party, or received from the terminating party via the terminating half BCSM. (DP9 - O\_Disconnect)
- An exception condition is encountered.

#### 4.4.2.1.1.5 O\_Exception

##### Entry events:

- An exception condition is encountered. In addition to specific examples listed above, exception events include any type of failure, which means that the normal exit events for a PIC can not be met.

##### Actions:

- Default handling of the exception condition is being provided. This includes general actions necessary to ensure that no resources remain inappropriately allocated such as:
  - If any relationship exists between the gsmSSF and the gsmSCF send an error information flow closing the relationships and indicating that any outstanding call handling instructions will not run to completion
  - The (G)MSC/gsmSSF should make use of vendor-specific procedures to ensure release of resources within the (G)MSC/gsmSSF, so that line, trunk and other resources are made available for new calls.

##### Exit events:

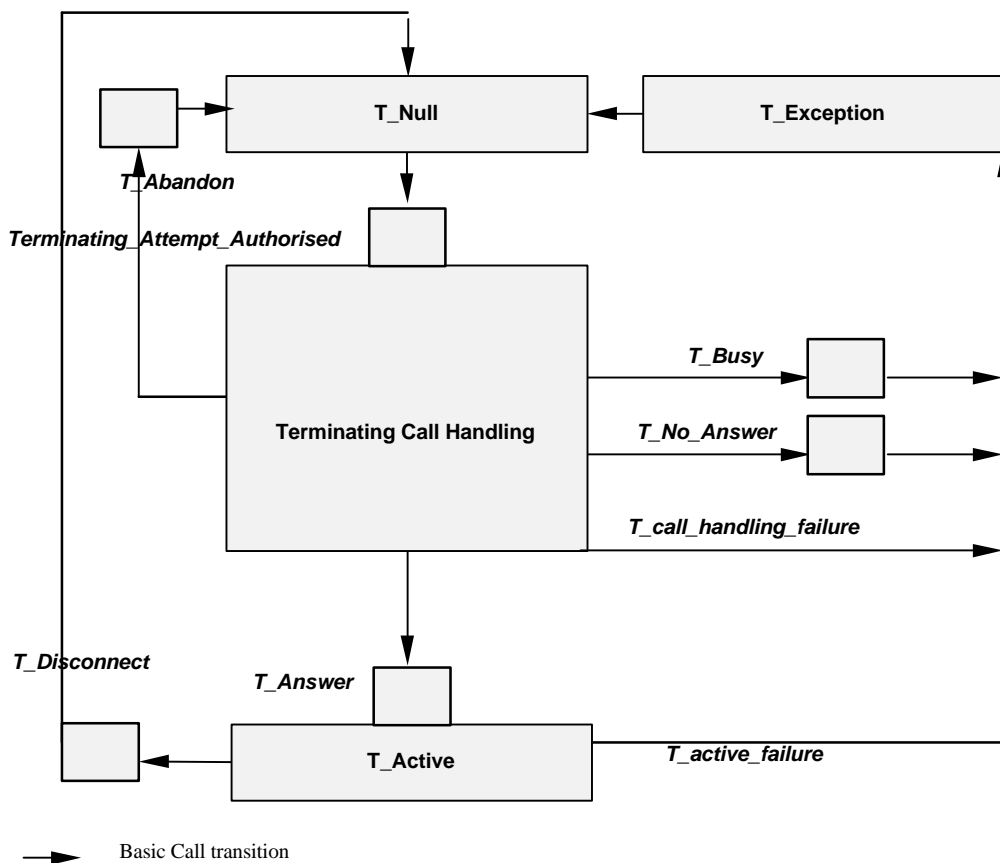
- Default handling of the exception condition by gsmSSF/(G)MSC completed.

### 4.4.3 Terminating Basic Call State Model (T-BCSM)

#### 4.4.3.1 Description of T-BCSM

The T-BCSM is used to describe the actions in a GMSC and in a VMSC during terminating calls.

When encountering a DP the T-BCSM processing is suspended at the DP and the GMSC / VMSC indicates this to the gsmSSF which determines what action, if any, shall be taken in case the DP is armed.



**Figure 4.4: T-BCSM in the GMSC / VMSC**

In the following table the different DPs (in the T-BCSM) are described.

**Table 4.2: Description of T-BCSM DPs in the GMSC / VMSC**

CAMEL Detection Point:	DP Type	Description:
DP Terminating_Attempt_Authorised	TDP-R	Indication that the T-CSI / VT_CSI is analysed.
DP T_Busy	TDP-R (note 2), EDP-N, EDP-R	Indication that: - a busy indication is received from the destination exchange, - Busy event is determined in the visited MSC, - Not reachable or call establishment failure event is determined from the HLR response or upon a cause IE in the ISUP release message.
DP T_No_Answer	TDP-R (note 2), EDP-N, EDP-R	Indication that an application timer associated with the T_No_Answer DP expires
DP T_Answer	EDP-N, EDP-R	Call is accepted and answered by terminating party
DP T_Disconnect	EDP-N, EDP-R	A disconnect indication is received from the terminating party or from the originating party.
DP T_Abandon	EDP-N, EDP-R	A disconnect indication is received from the originating party during the call establishment procedure
NOTE 1: The DPs are defined in ITU-T Q.1224 ([6]).		
NOTE 2: DP T_No_Answer and DP T_Busy shall be reported as TDP-R when there is no relationship to gsmSCF. If a relationship to gsmSCF is already open, it shall be reported as EDP-R or EDP-N if armed so.		

#### 4.4.3.1.1 Description of the call model (PICs)

This subclause describes the call model for terminating calls in the GMSC and in the VMSC. For each PIC a description can be found of the entry events, functions, information available and exit events.

It should be noted that although the names used for PICs match those used in ITU-T Q.1224 [6] the specific descriptions differ.

##### 4.4.3.1.1.1 T\_Null

Entry events:

- Disconnection and clearing of a previous call (DP T\_Disconnect) or default handling of exceptions by gsmSSF / GMSC / VMSC completed.
- Abandon event is reported from Terminating Call Handling PIC ;
- Exception event is reported.

Actions:

- Interface is idled.
- ISUP\_IAM is received, the appropriate information is analysed.
- Send\_Routeing\_Info information flow is sent to HLR in case of GMSC.
- Send\_Info\_For\_Incoming\_Call information flow is sent to VLR in case of VMSC.
- In case of GMSC:
  - The supplementary services "barring of all incoming calls" and "barring of incoming calls when roaming" are checked and invoked if necessary.
  - The ODB categories "barring of all incoming calls" and "barring of incoming calls when roaming" are checked and ODB is invoked if necessary.
  - The supplementary service "CUG" is checked and invoked if necessary.
- T-CSI/VT-CSI is received and analysed.

Exit events:

- Response is received from HLR / VLR and terminating CSI (if available) is analysed.
- An exception condition is encountered. For this PIC, if the call encounters one of these exceptions during the PIC processing, the exception event is not visible because there is no corresponding DP.

Example exception condition is:

- Calling party abandons call.

##### 4.4.3.1.1.2 Terminating Call Handling

Entry events:

- Response is received from HLR / VLR and terminating CSI (if available) is analysed. (DP Terminating\_Attempt\_Authorised),
- New routeing information is received when Busy event or No Answer event is reported from Terminating Call Handling PIC,
- New routeing information is received when Disconnect event is reported from T\_Active PIC.
- New routeing information is received when the terminating party not reachable is reported from Terminating Call Handling PIC.

NOTE: The HLR may use MAP signalling to indicate to the GMSC before the call is extended to the destination VMSC that the terminating party is not reachable, or the destination VMSC may use telephony signalling to indicate to the GMSC after the call has been extended to the destination VMSC that the terminating party is not reachable.

Actions:

- The response from HLR / VLR is analysed.
- Routing address and call type being interpreted. The next route or terminating access is being selected.
- The terminating party is being alerted. Waiting for the call to be answered by terminating party.
- The GSM supplementary service call forwarding is invoked if necessary.

Exit events:

- Call is accepted and answered by terminating party.
- An exception condition is encountered - this leads to the T\_Exception PIC. Example exception conditions: the call setup to the MSC/GMSC was not successful.
- Calling party abandons the call - this leads to the T\_Abandon DP.
- The terminating access is busy in the VMSC or a busy indication is received from the destination exchange in the GMSC - this leads to the T\_Busy DP.
- Not reachable event detected or failure of attempt to select the route for the terminating leg in GMSC or the MS cannot be reached in the VMSC - this leads to the T\_Busy DP.
- If no reply timer expires and DP T\_No\_Answer is armed - this leads to the T\_No\_Answer DP.

#### 4.4.3.1.1.3 T\_Active

Entry events:

- Indication that the call is accepted and answered by the terminating party. (DP T\_Answer)

Actions:

- Connection established between originating party and terminating party. Call supervision is being provided.
- Call release is awaited.

Exit events:

- A disconnection indication is received from the terminating party, or received from the originating party via the originating half BCSM. (DP T\_Disconnect)
- An exception condition is encountered. In addition to specific examples listed above, exception events include any type of failure that means that the normal exit events for a PIC can not be met.

#### 4.4.3.1.1.4 T\_Exception

Entry events:

- An exception condition is encountered. In addition to specific examples listed above, exception events include any type of failure, which means that the normal exit events for PIC cannot be met.

Actions:

- Default handling of the exception condition is being provided. This includes general actions necessary to ensure that no resources remain inappropriately allocated such as:
  - If any relationship exists between the gsmSSF and the gsmSCF send an error information flow closing the relationships and indicating that any outstanding call handling instructions will not run to completion
  - The GMSC / VMSC / gsmSSF should make use of vendor-specific procedures to ensure release of resources within the GMSC / VMSC / gsmSSF, so that line, trunk and other resources are made available for new calls.

Exit events:

- Default handling of the exception condition by gsmSSF/GMSC completed.

#### 4.4.4 Rules for Implicit Disarming of Event Detection Points'

The following tables give the rules for implicit disarming of event detection points.

Implicit EDP disarming rules are specified in the tables below for Originating BCSM and respectively Terminating BCSM. Each table specifies which EDP's shall be disarmed (i.e. MonitorMode set to Transparent) if/when each EDP is encountered, irrespective of the EDP's MonitorMode (Transparent, NotifyAndContinue, or Request).

When EDP's armed with MonitorMode 'Request' (EDP-R's) are encountered, any implicit EDP disarming shall take place before reporting the EDP and transiting the gsmSSF to the WFI state (if not already suspended in the WFI state).

If the BCSM has encountered DP O/T\_Answer then an originator release must be detected as a DP O/T\_Disconnect.

NOTE: The rules are designed for use in a Single Point of Control configuration and may require further enhancements if they were to be used in a Multiple Points of Control configuration. Enhancements to these rules in order to cover all aspects of MPC will have to be catered for in the next CAMEL Phase.

The table entry 'X' means that if one DP occurs (independently of arming and reporting to the gsmSCF) the marked one is implicitly disarmed.

It shall be possible to rearm explicitly an implicitly disarmed DP, e.g. for follow on call.

**Table 4.3: Implicit disarmed DPs in the O-BCSM**

Encountered DP	Implicit disarmed DPs						
	DP4	DP 5	DP 6	DP 7	DP 9 C Leg	DP 9 P Leg	DP 10
DP4 Route_Select_Failure	X	X	X	X		X	
DP5 O_Busy	X	X	X	X		X	
DP6 O_No_Answer	X	X	X	X		X	
DP7 O_Answer	X	X	X	X			X
DP9 O_DisconnectC Leg					X		X
DP9 O_DisconnectP Leg	X	X	X	X		X	
DP10 O_Abandon					X		X

**Table 4.4: Implicit disarmed DPs in the T-BCSM**

Encountered DP	Implicit disarmed DPs					
	DP 13	DP 14	DP 15	DP 17 P Leg	DP 17 C Leg	DP 18
DP13 T_Busy	X	X	X		X	
DP14 T_No_Answer	X	X	X		X	
DP15 T_Answer	X	X	X			X
DP17 T_Disconnect P Leg				X		X
DP17 T_Disconnect C Leg	X	X	X		X	
DP18 T_Abandon				X		X

#### 4.4.5 BCSM Modelling of Call Scenarios

This subclause describes how the BCSMs defined above are used to model GSM call scenarios. For each scenario the used and unused BCSMs involved in the call are shown.

In some cases these models may have an allocation to physical nodes different from that shown. However, the physical separation of the logic functions shown shall not impact the modelling. This subclause describes the call scenarios without optimal routing. If optimal routing is invoked the physical configurations may be different from those shown, but the modelling is not changed.

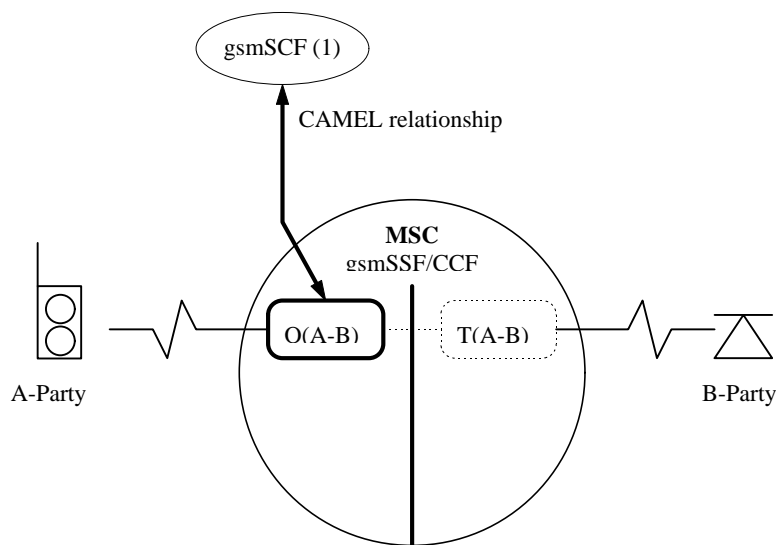


CAMEL may be applied simultaneously and independently for each GSM subscriber involved in a call. This is not shown in these scenarios.

Subscribers other than those being served by CAMEL may be either PSTN subscribers, other GSM subscribers or any other addressable subscriber.

#### 4.4.5.1 Mobile Originated Call

The O-BCSM for the call from A to B (labelled "O(A-B)") is invoked if the A-party has an active O-CSI. A control relationship with gsmSCF (1) will be created.



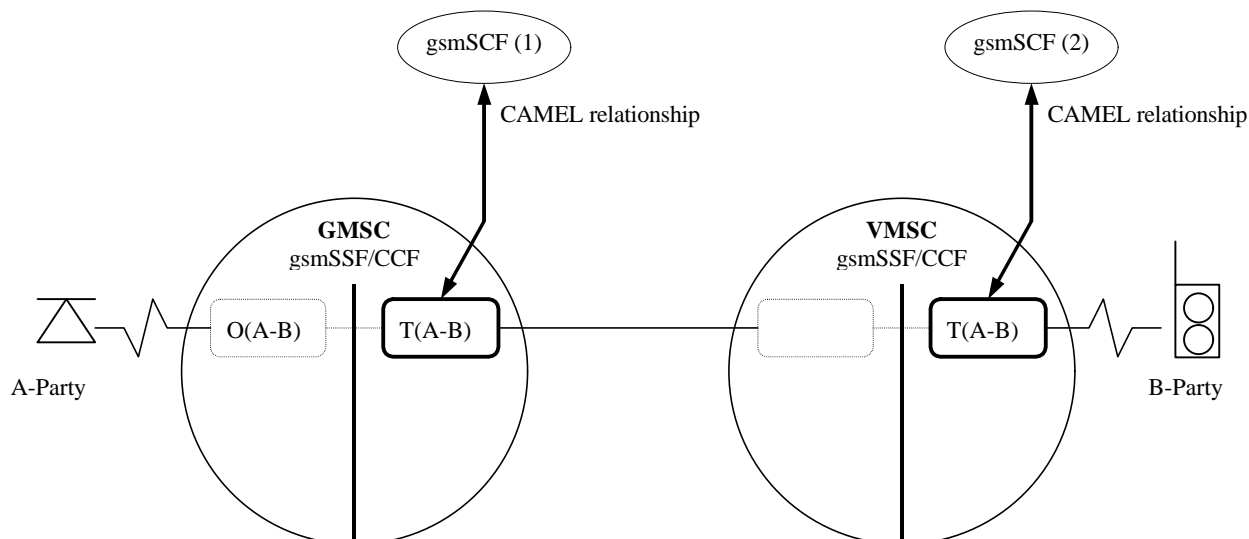
**Figure 4. 5: BCSM Scenario for Mobile Originated Call**

#### 4.4.5.2 Mobile Terminated Call at the GMSC / VMSC

The T-BCSM for the call from A to B (labelled "T(A-B)") is invoked if the B-party has an active T-CSI (in GMSC) or VT-CSI (in VMSC). A control relationship with gsmSCF (1) / gsmSCF (2) will be created.

The relationships with gsmSCF (1) and gsmSCF(2) may exist simultaneously. The two gsmSCF endpoints of the relationships are treated independently.

The nodes gsmSCF (1) and gsmSCF (2) may be the same or different entities.



**Figure 4.6: BCSM Scenario for Mobile Terminated Calls at the GMSC / VMSC**

#### 4.4.5.3 Call Forwarding at the GMSC / VMSC

The T-BCSM for the call from A to B (labelled "T(A-B)") is invoked if the B-party has an active T-CSI (in GMSC) or VT-CSI (in VMSC). A control relationship with gsmSCF (1) will be created. Following processing at the GMSC / VMSC the call will be extended to the VMSC serving the B-party. This VMSC may be physically integrated with the GMSC.

A new call leg to a "C" party is created if:

- a GSM call forwarding supplementary service forwards the call to C. In this case O-BCSM O(B-C) is always invoked for the forwarding party if an O-CSI has been received by the GMSC from the HLR; or
- a CAMEL service in a control relationship with T(A-B) performs a CAMEL-based call forwarding by using a Connect information flow. In this case O-BCSM O(B-C) is created. The O-BCSM opens a control relationship if the following conditions are met:
  - The subscriber has an active O-CSI or there is an active N-CSI or there is an active D-CSI.
  - The triggering criteria are satisfied.
  - The last Connect operation included the "O-CSI applicable" flag. This flag affects to O-CSI only.

A control relationship with gsmSCF (2) will be created.

The relationships with gsmSCF (1) and gsmSCF(2) may exist simultaneously. The two relationships are treated independently at the GMSC. The BCSM T(A-B) and BCSM O(B-C) are linked by an internal interface which is assumed to behave in a similar way to an ISUP interface.

The nodes gsmSCF (1) and gsmSCF (2) may be the same or different physical entities.

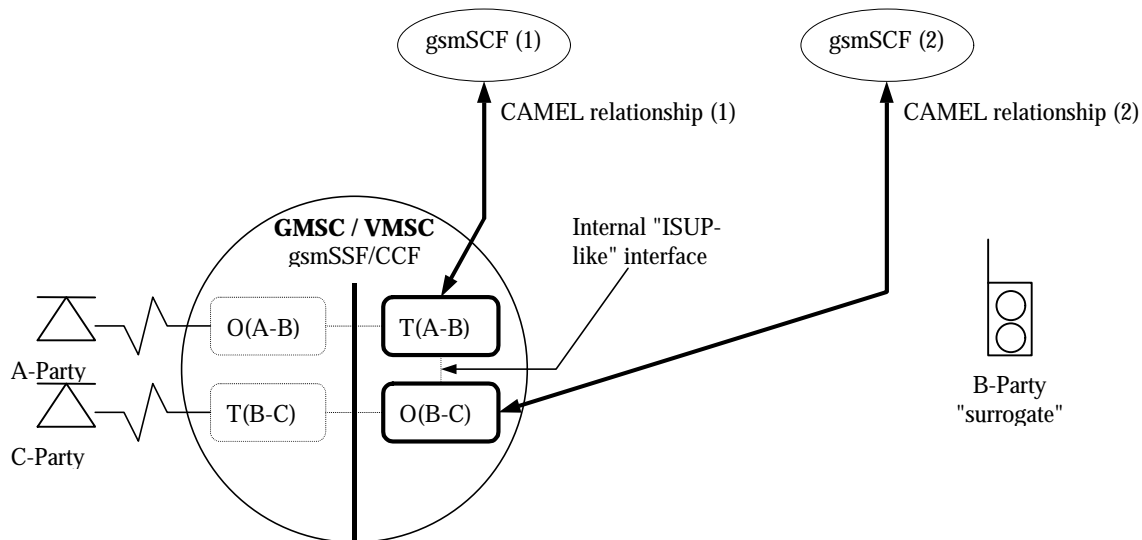


Figure 4.7: BCSM Scenario for Call Forwarding at the GMSC / VMSC

## 4.5 Procedures for CAMEL

The SDLs in this specification illustrate how CAMEL modifies the normal call handling. They do not attempt to show all the details of call handling in nodes that support CAMEL. Relevant parts of 3G TS 23.018 [3] apply in addition to these SDLs. For example, some inputs leading to unsuccessful call attempts are not shown on these diagrams - corresponding clauses in 3G TS 23.018 [3] apply.

Note that in some SDL processes and procedures the Release message may be sent on both an access interface and an inter-switch interface. If the message is sent on a UNI, its effect is the same as a Release transaction message.

The text in this clause is a supplement to the definition in the SDL diagrams ; it does not duplicate the information in the SDL diagrams.

### 4.5.1 Overall SDL architecture

The following diagram shows the overall architecture for the SDL diagrams.

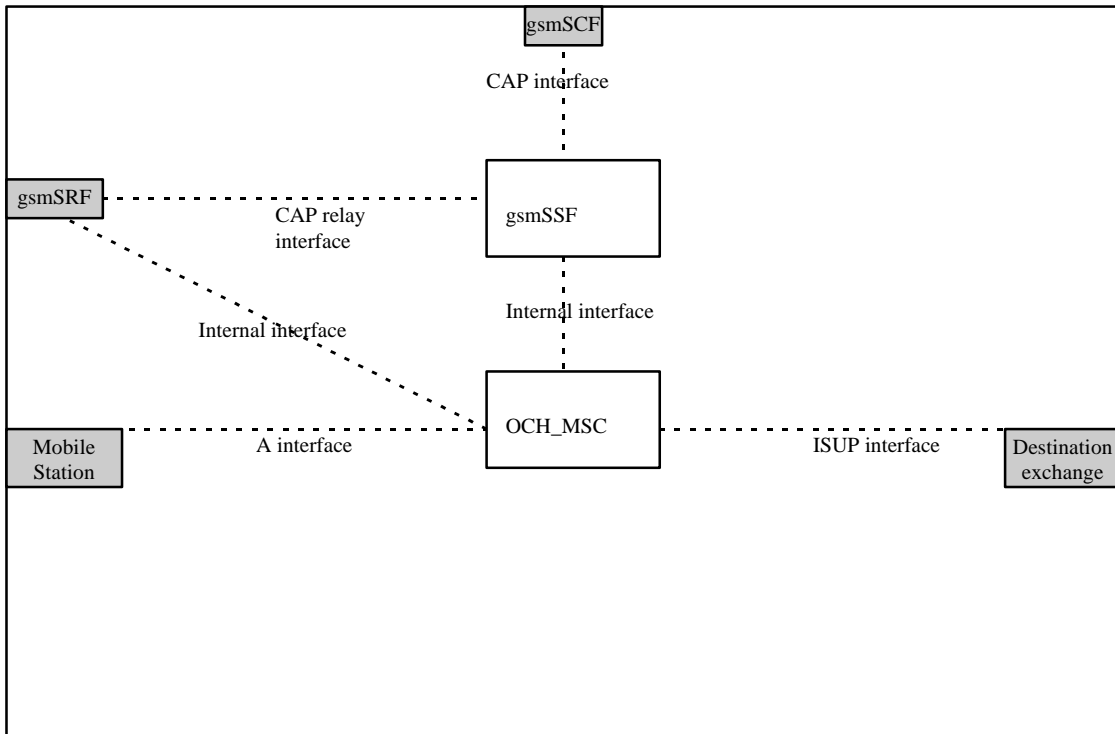


Figure 4.8a: Outgoing case (gsmSSF relay)

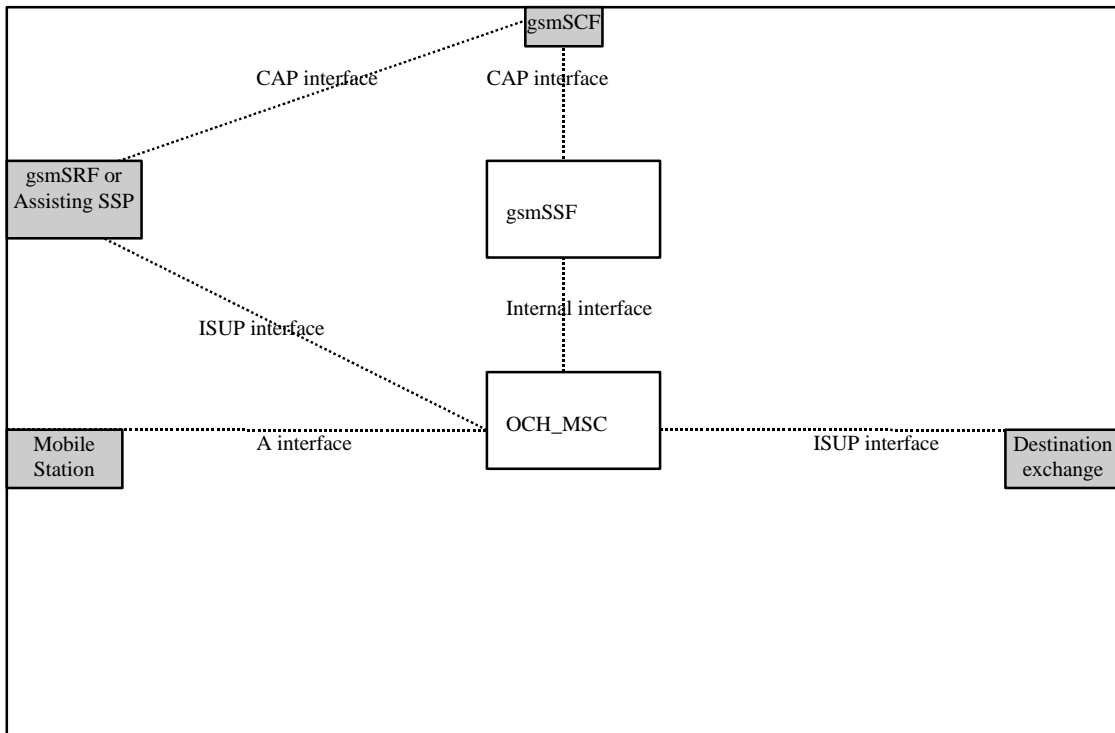


Figure 4.8b: Outgoing case (direct path gsmSCF to gsmSRF or assist with relay)

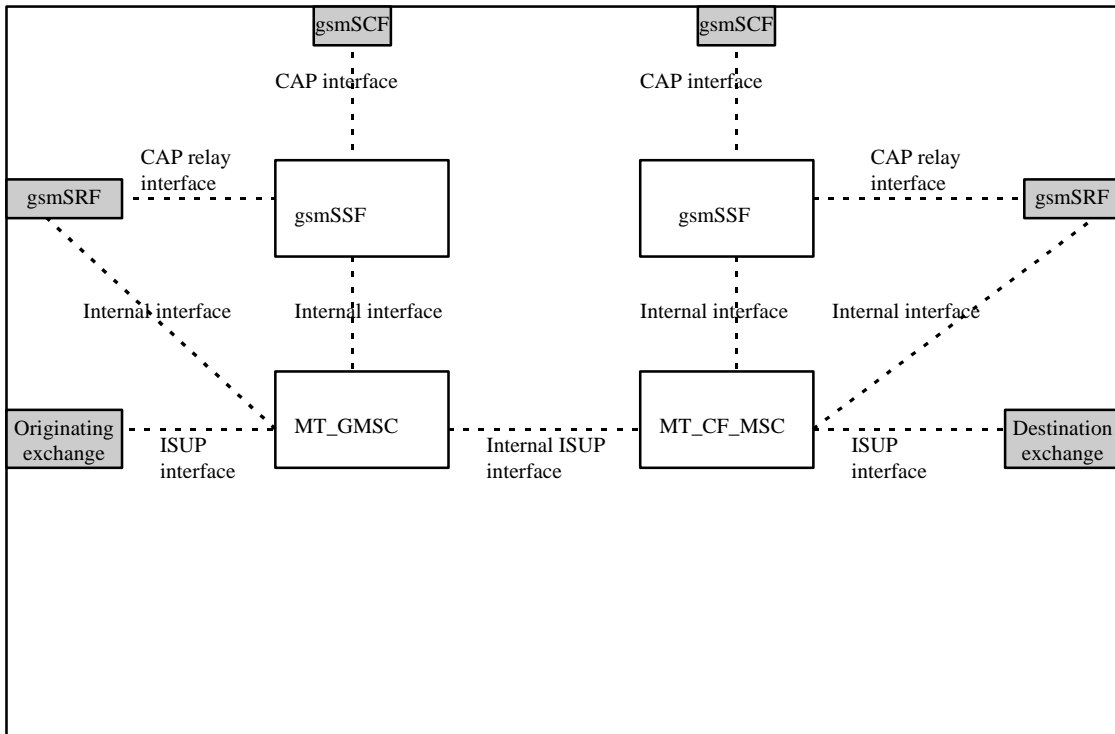


Figure 4.8c: Terminating GMSC case (gsmSSF relay)

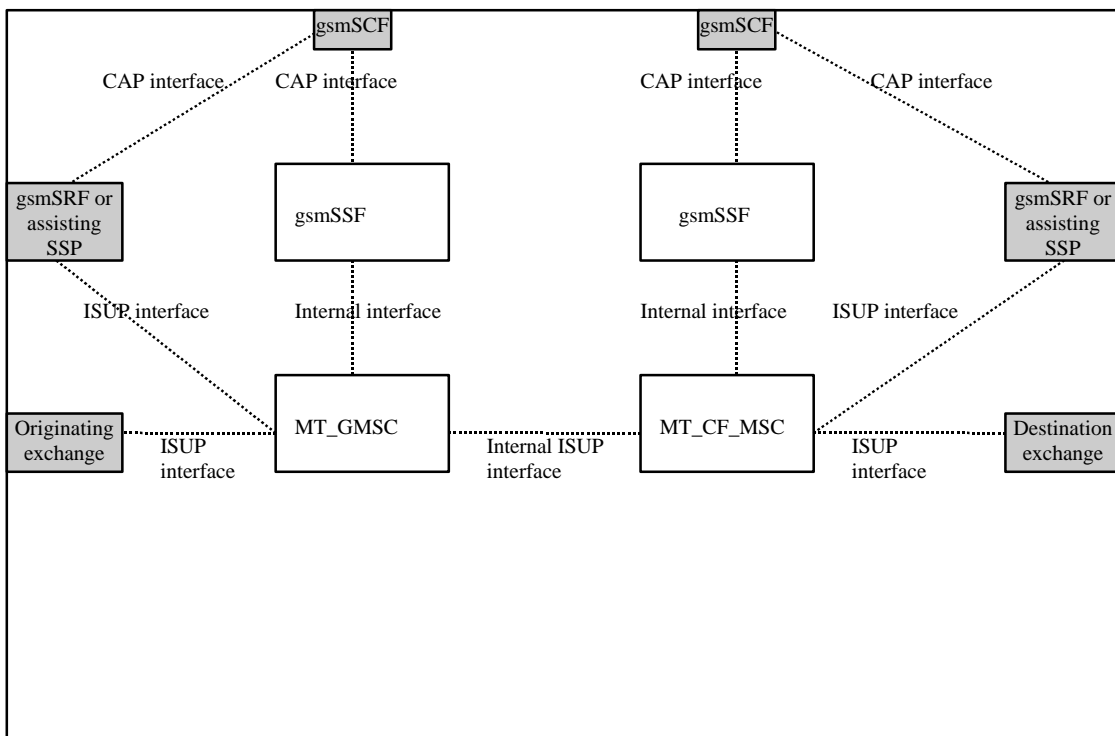
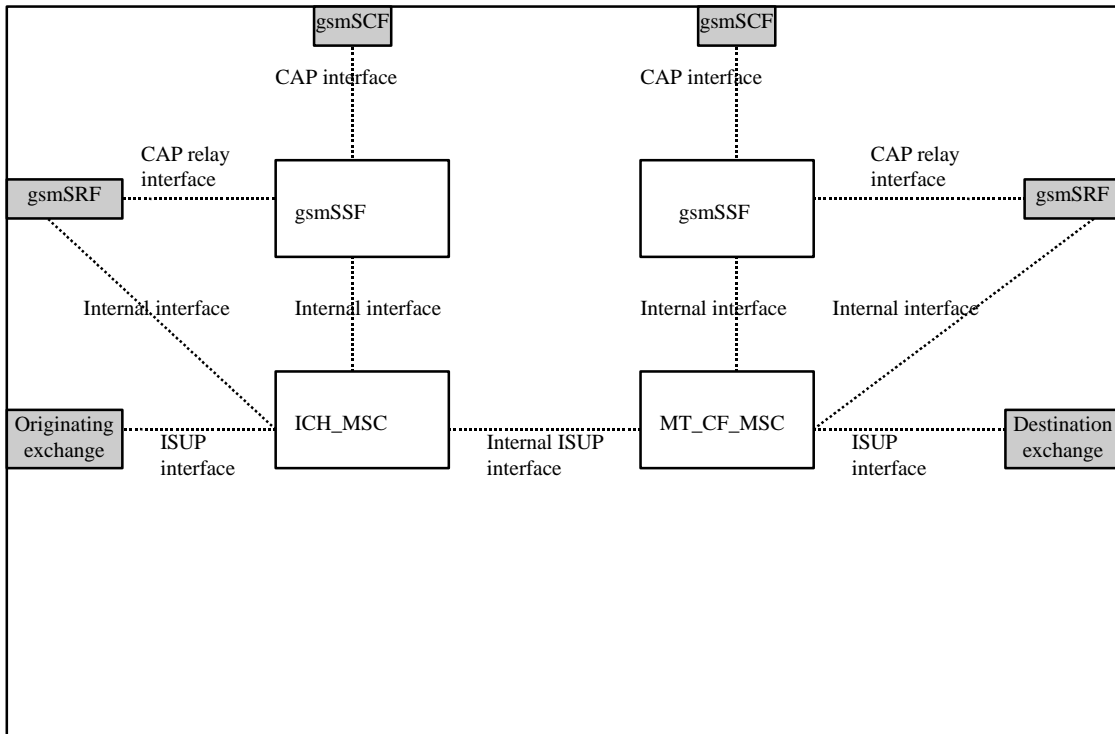
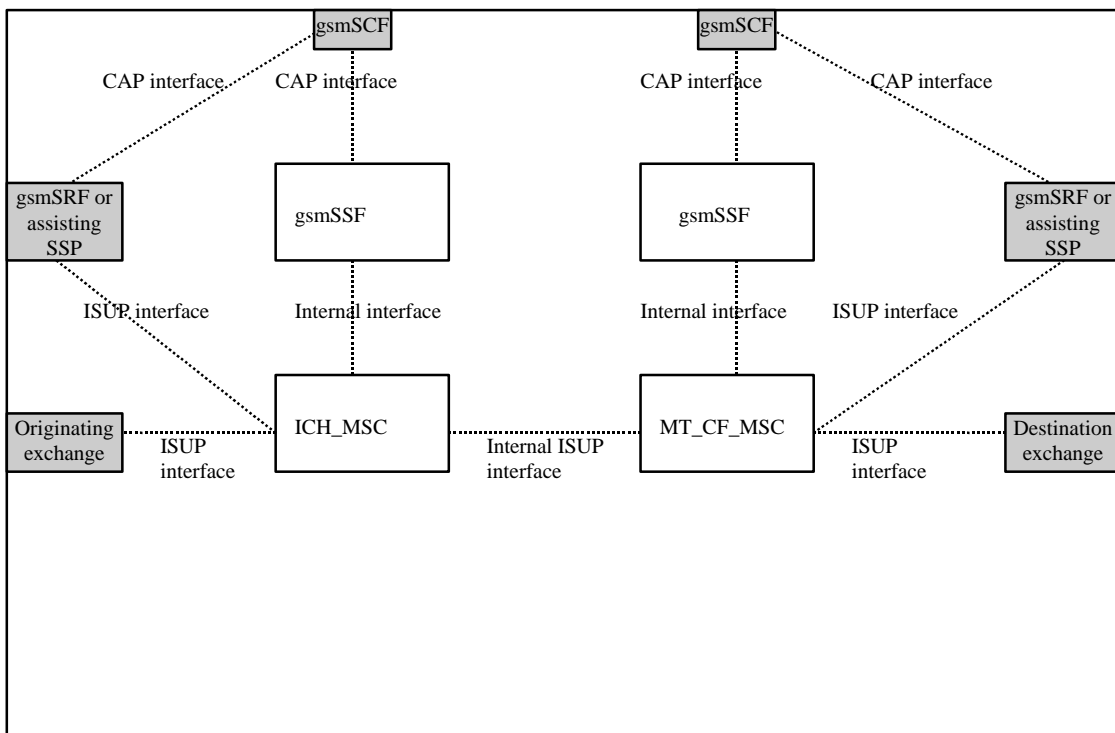


Figure 4.8d: Terminating GMSC case (direct path gsmSCF to gsmSRF or assist with relay)



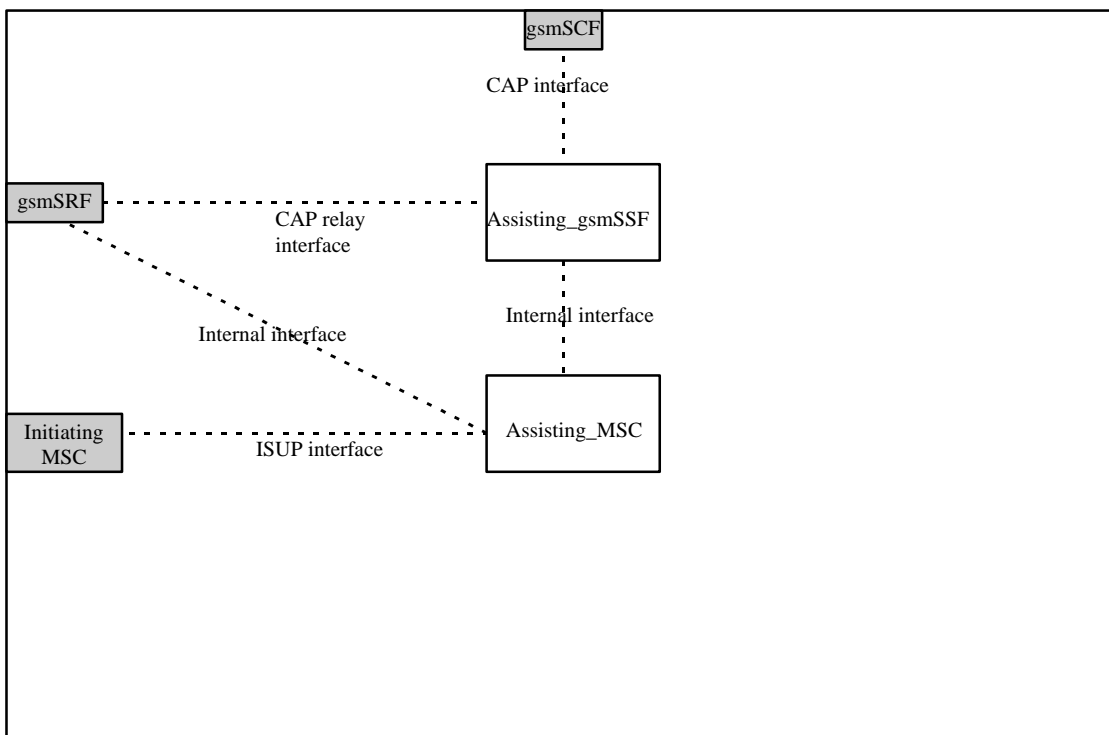
NOTE: The ICH\_MSC may also be connected via an A interface to the terminating Mobile Station.

**Figure 4.8e: Terminating VMSC case (gsmSSF relay)**



NOTE: The ICH\_MSC may also be connected via an A interface to the terminating Mobile Station

**Figure 4.8f: Terminating VMSC case (direct path gsmSCF to gsmSRF or assist with relay)**



**Figure 4.8g: Assisting case**

## 4.5.2 Handling of mobile originated calls

### 4.5.2.1 Handling of mobile originated calls in the originating MSC

The functional behaviour of the originating VMSC is specified in 3G TS 23.018 [3]. The procedures specific to CAMEL are specified in this subclause :

- Procedure CAMEL\_OCH\_MSC\_INIT,
- Procedure CAMEL\_OCH\_MSC\_ANSWER,
- Procedure CAMEL\_OCH\_MSC1,
- Procedure CAMEL\_OCH\_MSC2,
- Procedure CAMEL\_OCH\_MSC\_DISC1,
- Procedure CAMEL\_OCH\_MSC\_DISC2,
- Procedure CAMEL\_OCH\_MSC\_DISC4,
- Procedure CAMEL\_OCH\_ETC,
- Procedure CAMEL\_OCH\_CTR,
- Procedure CAMEL\_Start\_TNRy,
- Procedure CAMEL\_Stop\_TNRy.
- Procedure CAMEL\_Store\_Destination\_Address

The procedure Send\_Access\_Connect\_If\_Required is specified in 3G TS 23.018 [3].

The following paragraphs gives details on the behaviour of the MSC in the procedure CAMEL\_OCH\_MSC\_INIT, CAMEL\_OCH\_ETC, CAMEL\_OCH\_ANSWER and CAMEL\_Store\_Destination\_Address.

#### 4.5.2.1.1 Actions of the MSC on receipt of Int\_Error

The MSC checks the default Call Handling parameter in the relevant CSI.

If the default call handling is release call, a Release is sent to the MS and an Abort to the VLR. The MSC then releases all call resources and the procedure CAMEL\_OCH\_MSC\_INIT ends.

If the default call handling is continue call, the MSC continues processing without CAMEL support. It sends Send\_Info\_For\_Outgoing\_Call to the VLR and waits in state Wait\_For\_MO\_Call\_Result.

#### 4.5.2.1.2 Actions of the MSC on receipt of Int\_Continue

The MSC continues processing without any modification of call parameters. At DP\_Analysed\_Information it sends Send\_Info\_For\_Outgoing\_Call to the VLR and waits in state Wait\_For\_MO\_Call\_Result.

#### 4.5.2.1.3 Actions of the MSC on receipt of Int\_Continue\_With\_Argument

The MSC continues processing with modified call parameters. The MSC shall replace the call parameters by the information received in the Int\_Continue\_With\_Argument message. Call parameters which are not included in the Int\_Continue\_With\_Argument message are unchanged.

Signalling limitations or regulatory requirements may require the Calling Partys Category, Generic Number, Original Called Party Number and Redirecting Party ID to be ignored or modified.

#### 4.5.2.1.4 Actions of the MSC on receipt of Int\_Connect

The MSC continues processing with modified call parameters. The MSC shall transparently modify the call parameters with the received information. The MSC then sends a PROGRESS message to the MS. Call parameters which are not included in the Int\_Connect message are unchanged.

Signalling limitations or regulatory requirements may require the Calling Partys Category, Generic Number, Original Called Party Number and Redirecting Party ID to be ignored or modified.

The network signalling system shall indicate that this is an internal network number.

At DP\_Analysed\_Information the MSC sets the O-CSI suppression parameter, sends a Send Info For Outgoing Call to the VLR and waits in state Wait\_For\_MO\_Call\_Result.

#### 4.5.2.1.5 Actions of the MSC on receipt of Int\_Release\_Call

A Release is sent to the MS, an abort to the VLR and a Release is sent to the destination exchange. The release cause received in the Int\_Release\_Call is used. The MSC then releases all call resources and the procedure CAMEL\_OCH\_MSC\_INIT ends.

#### 4.5.2.1.6 Action of the MSC in procedure CAMEL\_OCH\_MSC\_ANSWER

If the MSC received a destination address from the GMSC in the ISUP Answer or Connect message, the MSC relays the destination address to the gsmSSF in the Int\_DP\_O\_Answer message.

NOTE: The sending of e-parameters by the gsmSCF after receiving the DP\_O\_Answer indication may be to late.

#### 4.5.2.1.7 Action of the MSC in procedure CAMEL\_OCH\_ETC

In procedure CAMEL\_OCH\_ETC (sheet 2) the MSC will remain in the Wait\_For\_Assisting\_Answer state until it receives an ISUP Answer Message (ANM) or timeout occurs. This is to ensure that a call record is always generated for every successful establishment of a temporary connection to a gsmSRF, especially in the case where the connection is between PLMNs.

NOTE: This means that it may not be possible to access an SRF which does not generate an ISUP Answer Message (ANM).

If a Progress message is sent towards the MS the progress indicator shall indicate "In Band Information".



4.5.2.1.8 Action of the MSC in procedure CAMEL\_Store\_Destination\_Address

The Int\_Store\_DA message carries the value of the global variable Destination address and the parameters OR and Forwarding received in the procedure call.

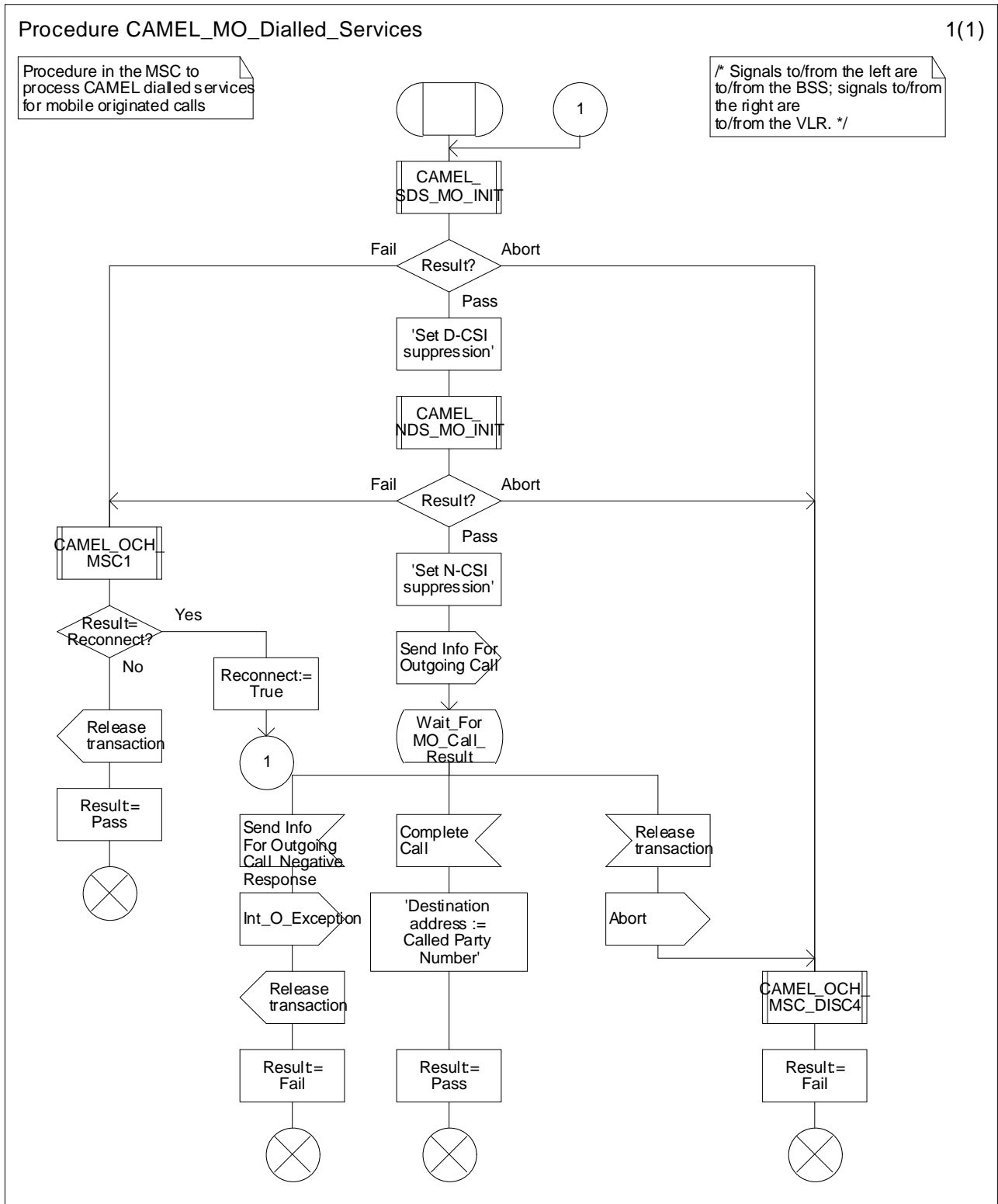


Figure 4.9a: Procedure CAMEL\_MO\_Dialled\_Services (sheet 1)

Procedure CAMEL\_OCH\_MSC\_INIT

1(4)

/\* Procedure in the MSC to perform CAMEL handling for an outgoing call request \*/

/\* Signals to/from the right are to/from the gsmSSF. \*/

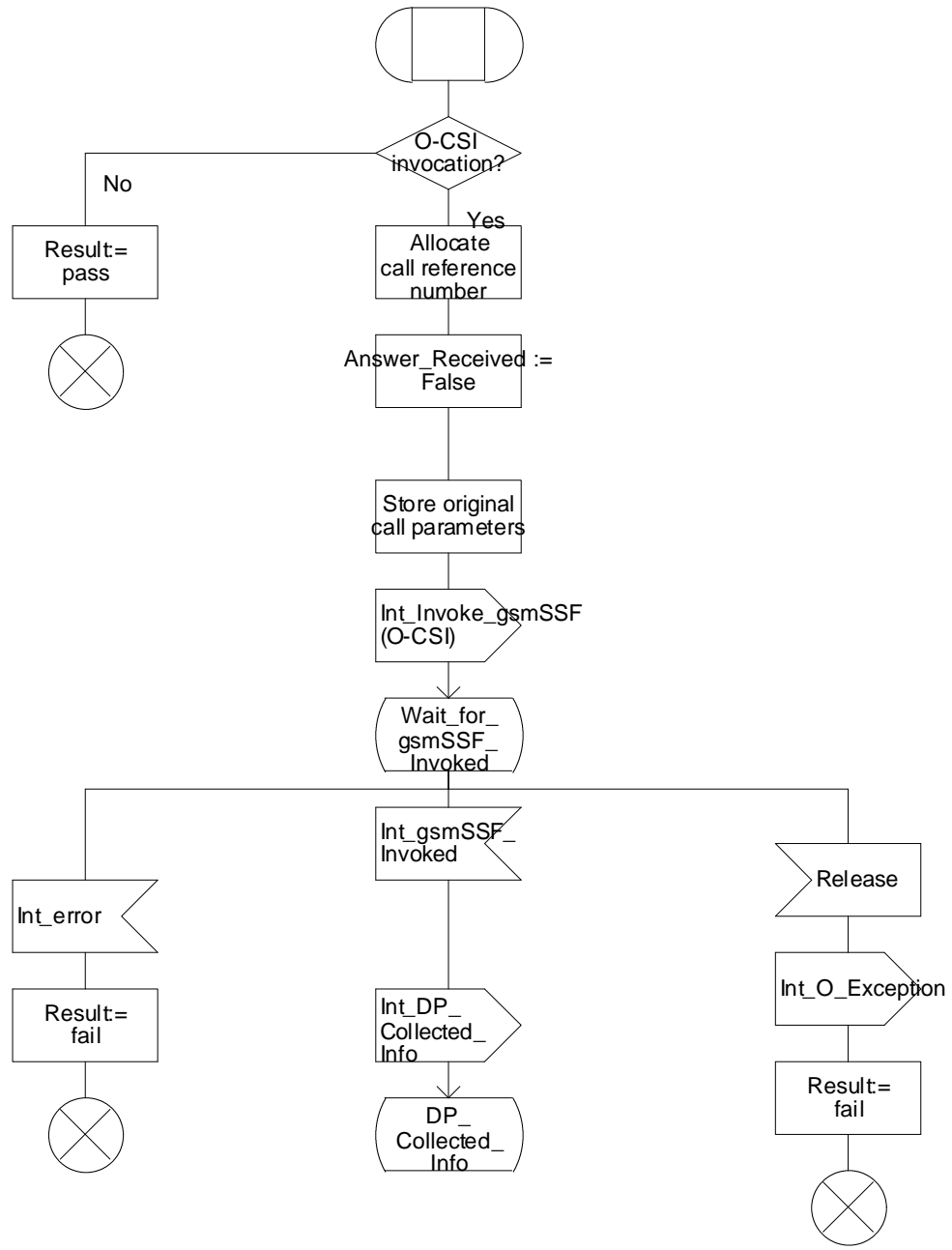


Figure 4.10a: Procedure CAMEL\_OCH\_MSC\_INIT (sheet 1)

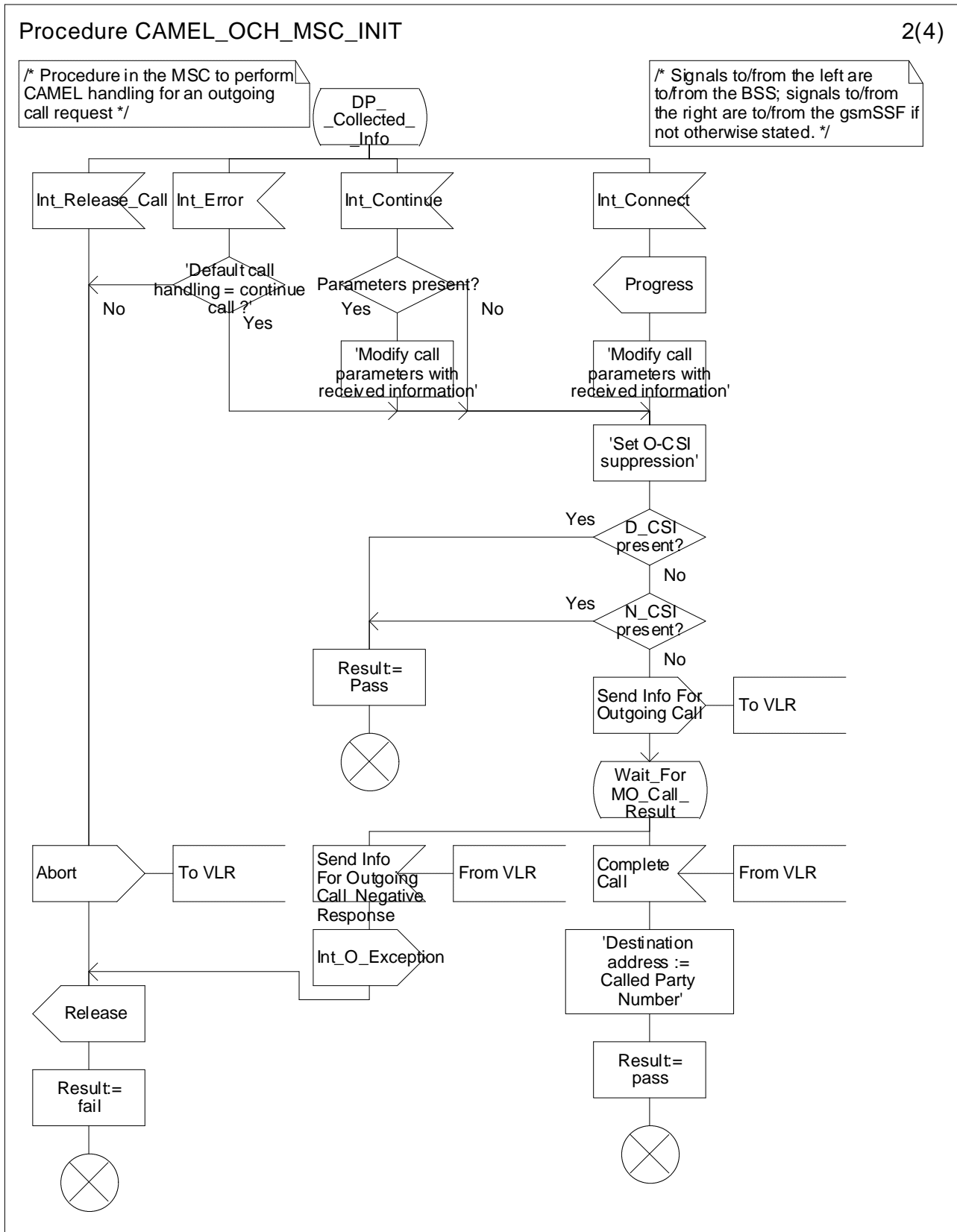


Figure 4.10b: Procedure CAMEL\_OCH\_MSC\_INIT (sheet 2)

Procedure CAMEL\_OCH\_MSC\_INIT

3(4)

/\* Procedure in the MSC to perform CAMEL handling for an outgoing call request \*/

/\* Signals to/from the right are to/from the gsmSSF if not otherwise stated. \*/

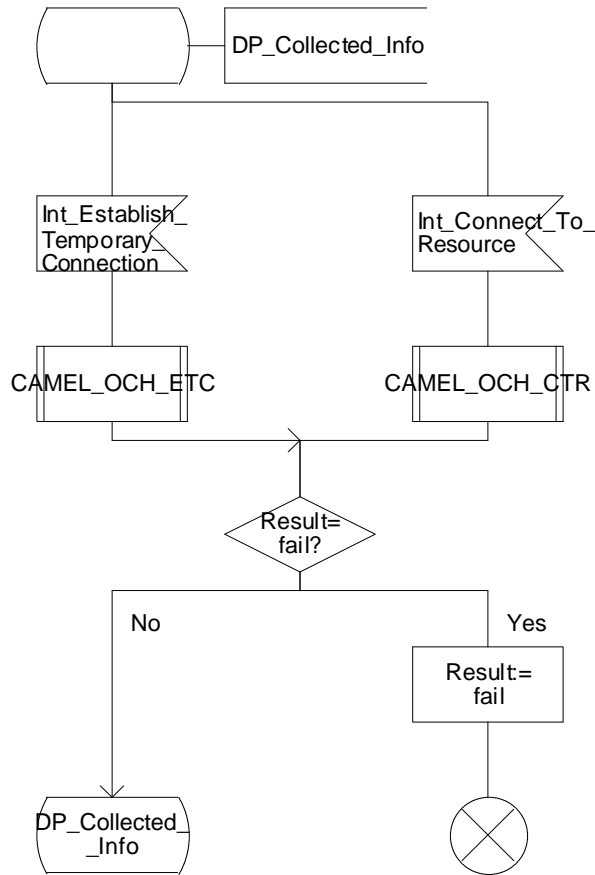


Figure 4.10d: Procedure CAMEL\_OCH\_MSC\_INIT (sheet 3)

### Procedure CAMEL\_OCH\_MSC\_INIT

4(4)

/\* Procedure in the MSC to perform CAMEL handling for an outgoing call request \*/

/\* Signals to/from the left are to/from the BSS; signals to/from the right are to/from the gsmSSF. \*/

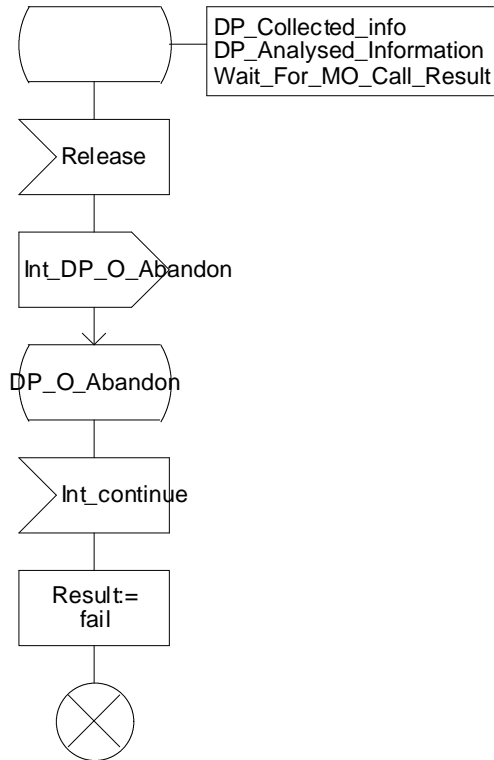


Figure 4.10e: Procedure CAMEL\_OCH\_MSC\_INIT (sheet 4)

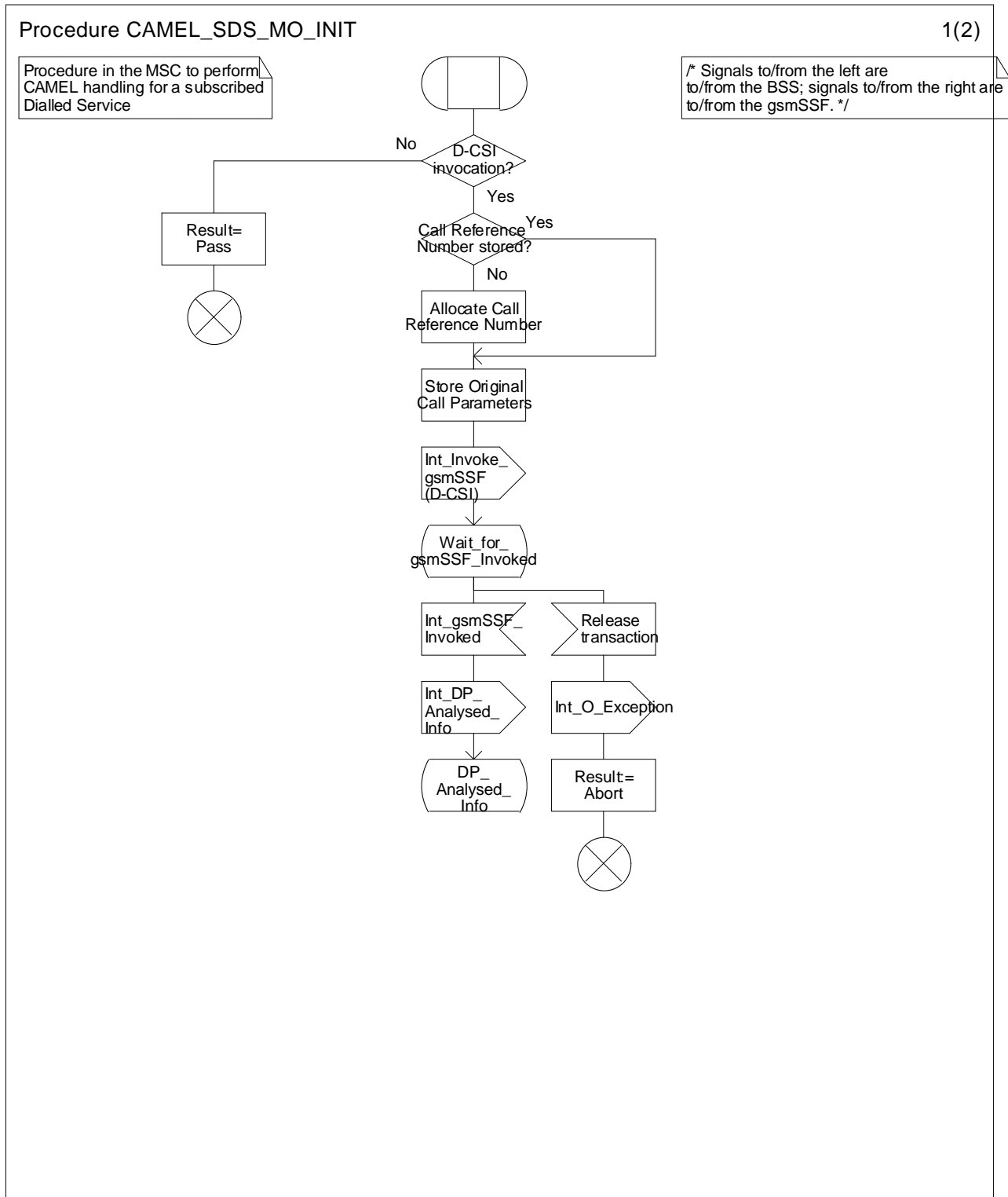


Figure 4.11a: Procedure CAMEL\_SDS\_MO\_Init (sheet 1)

Procedure CAMEL\_SDS\_MO\_INIT

2(2)

Procedure in the MSC to perform CAMEL handling for a subscribed Dialed Service

\* Signals to/from the left are to/from the BSS; signals to/from the right are to/from the gsmSSF. \*/

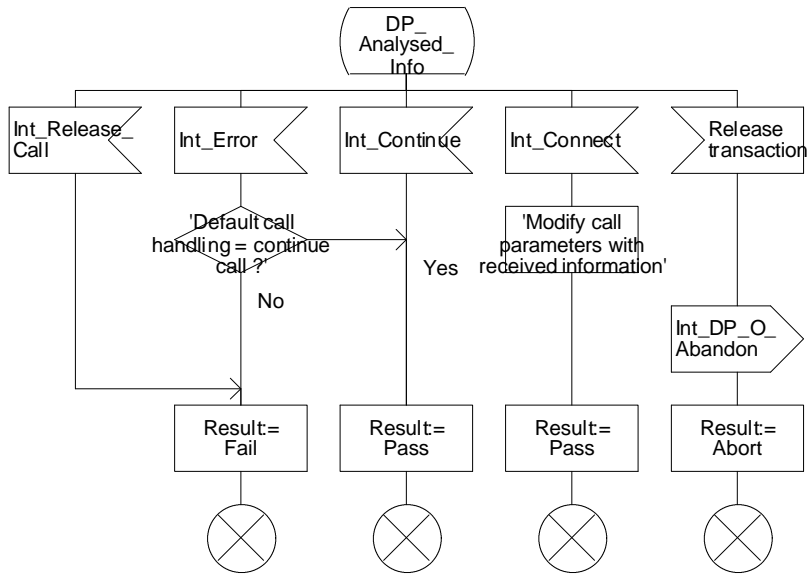


Figure 4.11b: Procedure CAMEL\_SDS\_MO\_INIT (sheet 2)

Procedure CAMEL\_NDS\_MO\_INIT

1(2)

Procedure in the MSC to perform CAMEL handling for a network Dialed Service for mobile originated calls

/\* Signals to/from the right are to/from the gsmSSF. \*/

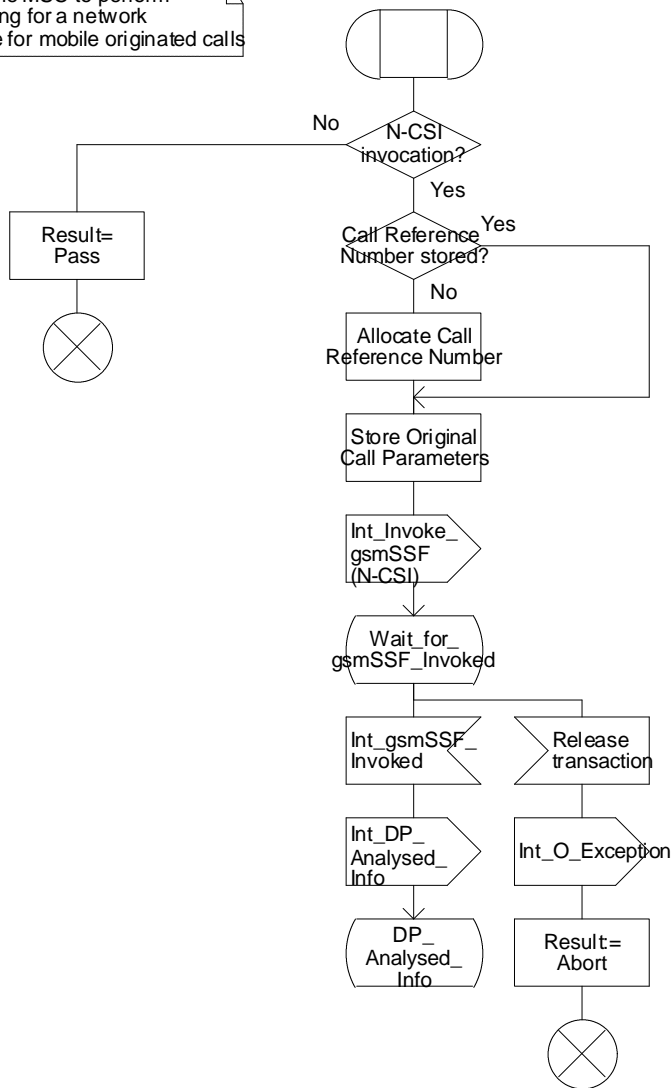


Figure 4.12a: Procedure CAMEL\_NDS\_MO\_INIT (sheet 1)



Procedure CAMEL\_NDS\_MO\_INIT

2(2)

Procedure in the MSC to perform CAMEL handling for a network Dialed Service for mobile originated calls

/\* Signals to/from the right are to/from the gsmSSF if not otherwise stated. \*/

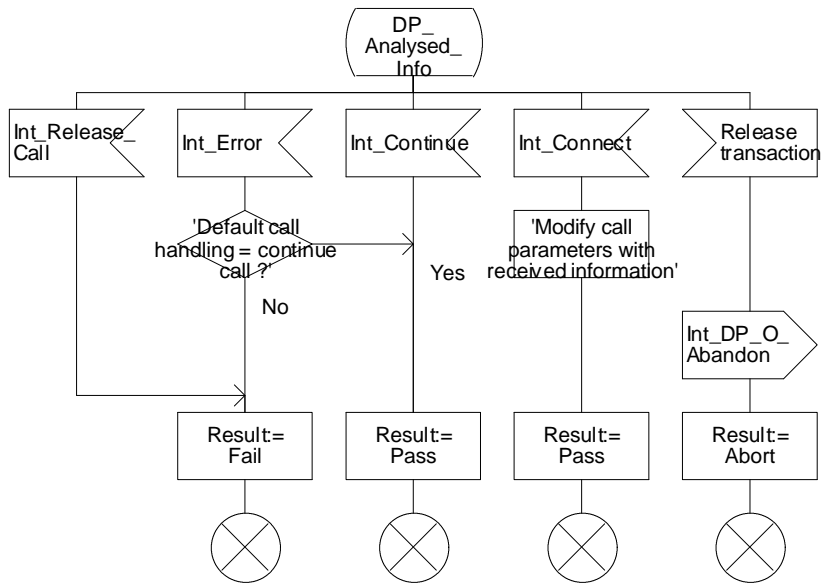


Figure 4.12b: Procedure CAMEL\_NDS\_MO\_INIT (sheet 2)

Procedure CAMEL\_OCH\_MSC\_ANSWER

1(1)

/\* Procedure in the MSC to handle an outgoing call \*/

/\* Signals to/from the left are to/from the BSS; signals to/from the right are to/from the gsmSSF if not otherwise stated. \*/

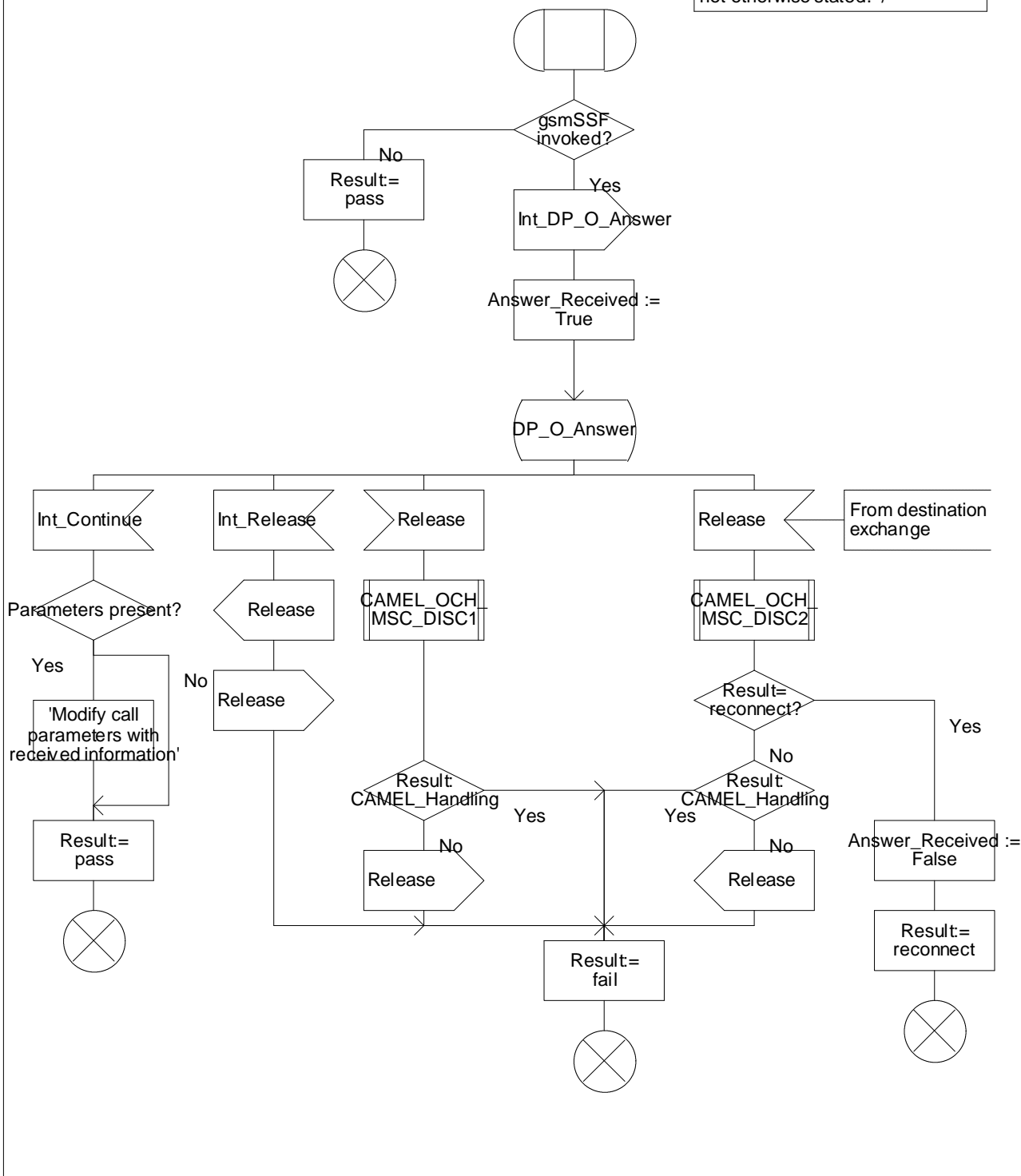


Figure 4.13a: Procedure CAMEL\_OCH\_MSC\_ANSWER (sheet 1)

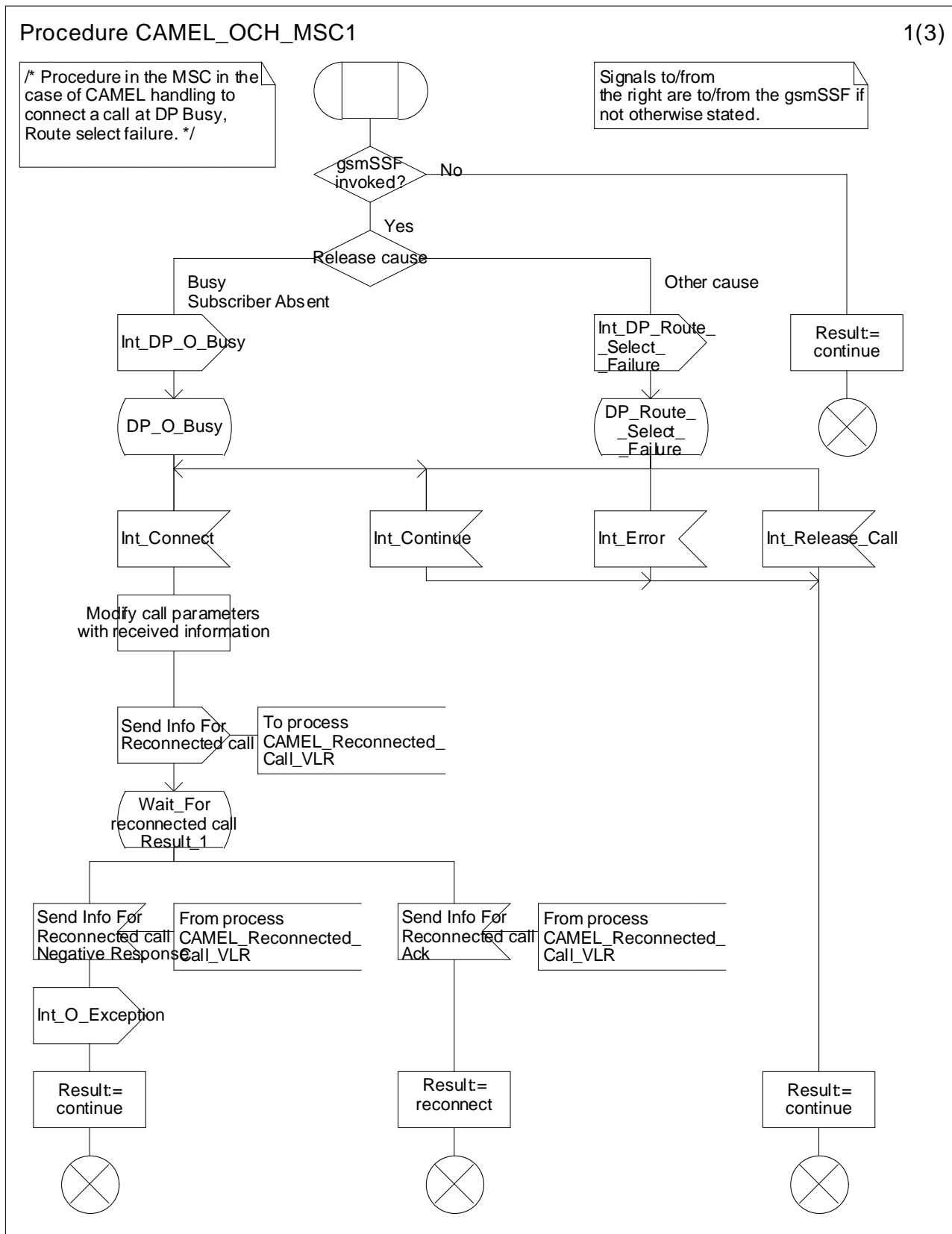
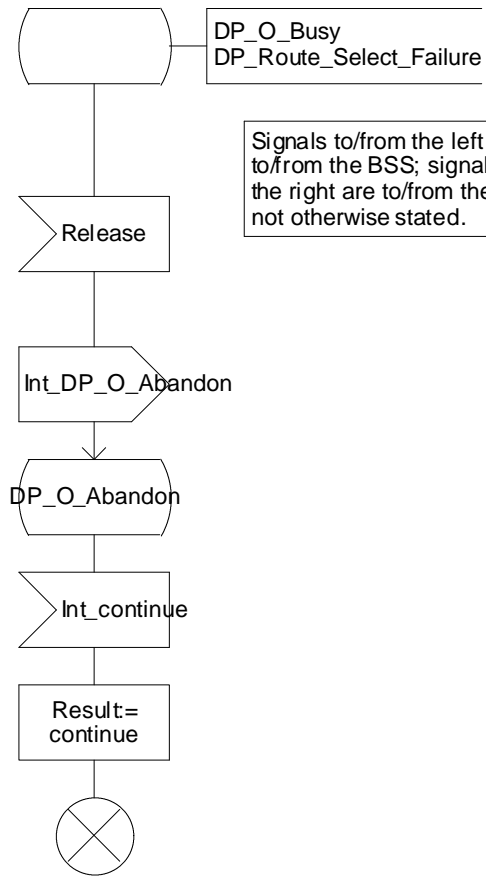


Figure 4.14a: Procedure CAMEL\_OCH\_MSC1 (sheet 1)

Procedure CAMEL\_OCH\_MSC1

2(3)

\* Procedure in the MSC in the case of CAMEL handling to connect a call at DP Busy, Route select failure. \*/



Signals to/from the left are to/from the BSS; signals to/from the right are to/from the gsmSSF if not otherwise stated.

Figure 4.14b: Procedure CAMEL\_OCH\_MSC1 (sheet 2)

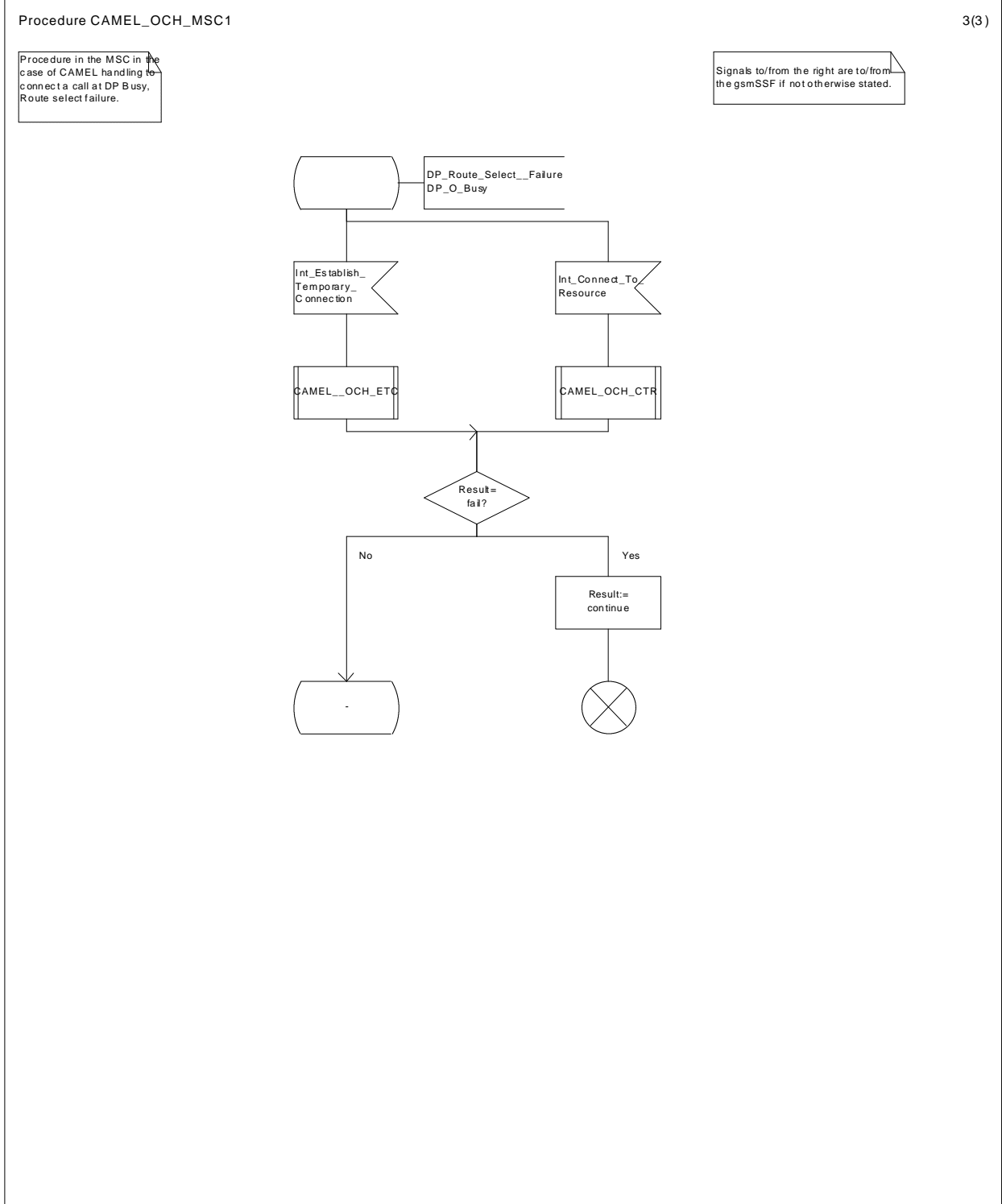


Figure 4.14c: Procedure CAMEL\_OCH\_MSC1 (sheet 3)

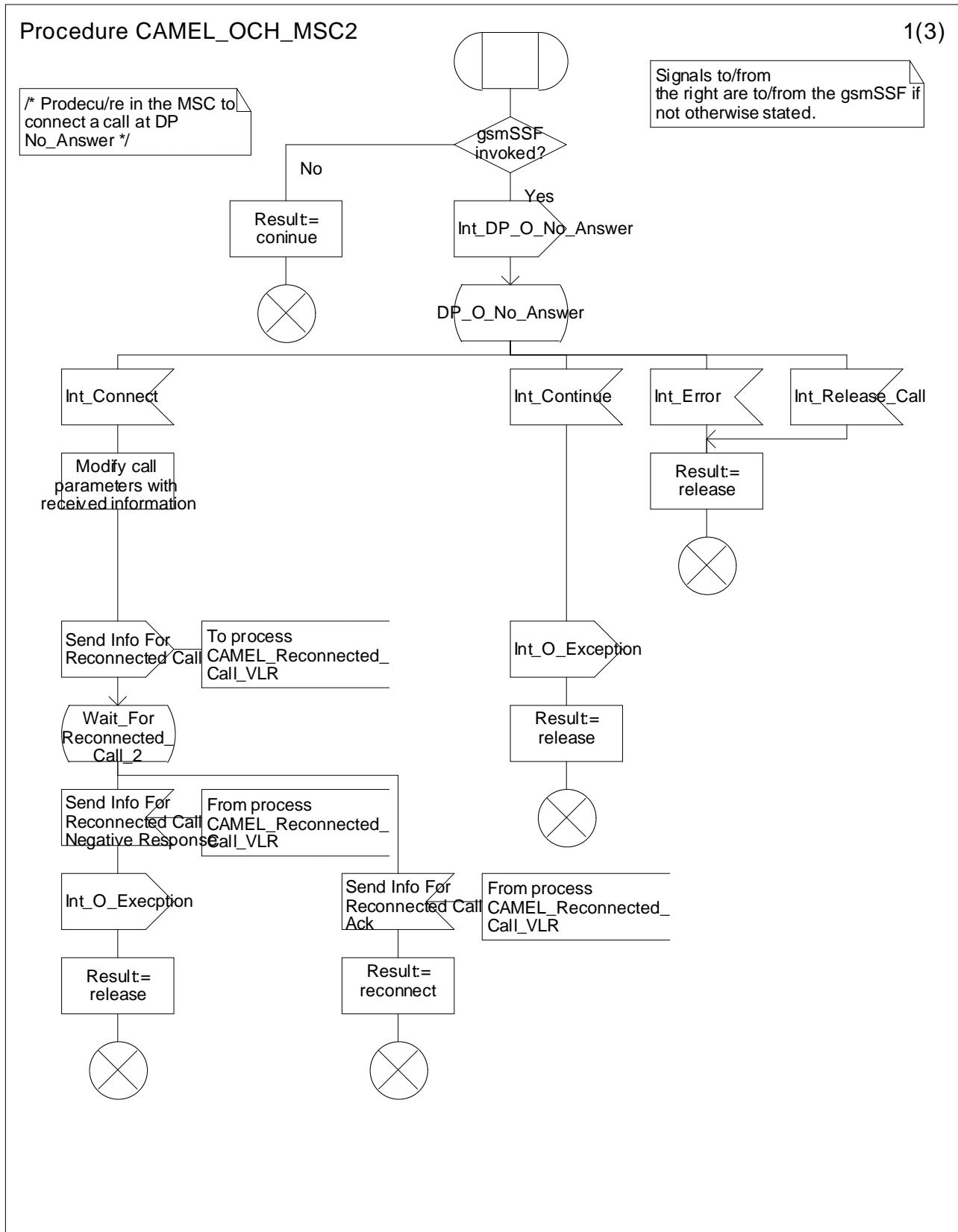


Figure 4.15a: Procedure CAMEL\_OCH\_MSC2 (sheet 1)

Procedure CAMEL\_OCH\_MSC2

2(3)

/\* Prodecu/re in the MSC to connect a call at DP No\_Answer \*/

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the gsmSSF if not otherwise stated.

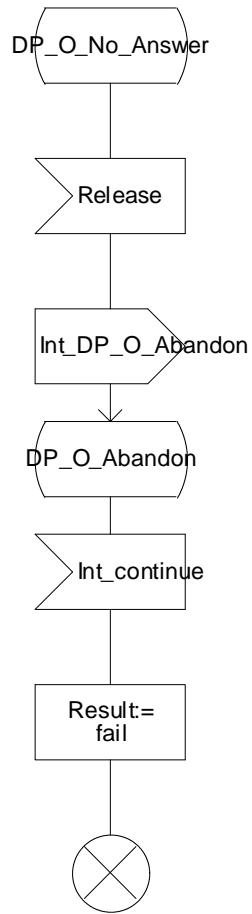


Figure 4.15b: Procedure CAMEL\_OCH\_MSC2 (sheet 2)

Procedure CAMEL\_OCH\_MSC2

3(3)

Prodecure in the MSC to connect a call at DP No\_Answer

Signals to/from the right are to/from the gsmSSF if not otherwise stated.

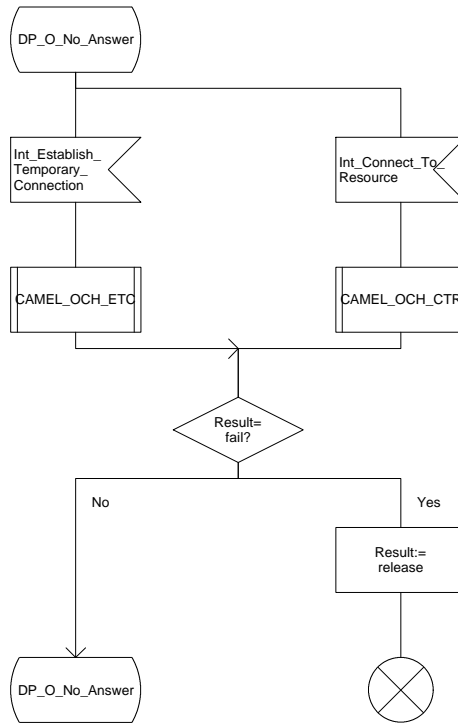


Figure 4.15c: Procedure CAMEL\_OCH\_MSC2 (sheet 3)



Procedure CAMEL\_OCH\_MSC\_DISC1

1(1)

/\* Procedure in the MSC perform handling for a call release \*/

/\* Signals to/from the right are to/from the gsmSSF if not otherwise stated. \*/

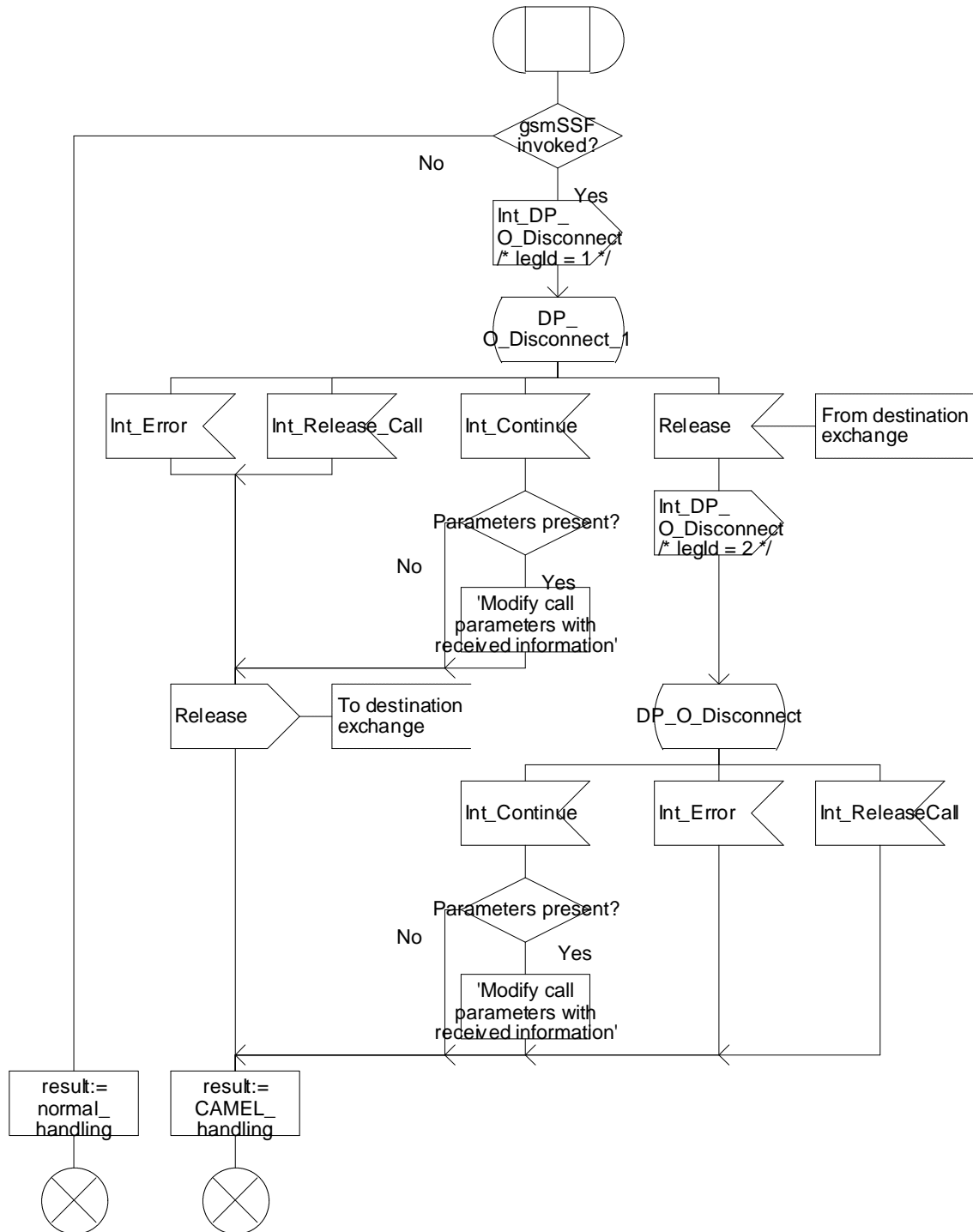


Figure 4.16a: Procedure CAMEL\_OCH\_MSC\_DISC1 (sheet 1)

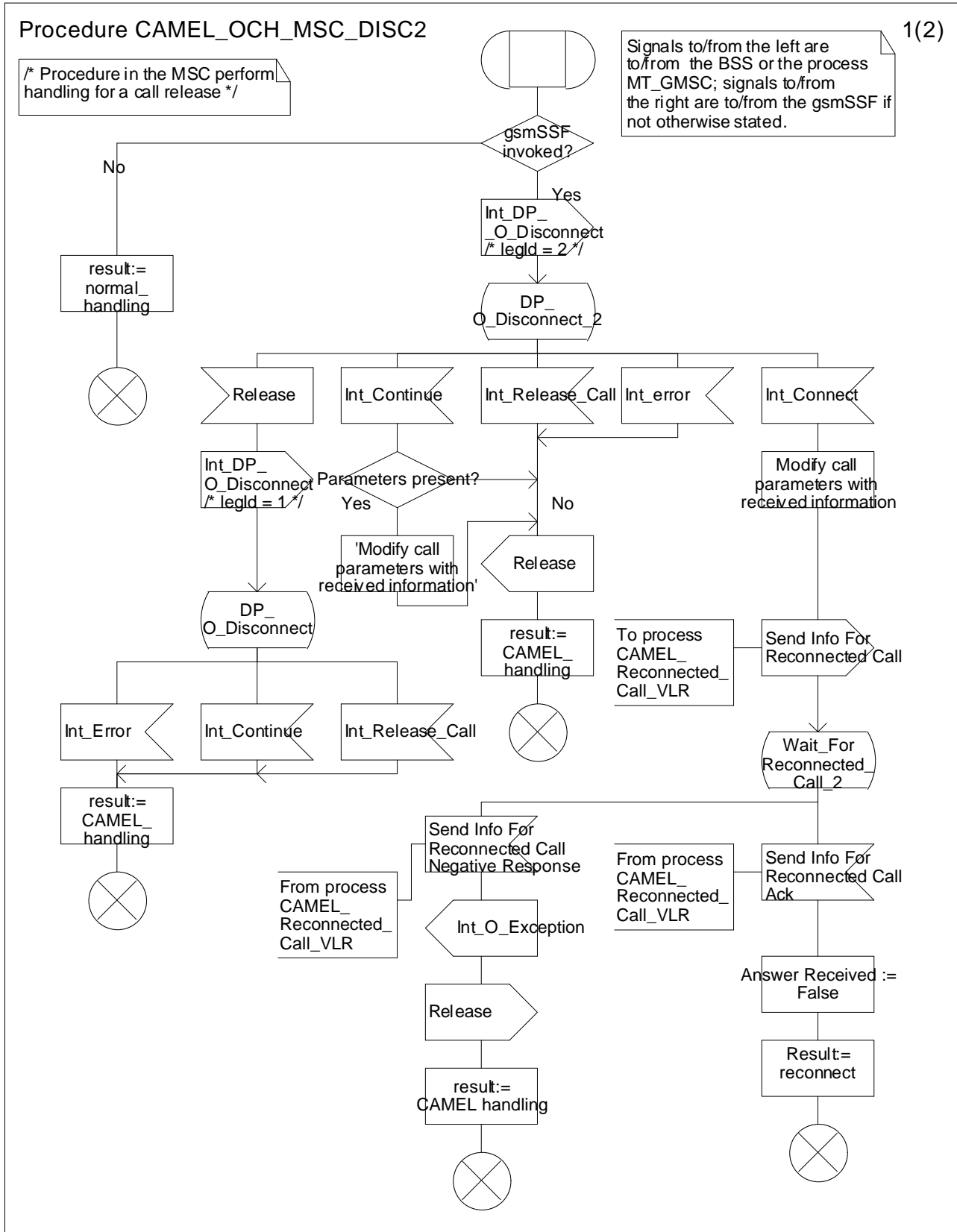


Figure 4.17a: Procedure CAMEL\_OCH\_MSC\_DISC2 (sheet 1)

Procedure CAMEL\_OCH\_MSC\_DISC2

2(2)

Procedure in the MSC performing for a call release

Signals to/from the right are to/from the gsmSSF if not otherwise stated.

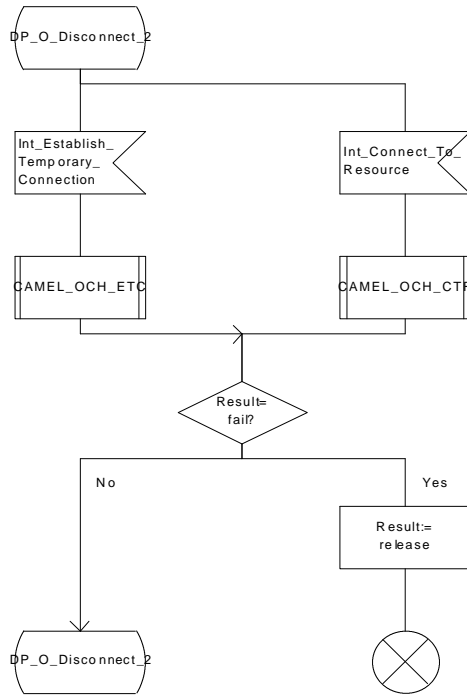


Figure 4.17b: Procedure CAMEL\_OCH\_MSC\_DISC2 (sheet 2)

Procedure CAMEL\_OCH\_MSC\_DISC4

1(1)

*\* Procedure in the MSC perform CAMEL handling for a call release \**

*\* Signals to the right are to the gsmSSF \**

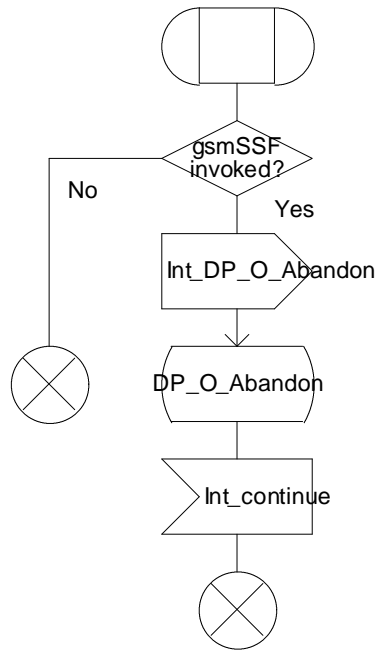


Figure 4.18a: Procedure CAMEL\_OCH\_MSC\_DISC4 (sheet 1)

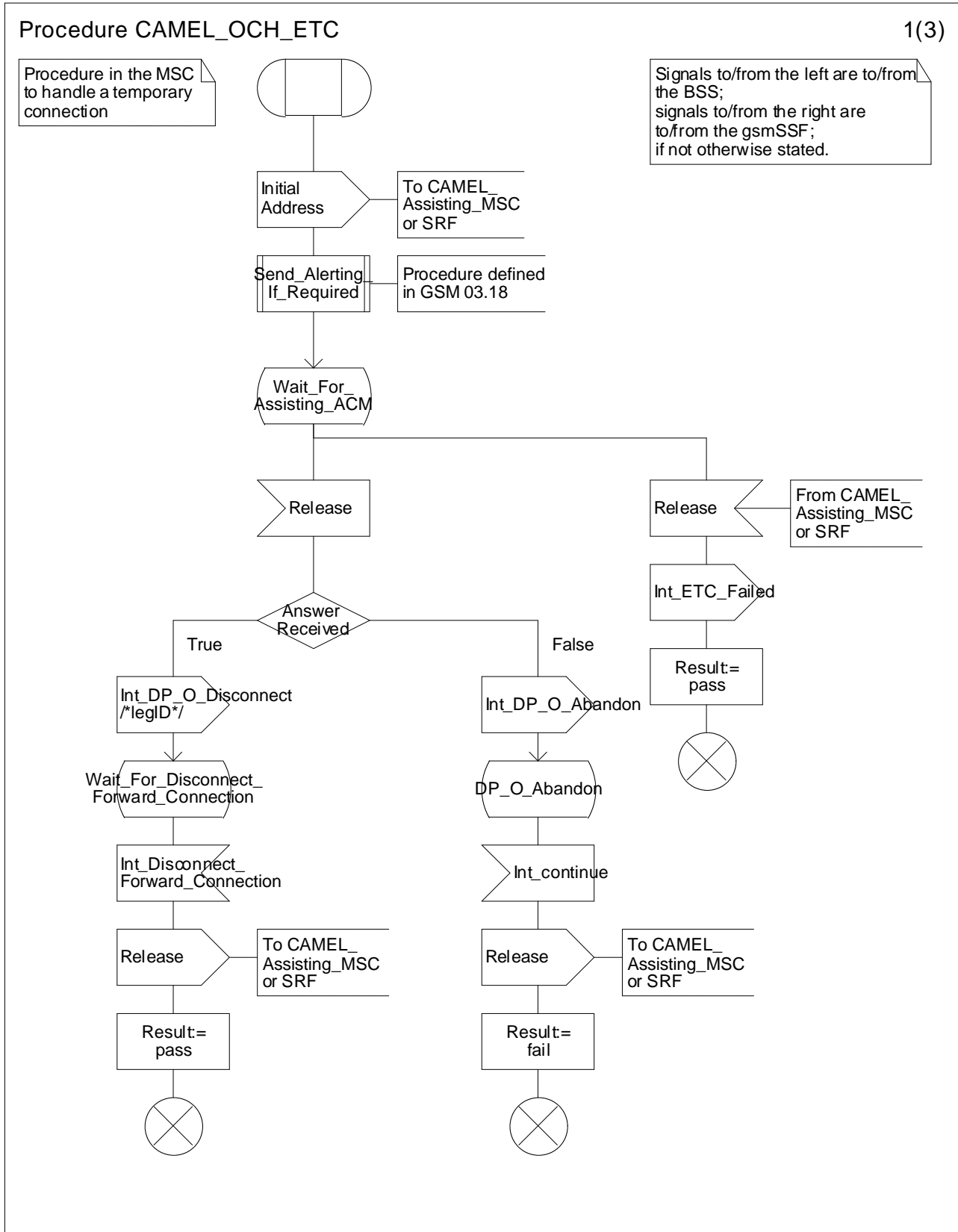


Figure 4.19a: Procedure CAMEL\_OCH\_ETC (sheet 1)

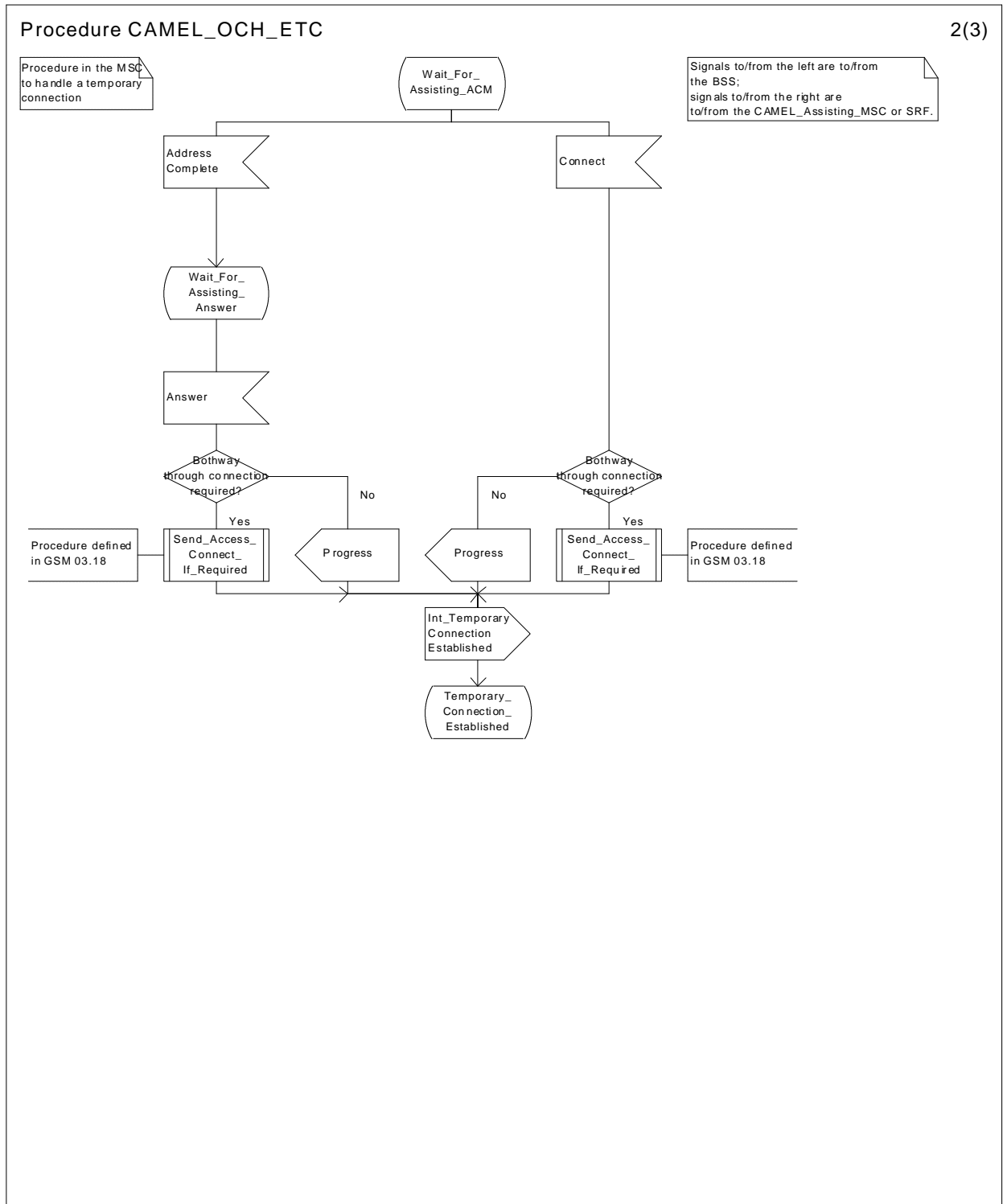


Figure 4.19b: Procedure CAMEL\_OCH\_ETC (sheet 2)

### Procedure CAMEL\_OCH\_ETC

3(3)

Procedure in the MSC to handle a temporary connection

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the gsmSSF; if not otherwise stated.

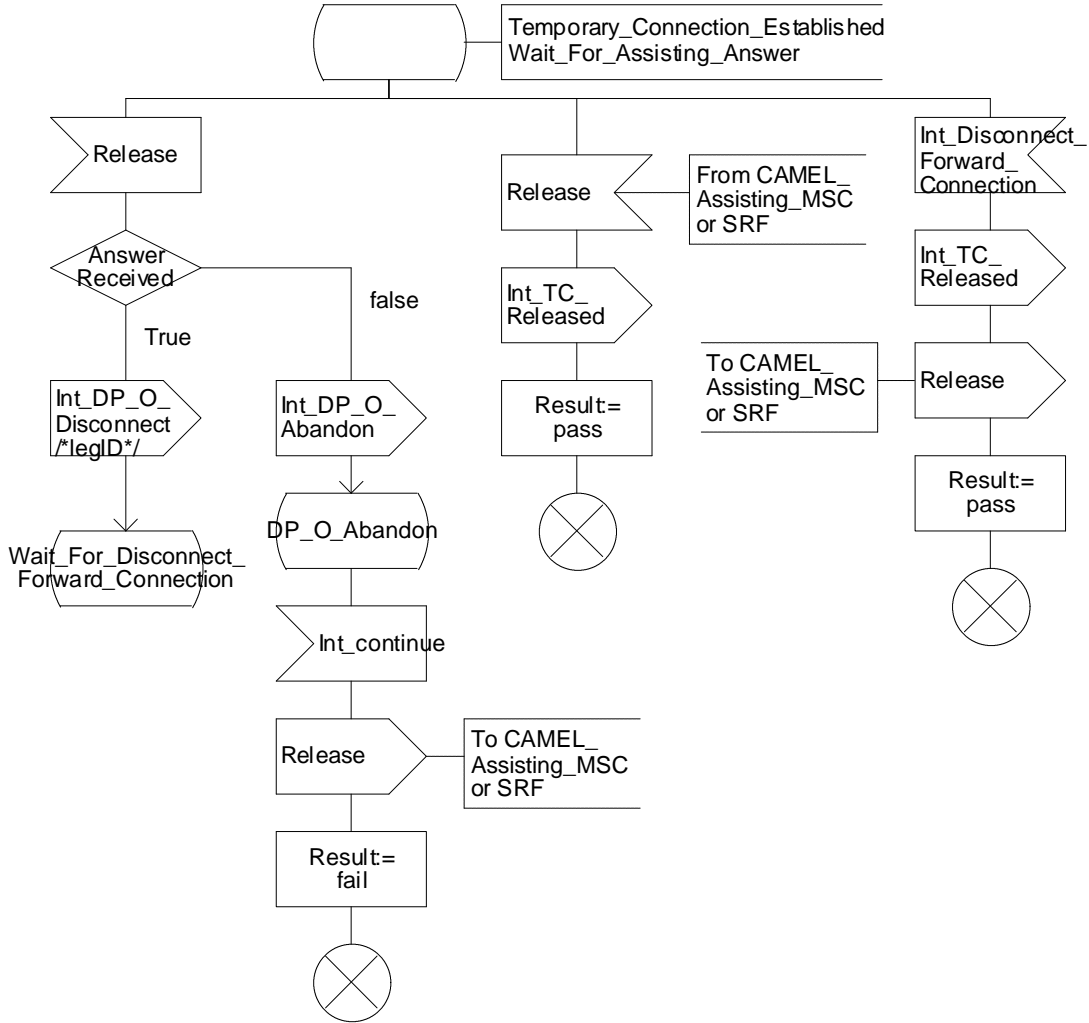


Figure 4.19c: Procedure CAMEL\_OCH\_ETC (sheet 3)

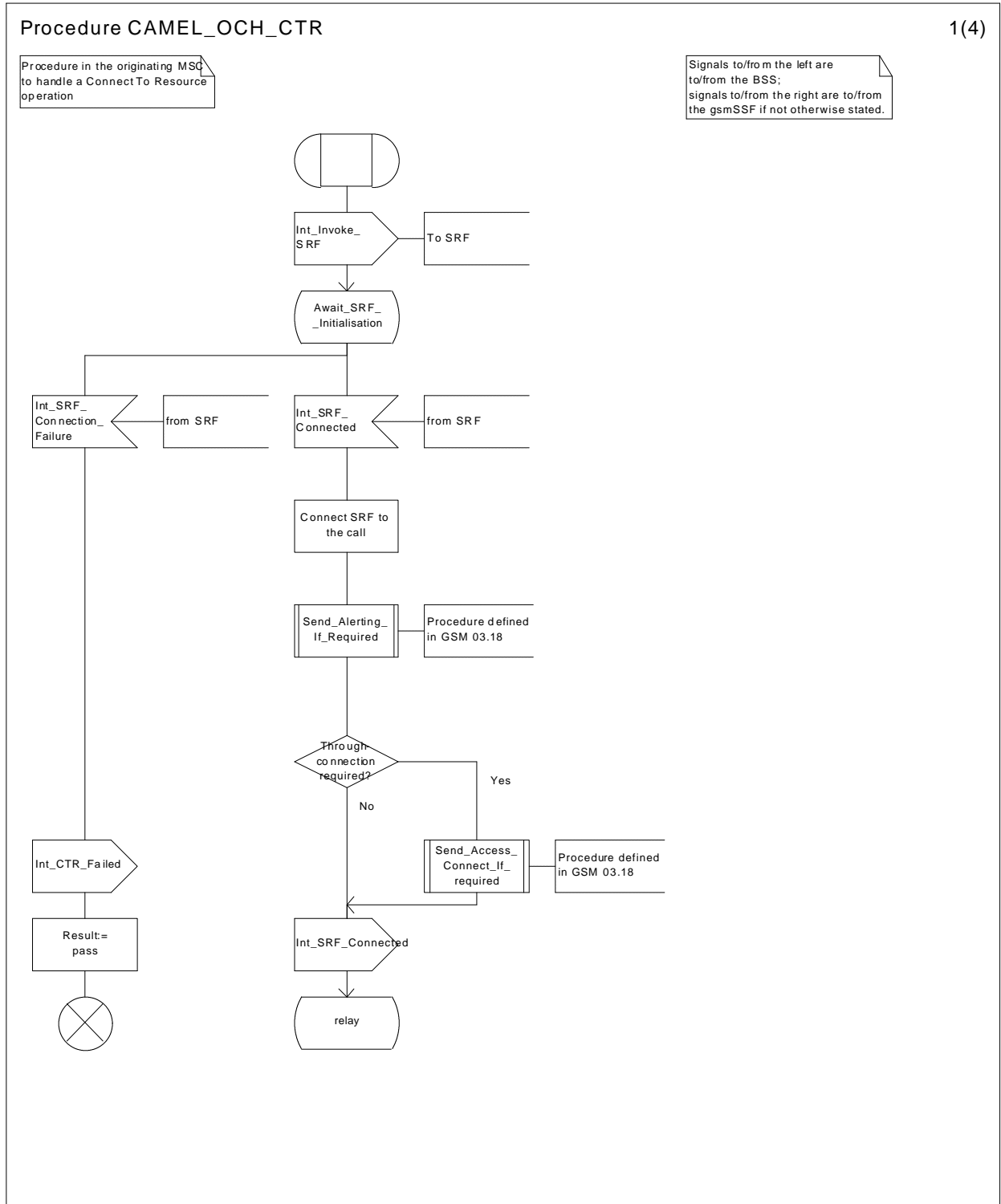


Figure 4.20a: Procedure CAMEL\_OCH\_CTR (sheet 1)



Procedure CAMEL\_OCH\_CTR

2(4)

Procedure in the originating MSC to handle a Connect To Resource operation

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the gsmSSF if not otherwise stated.

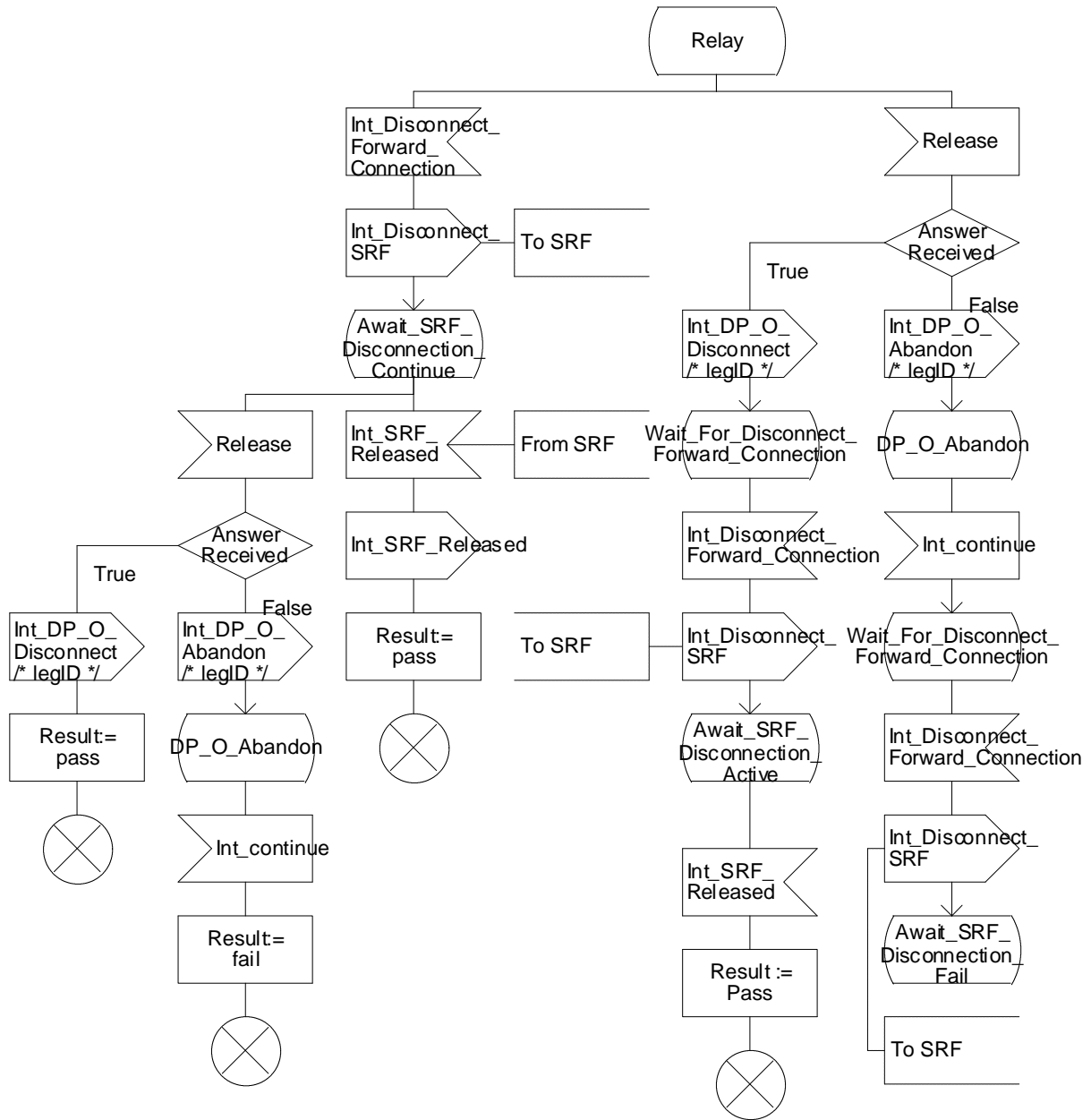


Figure 4.20b: Procedure CAMEL\_OCH\_CTR (sheet 2)

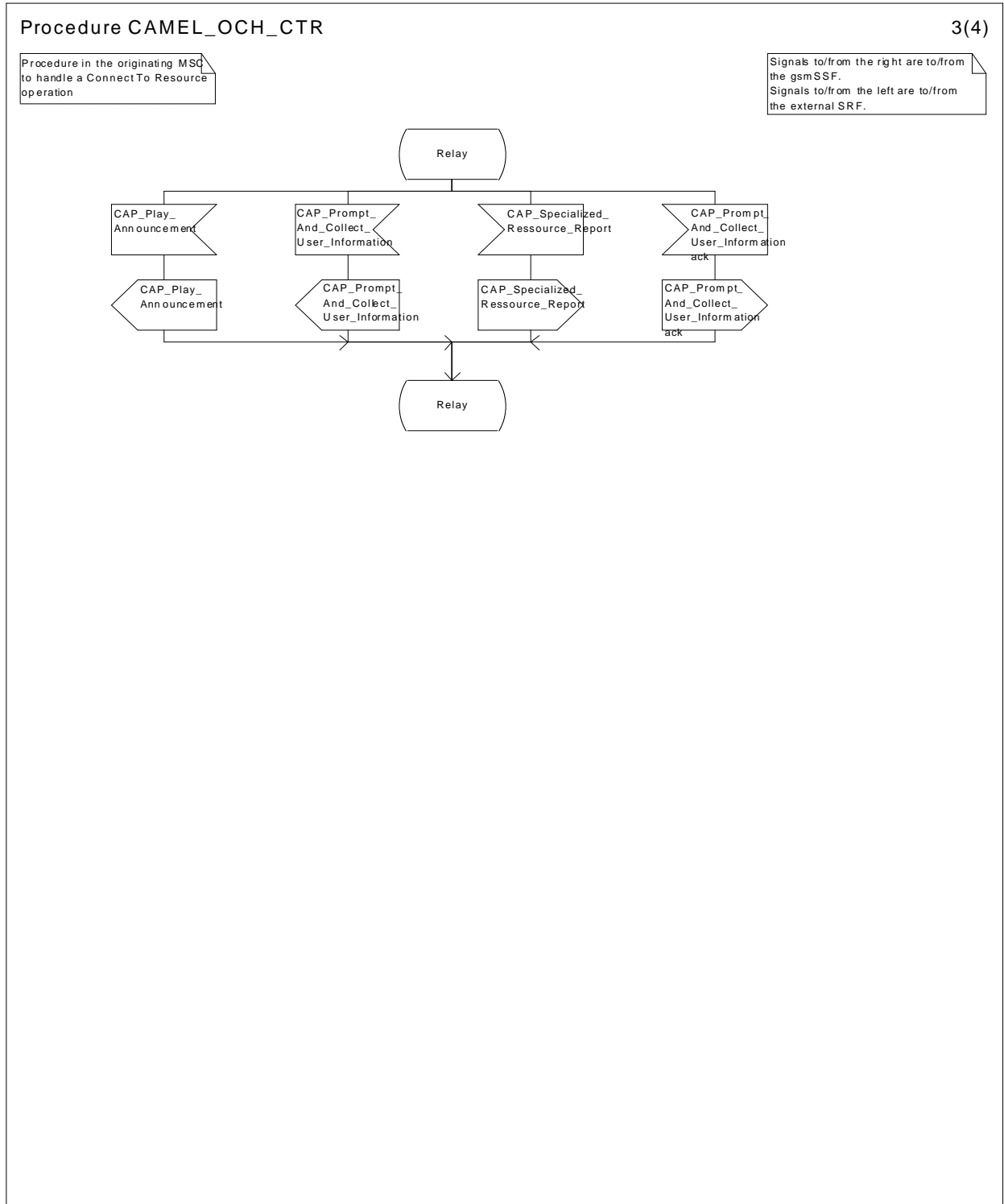


Figure 4.20c: Procedure CAMEL\_OCH\_CTR (sheet 3)

Procedure CAMEL\_OCH\_CTR

4(4)

Procedure in the originating MSC to handle a Connect To Resource operation

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the gsmSSF if not otherwise stated.

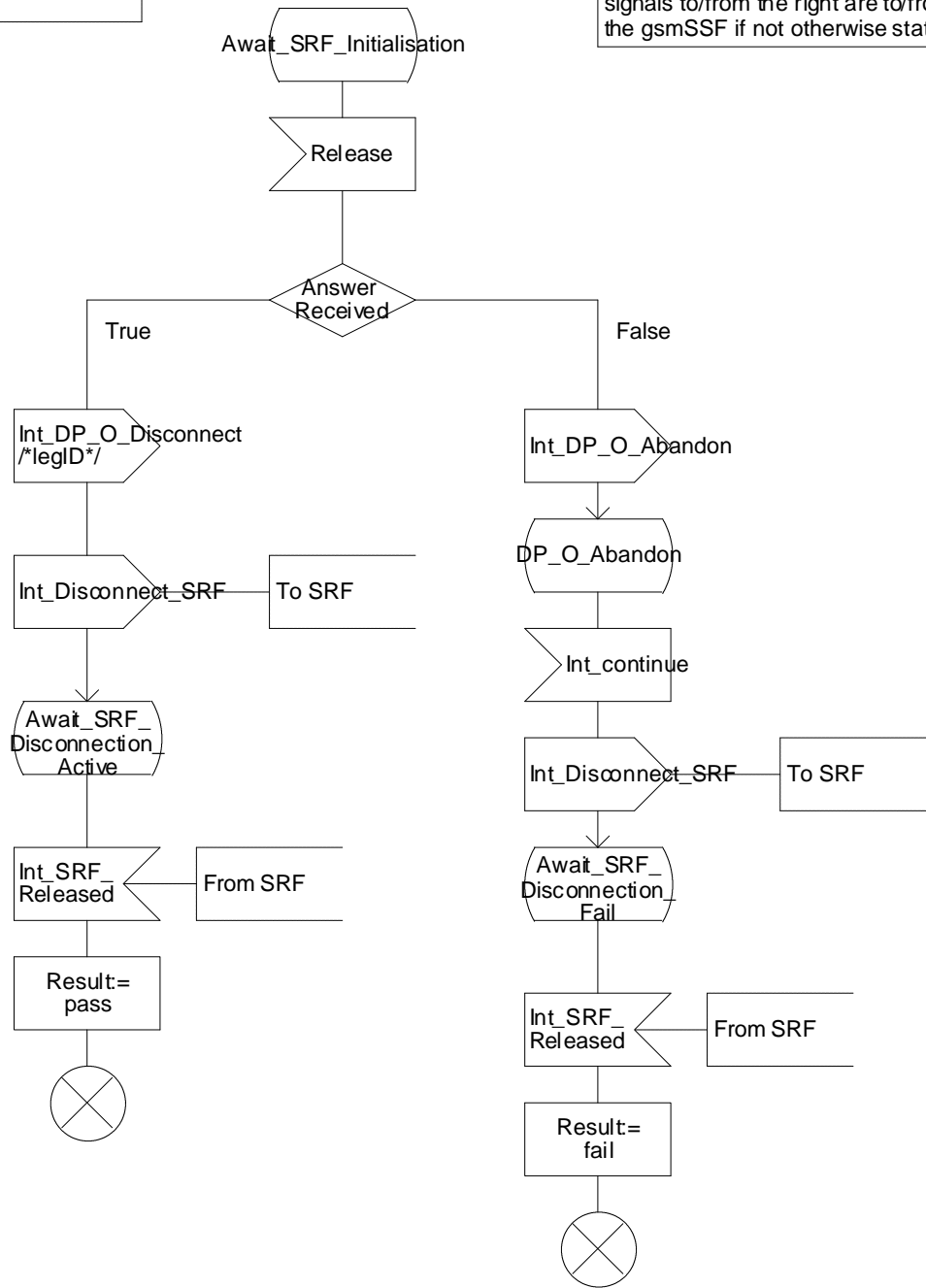


Figure 4.20d: Procedure CAMEL\_OCH\_CTR (sheet 4)

Procedure CAMEL\_Start\_TNRy

1(1)

Procedure in MSC to start the timer TNRy

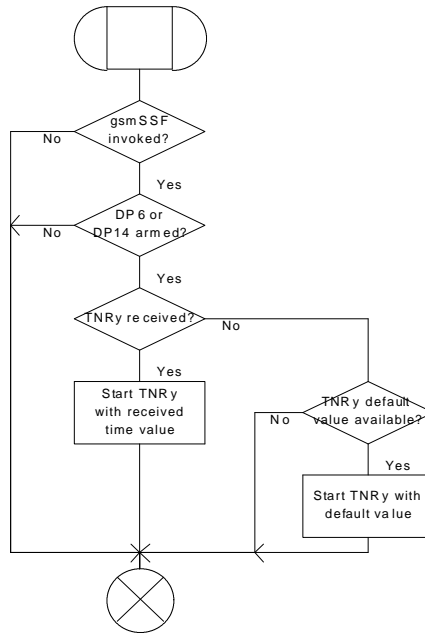


Figure 4.21a: Procedure CAMEL\_Start\_TNRy (sheet 1)

Procedure CAMEL\_Stop\_TNRy

1(1)

Procedure in the MSC to stop the timer TNRy

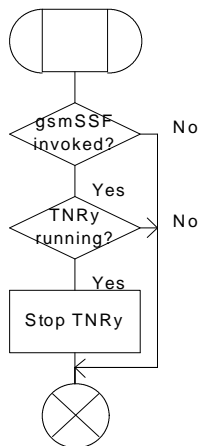
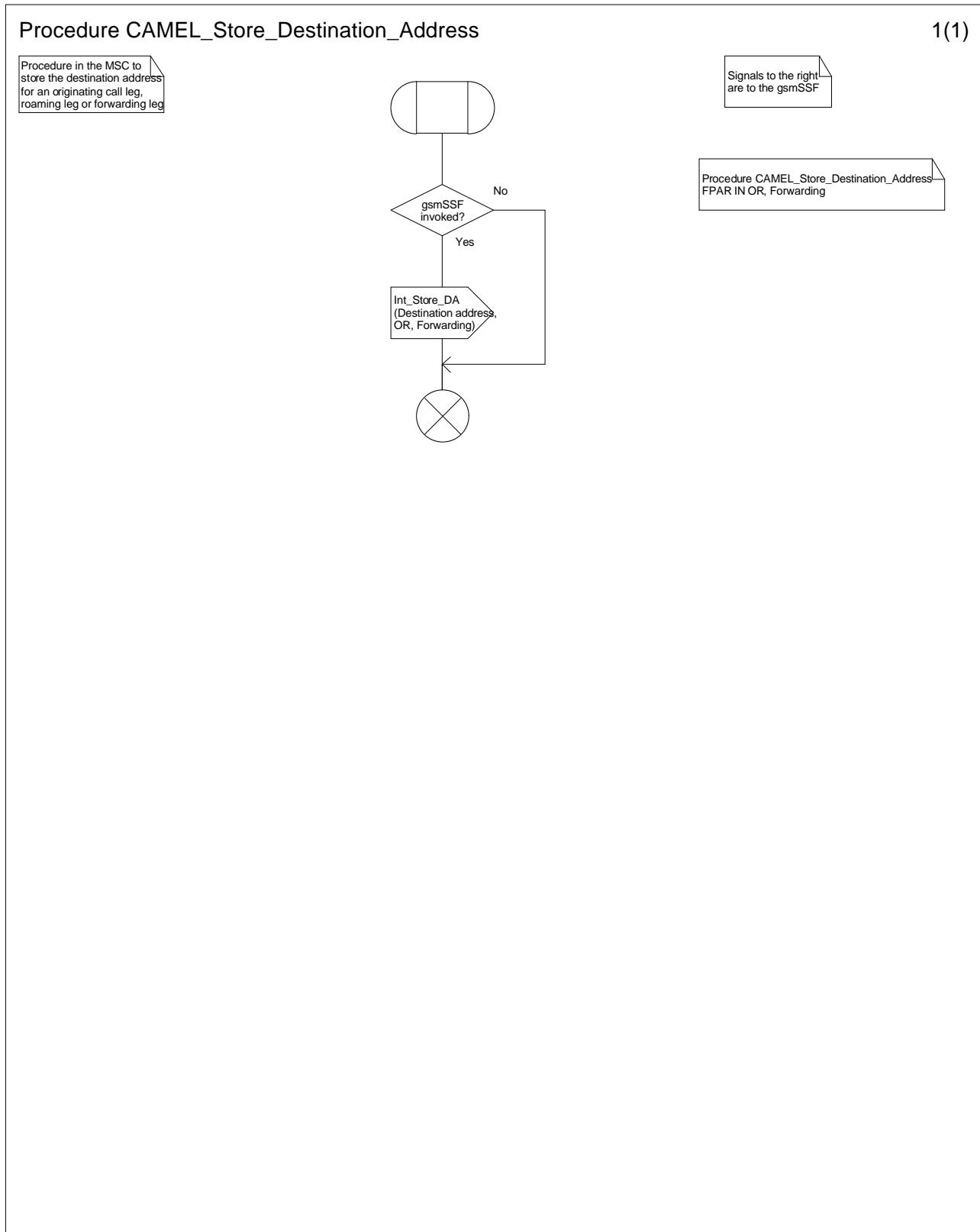


Figure 4.22a: Procedure CAMEL\_Stop\_TNRy (sheet 1)



**Figure 4.23a: Procedure CAMEL\_Store\_Destination\_Address (sheet 1)**

#### 4.5.2.2 Handling of mobile originating calls in the originating VLR

The functional behaviour of the originating VLR is specified in 3G TS 23.018 [3]. The procedure specific to CAMEL are specified in this subclause :

- Procedure CAMEL\_OCH\_VLR

- Process CAMEL\_Reconnected\_Call\_VLR

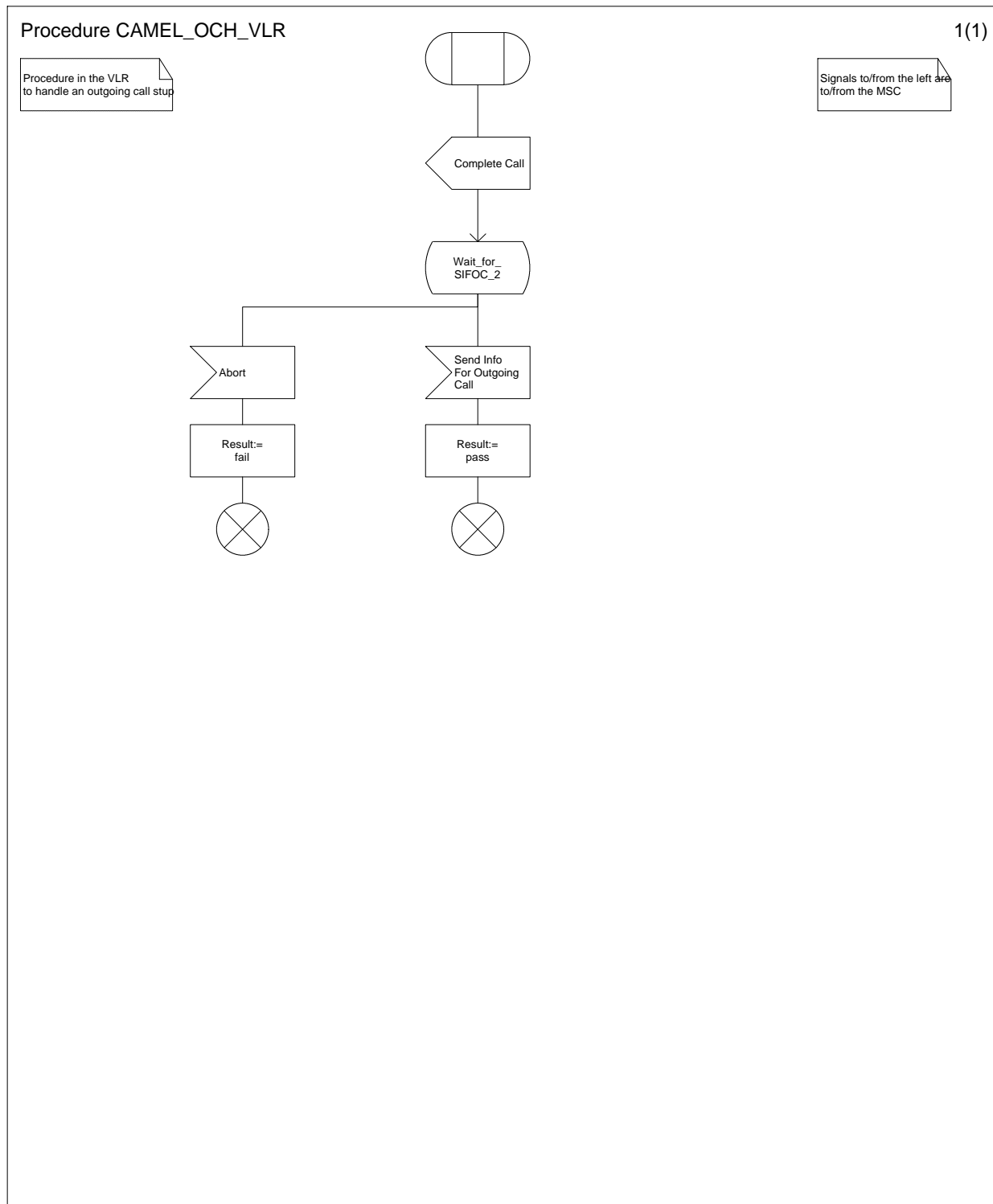


Figure 4.24a: Procedure CAMEL\_OCH\_VLR (sheet 1)

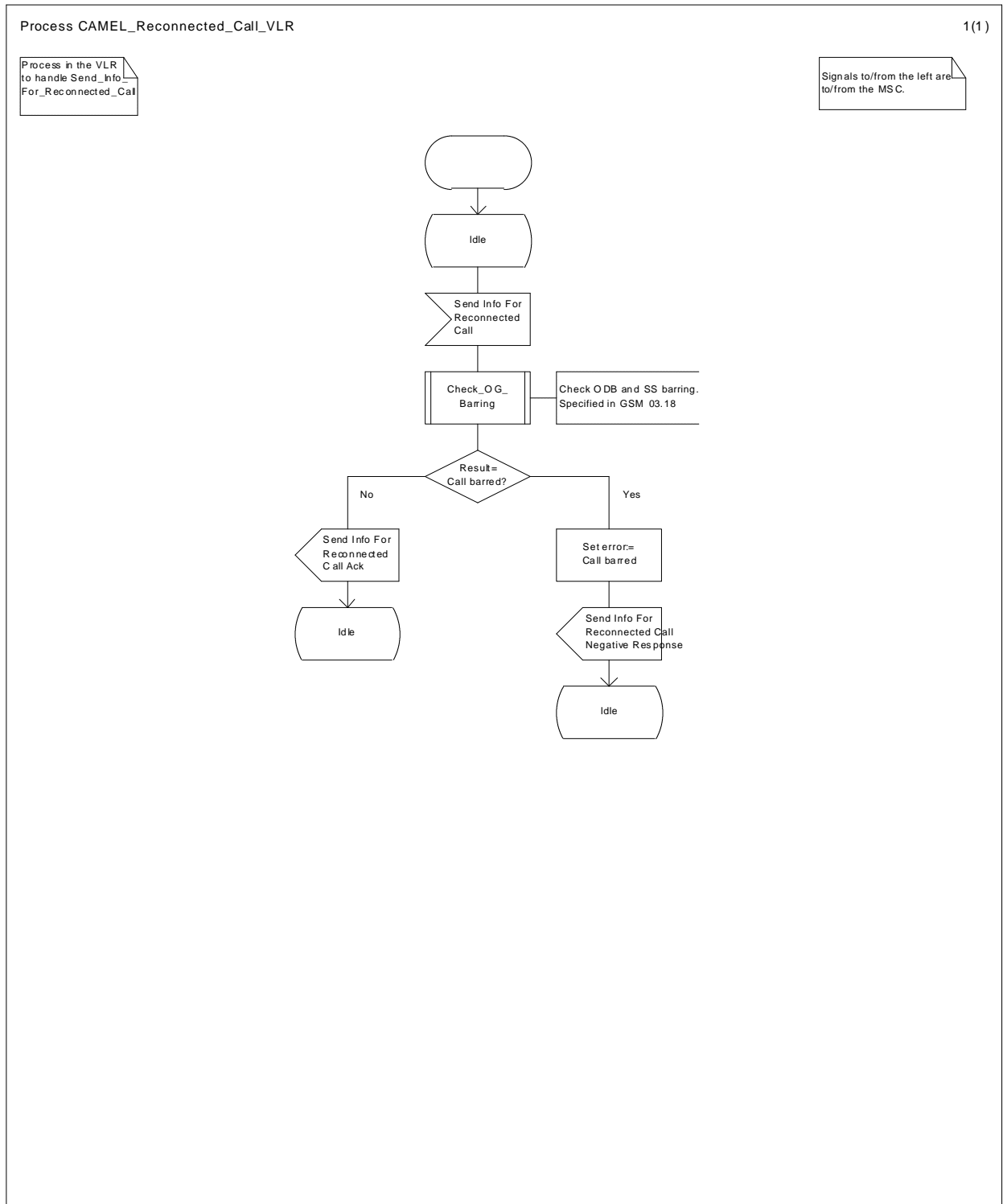


Figure 4.25a: Process CAMEL\_Reconnected\_Call\_VLR (sheet 1)

### 4.5.3 Retrieval of routing information

#### 4.5.3.1 Retrieval of routing information in the GMSC

The functional behaviour of the GMSC is specified in 3G TS 23.018 [3]. The procedures specific to CAMEL are specified in this subclause :

- Procedure CAMEL\_Set\_ORA\_Parameters



- Procedure CAMEL\_MT\_GMSC\_INIT
- Procedure CAMEL\_MT\_GMSC\_ANSWER
- Procedure CAMEL\_MT\_GMSC\_DISC1
- Procedure CAMEL\_MT\_GMSC\_DISC2
- Procedure CAMEL\_MT\_GMSC\_DISC4,
- Procedure CAMEL\_MT\_GMSC\_DISC5,
- Procedure CAMEL\_MT\_GMSC\_DISC6
- Procedure CAMEL\_MT\_CTR,
- Procedure CAMEL\_MT\_ETC
- Procedure CAMEL\_Start\_TNRy,
- Procedure CAMEL\_Stop\_TNRy.
- Procedure CAMEL\_MT\_GMSC\_Notify\_CF

The procedure Send\_ACM\_If\_Required is specified in 3G TS 23.018 [3].

The following paragraphs gives details on the behaviour of the GMSC in the procedure CAMEL\_MT\_GMSC\_INIT.

#### 4.5.3.1.1 Action of the GMSC on receipt of Int\_Release\_Call

An ISUP\_Release is sent to the originating exchange and resources are released.

#### 4.5.3.1.2 Action of the GMSC on receipt of Int\_Error

The GMSC checks in T-CSI the default Call Handling parameter.

If the default call handling is release call, an ISUP\_Release is sent to the originating exchange. The MSC then releases all call resources and the procedure CAMEL\_MT\_GMSC\_INIT returns result=fail.

If the default call handling is continue call, the MSC continue call handling without CAMEL support.

#### 4.5.3.1.3 Action of the GMSC on receipt of Int\_Continue

If a FTN has been stored the information received from HLR is used to overwrite corresponding call parameters. Note that the MSISDN is replaced by the FTN as the Called party number. The redirection counter is incremented.

If no FTN has been stored, a Send Routeing Info message including a T-CSI suppression parameter is sent to the HLR. The Send Routing Info includes an indication which CAMEL Phases are supported by the GMSC/gsmSSF.

#### 4.5.3.1.4 Action of the GMSC on receipt of Int\_Continue\_With\_Argument

If an FTN has been stored, the information received from HLR is used to overwrite corresponding call parameters. The MSISDN is replaced by the FTN as the Called party number. The redirection counter is incremented.

If no FTN has been stored, a Send Routeing Info message including a T-CSI suppression parameter is sent to the HLR. The Send Routing Info includes an indication which CAMEL phases are supported by the GMSC/gsmSSF.

The MSC shall replace the call parameters by the information received in the Int\_Continue\_With\_Argument message. Call parameters which are not included in the Int\_Continue\_With\_Argument message are unchanged.

Signalling limitations or regulatory requirements may require the Calling Partys Category, Generic Number, Original Called Party Number and Redirecting Party ID to be ignored or modified.

#### 4.5.3.1.5 Action of the GMSC on receipt of Int\_Connect

If the Destination Number received from the gsmSCF (via the gsmSSF) is the same as the ISUP Called party number, i.e. the MSISDN, the following parameters, if received, are used to overwrite the corresponding ISUP parameters (for mapping see 3G TS 29.078 [5]): Calling Party's Category and Generic Number. If received, the Announcement Suppression Indicator is stored. The further processing is described in subclause 4.5.3.1.3 with the addition that the Announcement Suppression indicator, if stored, is sent to the HLR in the Send\_Routeing\_Info message.

If:

- the Destination Number received from the gsmSCF (via the gsmSSF) is not the same as the stored ISUP Called party number, i.e. the MSISDN; and
- a CUG active indication was received from the HLR ; and
- CUG information was received in the ISUP\_IAM for the incoming call,

then an exception event is reported to the process gsmSSF, an ISUP\_Release is sent to the originating exchange and all resources are released.

Otherwise the following parameters, if received, are used to overwrite the corresponding ISUP parameters (for mapping see 3G TS 29.078 [5]): Destination Number, Calling Party's Category, Generic Number, Original Called Party ID, Redirecting Party ID, Announcement Suppression Indicator, and Redirection Information. Call parameters that are not included in the Int\_Connect message are unchanged.

As a network operator option loop prevention mechanisms may cause the redirection information to be ignored or modified (e.g., if the Redirection counter has been decreased).

Signalling limitations or regulatory requirements may require the Calling Party's Category, Generic Number, Original Called Party Number and Redirecting Party ID to be ignored or modified.

The network signalling system shall indicate that this is an internal network number.

#### 4.5.3.1.6 Action of the GMSC on receipt of Send\_Routeing\_Info Negative Response (at state Wait\_For\_Routeing\_Info\_2)

An exception event is reported to the process gsmSSF. If the Announcement Suppression indicator has been received from the gsmSCF (via the gsmSSF) any announcements or tones shall be suppressed.

#### 4.5.3.1.7 Action of the GMSC on receipt of Send\_Routeing\_Info ack with MSRN (at state Wait\_For\_Routeing\_Info\_2)

An ISUP\_IAM with the MSRN as Called party number is constructed.

#### 4.5.3.1.8 Action of the GMSC on receipt of Send\_Routeing\_Info ack with FTN (at state Wait\_For\_Routeing\_Info\_2)

The information received from HLR is used to overwrite corresponding call parameters (for details see 3G TS 23.018 [3]). The redirection counter is incremented.

#### 4.5.3.1.9 Action of the GMSC on receipt of Send\_Routeing\_Info ack with O-CSI and FTN (at state Wait\_For\_Routeing\_Info\_2)

The information received from the HLR is used to overwrite corresponding call parameters. The redirection counter is incremented. The Called Party Number is set to FTN.

#### 4.5.3.1.10 Action of the GMSC in procedure CAMEL\_MT\_ETC

In procedure CAMEL\_MT\_ETC (sheet 2) the GMSC will remain in the Wait\_For\_Assiting\_Answer state until it receives an ISUP Answer Message (ANM) or timeout occurs. This is to ensure that a call record is always generated for every successful establishment of a temporary connection to a gsmSRF, especially in the case where the connection is between PLMNs.

NOTE: This means that it may not be possible to access an SRF which does not generate an ISUP Answer Message (ANM).

If a Progress message is sent towards the MS the progress indicator shall indicate "In Band Information".

#### 4.5.3.1.11 Action of the GMSC in procedure CAMEL\_MT\_GMSC\_Notify\_CF

The Forwarding reason is taken from the Send Routeing Info ack (for early call forwarding) or the Resume Call Handling (for Optimal Routeing of Late Call Forwarding).

The Int\_DP\_T\_No\_Answer and Int\_DP\_T\_Busy messages include a parameter to indicate that the call has encountered conditional call forwarding. The gsmSSF will transfer this parameter to the CAP\_Event\_Report\_BCSM message which it sends to the gsmSCF.

Procedure CAMEL\_Set\_ORA\_Parameters

1(1)

/\* Procedure in the GMSC  
to set CAMEL parameters for  
the procedure Obtain\_Routeing\_Address. \*/

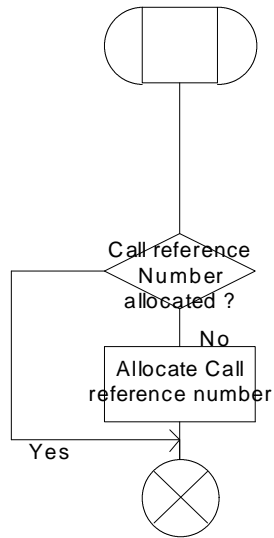


Figure 4.26a: Procedure CAMEL\_Set\_ORA\_Parameters (sheet 1)

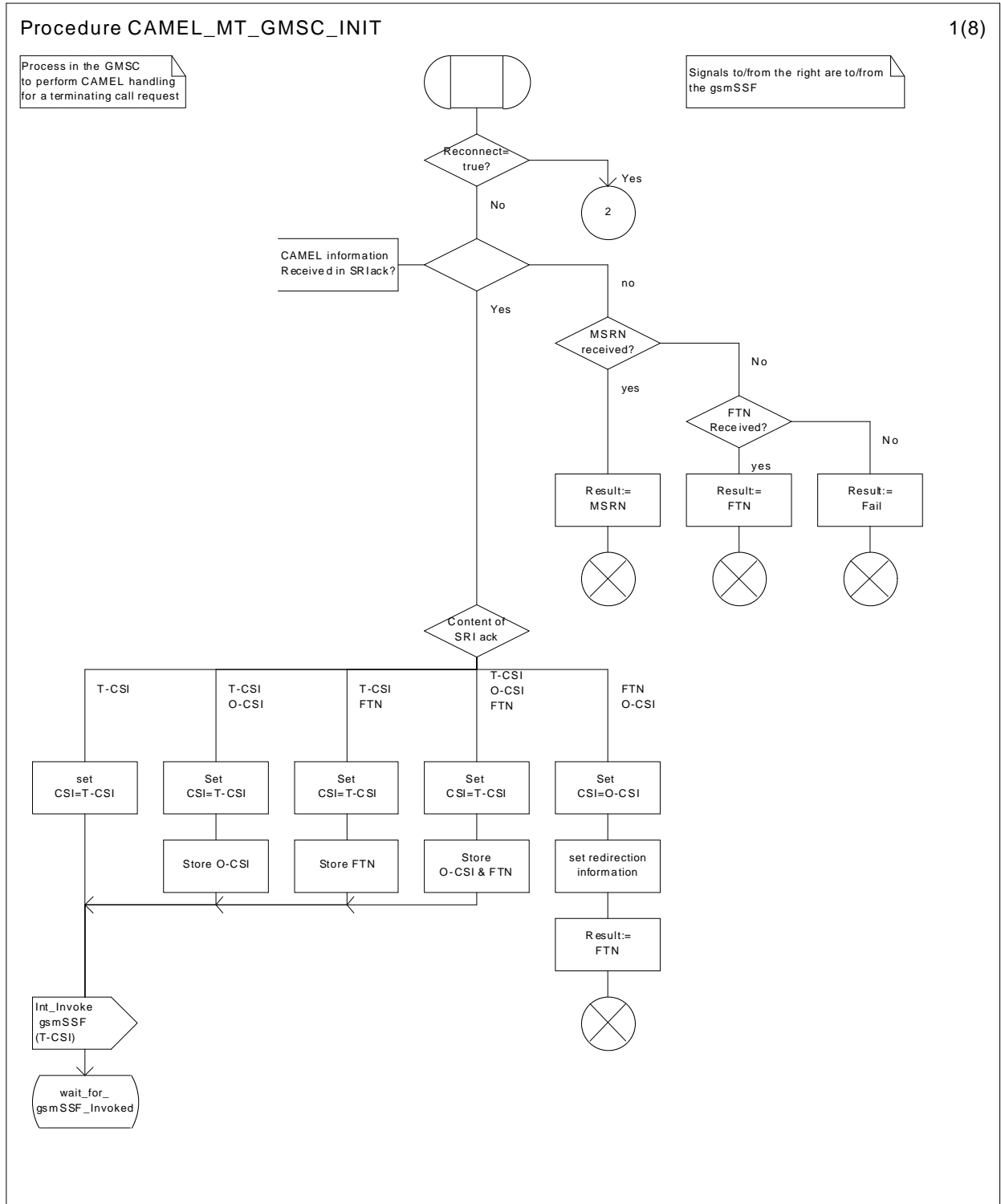


Figure 4.27a: Procedure CAMEL\_MT\_GMSC\_INIT (sheet 1)

Procedure CAMEL\_MT\_GMSC\_INIT

2(8)

Process in the GMSC to perform CAMEL handling for a terminating call request

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the gsmSSF

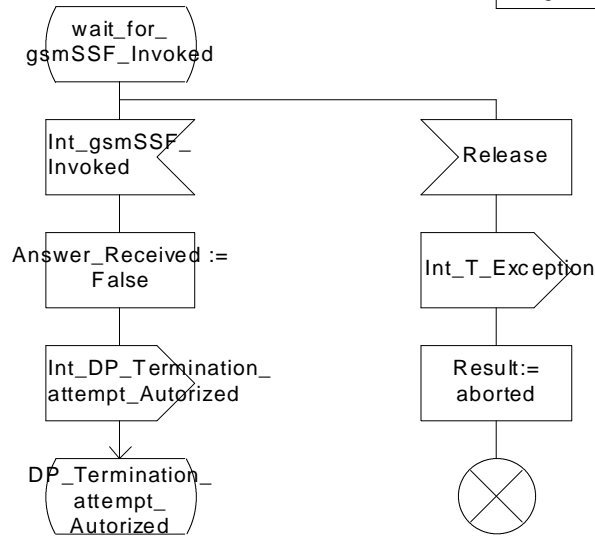


Figure 4.27b: Procedure CAMEL\_MT\_GMSC\_INIT (sheet 2)

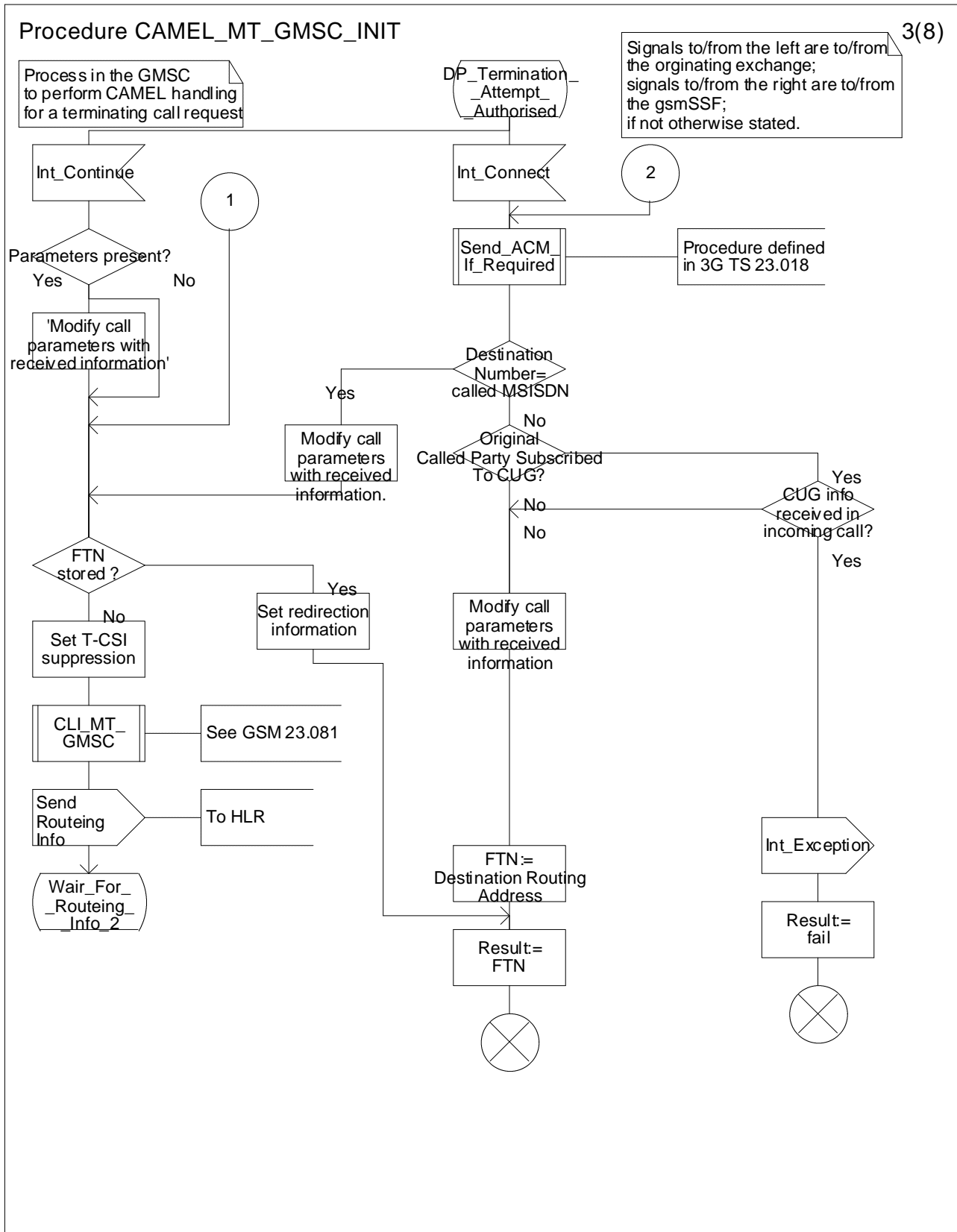


Figure 4.27c: Procedure CAMEL\_MT\_GMSC\_INIT (sheet 3)

Procedure CAMEL\_MT\_GMSC\_INIT

4(8)

Process in the GMSC to perform CAMEL handling for a terminating call request

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the gsmSSF; if not otherwise stated.

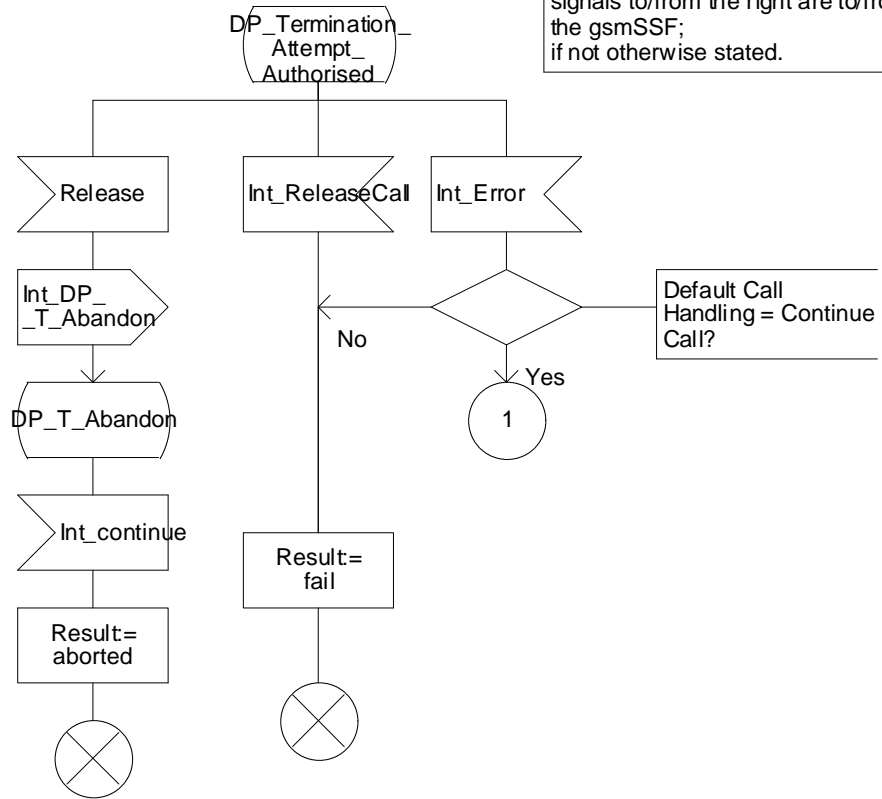


Figure 4.27d: Procedure CAMEL\_MT\_GMSC\_INIT (sheet 4)



Procedure CAMEL\_MT\_GMSC\_INIT

5(8)

Process in the GMSC to perform CAMEL handling for a terminating call request

Signals to/from the right are to/from the gsmSSF.

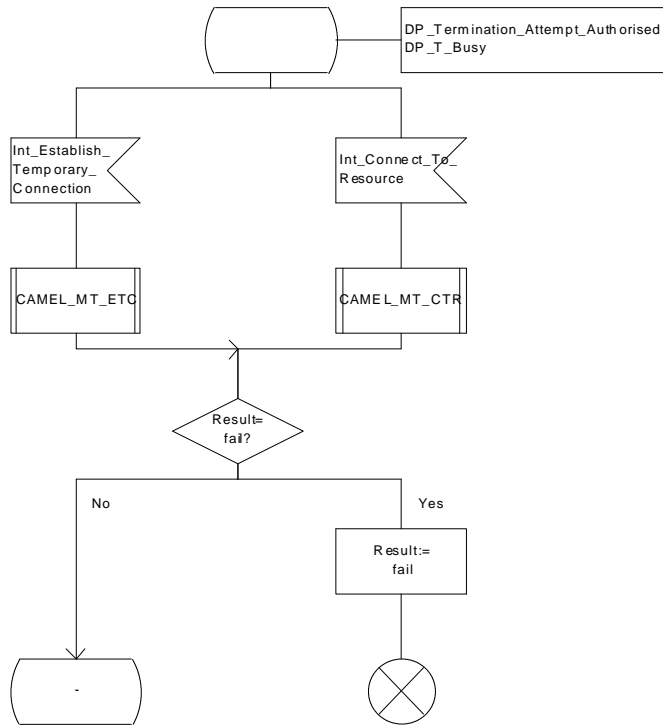


Figure 4.27e: Procedure CAMEL\_MT\_GMSC\_INIT (sheet 5)

### Procedure CAMEL\_MT\_GMSC\_INIT

6(8)

Process in the GMSC to perform CAMEL handling for a terminating call request

Signals to/from the right are to/from the gsmSSF; if not otherwise stated.

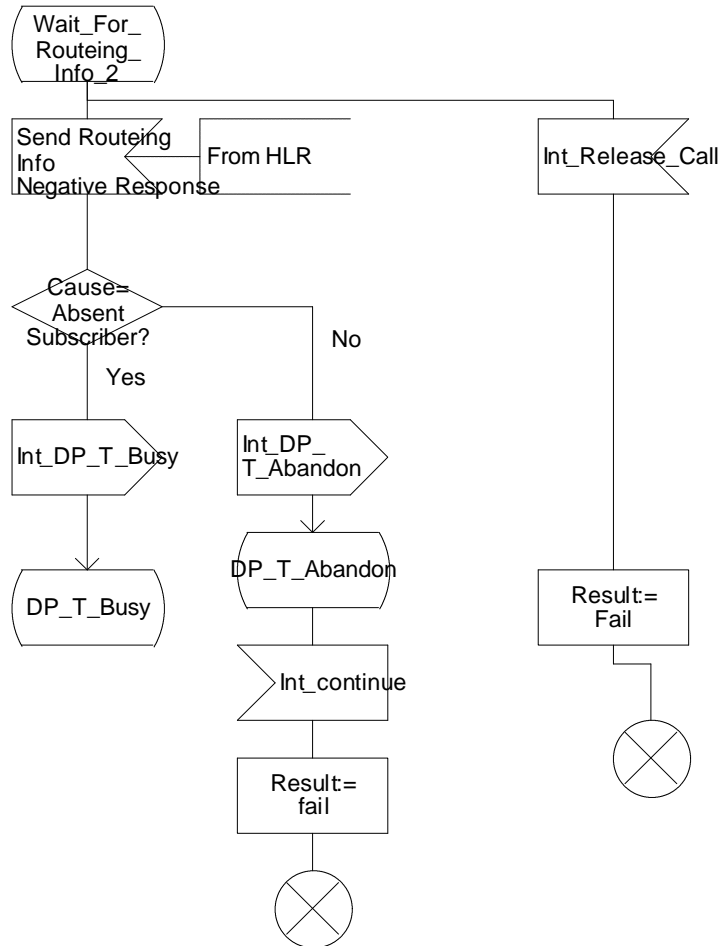


Figure 4.27f: Procedure CAMEL\_MT\_GMSC\_INIT (sheet 6)

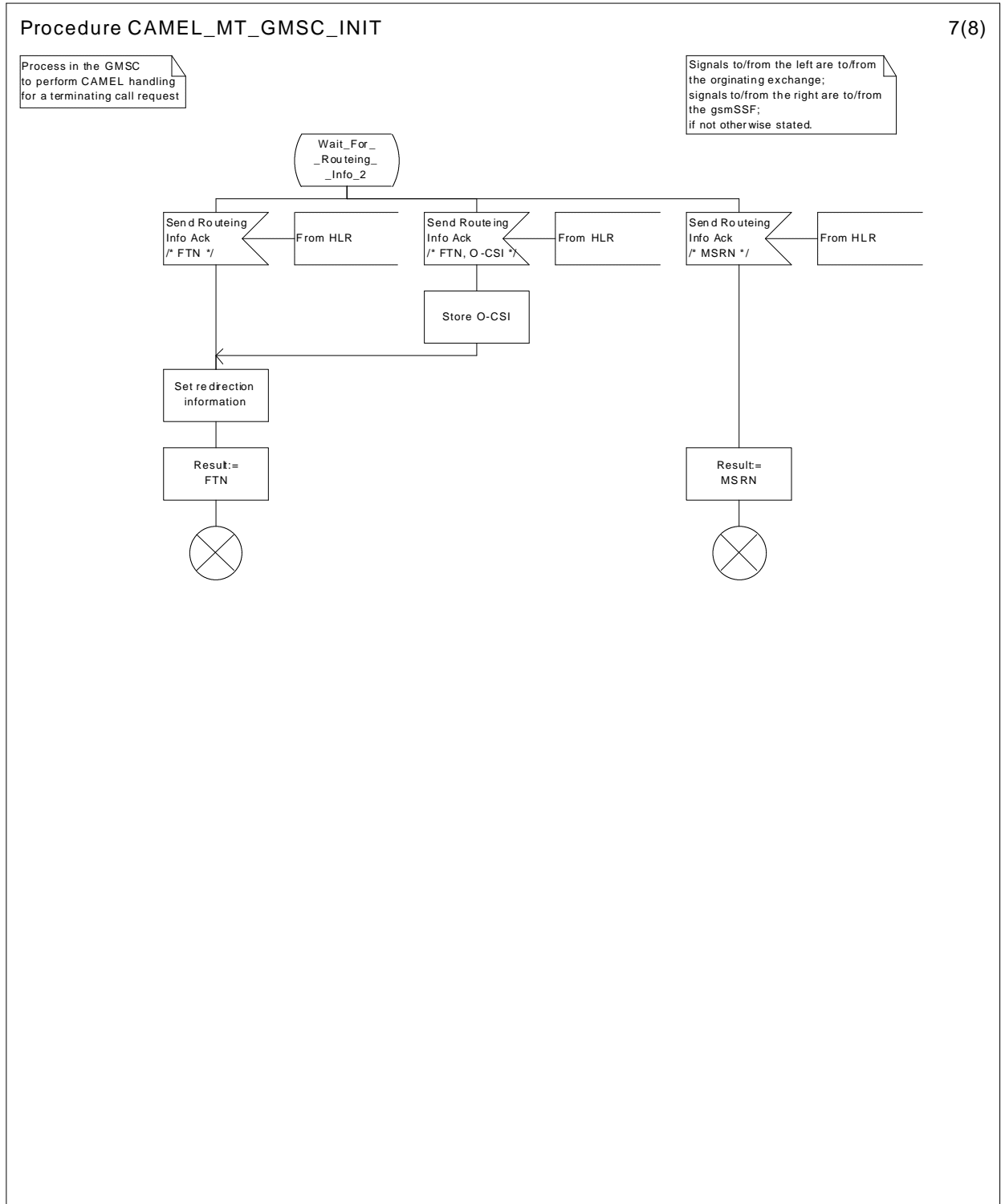


Figure 4.27g: Procedure CAMEL\_MT\_GMSC\_INIT (sheet 7)

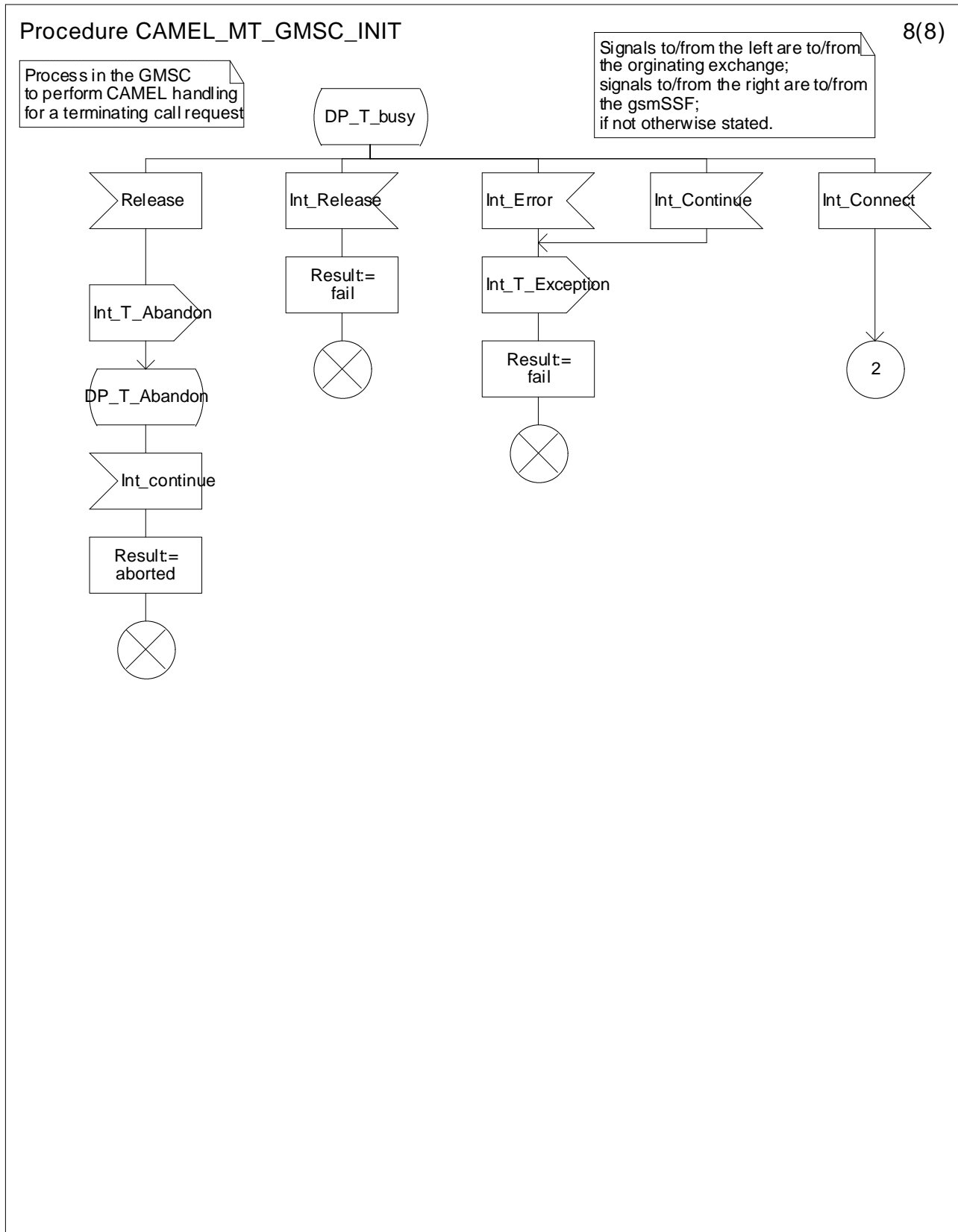


Figure 4.27h: Procedure CAMEL\_MT\_GMSC\_INIT (sheet 8)

Procedure CAMEL\_MT\_GMSC\_ANSWER

1(1)

/\* Process in the GMSC to handle a terminating call request \*/

/\* Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the terminating exchange if not otherwise stated. \*/

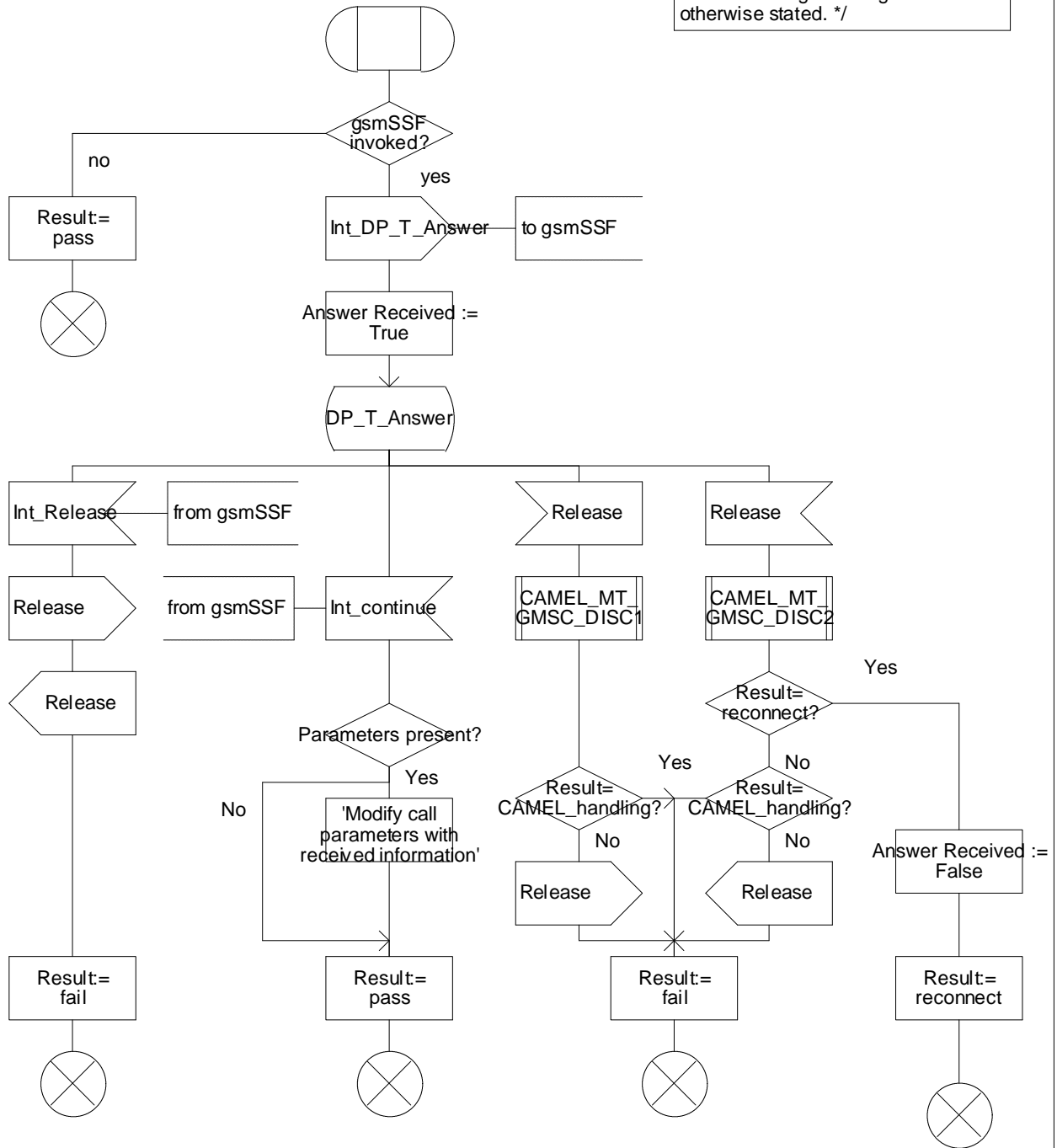


Figure 4.28a: Procedure CAMEL\_MT\_GMSC\_ANSWER (sheet 1)

Procedure CAMEL\_MT\_GMSC\_DISC1

1(1)

/\* Process in the GMSC to handle a terminating call request \*/

/\* Signals to/from the right are to/from the gsmSSF if not otherwise stated. \*/

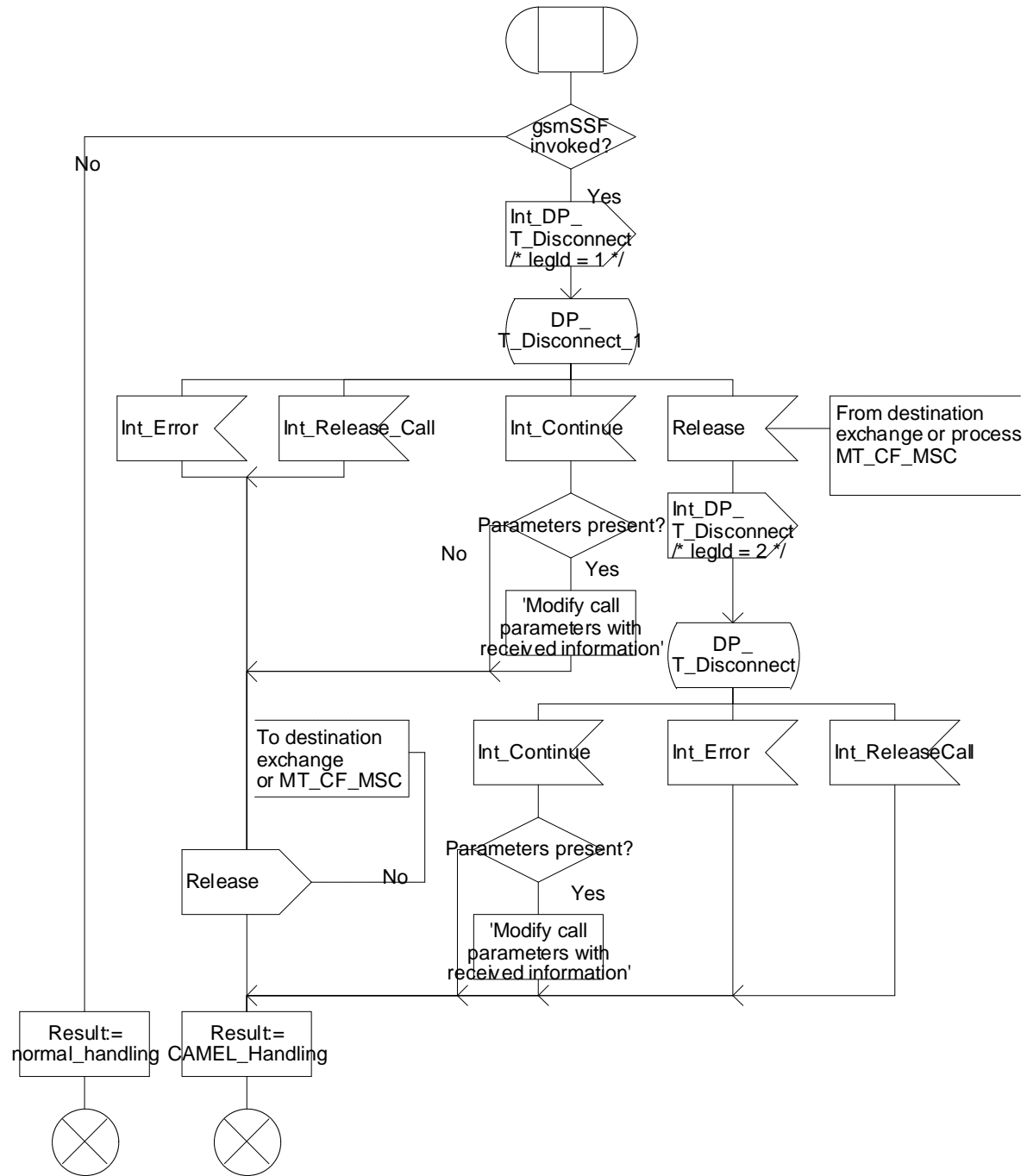


Figure 4.29a: Procedure CAMEL\_MT\_GMSC\_DISC1 (sheet 1)

Procedure CAMEL\_MT\_GMSC\_DISC2

1(2)

/\* Process in the GMSC to handle a terminating call request \*/

/\* Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the gsmSSF if not otherwise stated. \*/

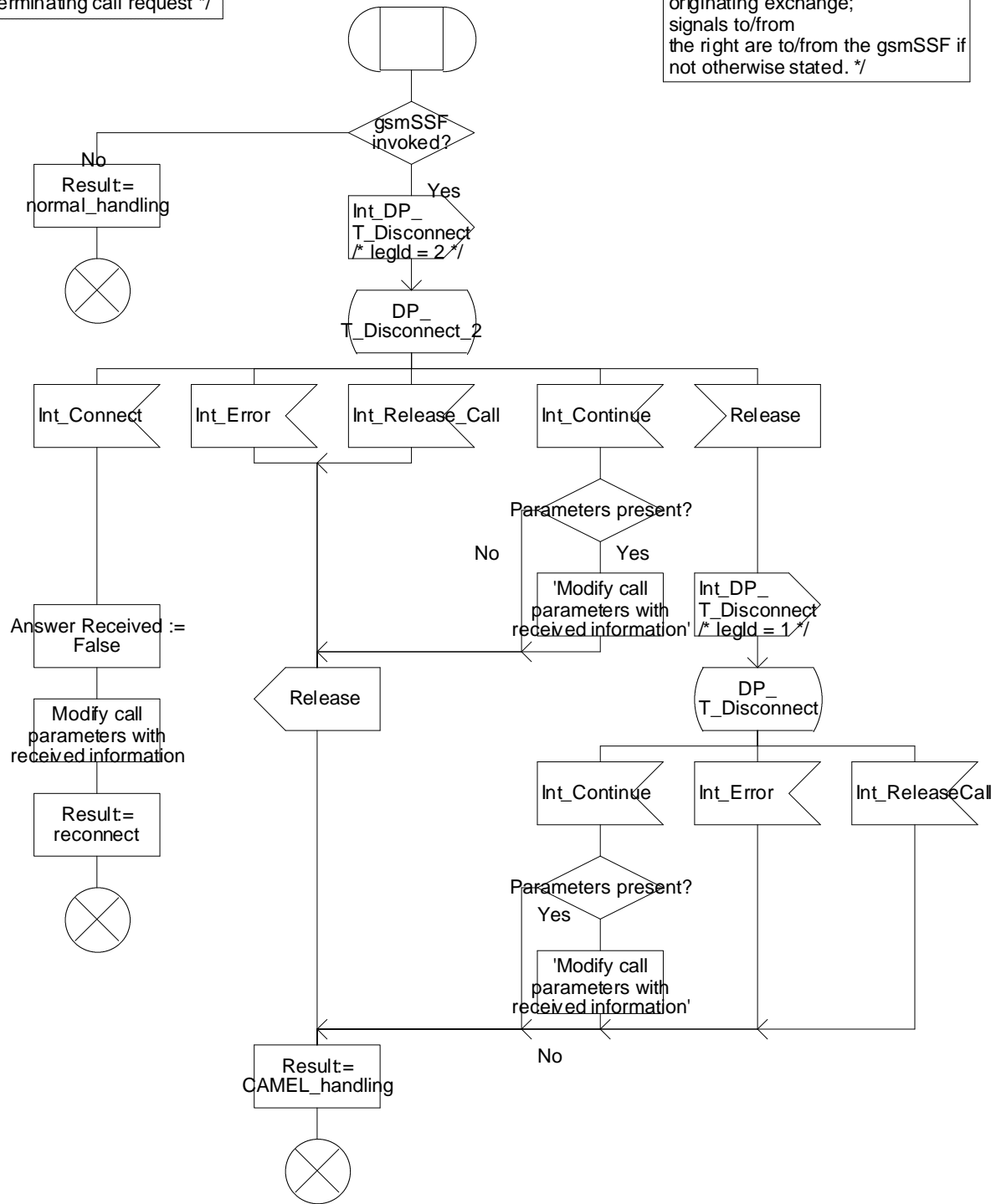


Figure 4.30a: Procedure CAMEL\_MT\_GMSC\_DISC2 (sheet 1)

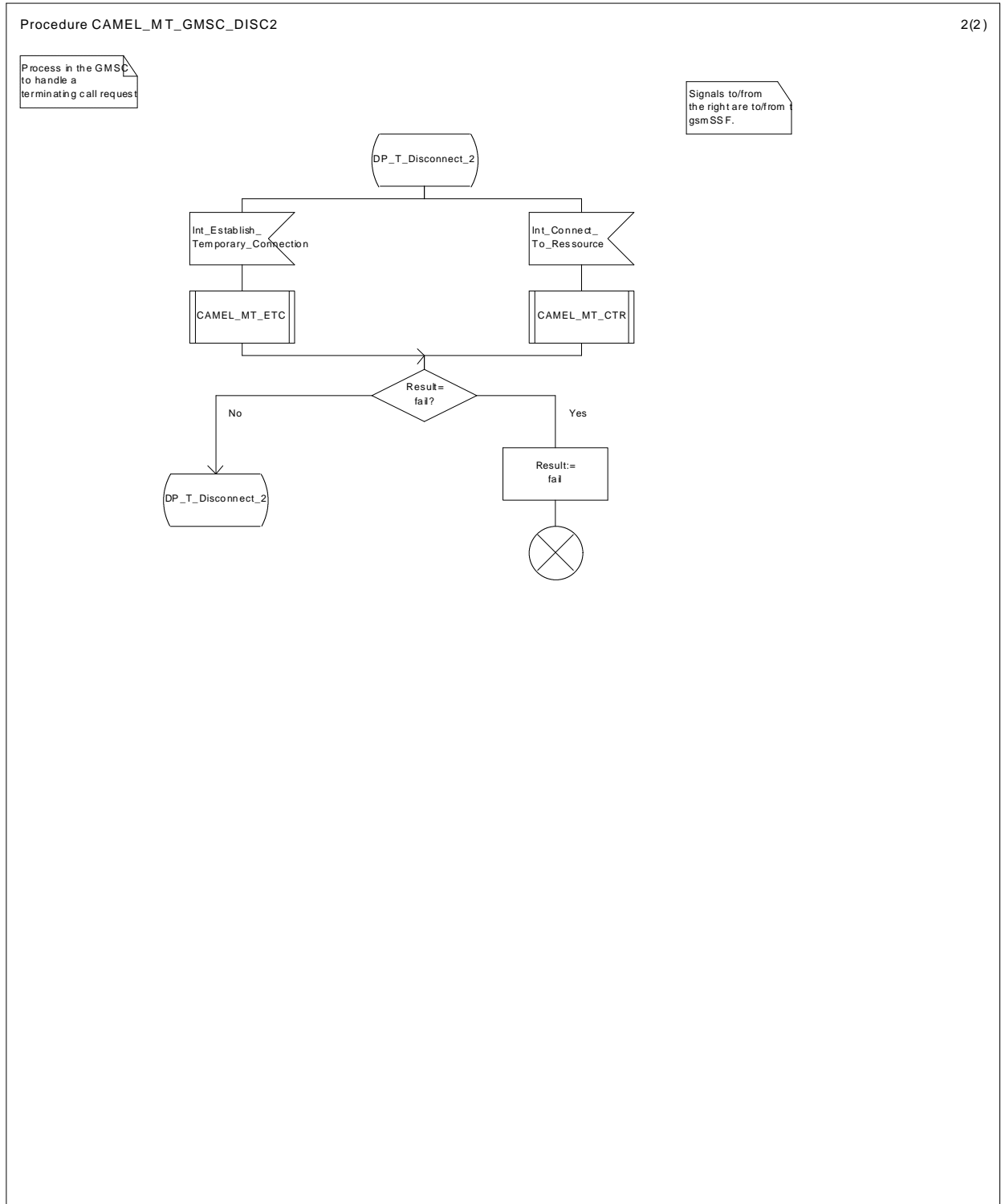


Figure 4.30b: Procedure CAMEL\_MT\_GMSC\_DISC2 (sheet 2)



Procedure CAMEL\_MT\_GMSC\_DISC4

1(3)

/\* Procedure in the GMSC to handle a terminating call request \*/

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the gsmSSF.

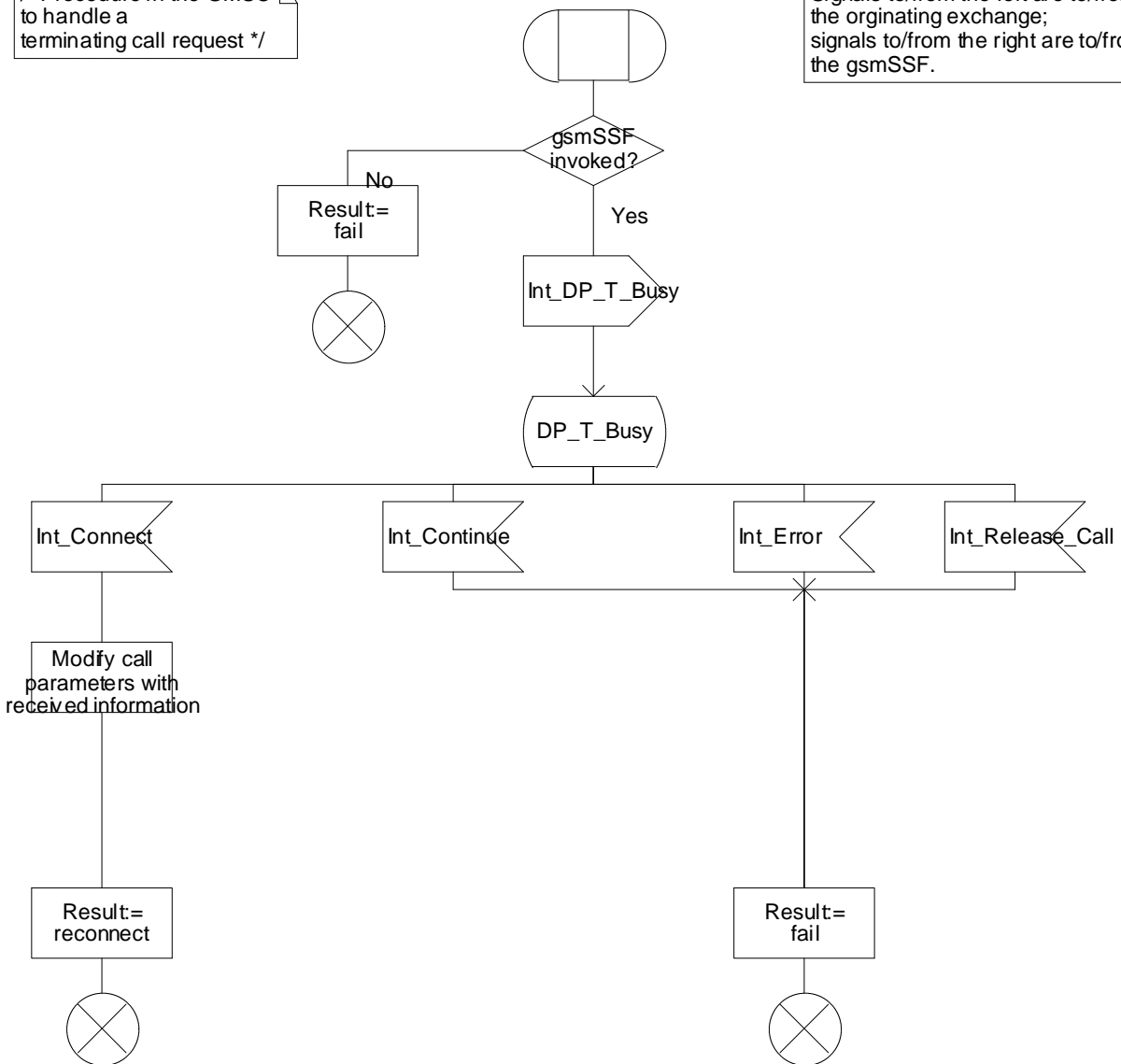


Figure 4.31a: Procedure CAMEL\_MT\_GMSC\_DISC4 (sheet 1)

Procedure CAMEL\_MT\_GMSC\_DISC4

2(3)

Procedure in the GSMSSF to handle a terminating call request

Signals to/from the right are to/from the gsmSSF if not otherwise stated.

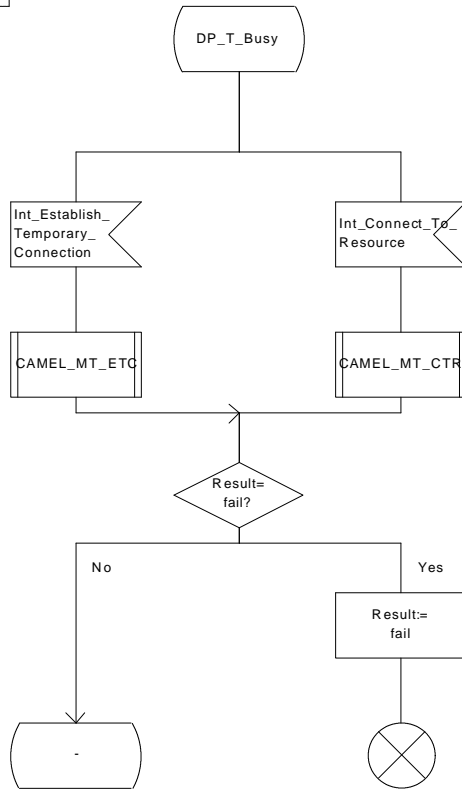


Figure 4.31b: Procedure CAMEL\_MT\_GMSC\_DISC4 (sheet 2)

Procedure CAMEL\_MT\_GMSC\_DISC4

3(3)

/\* Procedure in the GMSC to handle a terminating call request \*/

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the gsmSSF.

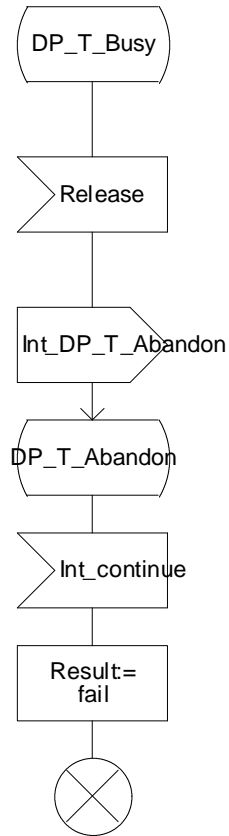


Figure 4.31c: Procedure CAMEL\_MT\_GMSC\_DISC4 (sheet 3)

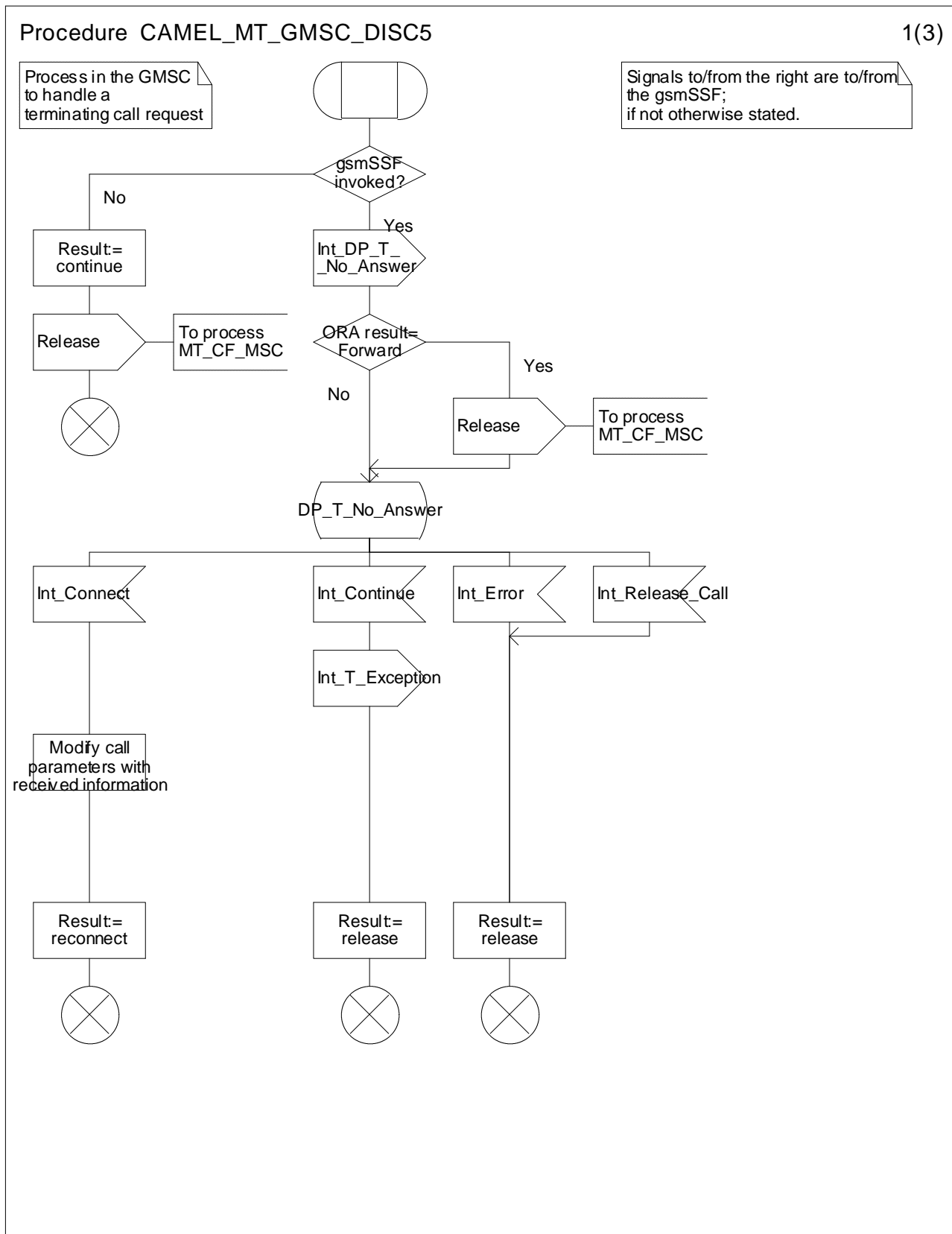


Figure 4.32a: Procedure CAMEL\_MT\_GMSC\_DISC5 (sheet 1)

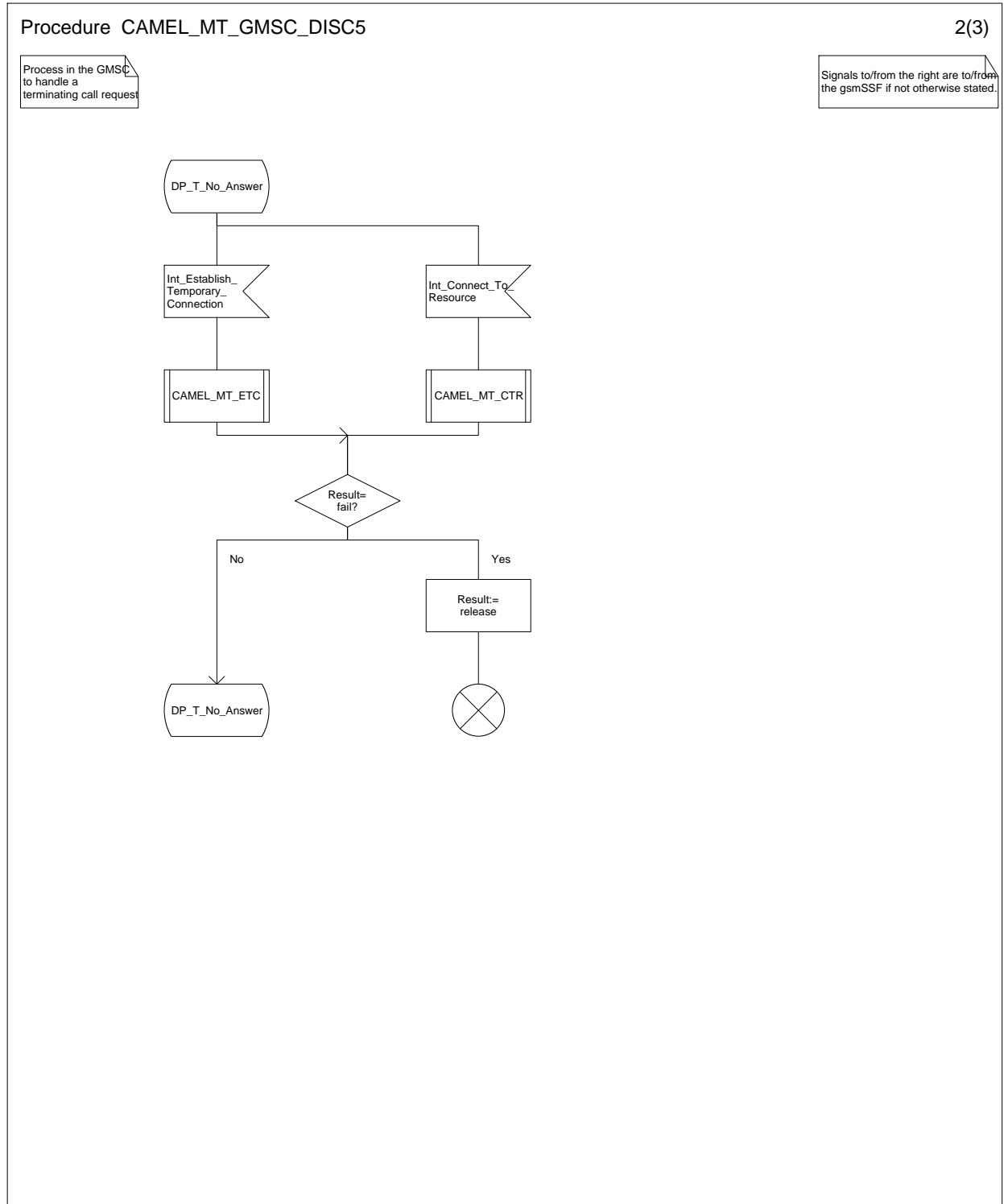


Figure 4.32b: Procedure CAMEL\_MT\_GMSC\_DISC5 (sheet 2)

Procedure CAMEL\_MT\_GMSC\_DISC5

3(3)

Process in the GMSC to handle a terminating call request

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the gsmSSF; if not otherwise stated.

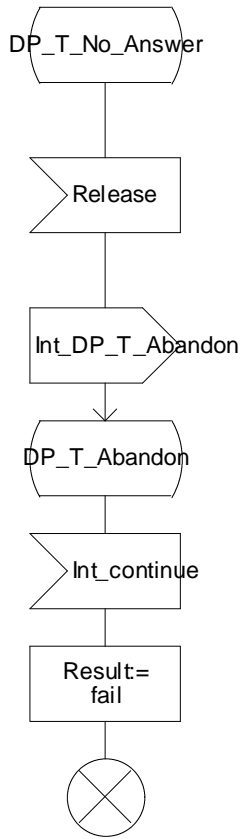


Figure 4.32c: Procedure CAMEL\_MT\_GMSC\_DISC5 (sheet 3)

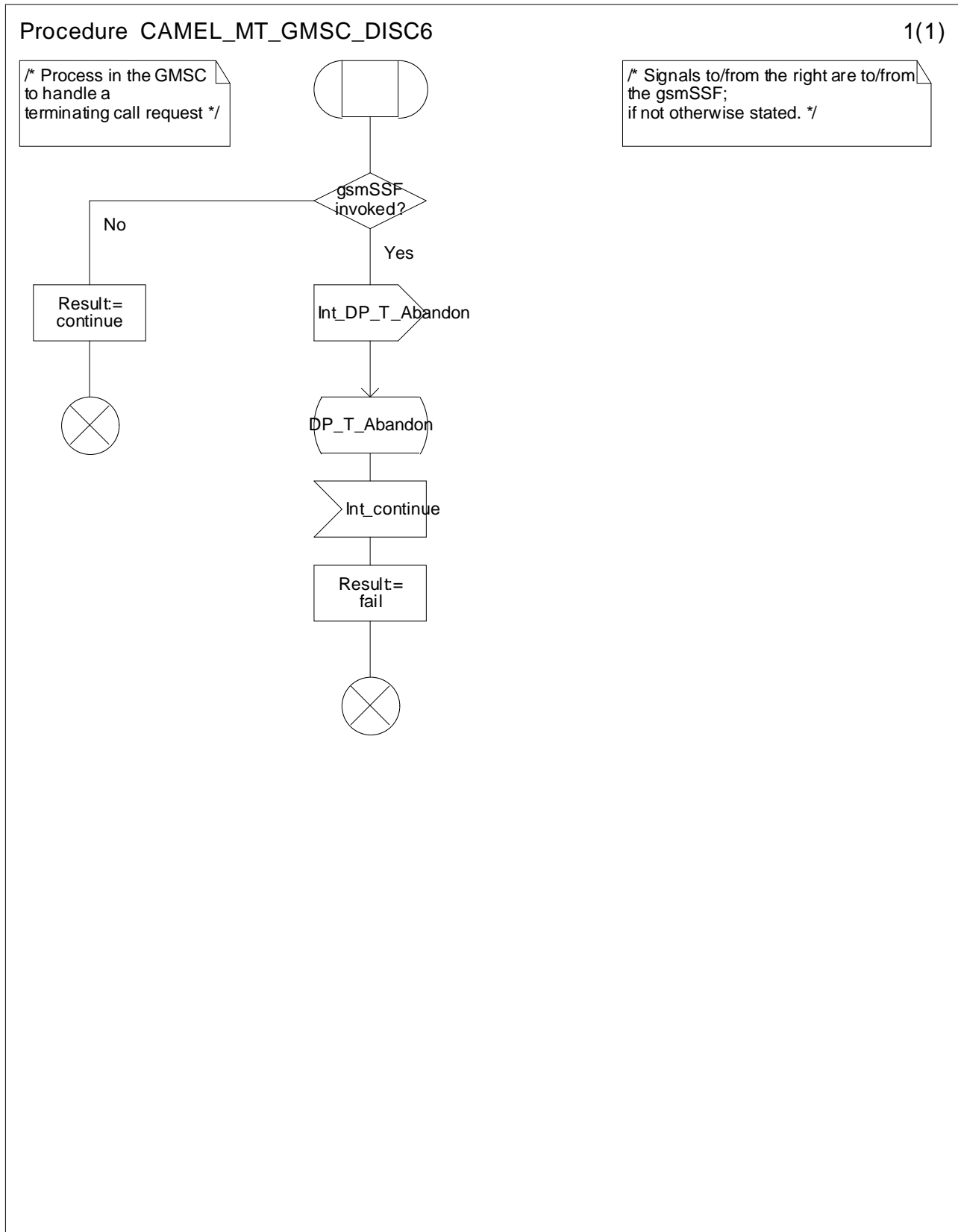


Figure 4.33a: Procedure CAMEL\_MT\_GMSC\_DISC6 (sheet 1)

### Procedure CAMEL\_MT\_ETC

1(3)

Procedure in the GMSC to handle a temporary connection

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the gsmSSF; if not otherwise stated.

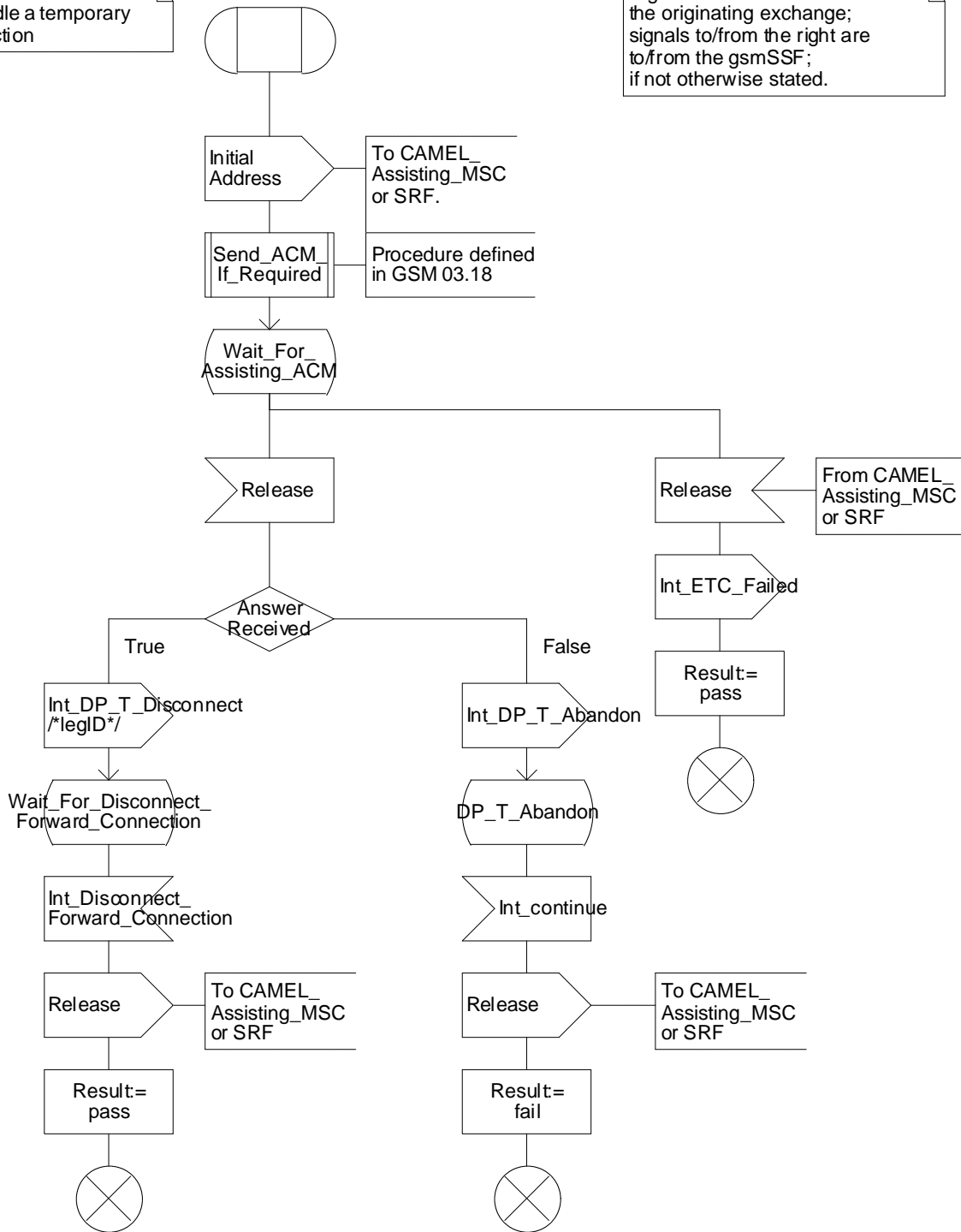


Figure 4.34a: Procedure CAMEL\_MT\_ETC (sheet 1)



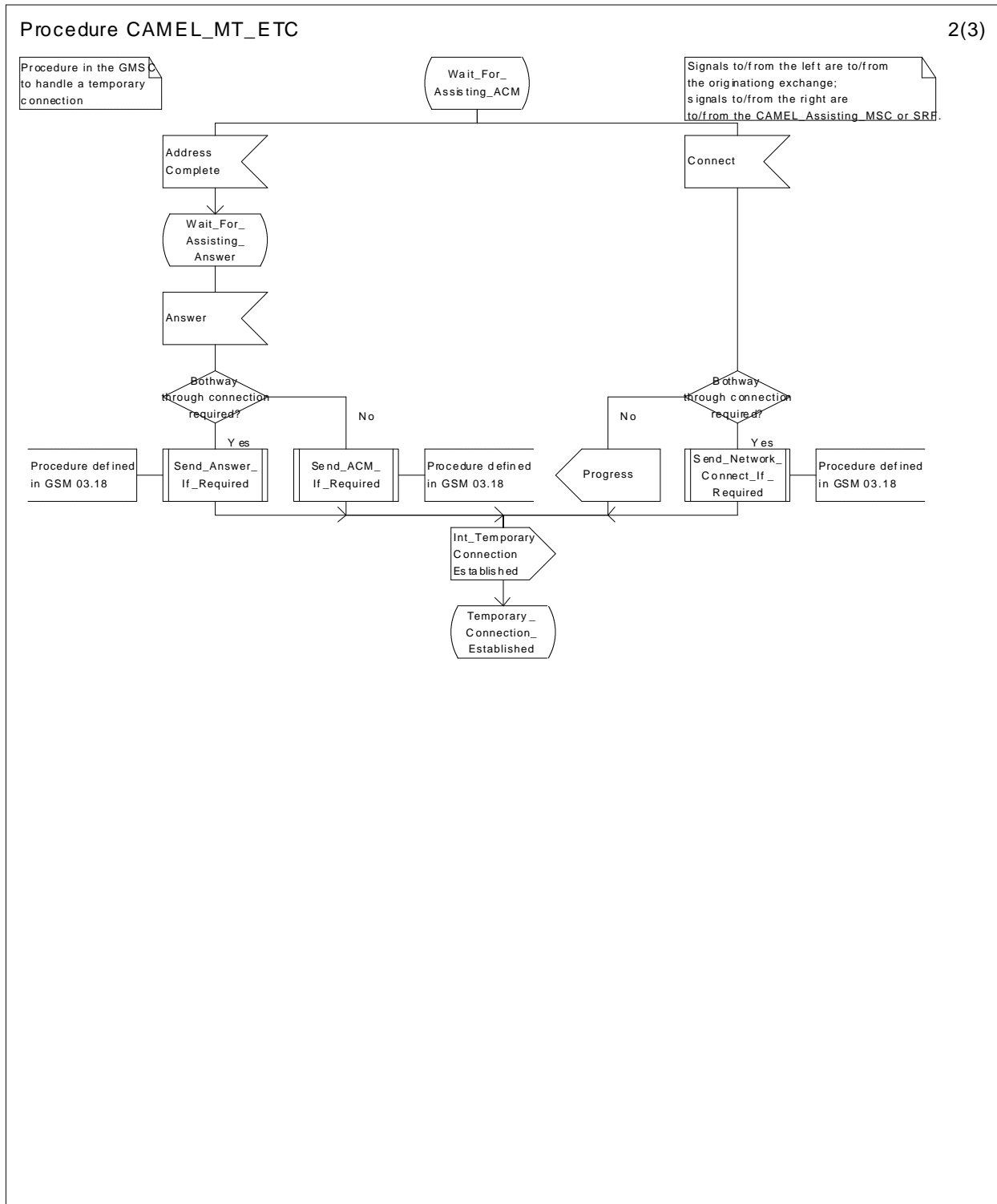


Figure 4.34b: Procedure CAMEL\_MT\_ETC (sheet 2)

Procedure CAMEL\_MT\_ETC

3(3)

Procedure in the GMSC to handle a temporary connection

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the gsmSSF; if not otherwise stated.

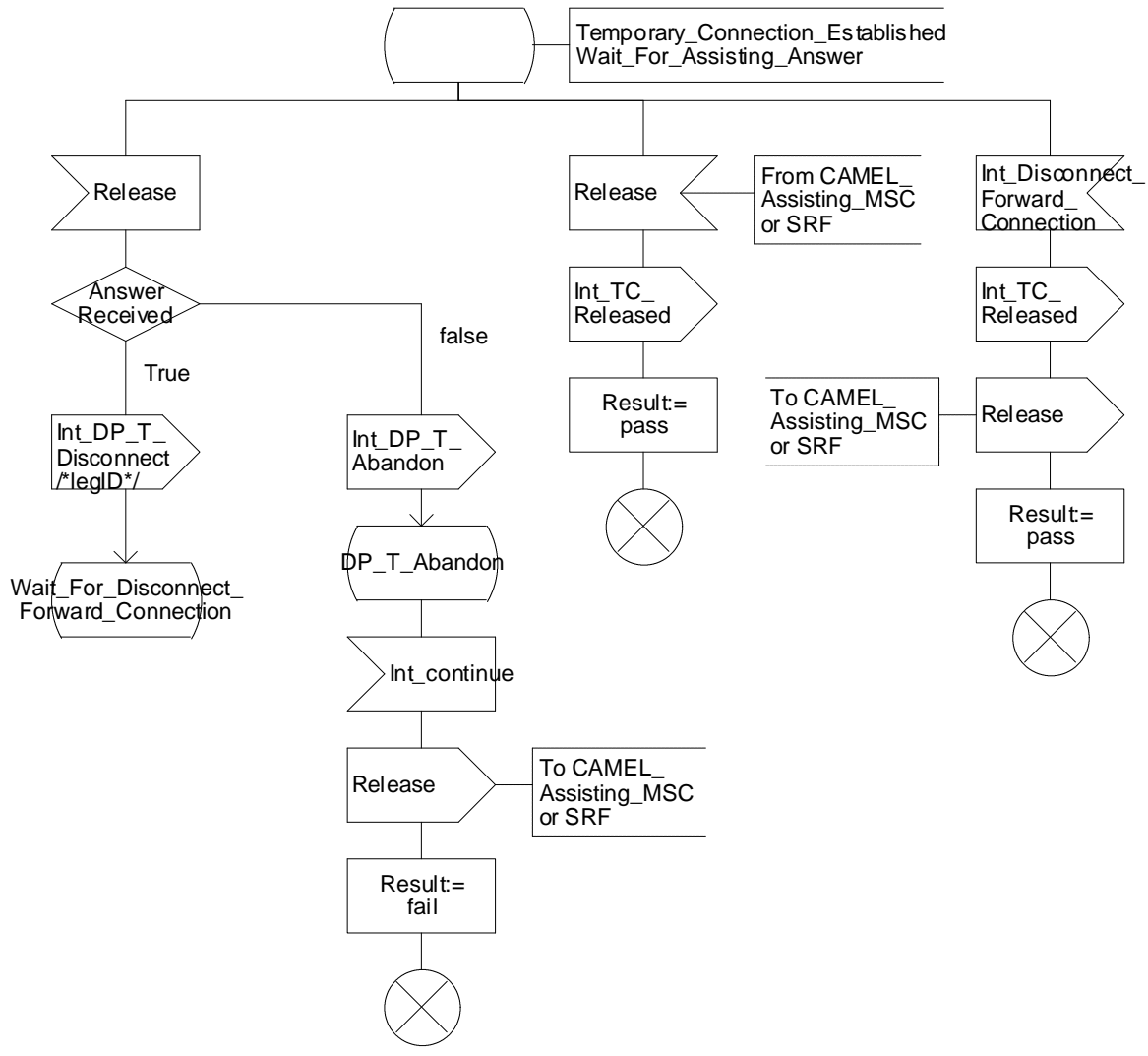


Figure 4.34c: Procedure CAMEL\_MT\_ETC (sheet 3)

Procedure CAMEL\_MT\_CTR

1(4)

Procedure in the GMSC to handle a Connect To Resource operation

Signals to/f from the left are to/f from the originating exchange; signals to/f from the right are to/f from the gsmSSF if not otherwise stated

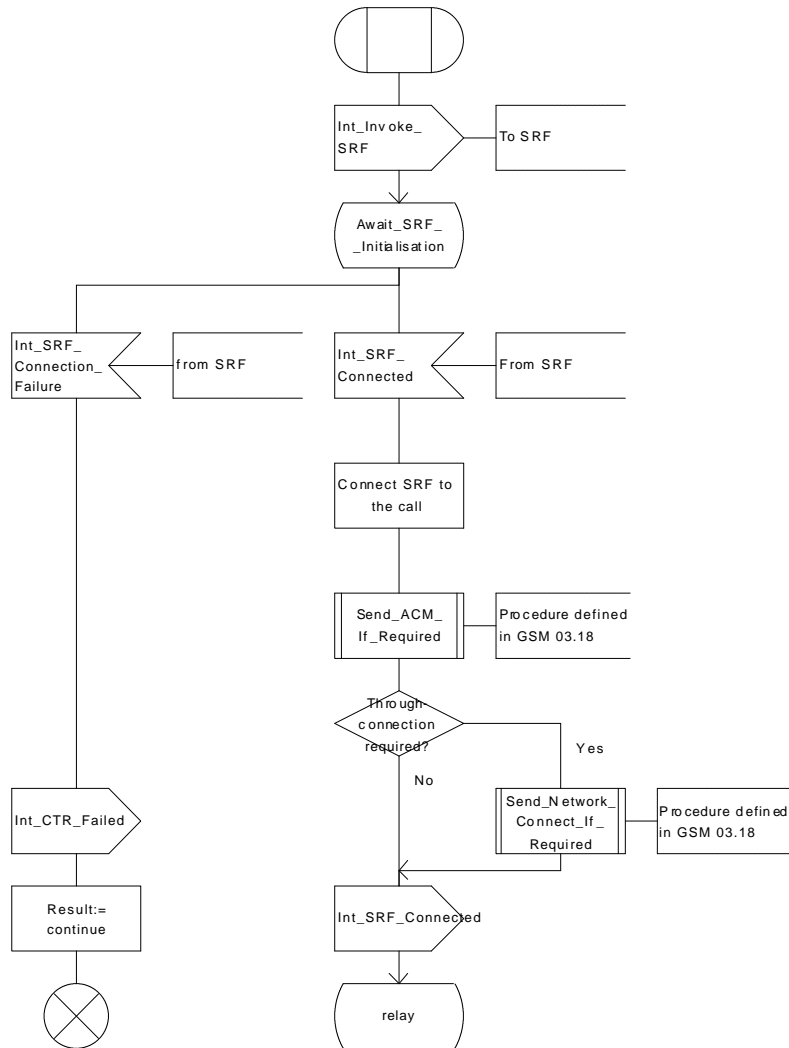


Figure 4.35a: Procedure CAMEL\_MT\_CTR (sheet 1)

Procedure CAMEL\_MT\_CTR

2(4)

Procedure in the GMSC to handle a Connect To Resource operation

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the gsmSSF if not otherwise stated.

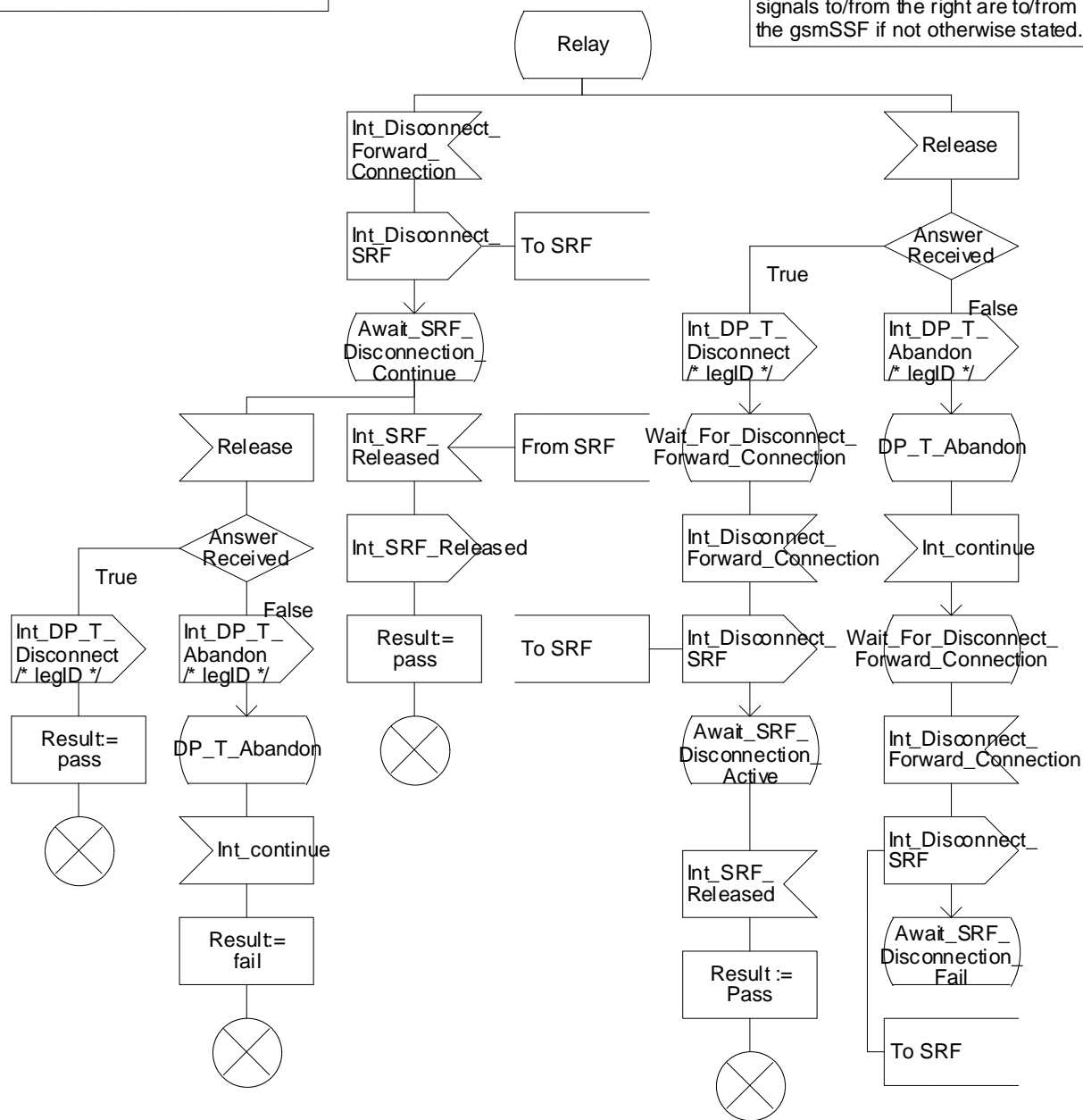


Figure 4.35b: Procedure CAMEL\_MT\_CTR (sheet 2)

Procedure CAMEL\_MT\_CTR

3(4)

Procedure in the GMSC to handle a Connect To Resource operation

Signals to/f from the right are to/f from the gsm SSF.  
Signals to/f from the left are to/f from the external SRF.

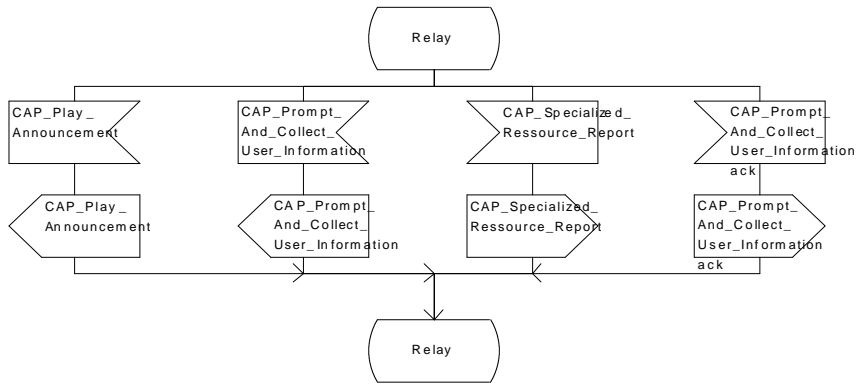


Figure 4.35c: Procedure CAMEL\_MT\_CTR (sheet 3)

Procedure CAMEL\_MT\_CTR

4(4)

Procedure in the GMSC to handle a Connect To Resource operation

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the gsmSSF if not otherwise stated.

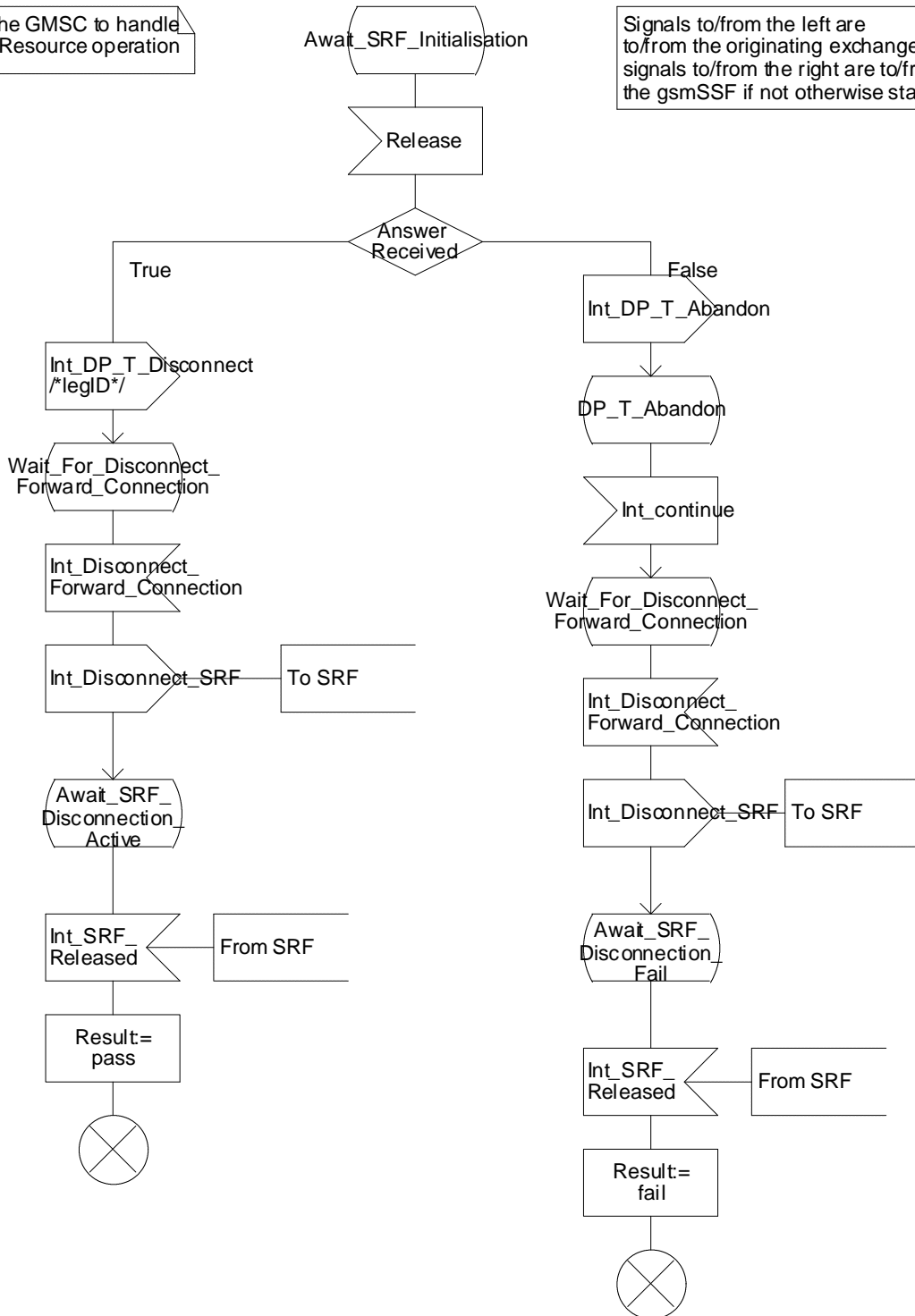


Figure 4.35d: Procedure CAMEL\_MT\_CTR (sheet 4)

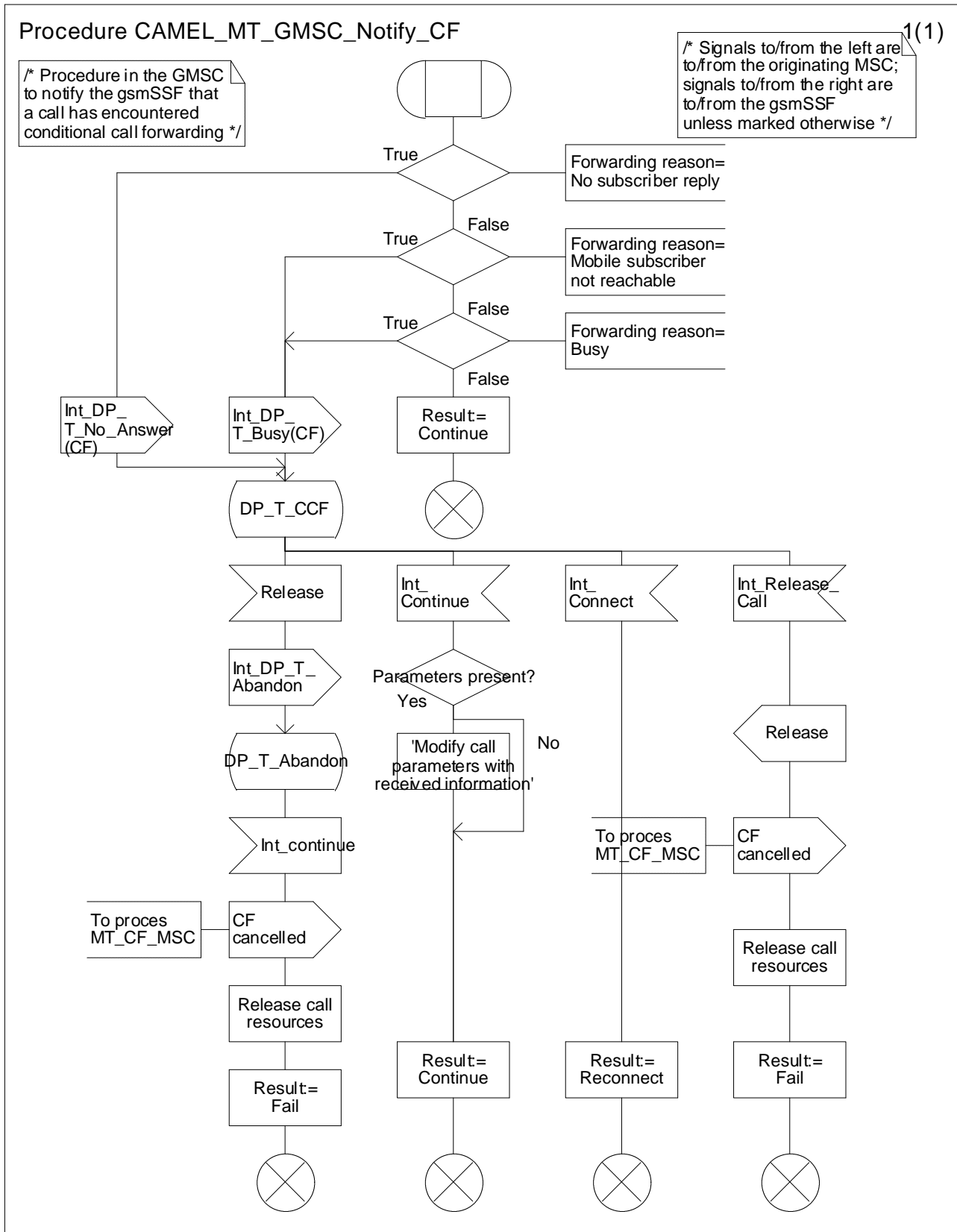


Figure 4.36: Procedure CAMEL\_MT\_GMSC\_Notify\_CF (sheet 1)

### 4.5.3.2 Retrieval of routing information in the HLR

The functional behaviour of the HLR is specified in 3G TS 23.018 [3]. The procedures specific to CAMEL are specified in this subclause :

- CAMEL\_HLR\_INIT,
- CAMEL\_CSI\_Check\_HLR,
- CAMEL\_O\_CSI\_CHECK\_HLR,
- CAMEL\_T\_CSI\_CHECK\_HLR,

The procedure CAMEL\_Provide\_Subscriber\_Info is specified in subclause 4.5.8.



Procedure CAMEL\_HLR\_INIT

1(1)

This procedure is called in SRI\_HLR (in GSM 03.18)

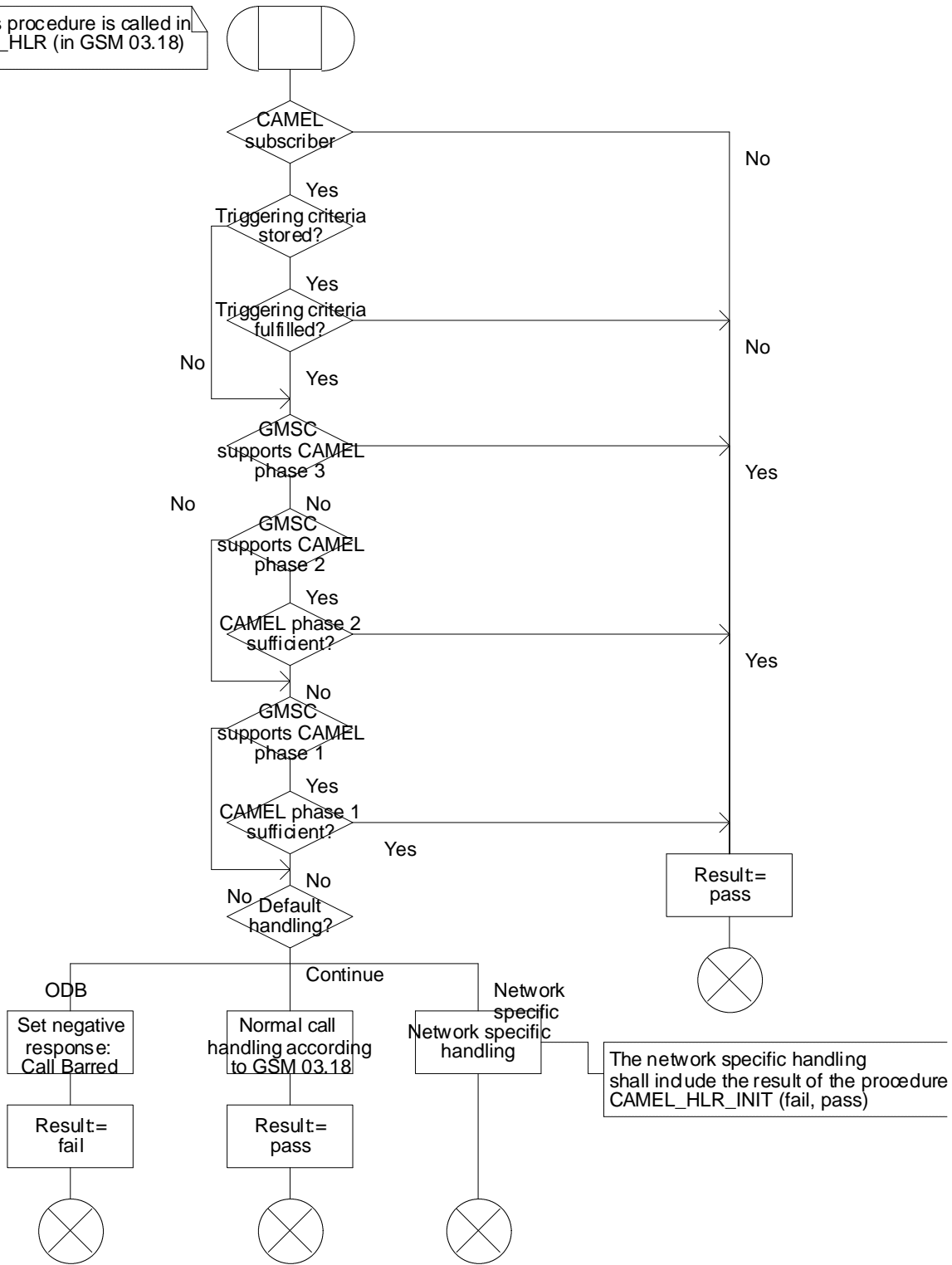


Figure 4.37a: Procedure CAMEL\_HLR\_INIT (sheet 1)

Procedure CAMEL\_CSI\_Check\_HLR

1(1)

/\* This procedure in the HLR to perform the handling for a forwarded CAMEL call. \*/

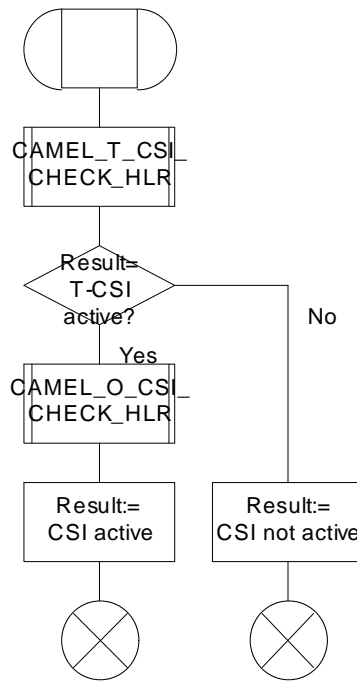


Figure 4.38a: Procedure CAMEL\_CSI\_Check\_HLR (sheet 1)

Procedure CAMEL\_O\_CSI\_CHECK\_HLR

1(1)

Procedure in the HLR to check the O-CSI and set the O-CSI parameter for SRI ack accordingly.

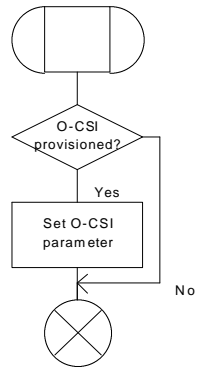


Figure 4.39a: Procedure CAMEL\_O\_CSI\_CHECK\_HLR (sheet 1)

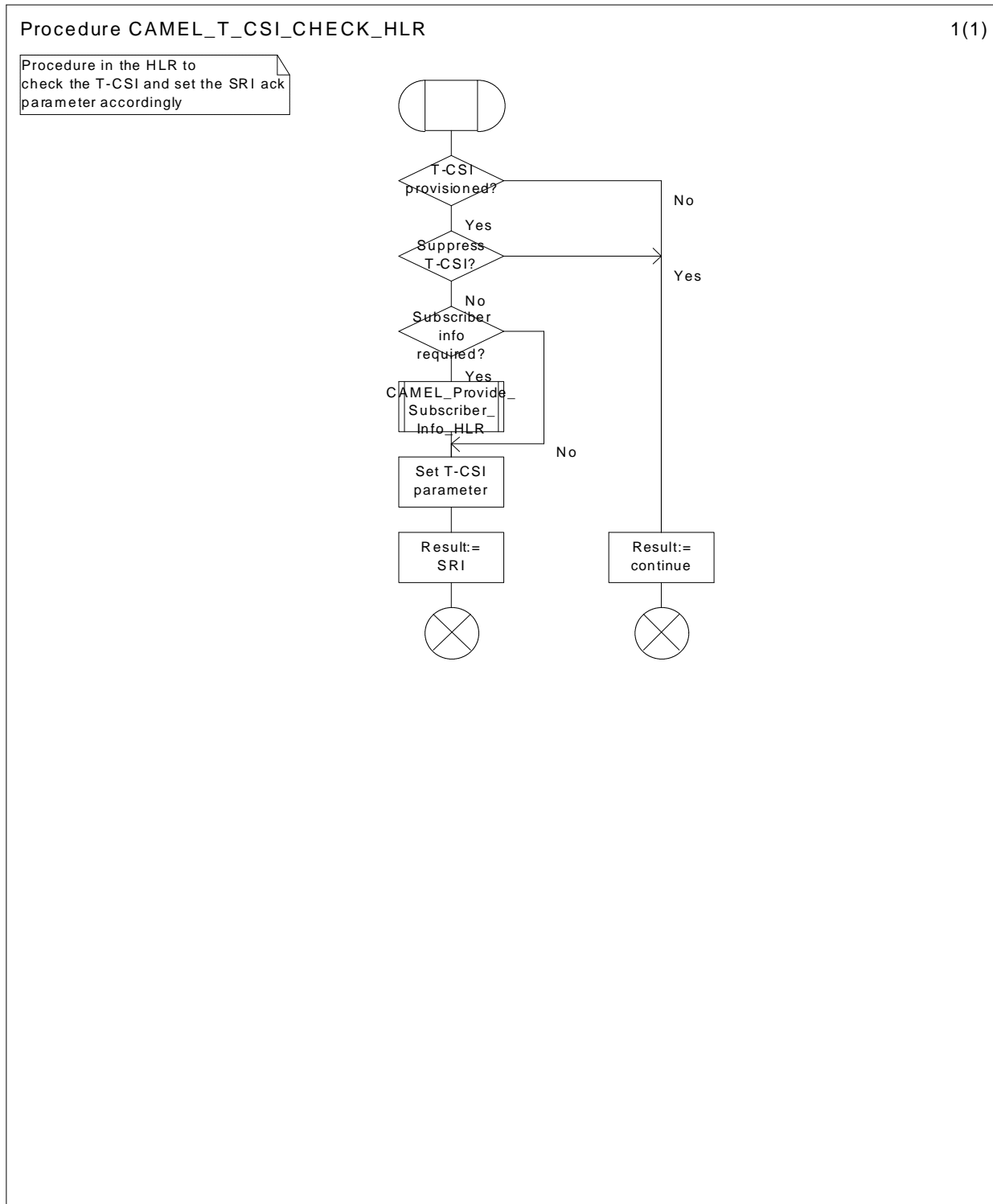


Figure 4.40a: Procedure CAMEL\_T\_CSI\_CHECK\_HLR (sheet 1)

### 4.5.3.3 Handling of provide roaming number request in the VLR

The functional behaviour of the VLR is specified in GSM 03.18 [3]. The procedure specific to CAMEL is specified in this subclause :

- CAMEL\_SET\_SOA.

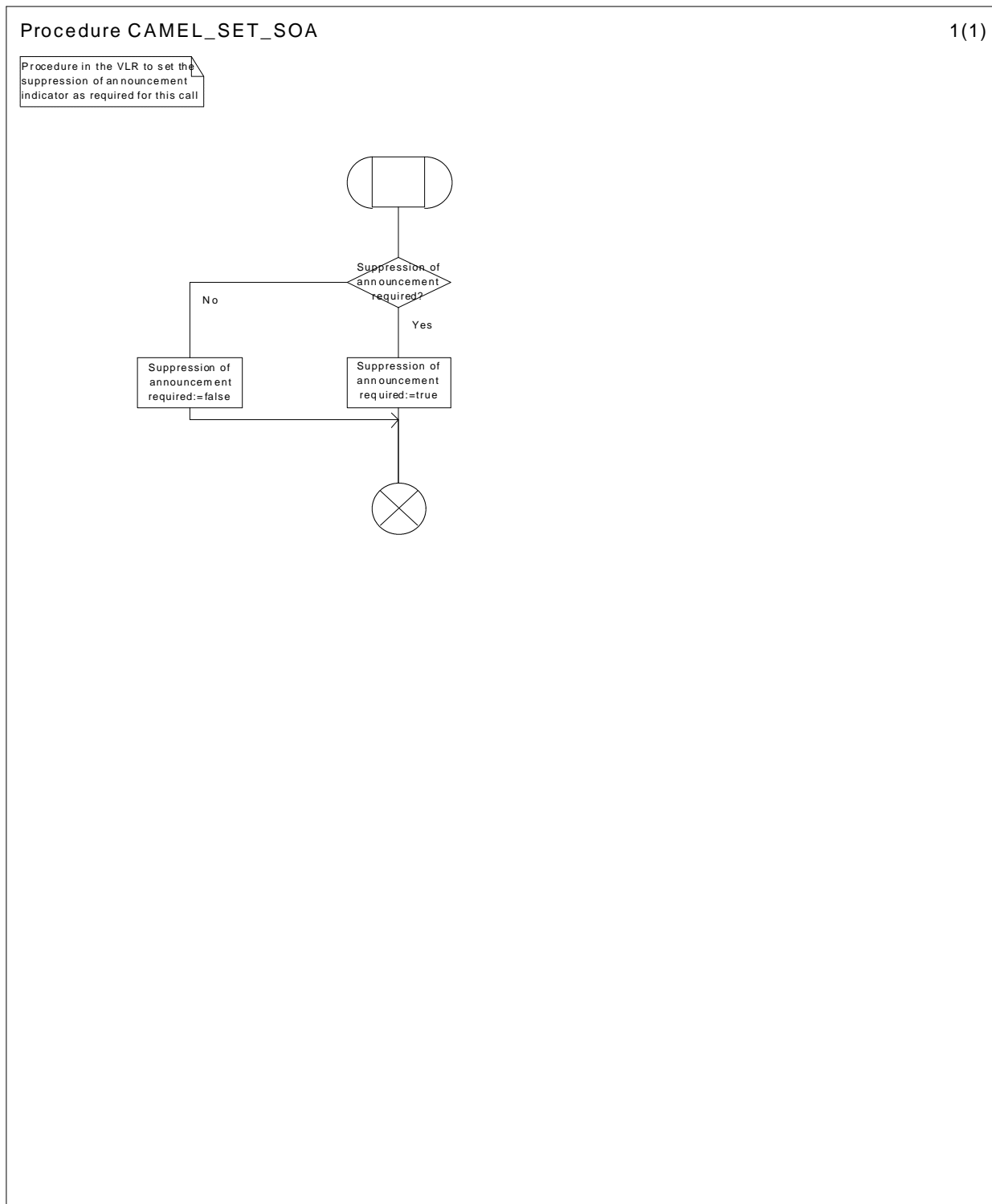


Figure 4.41a: Procedure CAMEL\_SET\_SOA (sheet 1)

#### 4.5.4 Handling of mobile terminating calls

##### 4.5.4.1 Handling of mobile terminating calls in the terminating VMSC

The functional behaviour of the terminating VMSC is specified in 3G TS 23.018 [3].

The behaviour specific to CAMEL is:

- the inclusion of the O-CSI parameter in the Perform Call Forwarding message sent to the process MT\_CF\_MSC if it was received in the Send Info For Incoming Call ack;
- the requirement to suppress the connection of announcements or tones if the VLR includes the suppression of announcements parameter in the Send Info For Incoming Call negative response.

The procedures specific to CAMEL are specified in this subclause :

- Procedure CAMEL\_ICH\_VLR
- Procedure CAMEL\_O\_CSI\_Check\_VLR
- Procedure CAMEL\_T\_CSI\_Check\_VLR
- Procedure CAMEL\_ICH\_MSC\_INIT
- Procedure CAMEL\_MT\_VMSC\_Notify\_CF

#### 4.5.4.1.1 Action of the VMSC in procedure CAMEL\_MT\_VMSC\_Notify\_CF

The Forwarding reason is taken from the Complete Call message from the VLR.

The Int\_DP\_T\_No\_Answer and Int\_DP\_T\_Busy messages include a parameter to indicate that the call has encountered conditional call forwarding. The gsmSSF will transfer this parameter to the CAP\_Event\_Report\_BCSM message which it sends to the gsmSCF.

Procedure CAMEL\_ICH\_VLR

1(1)

/\* This procedure is called in ICH\_VLR (in GSM 03.18) \*/

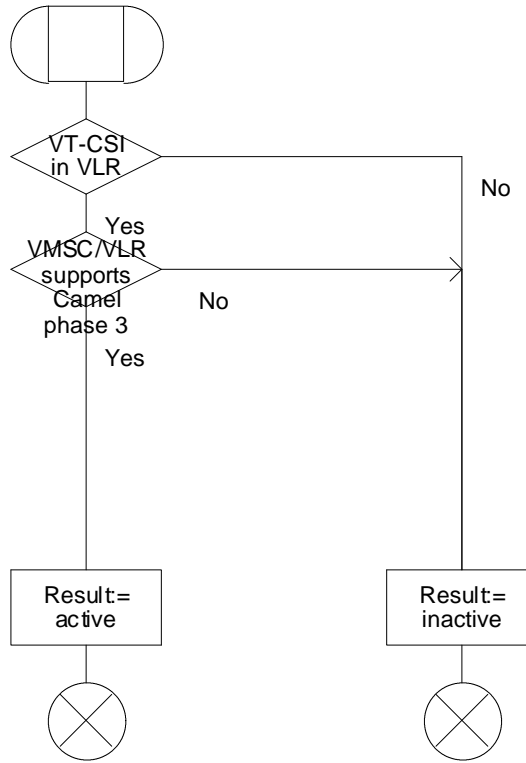


Figure 4.42: Procedure CAMEL\_ICH\_VLR (sheet 1)

### Procedure CAMEL\_O\_CSI\_CHECK\_VLR

1(

Procedure in the VLR to check the O-CSI and set the O-CSI parameter for SIFIC ack accordingly.

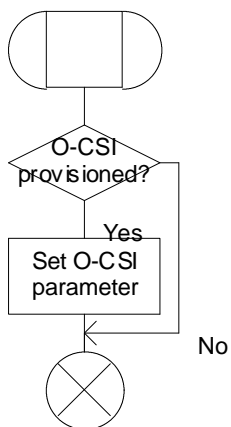


Figure 4.43: Procedure CAMEL\_O\_CSI\_Check\_VLR (sheet 1)



### Procedure CAMEL\_T\_CSI\_CHECK\_VLR

1(1)

*\* Procedure in the VLR to check the VT-CSI and set the SIFIC ack parameter accordingly \*/*

- Check basic service code criteria
- Check VT-CSI in VMSC-B

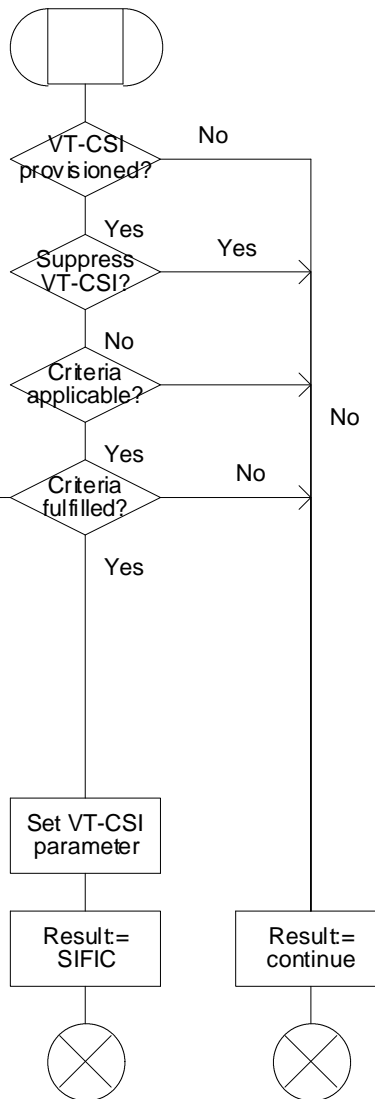


Figure 4.44: Procedure CAMEL\_T\_CSI\_Check\_VLR (sheet 1)

### Procedure CAMEL\_ICH\_MSC\_INIT

1(5)

/\* Process in the VMSC-B to handle a terminating call request \*/

/\* Signals to/from the right are to/from the gsmSSF \*/

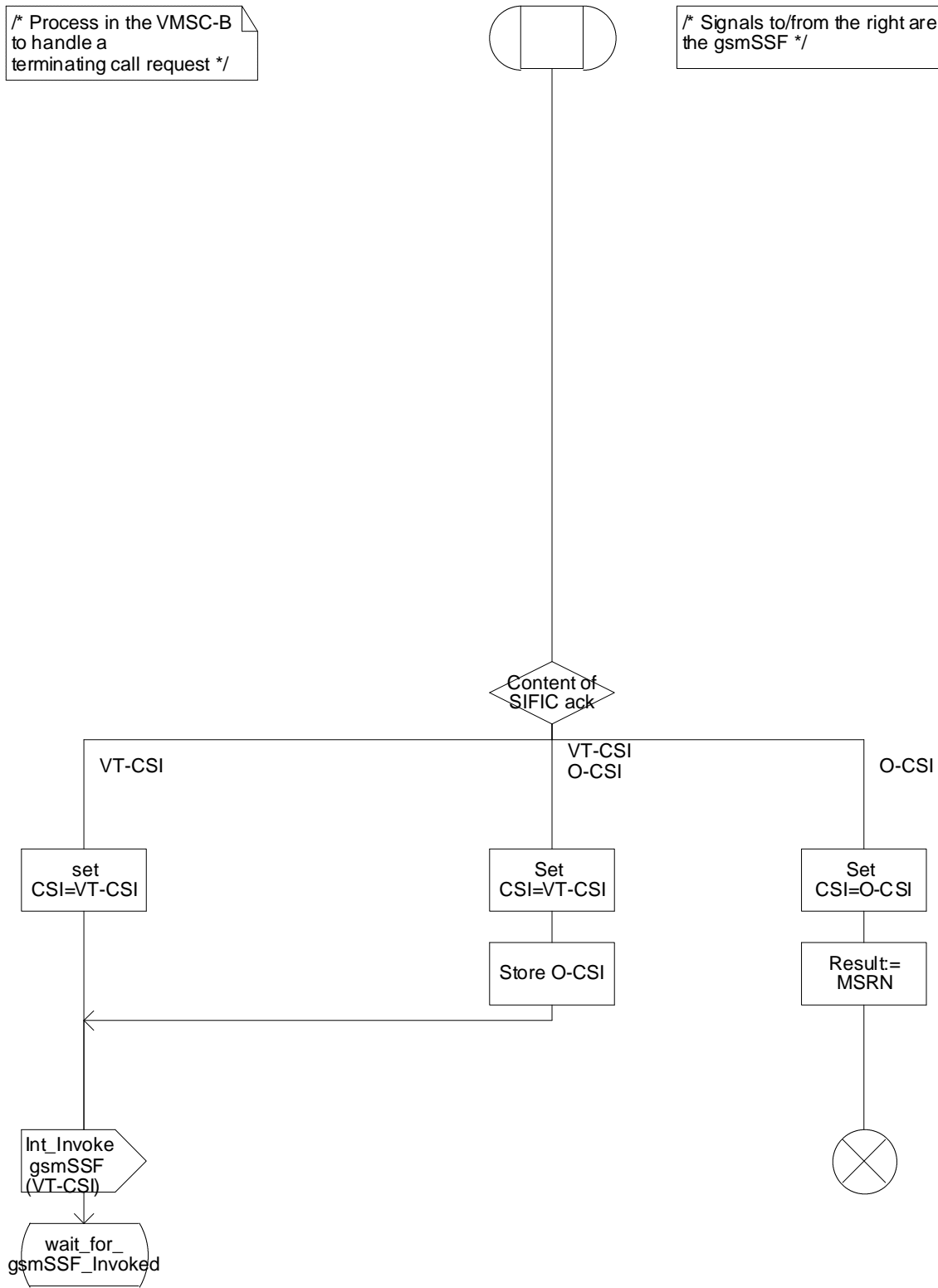


Figure 4.45a: Procedure CAMEL\_ICH\_MSC\_INIT (sheet 1)

Procedure CAMEL\_ICH\_MSC\_INIT

2(5)

/\* Process in the VMSC-B to handle a terminating call request \*/

/\* Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the gsmSSF \*/

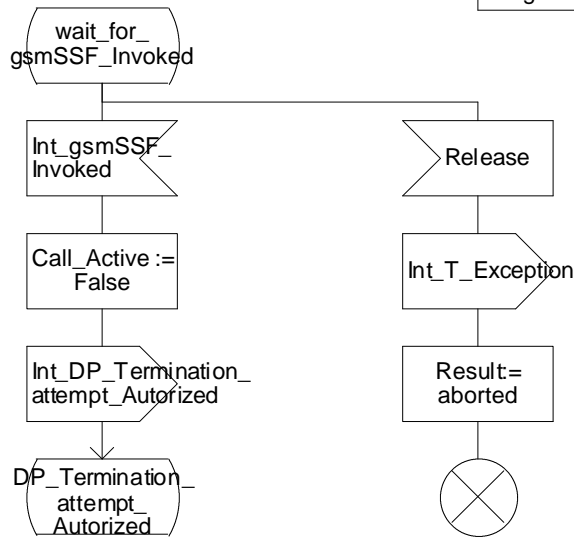


Figure 4.45b: Procedure CAMEL\_ICH\_MSC\_INIT (sheet 2)

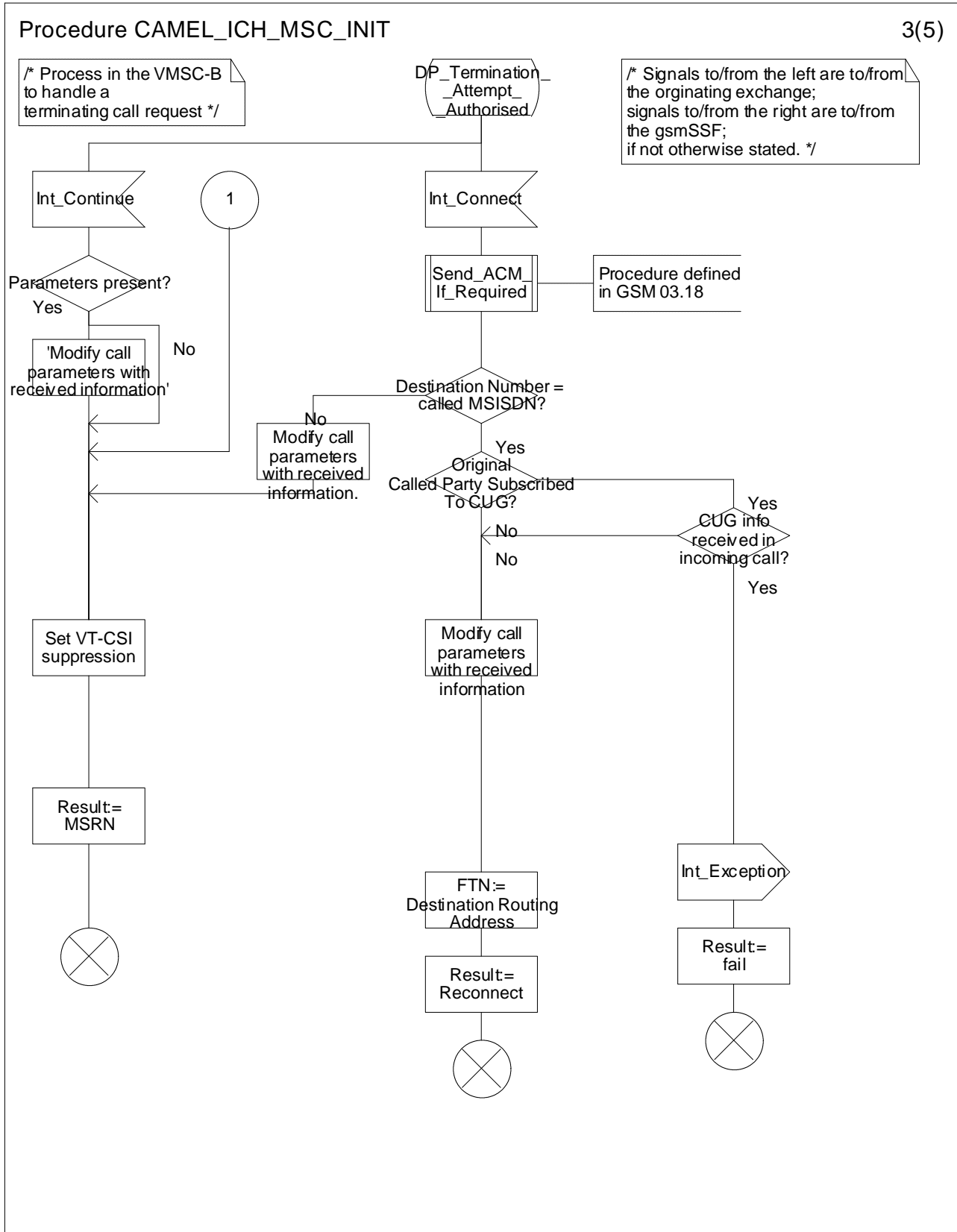


Figure 4.45c: Procedure CAMEL\_ICH\_MSC\_INIT (sheet 3)

Procedure CAMEL\_ICH\_MSC\_INIT

4(5)

/\* Process in the VMSC-B to handle a terminating call request \*/

/\* Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the gsmSSF; if not otherwise stated. \*/

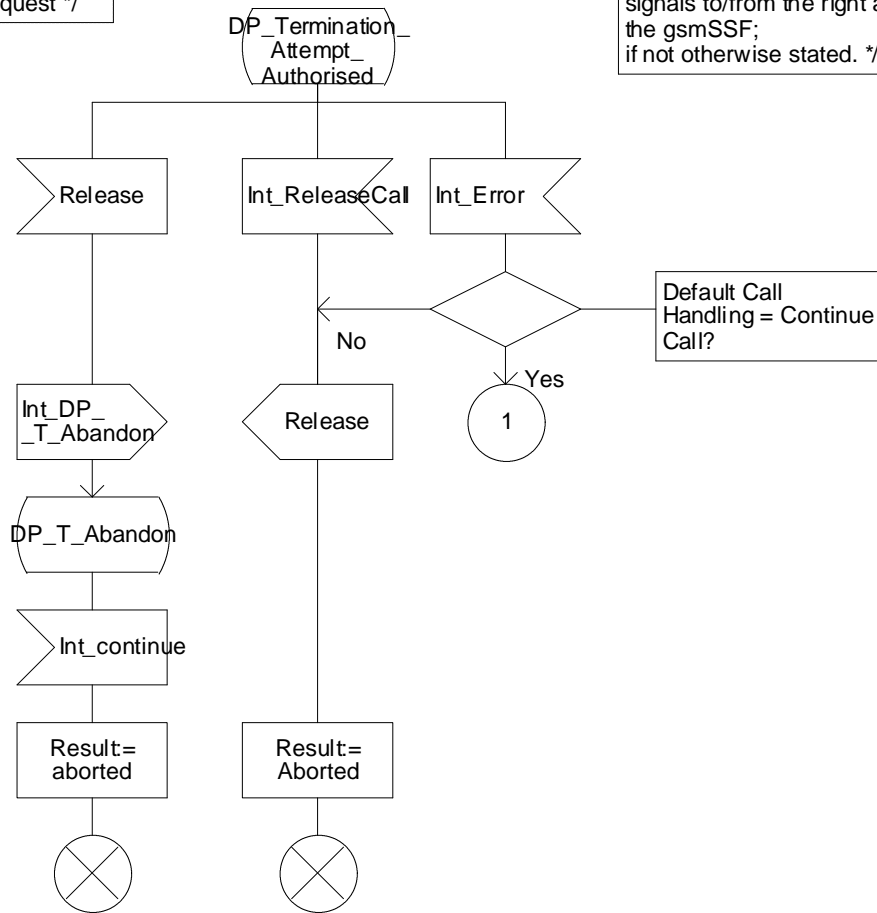


Figure 4.45d: Procedure CAMEL\_ICH\_MSC\_INIT (sheet 4)

Procedure CAMEL\_ICH\_MSC\_INIT

5(5)

/\* Process in the VMSC-B to handle a terminating call request \*/

/\* Signals to/from the right are to/from the gsmSSF. \*/

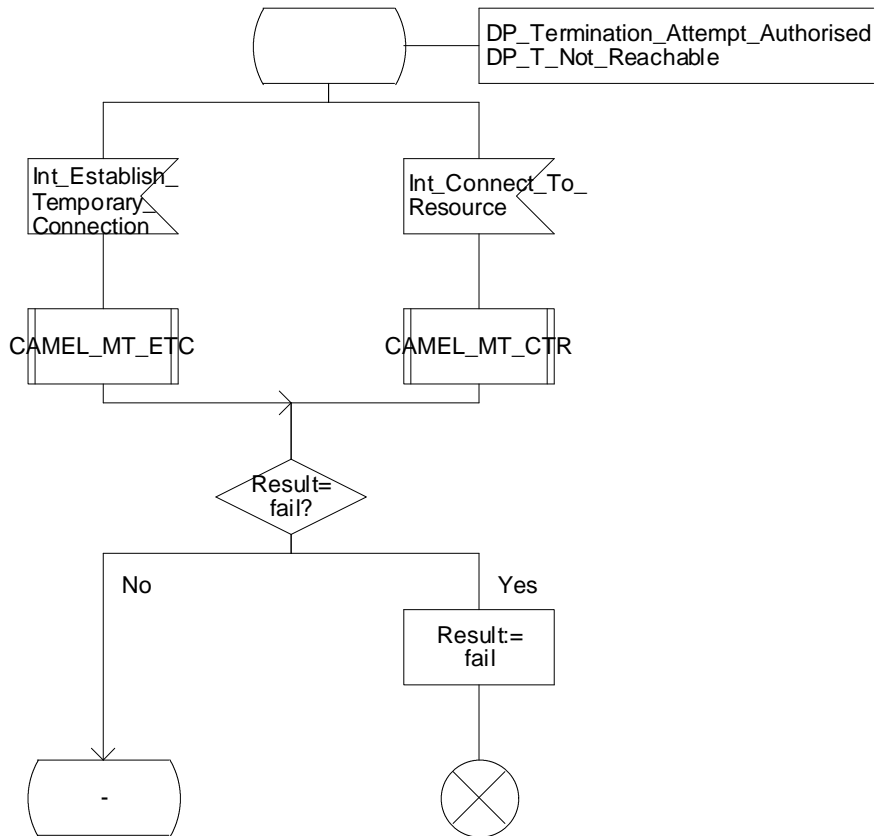
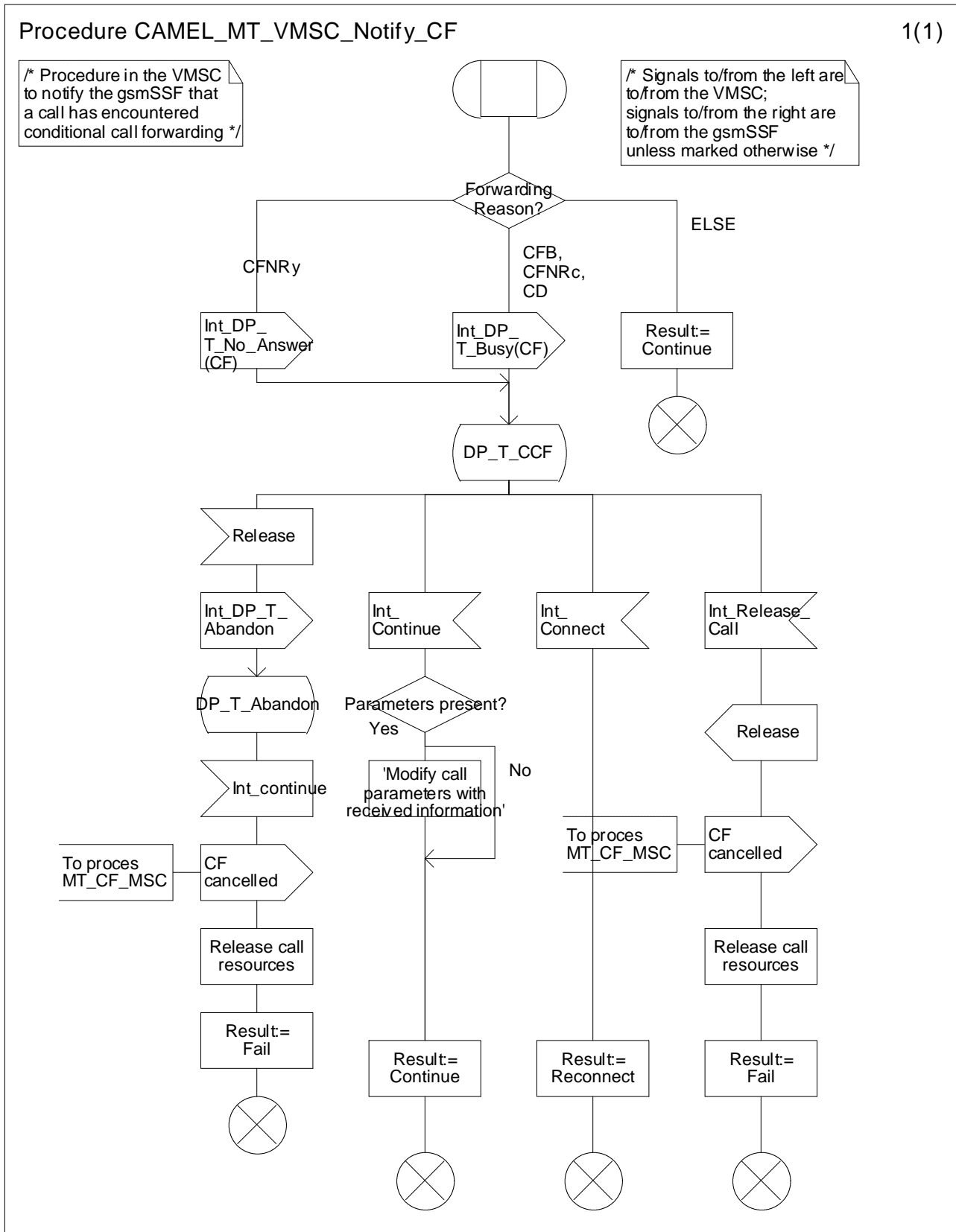


Figure 4.45e: Procedure CAMEL\_ICH\_MSC\_INIT (sheet 5)



**Figure 4.46: Procedure CAMEL\_MT\_VMSC\_Notify\_CF (sheet 1)**

**4.5.4.2 Handling of mobile terminating calls in the VLR**

The functional behaviour of the terminating VLR is specified in 3G TS 23.018 [3]. The process specific to CAMEL is specified in this subclause :

- Process Reconnected\_MT\_Call\_VLR

The behaviour specific to CAMEL is:

- the inclusion of the O-CSI parameter in the Send Info For Incoming Call ack if the call is to be forwarded and O-CSI is included in the subscriber data for that subscriber in the VLR;
- the inclusion of the suppression of announcements parameter in the Send Info For Incoming Call negative response if it was received in the Provide Roaming Number.



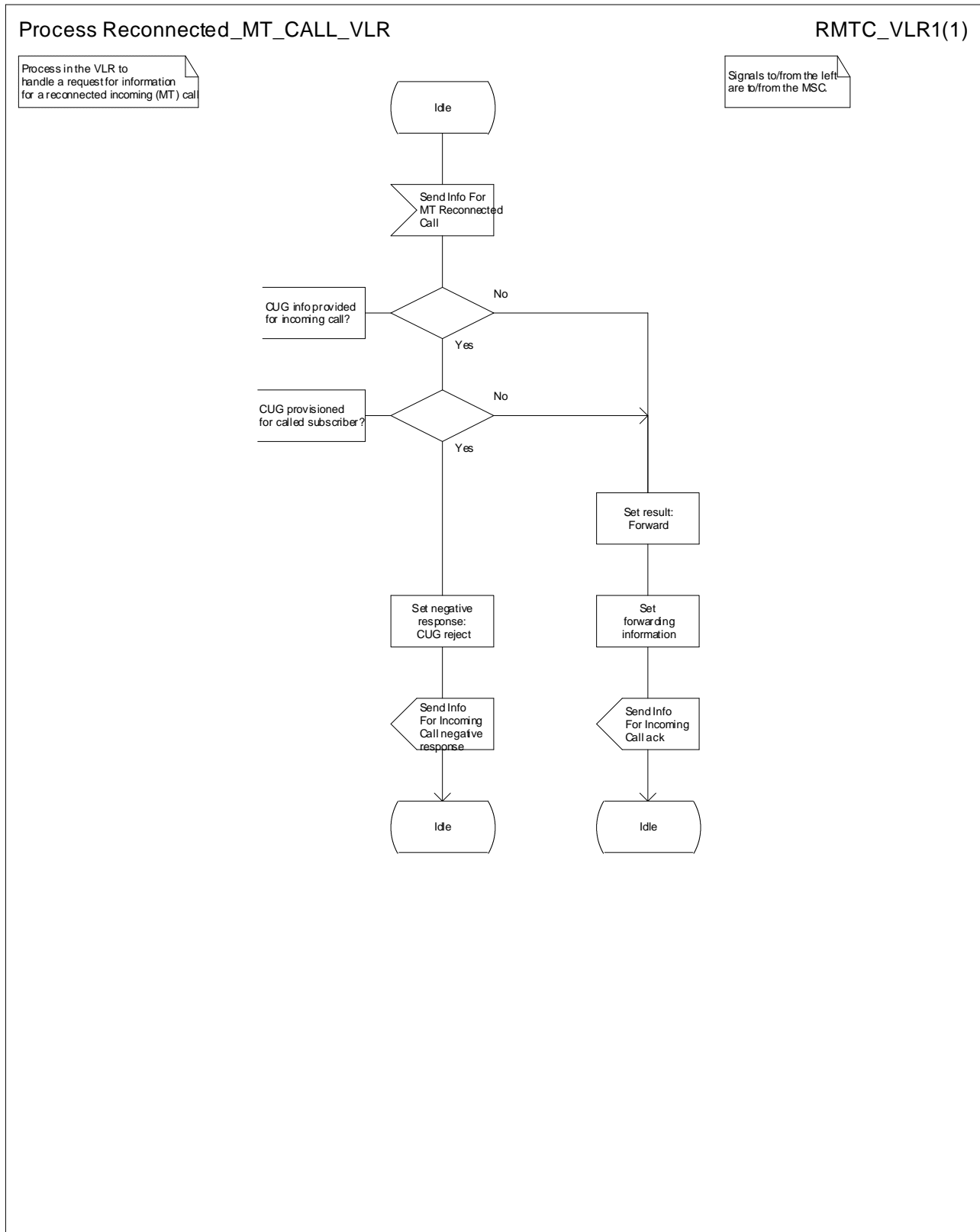


Figure 4.47: Process Reconnected\_MT\_Call\_VLR (sheet 1)

### 4.5.5 Handling of forwarded calls

The handling of forwarded calls in the GMSC or the terminating VMSC is specified in 3G TS 23.018 [3]. The procedures specific to CAMEL are specified in this subclause.

- Procedure CAMEL\_Check\_ORLFCF\_VMSC
- Procedure CAMEL\_CF\_MSC\_INIT,
- Procedure CAMEL\_CF\_MSC\_ANSWER
- Procedure CAMEL\_CF\_ETC,
- Procedure CAMEL\_CF\_CTR.

A mobile terminated call can be forwarded either in the GMSC (indicated by provision of Forwarded-To-Number from HLR or gsmSCF) or in the MSC (indicated by provisioning of Forwarded-To-Number from VLR).

#### 4.5.5.1 Procedure CAMEL\_CF\_MSC\_INIT: handling of Int\_Continue\_With\_Argument

The received parameters are used to overwrite the corresponding ISUP parameters (for mapping see 3G TS 29.078 [5]). Call parameters which are not included in the Int\_Continue\_With\_Argument message are unchanged.

Signalling limitations or regulatory requirements may require the Calling Partys Category, Generic Number, Original Called Party Number and Redirecting Party ID to be ignored or modified.

#### 4.5.5.2 Procedure CAMEL\_CF\_MSC\_INIT : handling of Int\_Connect

The received parameters are used to overwrite the corresponding ISUP parameters (for mapping see 3G TS 29.078 [5]). Call parameters which are not included in the Int\_Connect message are unchanged.

An a network operator option, loop prevention mechanisms may cause the redirection information to be ignored or modified (e.g., if the Redirection counter has been decreased).

Signalling limitations or regulatory requirements may require the Calling Partys Category, Generic Number, Original Called Party Number and Redirecting Party ID to be ignored or modified.

The network signalling system shall indicate that this is an internal network number.

#### 4.5.5.3 Action of the MSC in procedure CAMEL\_CF\_MSC\_ANSWER

If the MSC received a destination address from the GMSC in the ISUP Answer or Connect message, the MSC relays the destination address to the gsmSSF in the Int\_DP\_O\_Answer message.

#### 4.5.5.4 Action of the MSC in procedure CAMEL\_CF\_ETC

In procedure CAMEL\_CF\_ETC (sheet 2) the GMSC or terminating VMSC will remain in the Wait\_For\_Assisting\_Answer state until it receives an ISUP Answer Message (ANM) or timeout occurs. This is to ensure that a call record is always generated for every successful establishment of a temporary connection to a gsmSRF, especially in the case where the connection is between PLMNs.

NOTE: This means that it may not be possible to access an SRF which does not generate an ISUP Answer Message (ANM).

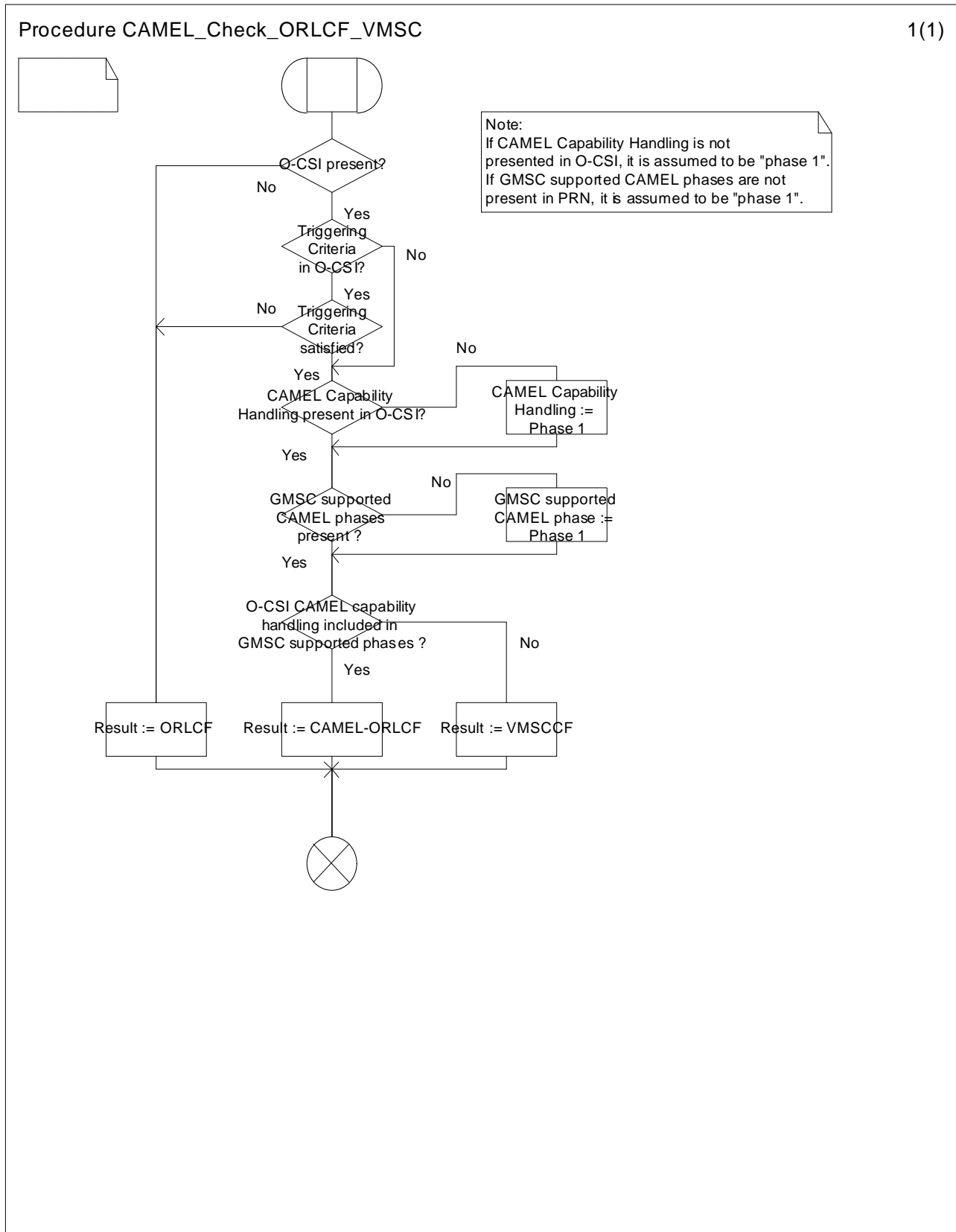


Figure 4.48a: Procedure CAMEL\_Check\_ORLCF\_VMSC (sheet 1)

Procedure CAMEL\_CF\_Dialled\_Services

1(1)

Procedure in the MSC to process CAMEL dialled services for forwarded calls

/\* Signals to/from the left are to/from the origination Exchange. \*/

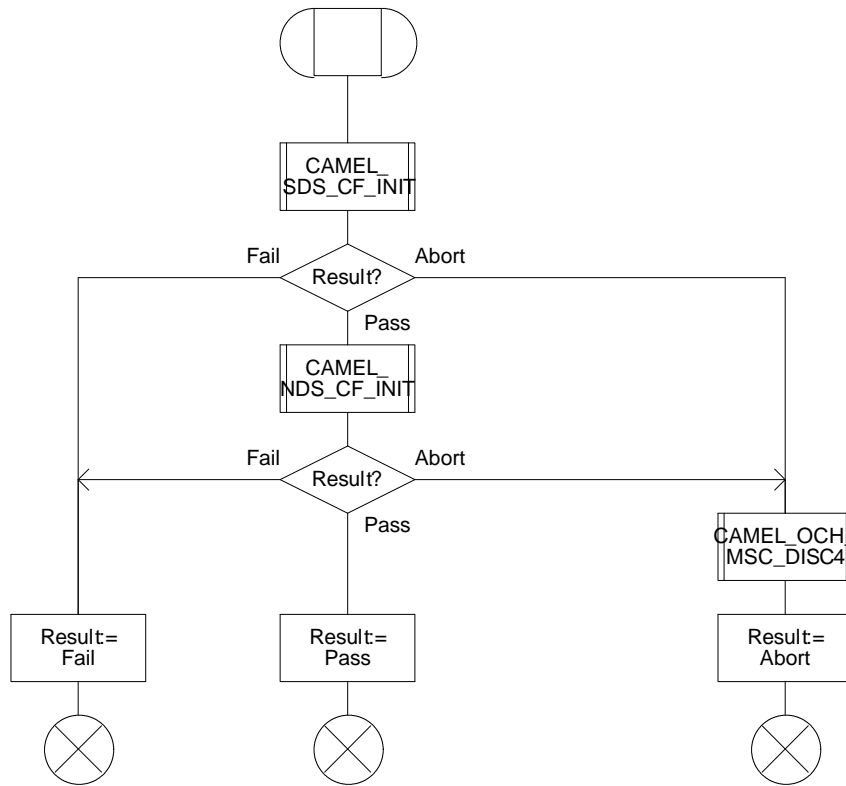


Figure 4.49a: Procedure CAMEL\_CF\_Dialled\_Services (sheet 1)

Procedure CAMEL\_CF\_MSC\_INIT

1(4)

/\* Procedure in the MSC to handle a forwarded call \*/

/\* Signals to/from the left are to/from the process MT\_GMSC / ICH\_MSC; signals to/from the right are to/from the process gsmSSF if not otherwise stated. \*/

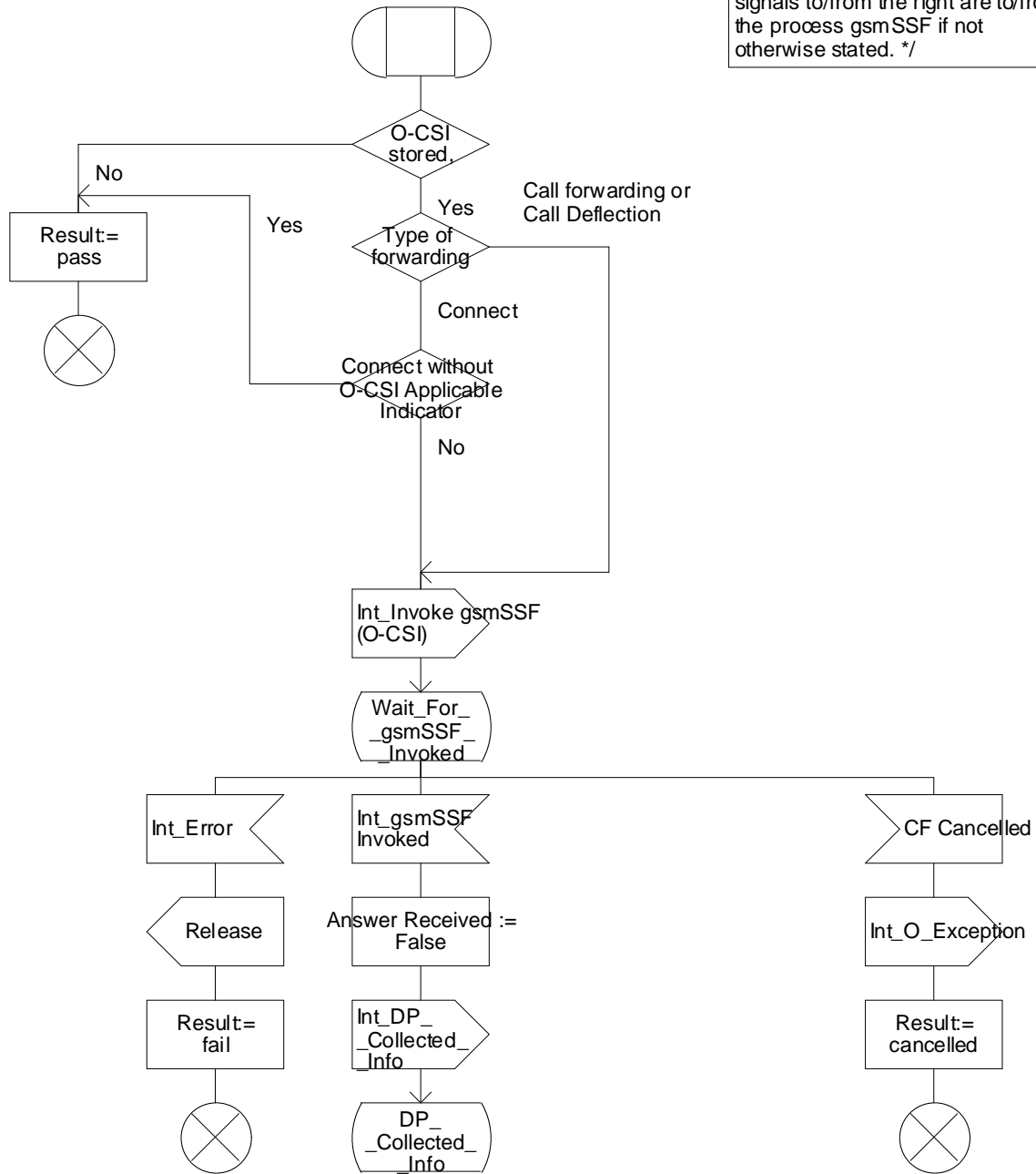


Figure 4.50a: Procedure CAMEL\_CF\_MSC\_INIT (sheet 1)

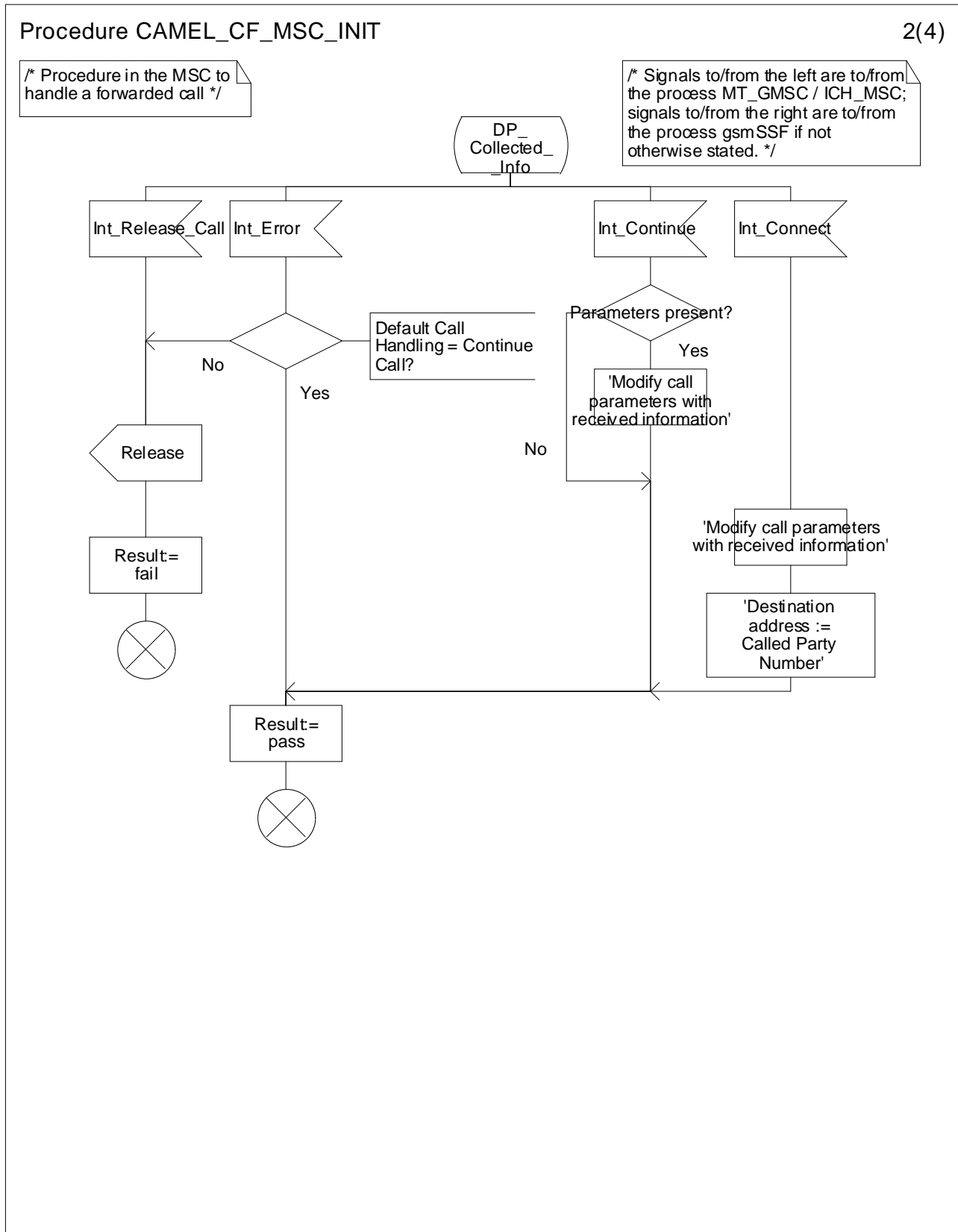


Figure 4.50b: Procedure CAMEL\_CF\_MSC\_INIT (sheet 2)

Procedure CAMEL\_CF\_MSC\_INIT

3(4)

/\* Procedure in the MSC to handle a forwarded call \*/

/\* Signals to/from the right are to/from the gsmSSF if not otherwise stated. \*/

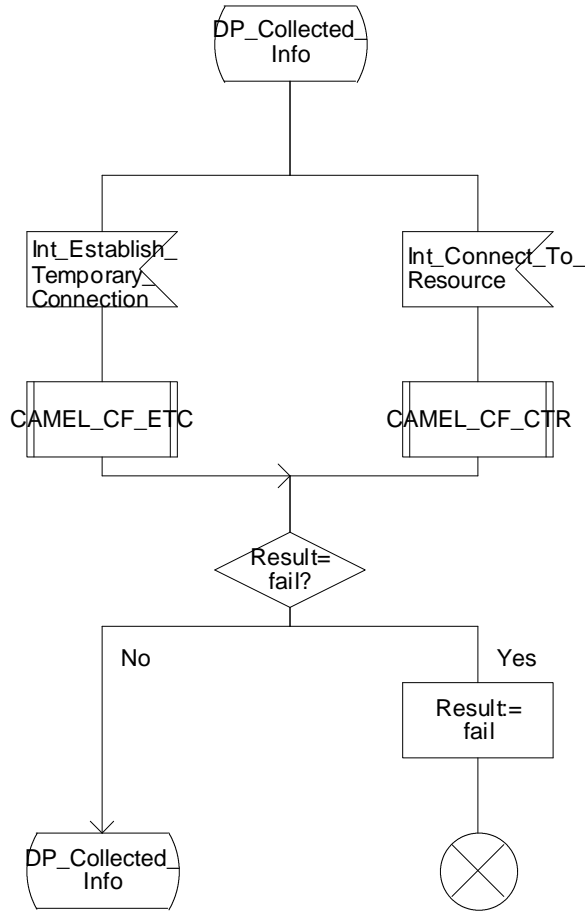


Figure 4.50c: Procedure CAMEL\_CF\_MSC\_INIT (sheet 3)

### Procedure CAMEL\_CF\_MSC\_INIT

4(4)

*/\* Procedure in the MSC to handle a forwarded call \*/*

*/\* Signals to/from the left are to/from the process MT\_GMSC / ICH\_MSC; signals to/from the right are to/from the gsmSSF; if not otherwise stated. \*/*

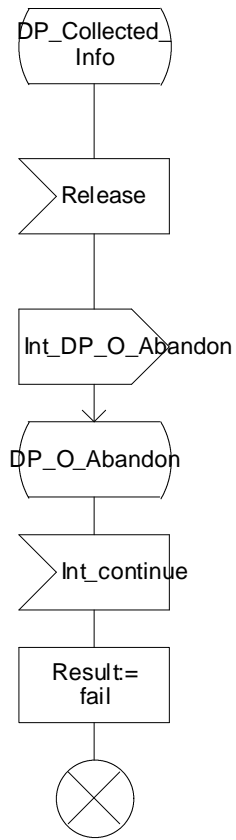


Figure 4.50d: Procedure CAMEL\_CF\_MSC\_INIT (sheet 4)



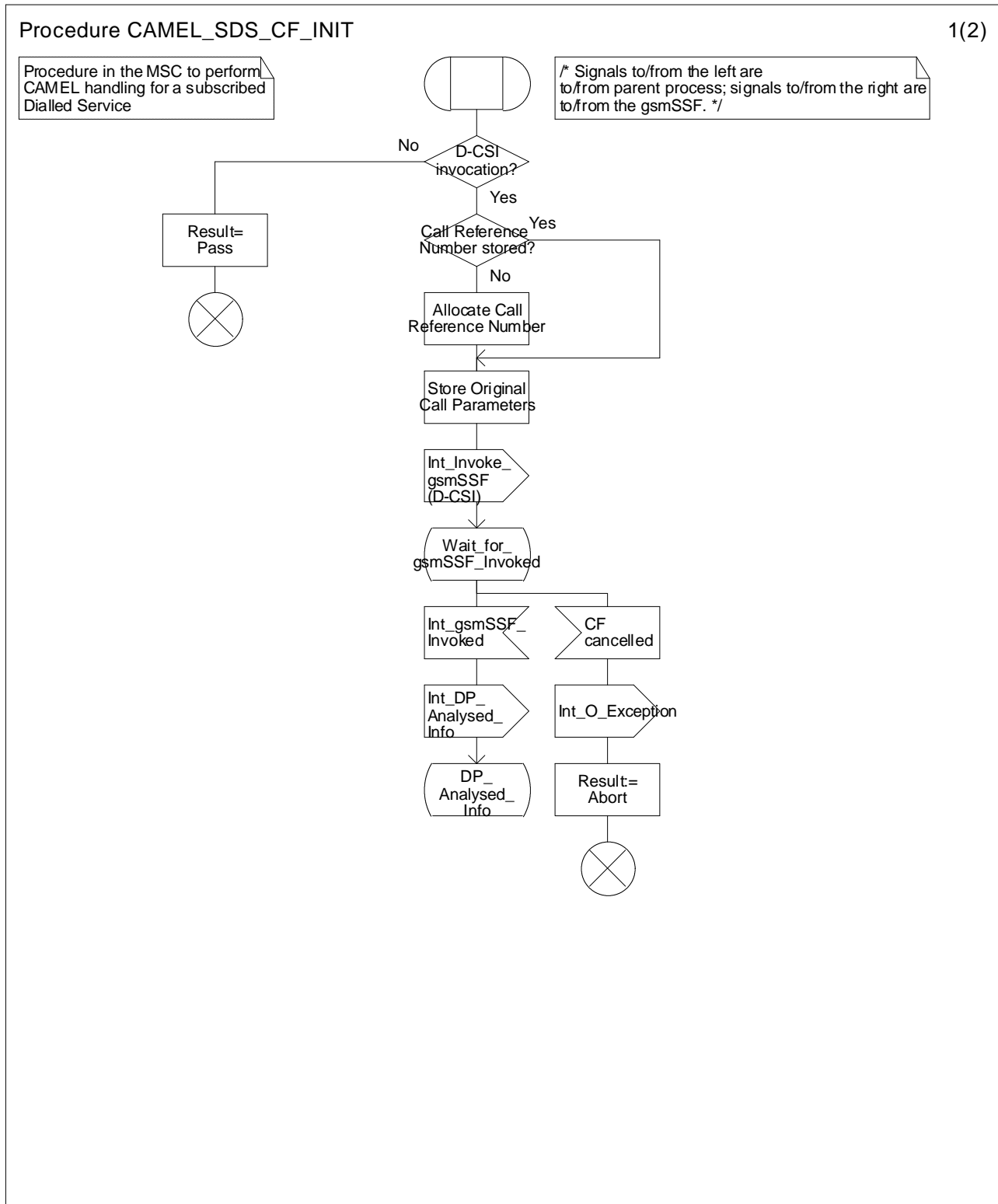


Figure 4.51a: Procedure CAMEL\_SDS\_CF\_INIT (sheet 1)

Procedure CAMEL\_SDS\_CF\_INIT

2(2)

Procedure in the MSC to perform CAMEL handling for a subscribed Dialed Service

/\* Signals to/from the left are to/from the parent process; signals to/from the right are to/from the gsmSSF. \*/

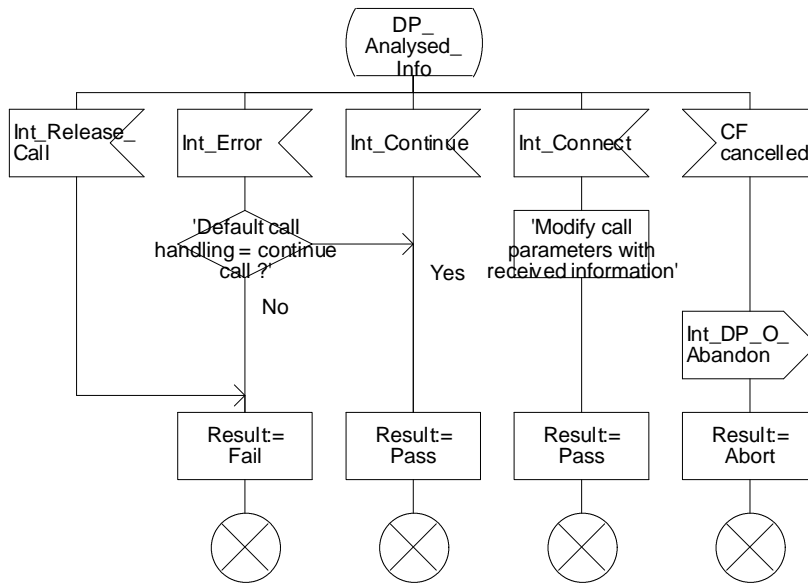


Figure 4.51b: Procedure CAMEL\_SDS\_CF\_INIT (sheet 2)

Procedure CAMEL\_NDS\_CF\_INIT

1(2)

Procedure in the MSC to perform CAMEL handling for a network Dialed Service for mobile originated calls

/\* Signals to/from the left are to/from parent process; signals to/from the right are to/from the gsmSSF. \*/

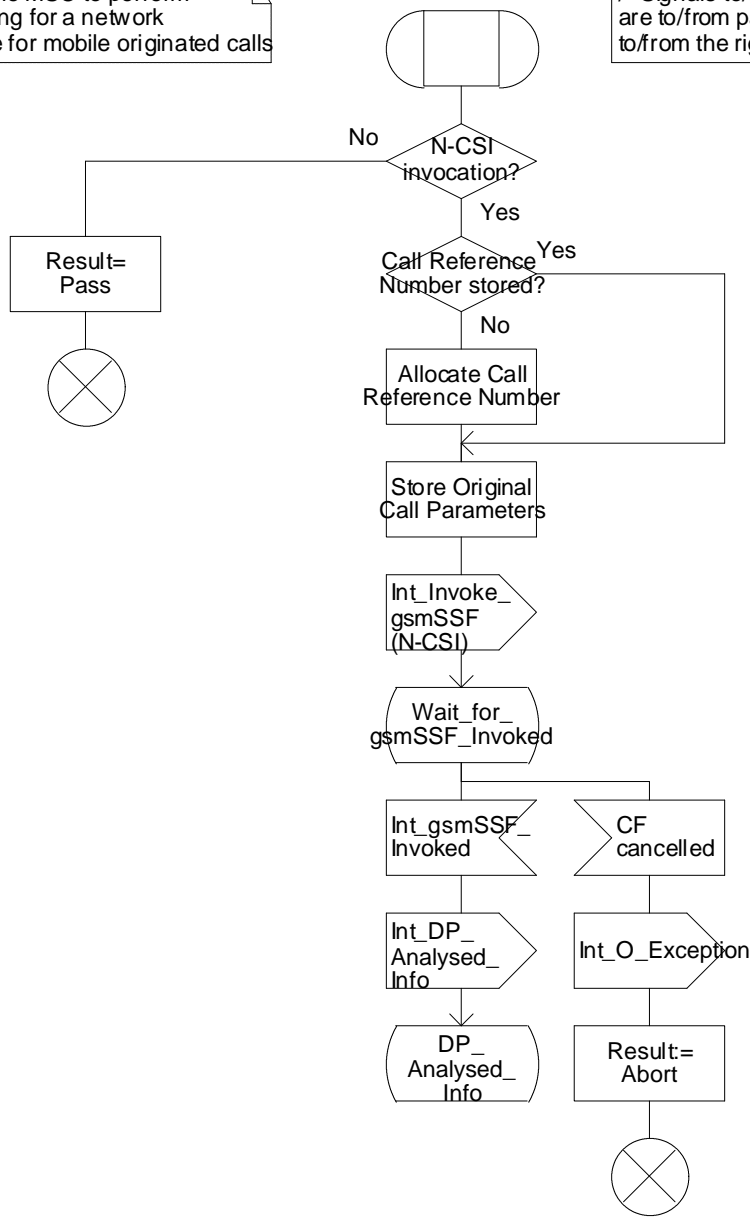


Figure 4.52a: Procedure CAMEL\_NDS\_CF\_INIT (sheet 1)

Procedure CAMEL\_NDS\_CF\_INIT

2(2)

Procedure in the MSC to perform CAMEL handling for a network Dialed Service for mobile originated calls

/\* Signals to/from the left are to/from parent process; signals to/from the right are to/from the gsmSSF. \*/

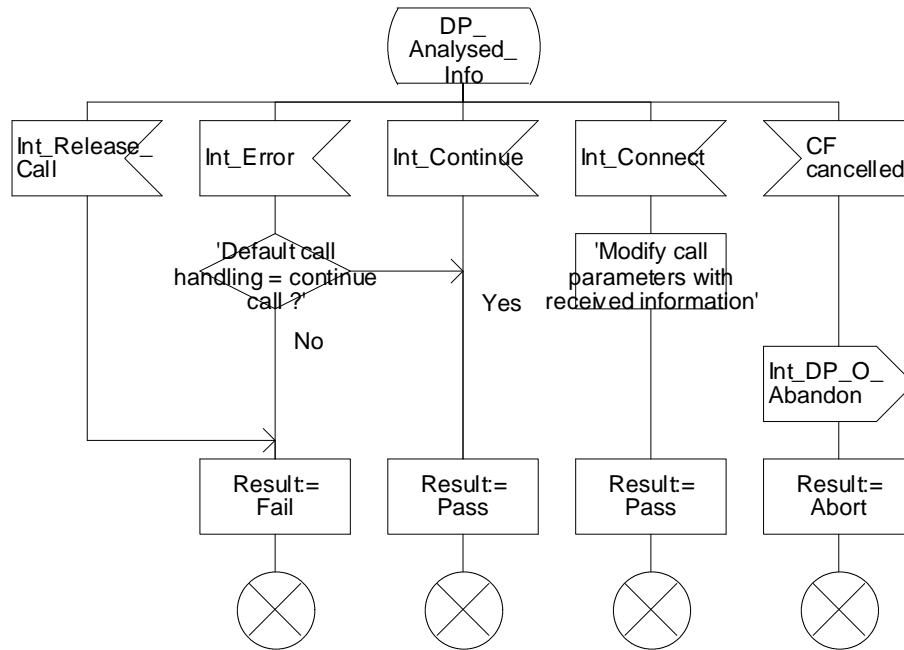


Figure 4.52b: Procedure CAMEL\_NDS\_CF\_INIT (sheet 2)

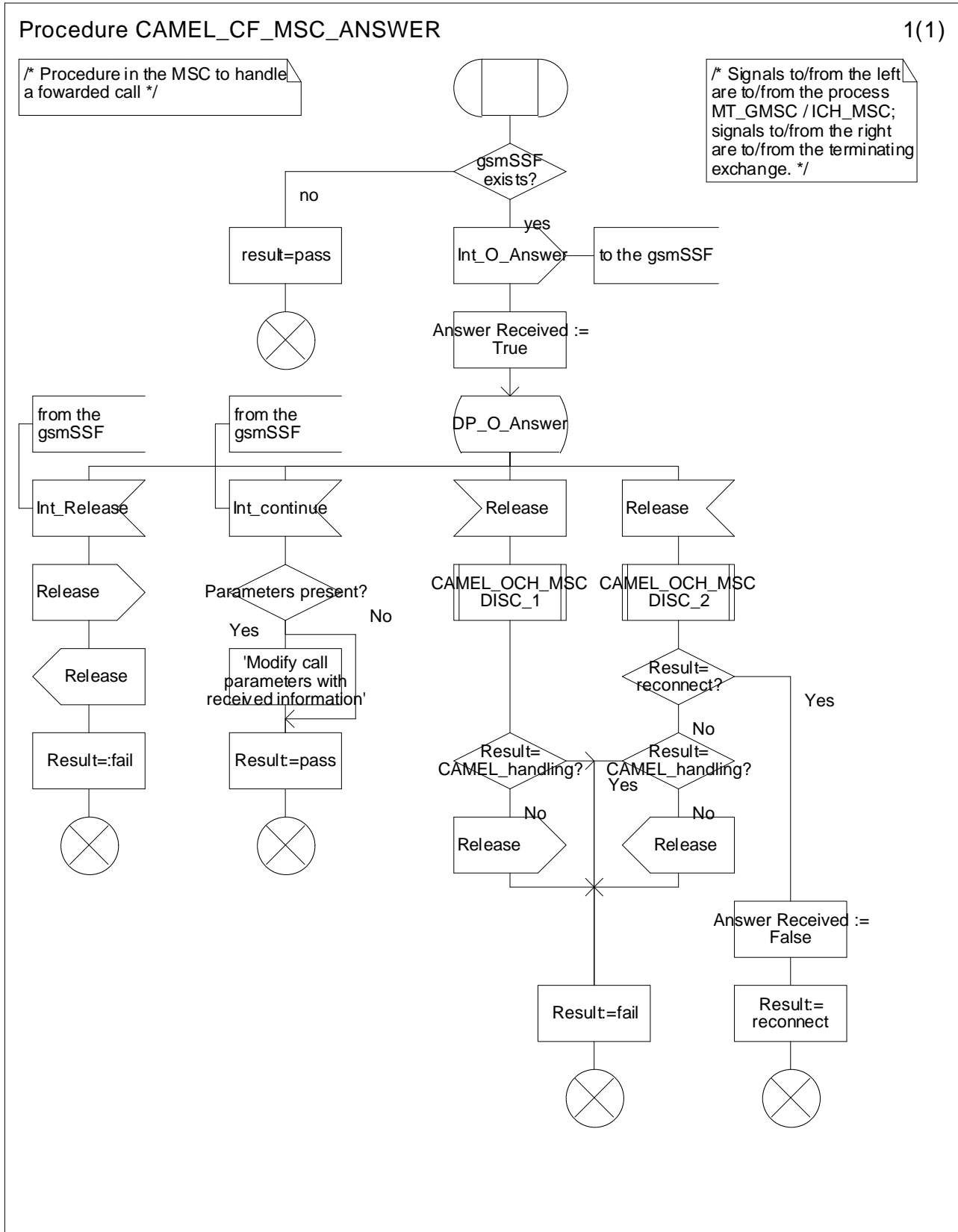


Figure 4.53a: Procedure CAMEL\_CF\_MSC\_ANSWER (sheet 1)

Procedure CAMEL\_CF\_ETC

1(3)

/\* Procedure in the MSC to handle a temporary connection \*/

/\* Signals to/from the left are to/from the process MT\_GMSC / ICH\_MSC; signals to/from the right are to/from the gsmSSF; if not otherwise stated. \*/

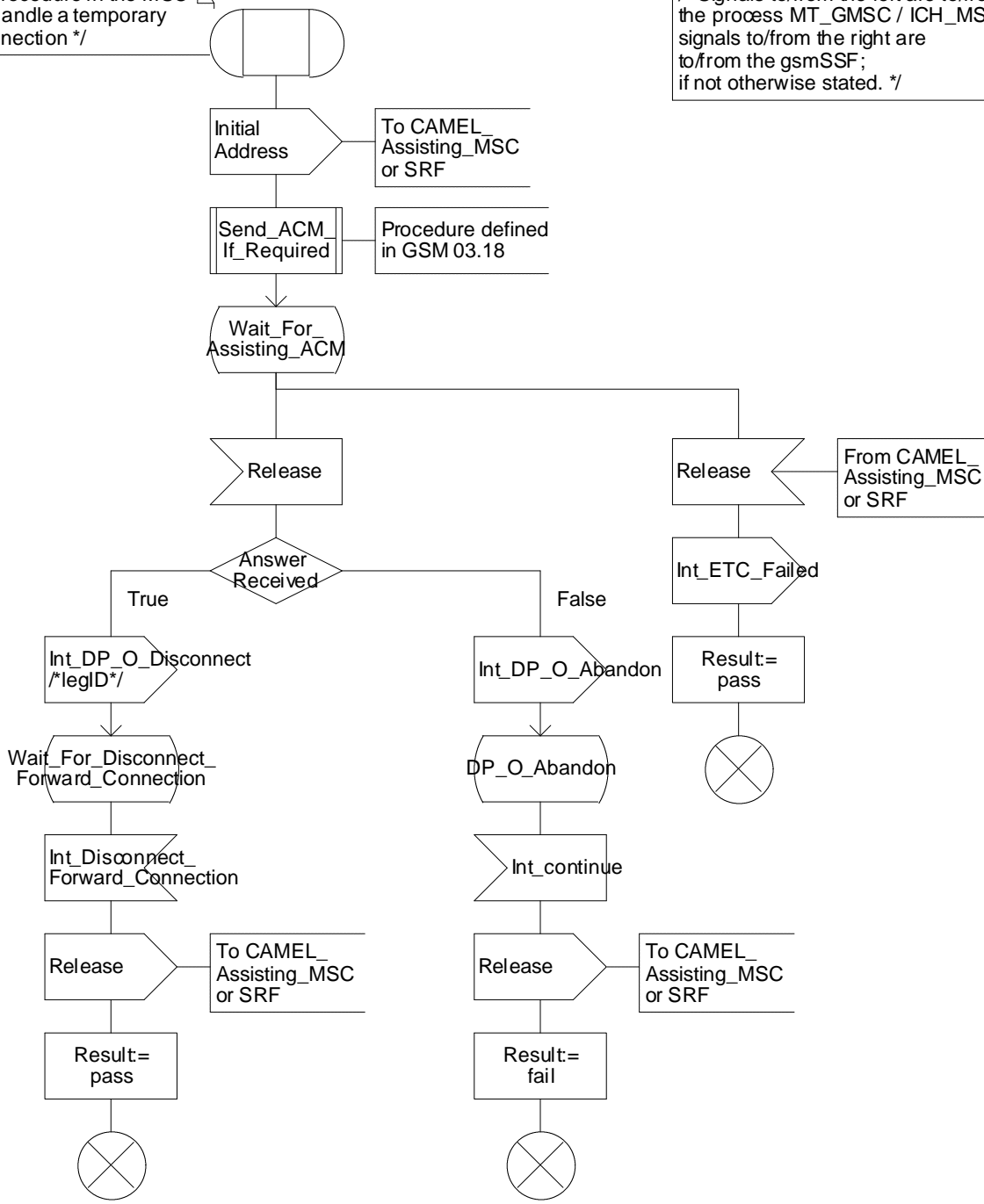


Figure 4.54a: Process CAMEL\_CF\_ETC (sheet 1)

Procedure CAMEL\_CF\_ETC

2(3)

/\* Procedure in the MSC to handle a temporary connection \*/

/\* Signals to/from the left are to/from the process MT\_GMSC / ICH\_MSC; signals to/from the right are to/from the CAMEL\_Assisting\_MSC or SRF. \*/

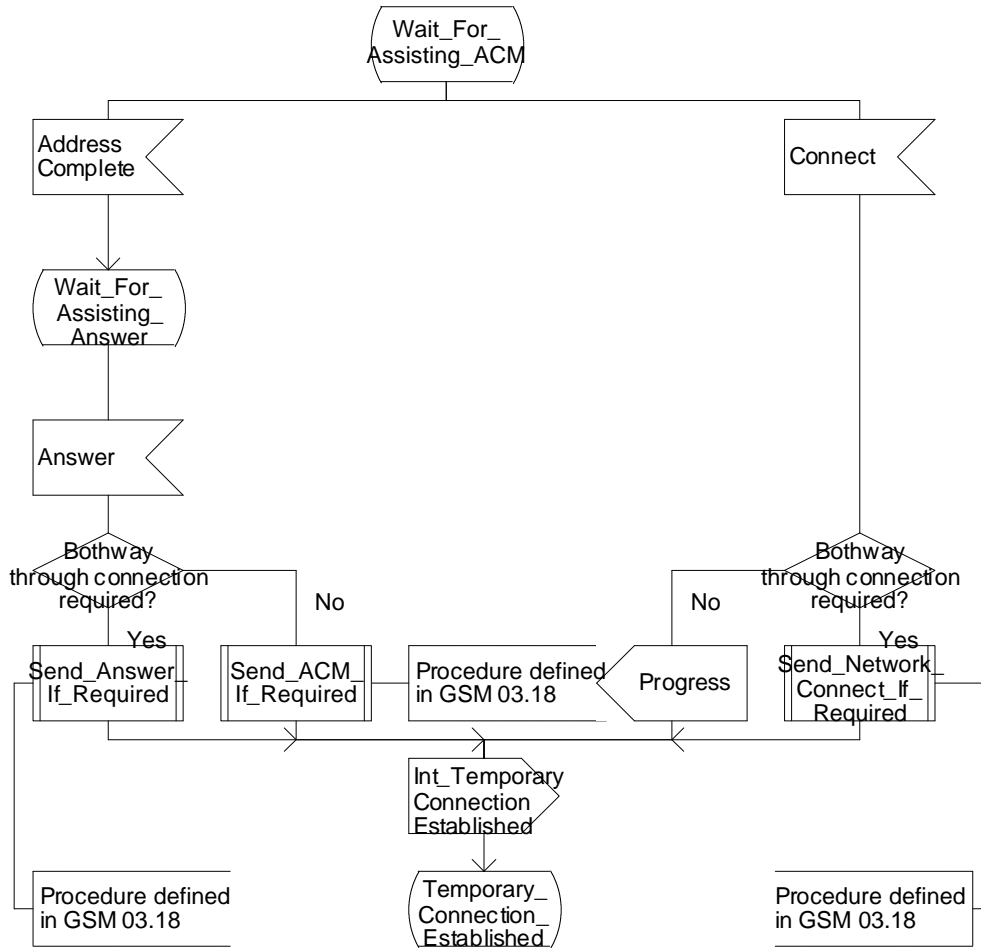


Figure 4.54b: Procedure CAMEL\_CF\_ETC (sheet 2)

Procedure CAMEL\_CF\_ETC

3(3)

/\* Procedure in the MSC to handle a temporary connection \*/

/\* Signals to/from the left are to/from the process MT\_GMSC / ICH\_MSC; signals to/from the right are to/from the gsmSSF; if not otherwise stated. \*/

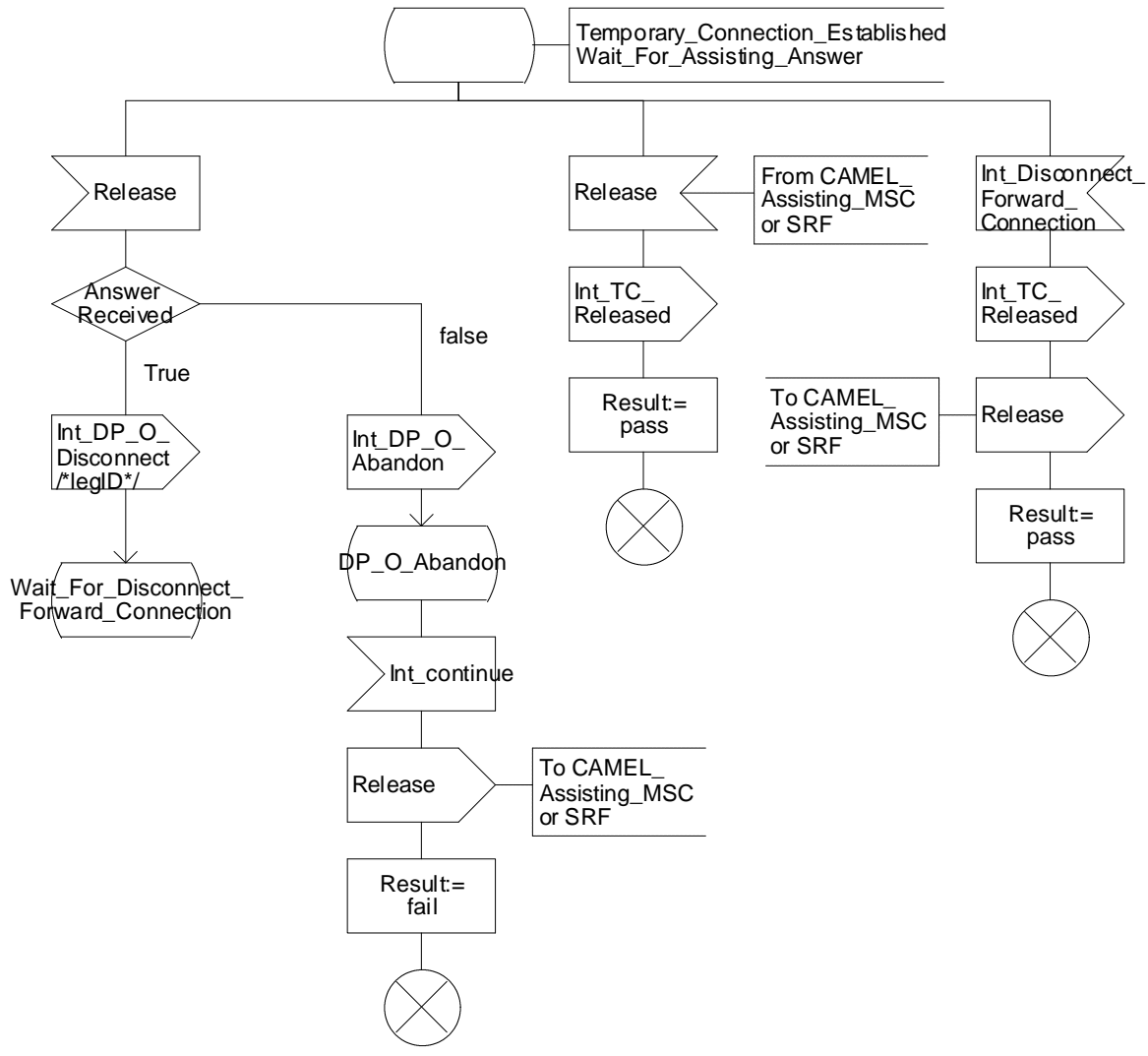


Figure 4.54c: Procedure CAMEL\_CF\_ETC (sheet 3)



Procedure CAMEL\_CF\_CTR

1(4)

/\* Procedure in the MSC to handle a Connect To Resource operation \*/

/\* Signals to/from the left are to/from the process MT\_GMSC / ICH\_MSC; signals to/from the right are to/from the gsmSSF if not otherwise stated. \*/

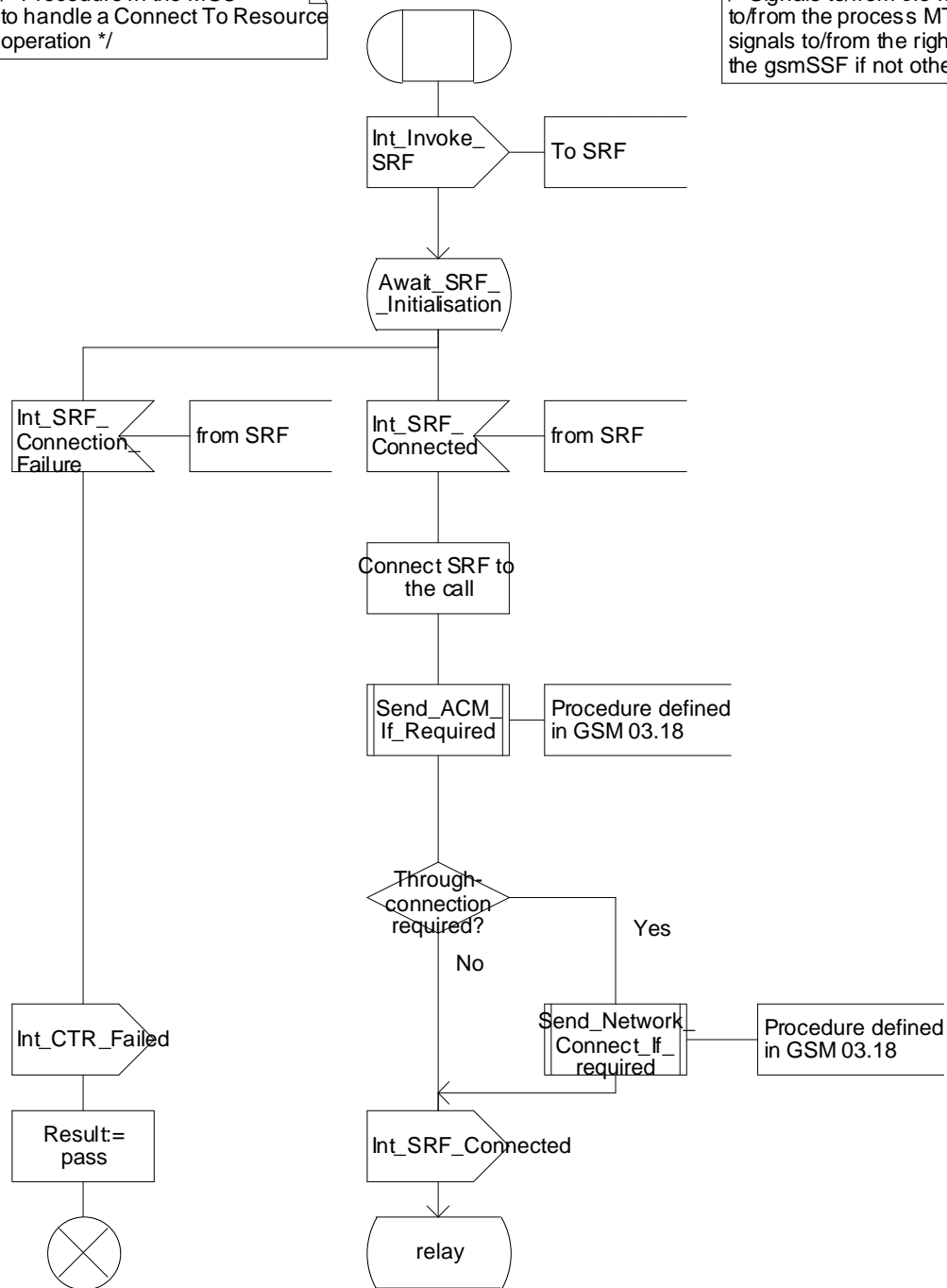


Figure 4.55a: Process CAMEL\_CF\_CTR (sheet 1)

### Procedure CAMEL\_CF\_CTR

2(4)

/\* Procedure in the MSC to handle a Connect To Resource operation \*/

/\* Signals to/from the left are to/from the process MT\_GMSC / ICH\_MSC; signals to/from the right are to/from the gsmSSF if not otherwise stated. \*/

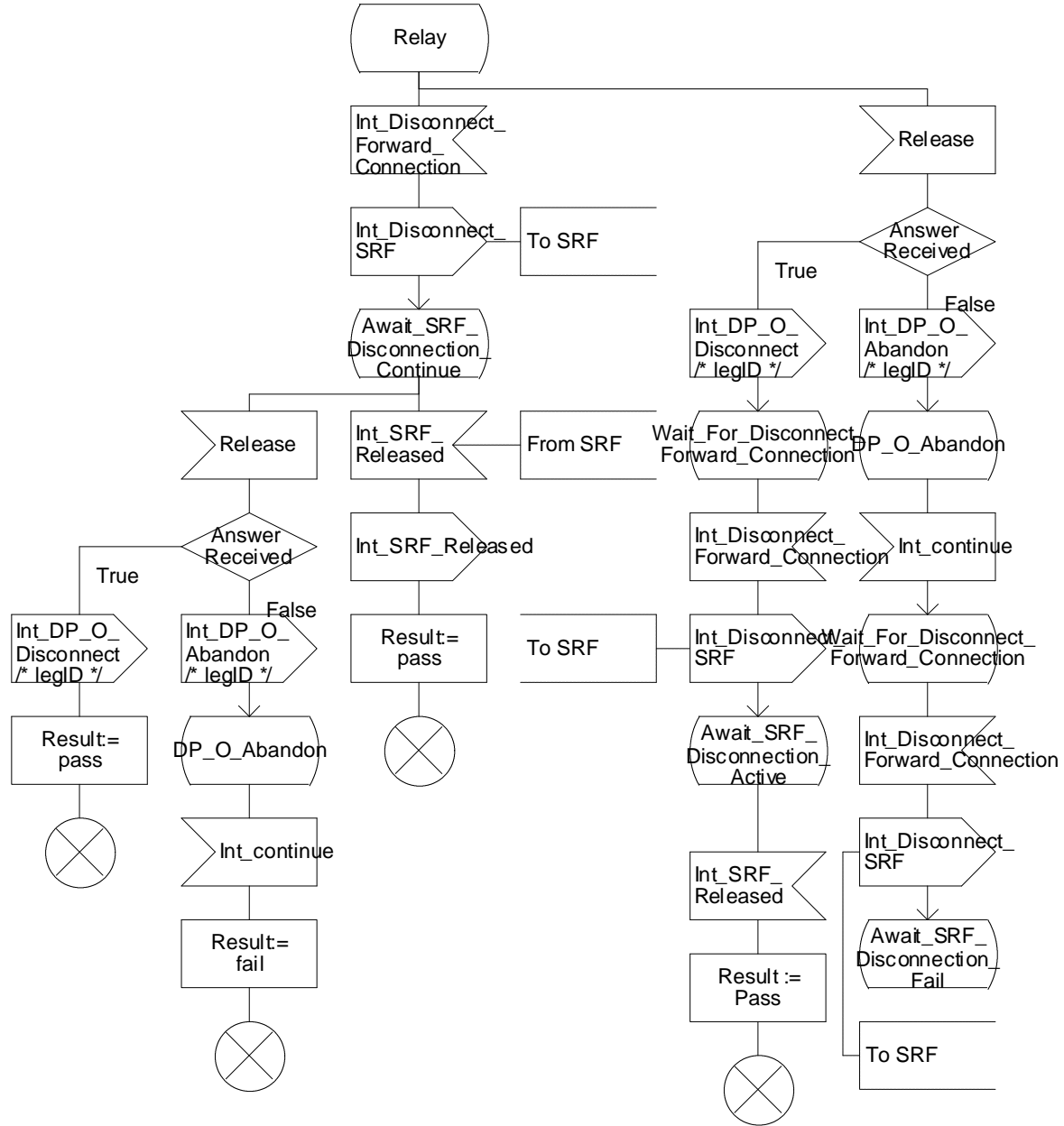


Figure 4.55b: Procedure CAMEL\_CF\_CTR (sheet 2)

### Procedure CAMEL\_CF\_CTR

3(4)

/\* Procedure in the MSC to handle a Connect To Resource operation \*/

/\* Signals to/from the right are to/from the gsmSSF. Signals to/from the left are to/from the external SRF. \*/

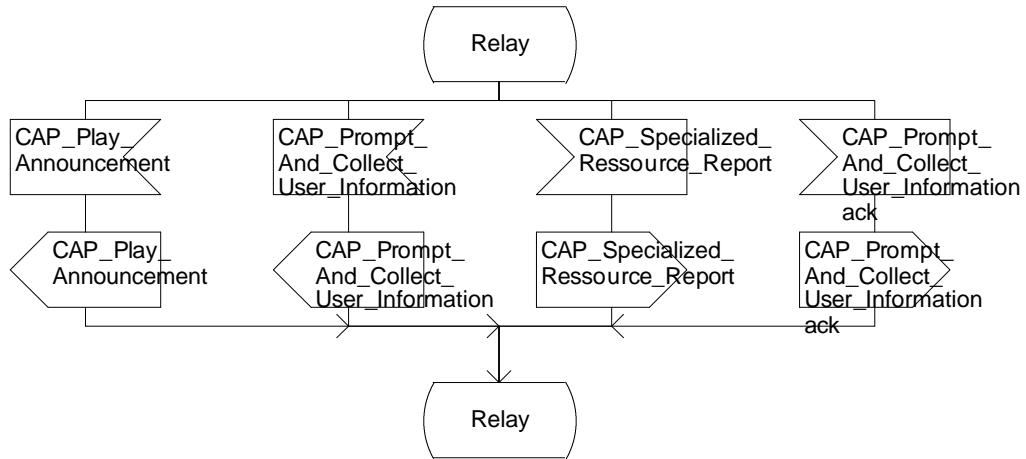


Figure 4.55c: Procedure CAMEL\_CF\_CTR (sheet 3)

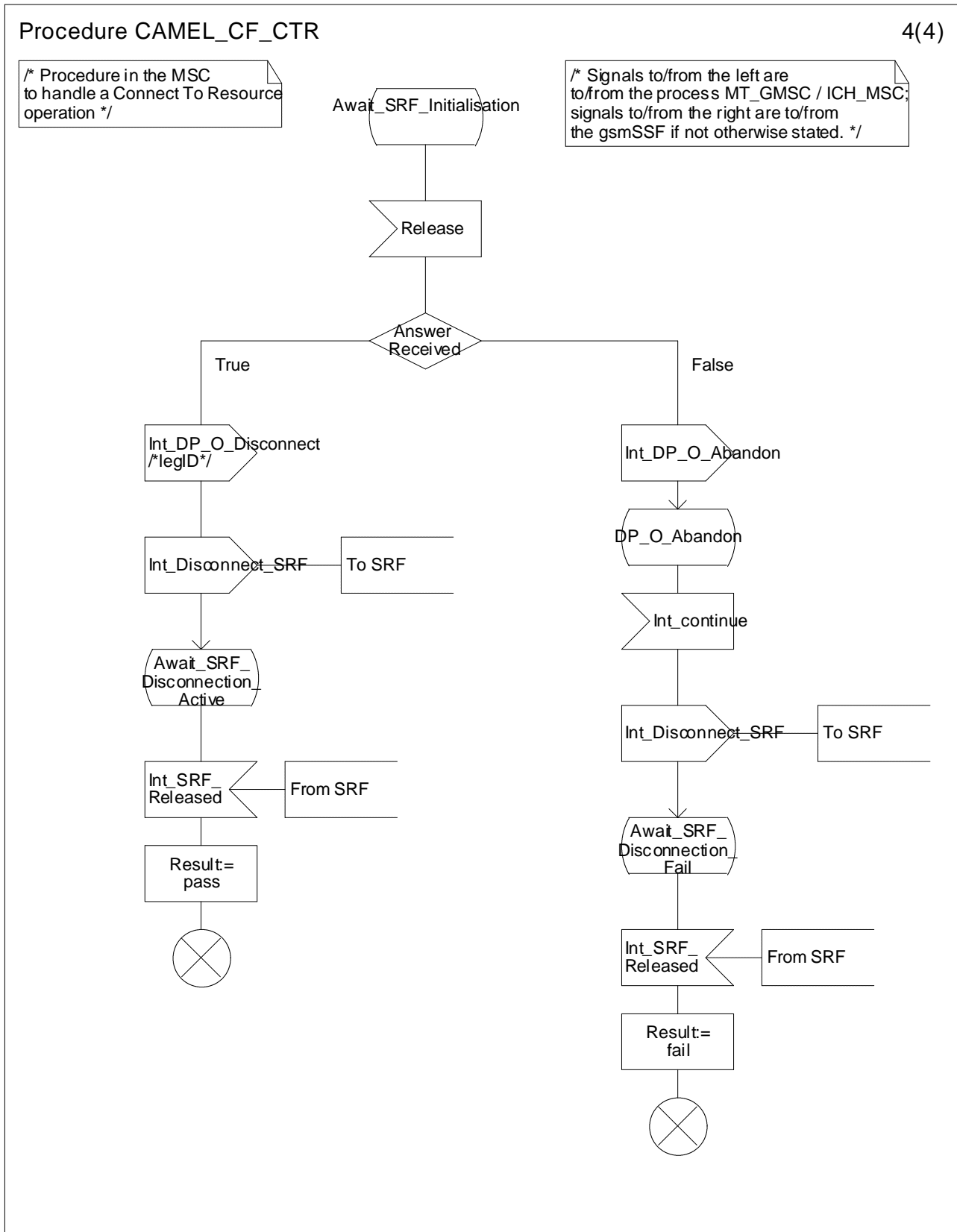


Figure 4.55d: Procedure CAMEL\_CF\_CTR (sheet 4)

### 4.5.6 Handling of mobile calls in the gsmSSF

Handling of mobile calls in the gsmSSF may involve the following process and procedures :

- gsmSSF,
- Check\_Criteria.
- Connect\_To\_Resource,
- Handle\_AC,
- Handle\_ACR,
- Handle\_CIR,
- Handle\_CIR\_leg,
- Complete\_FCI\_record,
- Complete\_all\_FCI\_records,
- Handle\_SCI,
- Handle\_O\_Answer,
- Handle\_T\_Answer.

The detailed error handling for the process gsmSSF and the associated procedures is specified in 3G TS 29.078 ([5]).

#### 4.5.6.1 Information flow for call duration control

The following diagram shows the handling of the different timers that are used in the process gsmSSF and in the procedures Handle\_AC, Handle\_ACR, Handle\_CIR. Timers Tssf, Tcp, Tsw, Tw and DELTA are defined in the process gsmSSF.

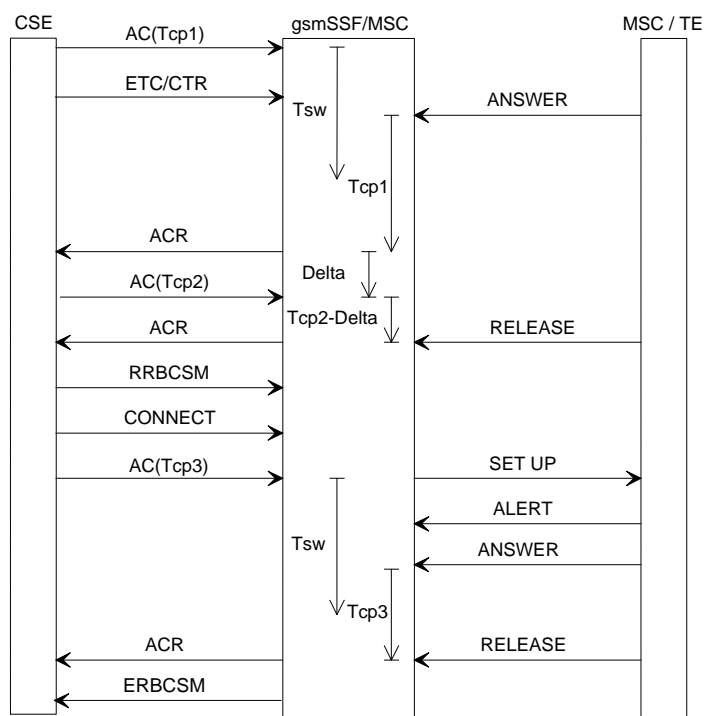


Figure 4.56: Information flow for call control duration

#### 4.5.6.2 Behaviour of the gsmSSF in the process gsmSSF

The following paragraphs give details on the behaviour of the gsmSSF in the process gsmSSF.

#### 4.5.6.2.1 Actions of the gsmSSF on receipt of CAP\_Request\_Report\_BCSM\_Event (at the state Waiting\_For\_Instructions)

The gsmSSF arms the requested EDP, if the arming rules are fulfilled and returns to state Waiting\_For\_Instructions.

The gsmSCF may request the monitoring for any one or more Answer, Busy, No Answer, Abandon, Route Select Failure and Disconnect Event of a party in the call.

#### 4.5.6.2.2 Actions of the gsmSSF on receipt of CAP\_Continue (at the state Waiting\_For\_Instructions)

An Int\_Continue is sent to request the GMSC/MSC to continue call set-up as originally requested.

#### 4.5.6.2.3 Actions of the gsmSSF on receipt of CAP\_Release\_Call (at the state Monitoring)

When a control relationship exists between the gsmSCF and gsmSSF (at least one EDP-R is armed), the gsmSCF may spontaneously instruct the gsmSSF to release the call at any time using the Release Call IF. The Release Call IF shall not be sent from the gsmSCF if only monitor relationship exists between the gsmSSF and the gsmSCF.

#### 4.5.6.2.4 Actions of the gsmSSF on receipt of Int\_DP\_T\_Busy or Int\_DP\_T\_No\_Answer including the parameter CF (at the state Monitoring)

If the handling of Int\_DP\_T\_Busy or Int\_DP\_T\_No\_Answer including the parameter CF leads to the gsmSSF sending a CAP\_Event\_Report\_BCSM to the gsmSCF, the gsmSSF shall include the parameter Call Forwarded as the Event Specific Information BCSM.

### 4.5.6.3 Procedure Handle\_SCI

1) Precondition: before an answer event is detected and no Tsw running:

if 1 set of e-parameters received --> send to the MSC

if 2 sets e-parameters received --> error

if 1 set of e-parameters and Tariff Switch received --> error

if 2 sets of e-parameters and Tariff Switch received --> send 1st/start Tsw/store 2nd

2) Precondition: before an answer event is detected and Tsw running and no e-parameters

if 1 set of e-parameters received --> error, no e-parameters stored

if 2 sets e-parameters received --> send 1st/store 2nd

if 1 set of e-parameters and Tariff Switch received --> error

if 2 sets of e-parameters and Tariff Switch received --> error

3) Precondition: before an answer event is detected and Tsw running and e-parameters stored:

if 1 set of e-parameters received --> error

if 2 sets e-parameters received --> error

if 1 set of e-parameters and Tariff Switch received --> error

if 2 sets of e-parameters and Tariff Switch received --> error

4) Precondition: after an answer event is detected and no Tsw running:

if 1 set of e-parameters received --> send to the MSC

if 2 sets e-parameters received --> error

if 1 set of e-parameters and Tariff Switch received --> start Tsw/store set

if 2 sets of e-parameters and Tariff Switch received --> error

5) Precondition: after an answer event is detected and Tsw running and no e-parameters

if 1 set of e-parameters received --> store e-parameters

if 2 sets e-parameters received --> error

if 1 set of e-parameters and Tariff Switch received --> error

if 2 sets of e-parameters and Tariff Switch received --> error

6) Precondition: after an answer event is detected and Tsw running and e-parameters stored:

if 1 set of e-parameters received --> error

if 2 sets e-parameters received --> error

if 1 set of e-parameters and Tariff Switch received --> error

if 2 sets of e-parameters and Tariff Switch received --> error

NOTE: The MSC shall store the received e-parameters to be sent subsequently to the MS. The MSC shall send these e parameters to the MS in a Connect message or in a Facility message.

## 4.5.6.4 Process gsmSSF and procedures

## Process gsmSSF

1(34)

/\* Invocation of gsmSSF in MO,  
MT, VT or CF call case. \*/

/\* Timers used in the gsmSSF process:

Tssf: Application timer in the ssf.

Tcp: Timer for call period.

This timer measures the duration of a call period.

Tsw: Timer for tariff switch.

At the expiration of this timer, a new tariff switch shall be started.

Tw: Warning timer.

At the expiration of this timer, a warning tone shall be played to the calling party.

DELTA: time, measured in the gsmSSF, elapsed between the time an

ApplyChargingReport operation is send to the gsmSCF and an

ApplyCharging operation is received from the gsmSCF.

Tccd: Control of call duration timer.

This timer supervises if after sending of ACR a new AC is received.

Ranges for the default values for Tssf.

- non user interaction Tssf timer value: 1 second to 20 seconds

- user interaction Tssf timer value: 1 minute to 30 minutes

\*/

/\* TASK definition:

The sending of an Application\_Begin signal opens a new relationship to the gsmSCF.

The sending of an Application\_End or Abort signal terminates the relationship to the gsmSCF.

\*/

Figure 4.57a: Process gsmSSF (sheet 1)

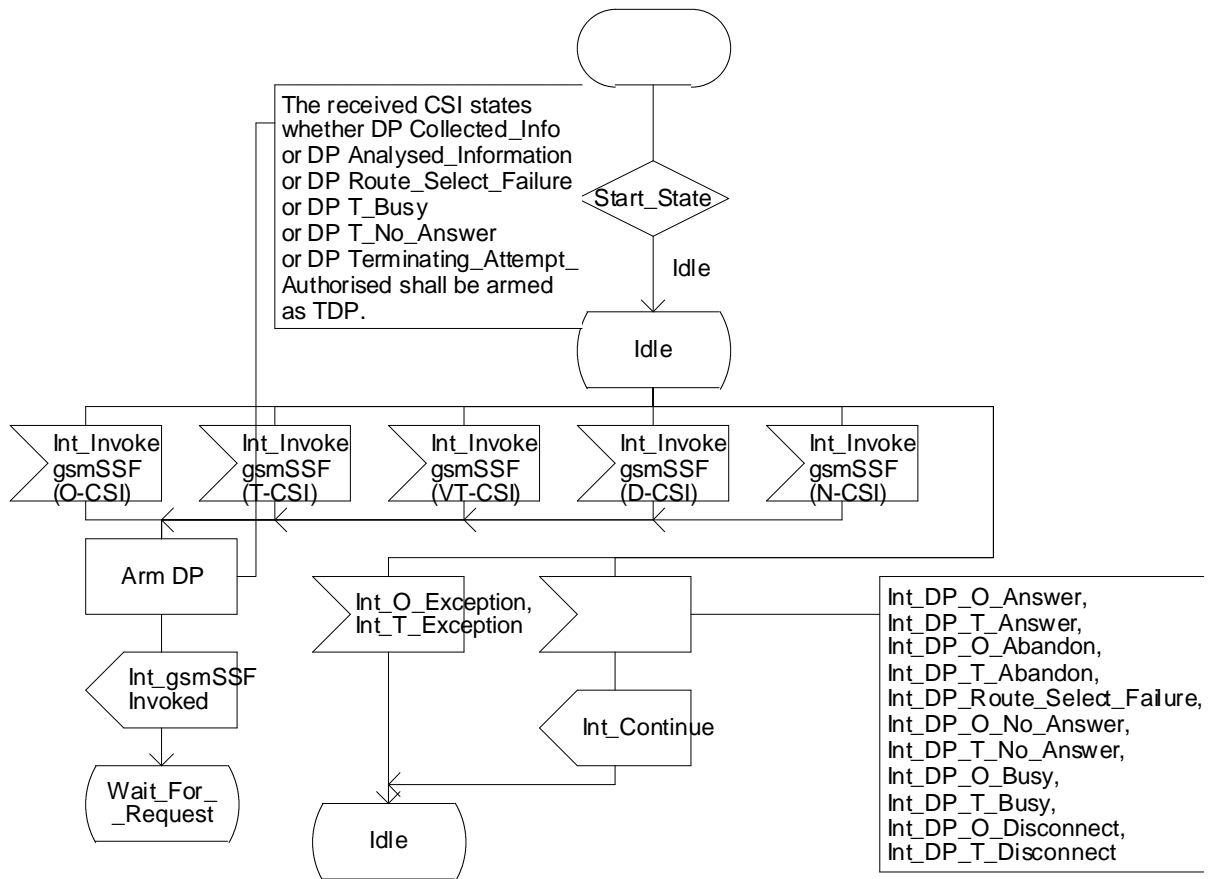


Process gsmSSF

2(36)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the left are to/from the MSC; signals to/from the right are to/from the gsmSCF. \*/



4.57b: Process gsmSSF (sheet 2)

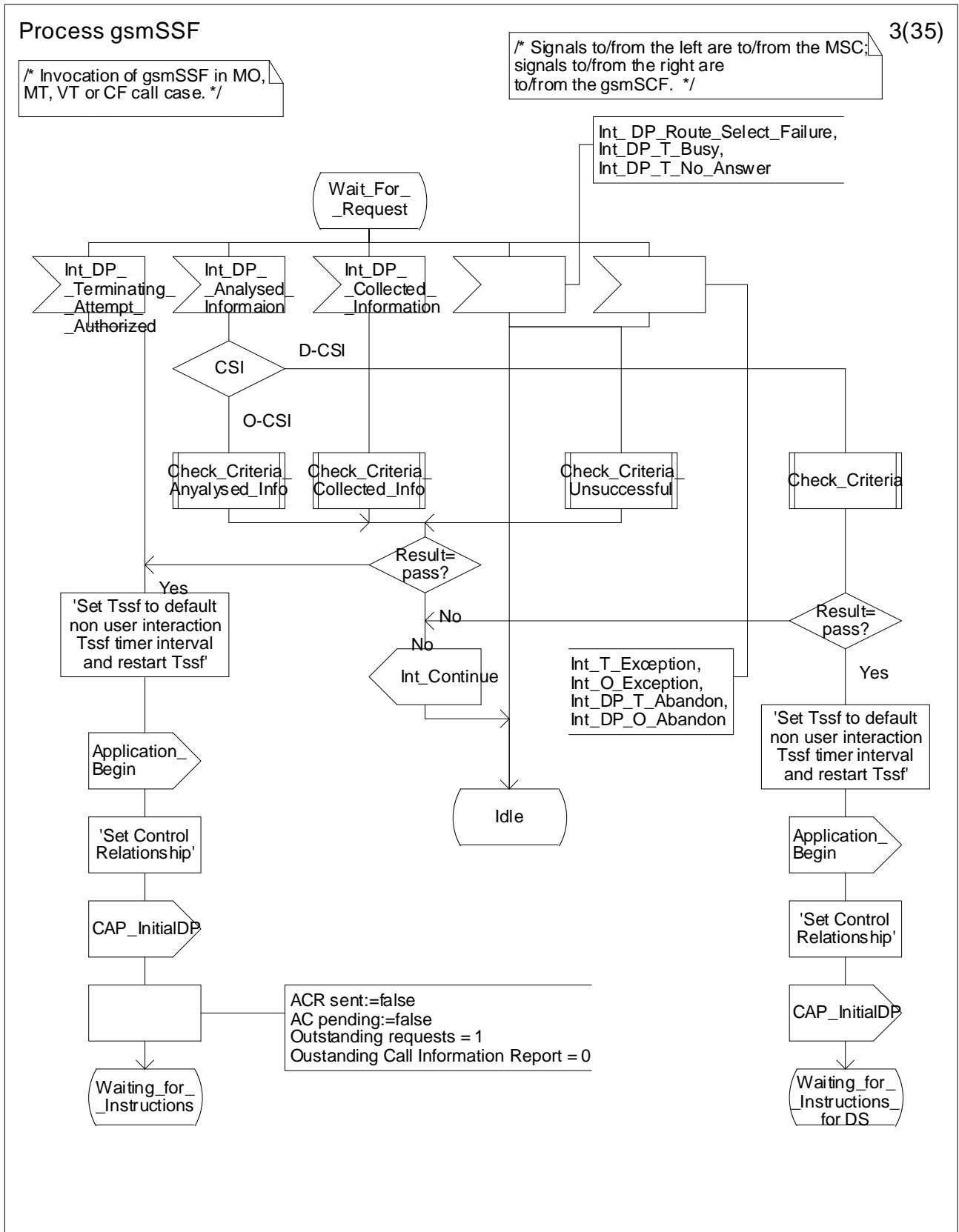


Figure 4.57c: Process gsmSSF (sheet 3)

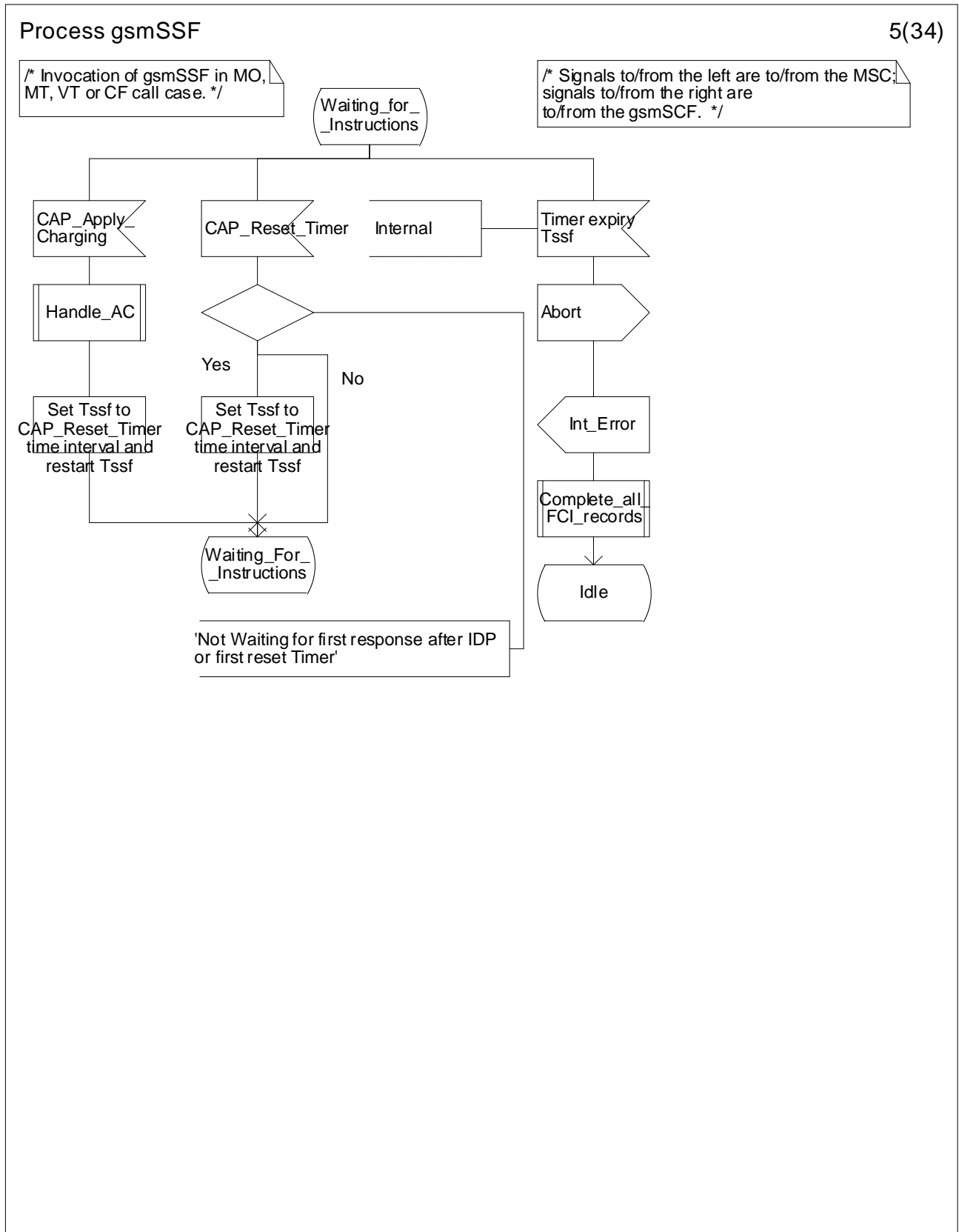


Figure 4.57d: Process gsmSSF (sheet 4)

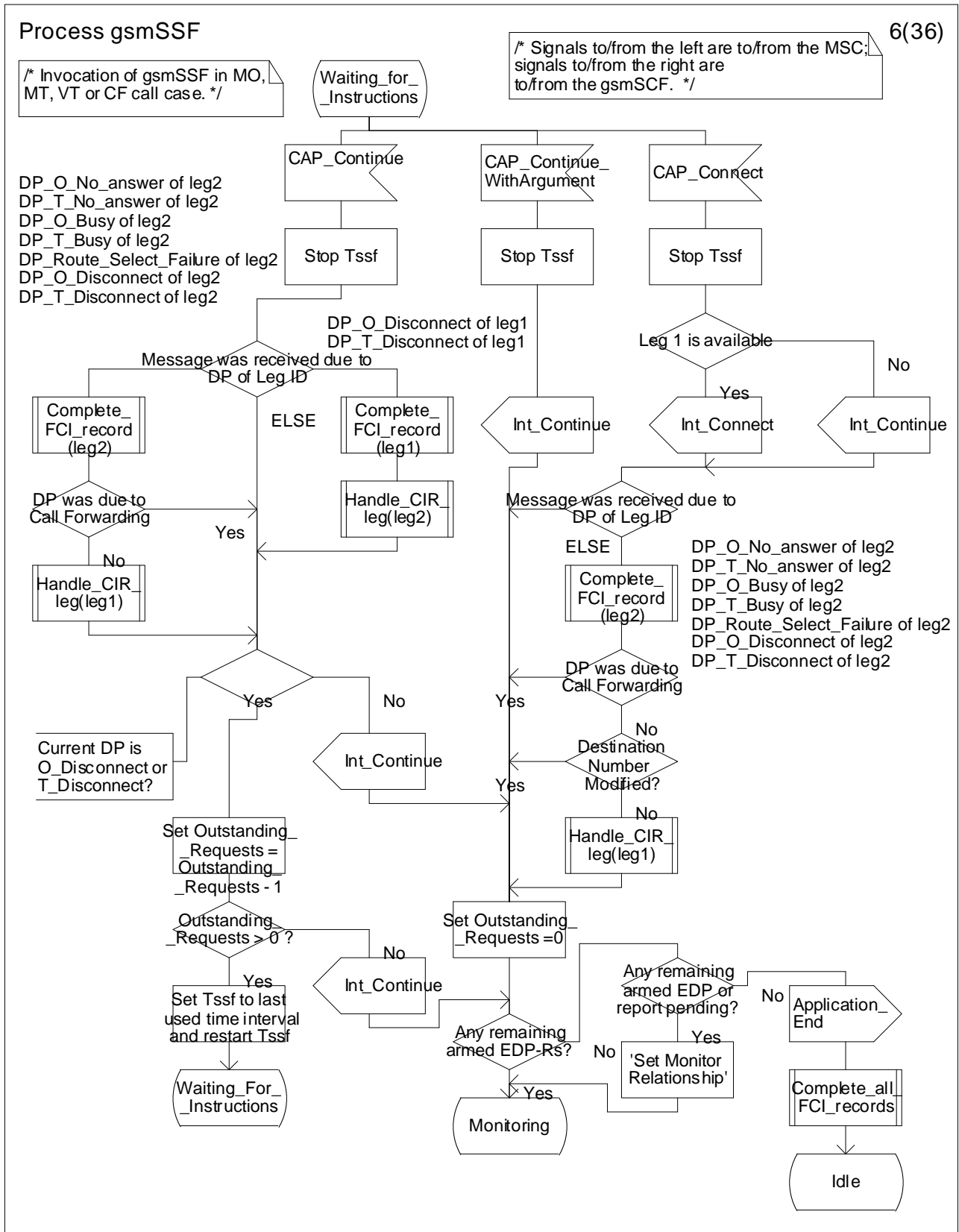


Figure 4.57e: Process gsmSSF (sheet 5)

Process gsmSSF

7(34)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the left are to/from the MSC; signals to/from the right are to/from the gsmSCF. \*/

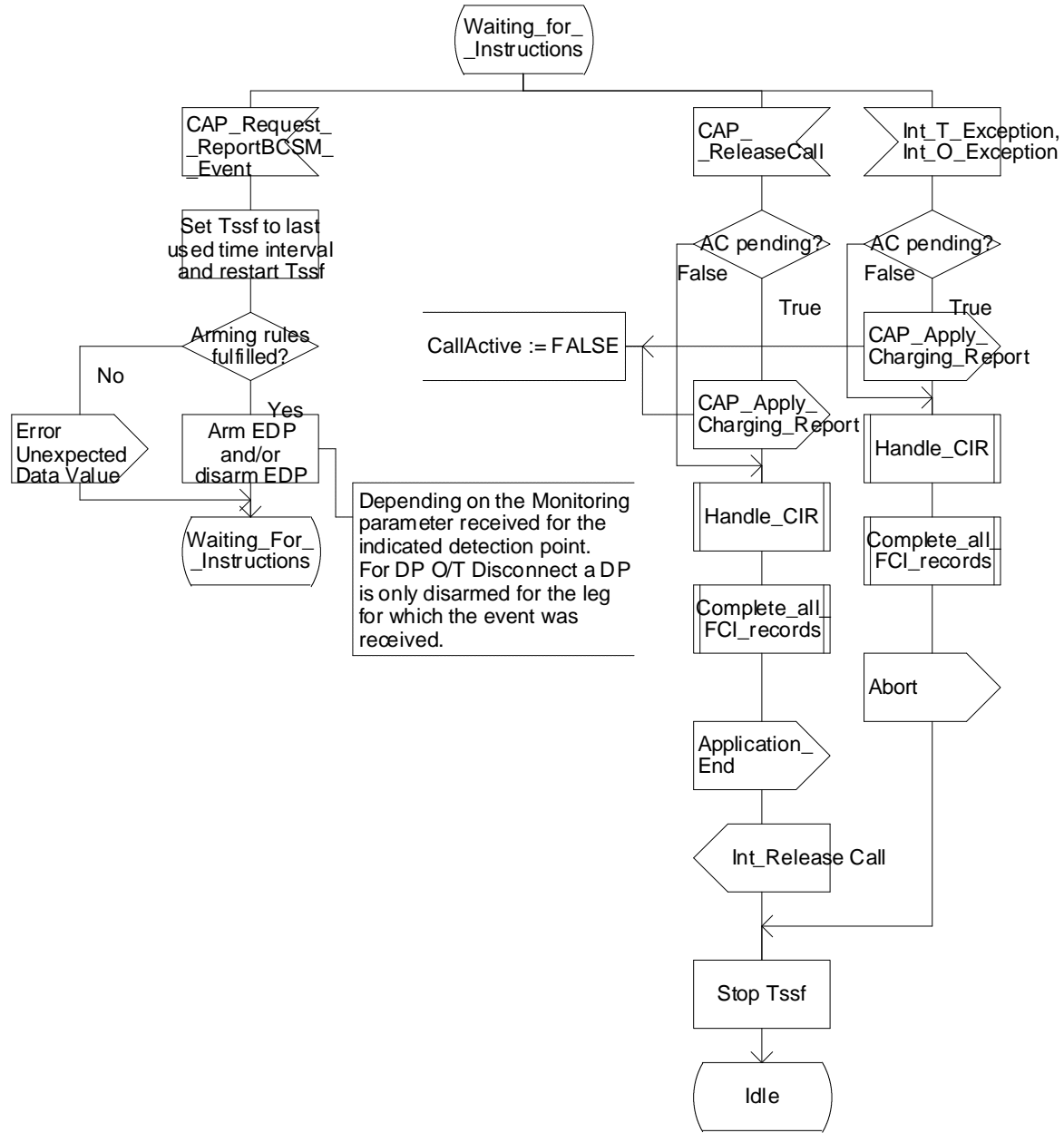


Figure 4.57f: Process gsmSSF (sheet 6)

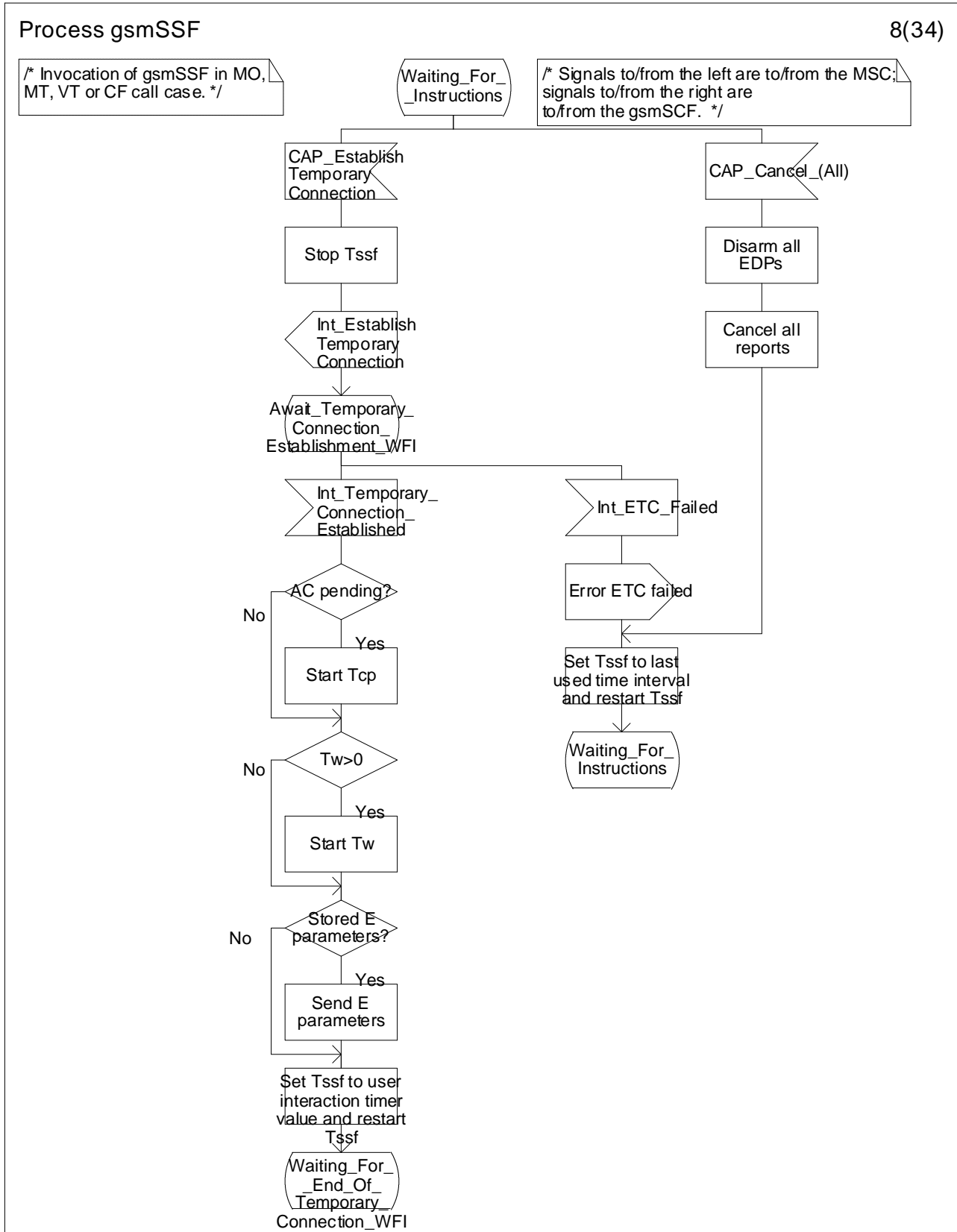


Figure 4.57g: Process gsmSSF (sheet 7)

Process gsmSSF

9(34)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the left are to/from the MSC; signals to/from the right are to/from the gsmSCF. \*/

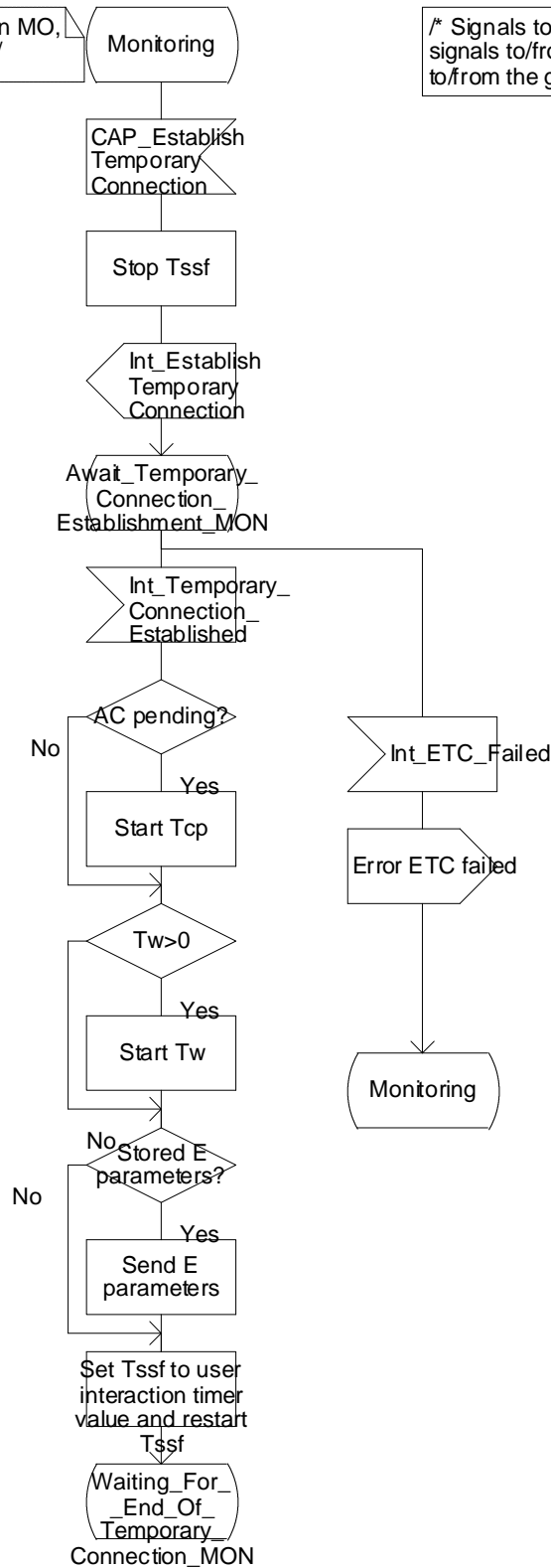


Figure 4.57h: Process gsmSSF (sheet 8)

Process gsmSSF

10(34)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the left are to/from the MSC; signals to/from the right are to/from the gsmSCF. \*/

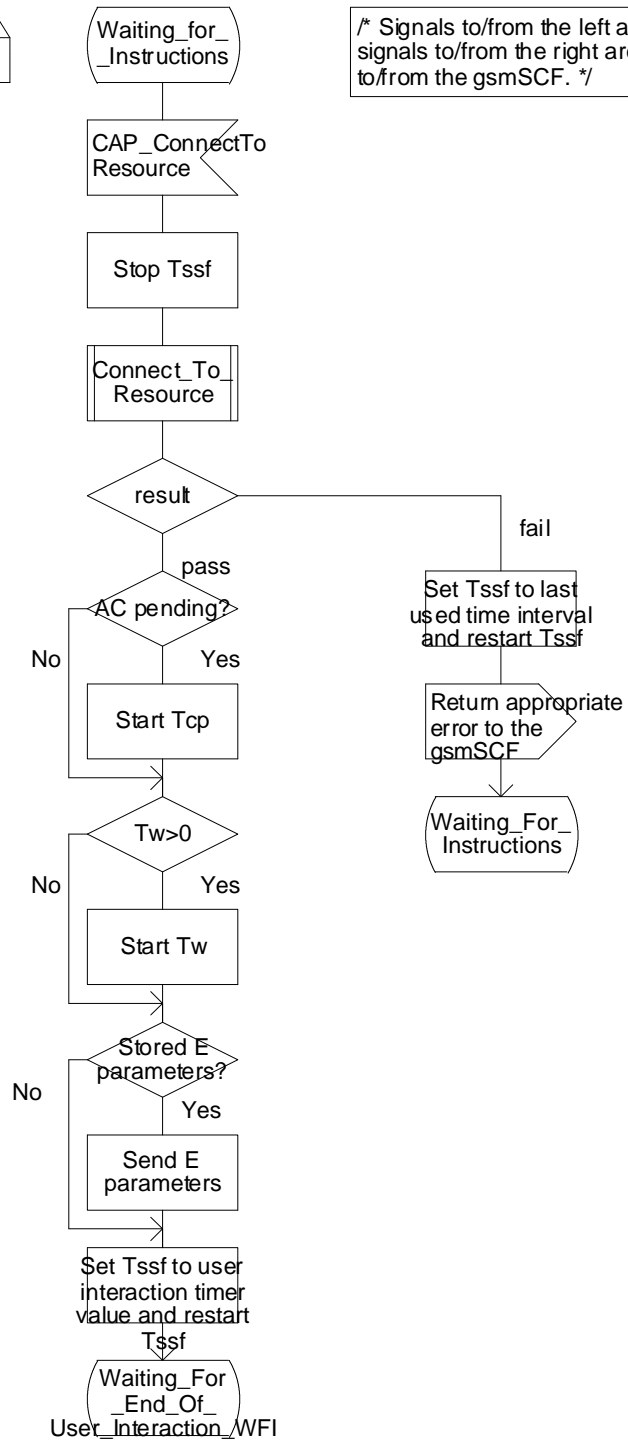


Figure 4.57i: Process gsmSSF (sheet 9)



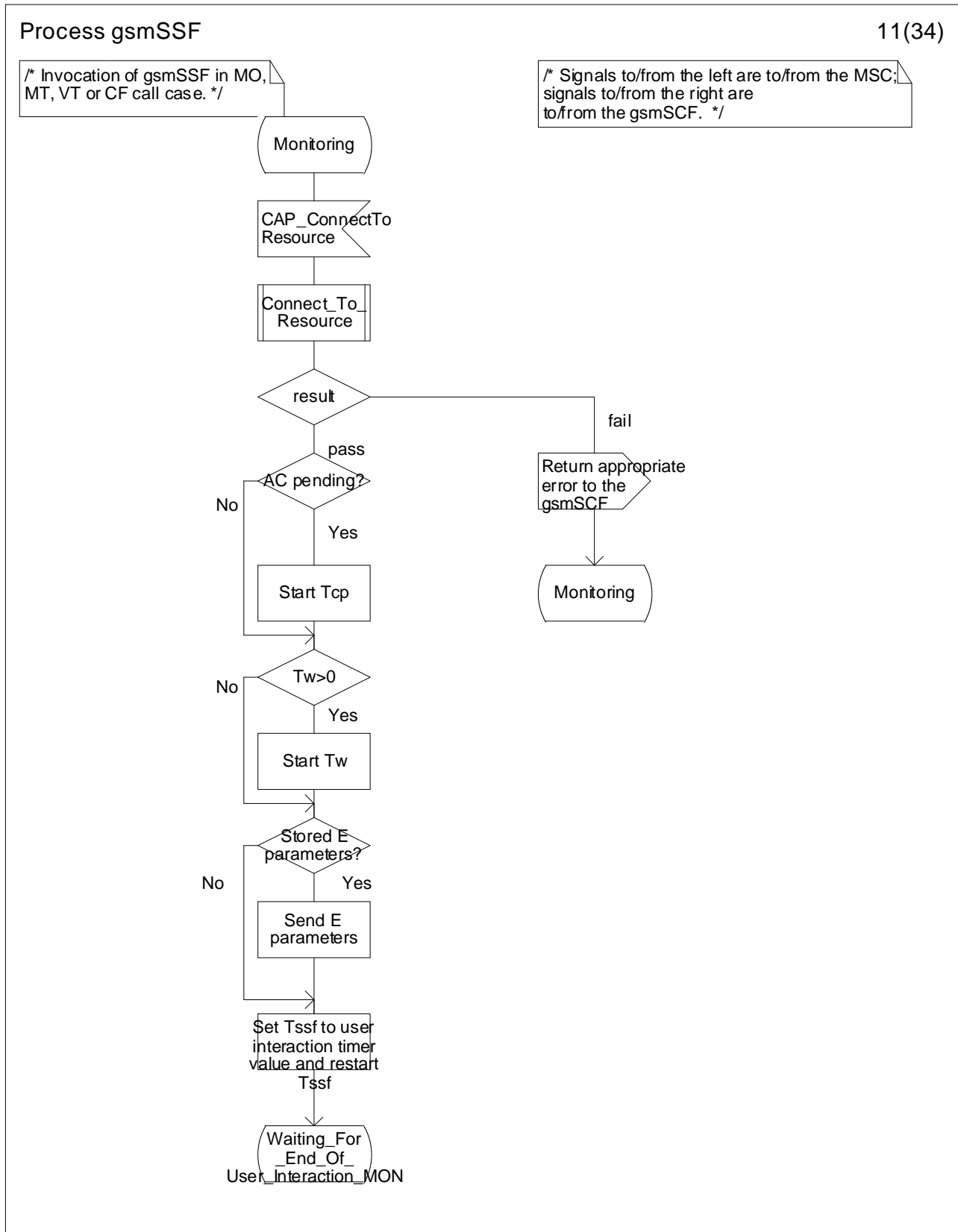


Figure 4.57j: Process gsmSSF (sheet 10)

Process gsmSSF

12(34)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the right are to/from the gsmSCF. \*/

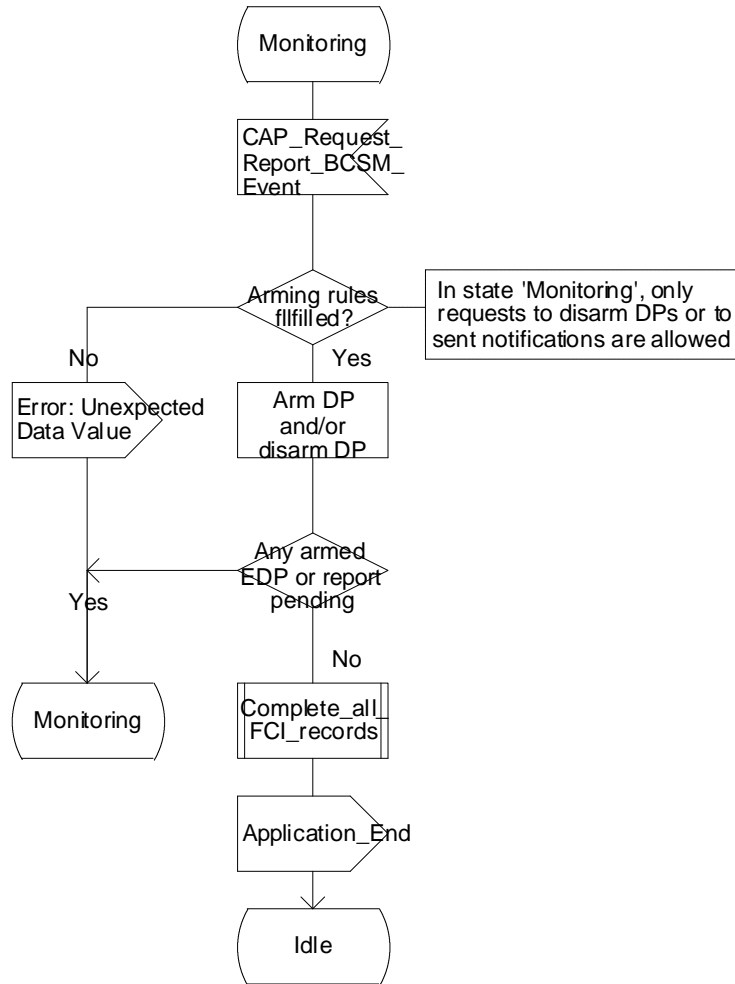


Figure 4.57k: Process gsmSSF (sheet 11)

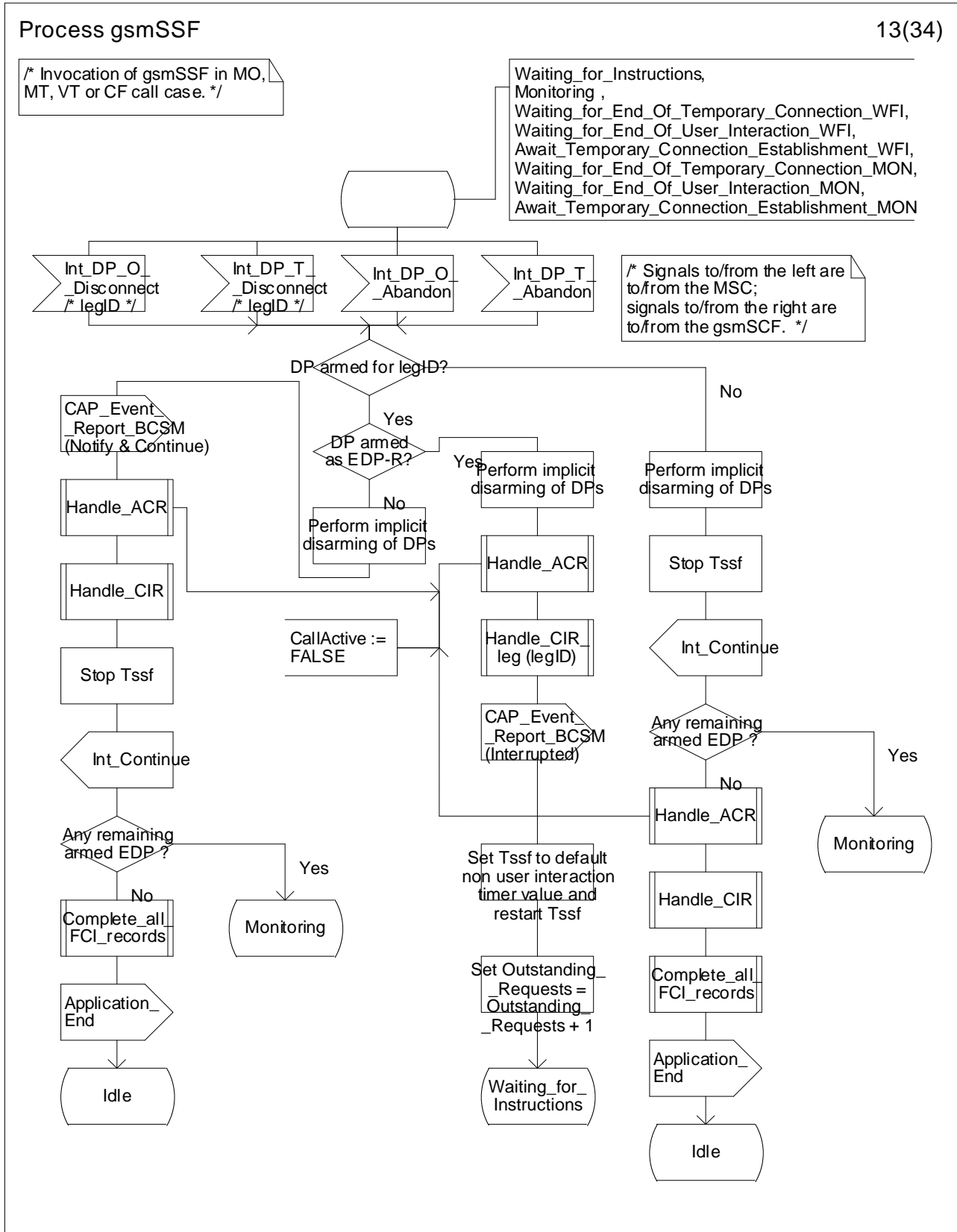


Figure 4.57I: Process gsmSSF (sheet 12)

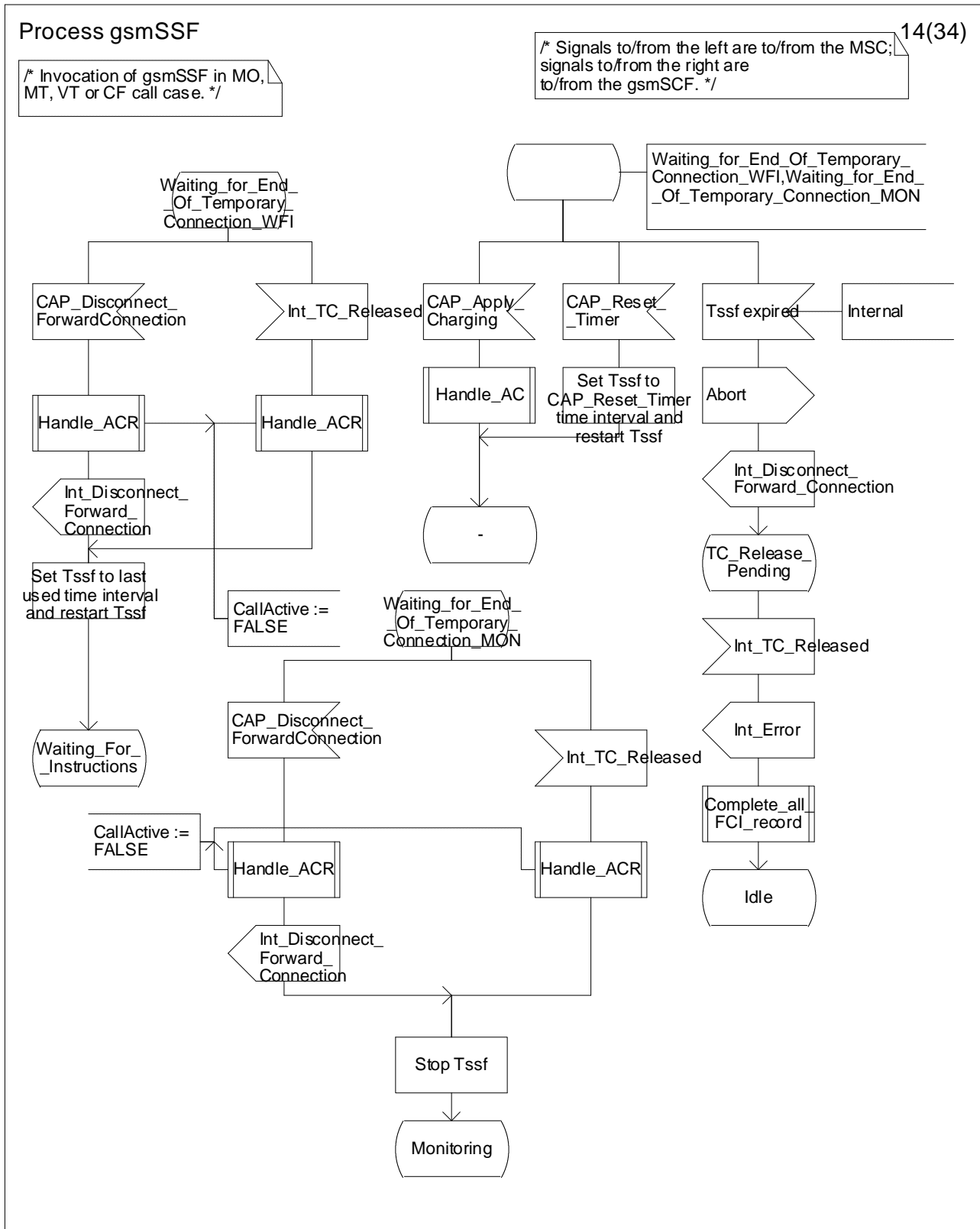


Figure 4.57m: Process gsmSSF (sheet 13)

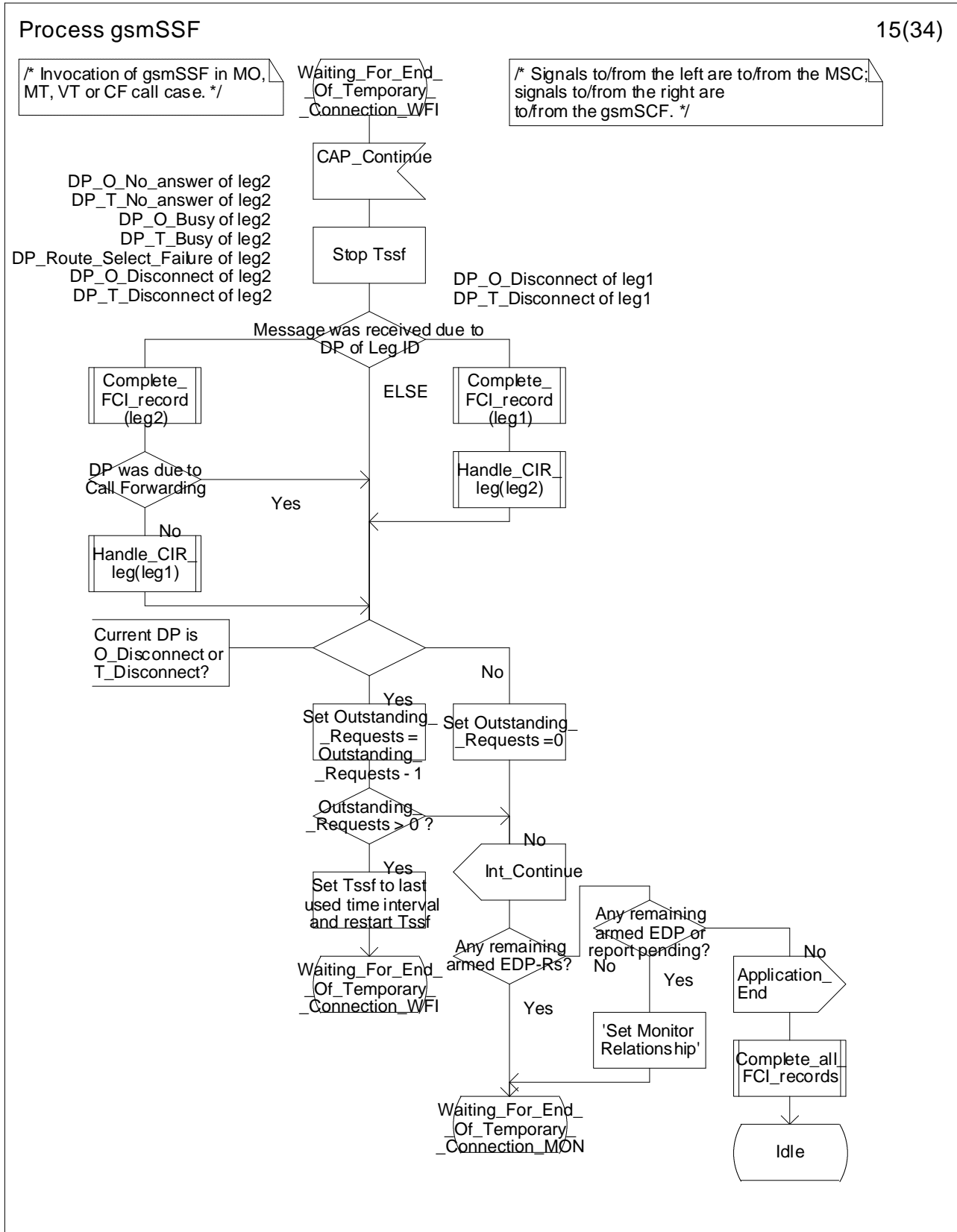


Figure 4.57n: Process gsmSSF (sheet 14)

Process gsmSSF

16(34)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the left are to/from the MSC; signals to/from the right are to/from the gsmSCF. \*/

DP\_O\_No\_answer of leg2  
 DP\_T\_No\_answer of leg2  
 DP\_O\_Busy of leg2  
 DP\_T\_Busy of leg2  
 DP\_Route\_Select\_Failure of leg2  
 DP\_O\_Disconnect of leg2  
 DP\_T\_Disconnect of leg2

DP\_O\_Disconnect of leg1  
 DP\_T\_Disconnect of leg1

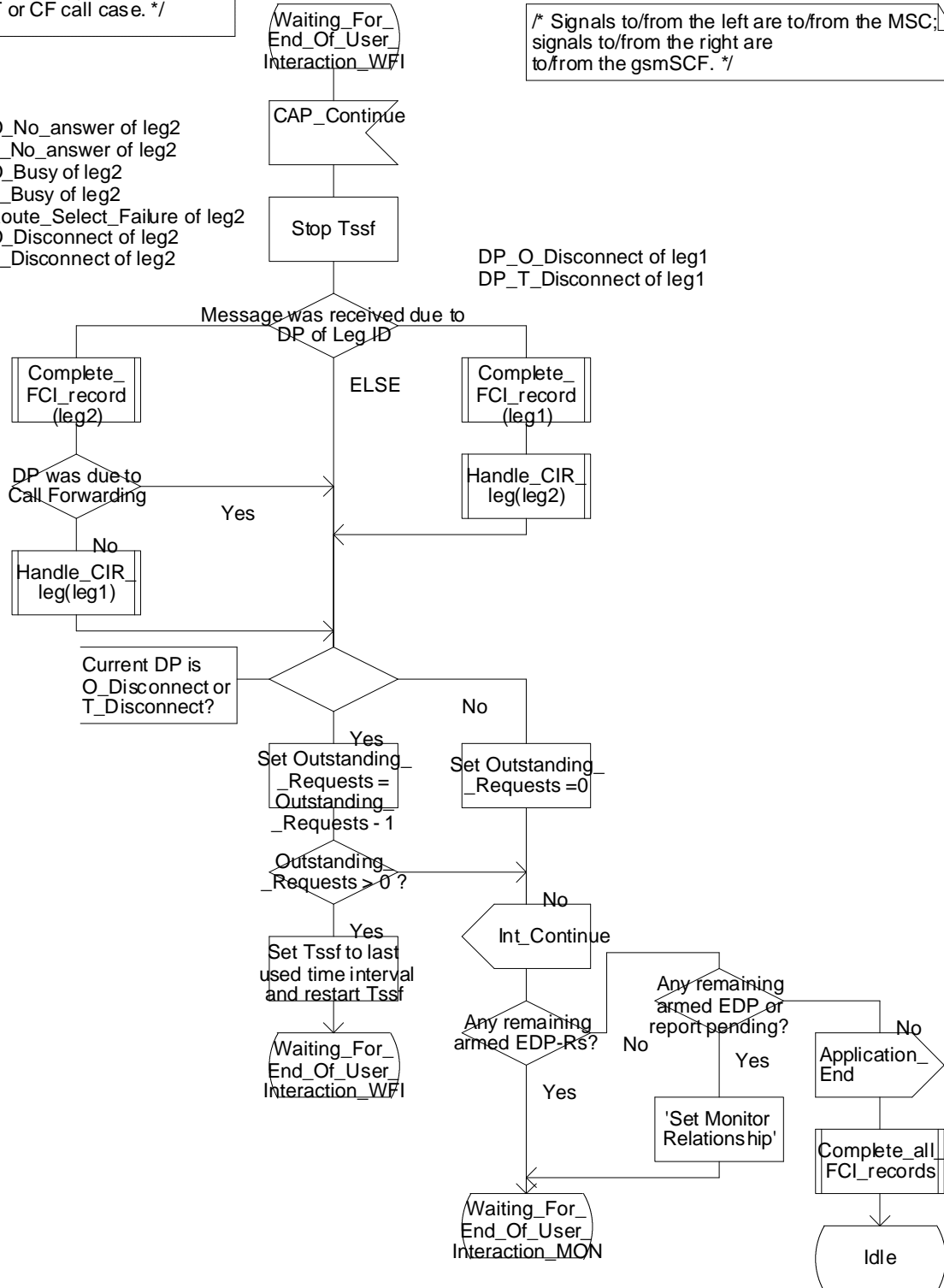


Figure 4.57o: Process gsmSSF (sheet 15)

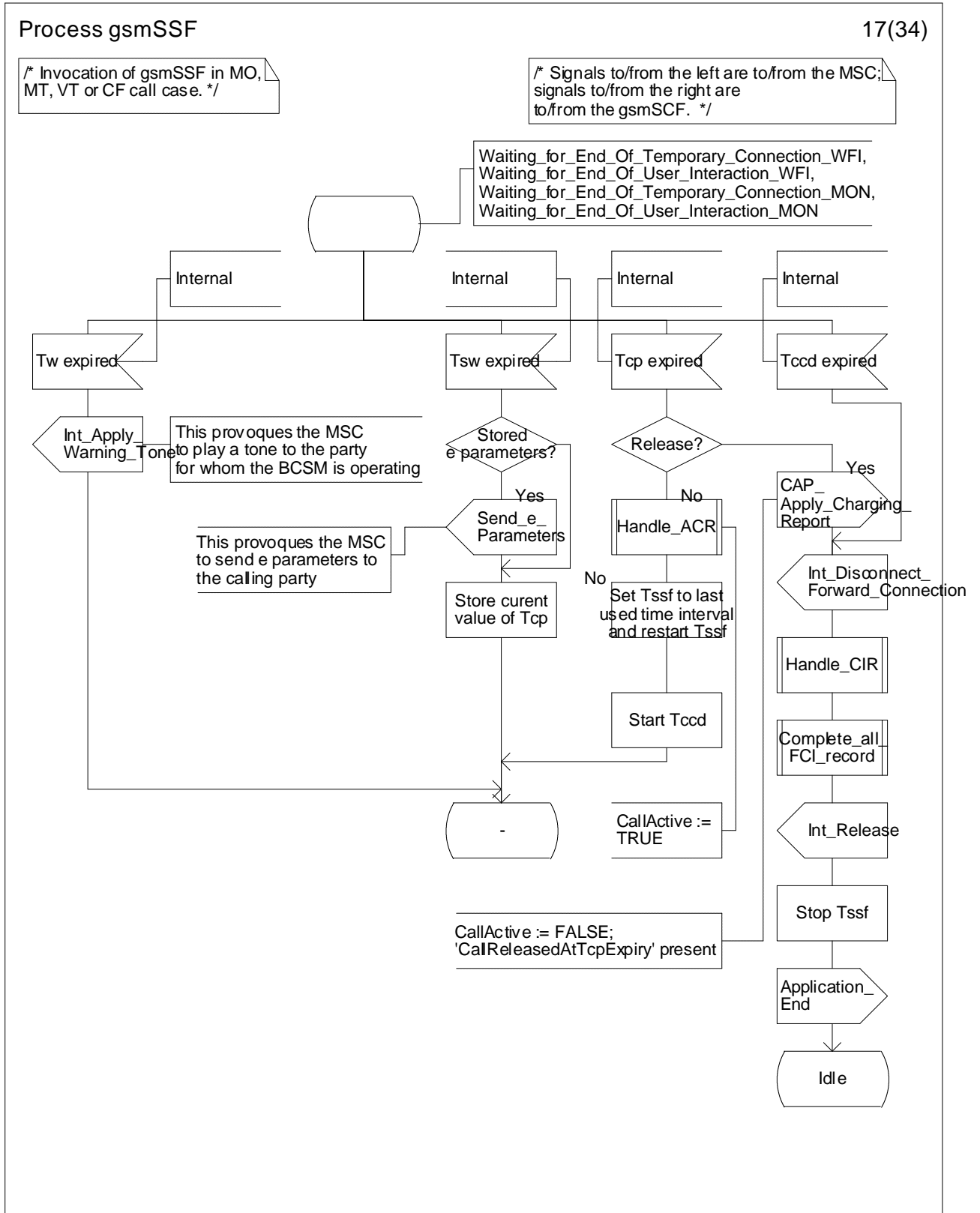


Figure 4.57p: Process gsmSSF (sheet 16)

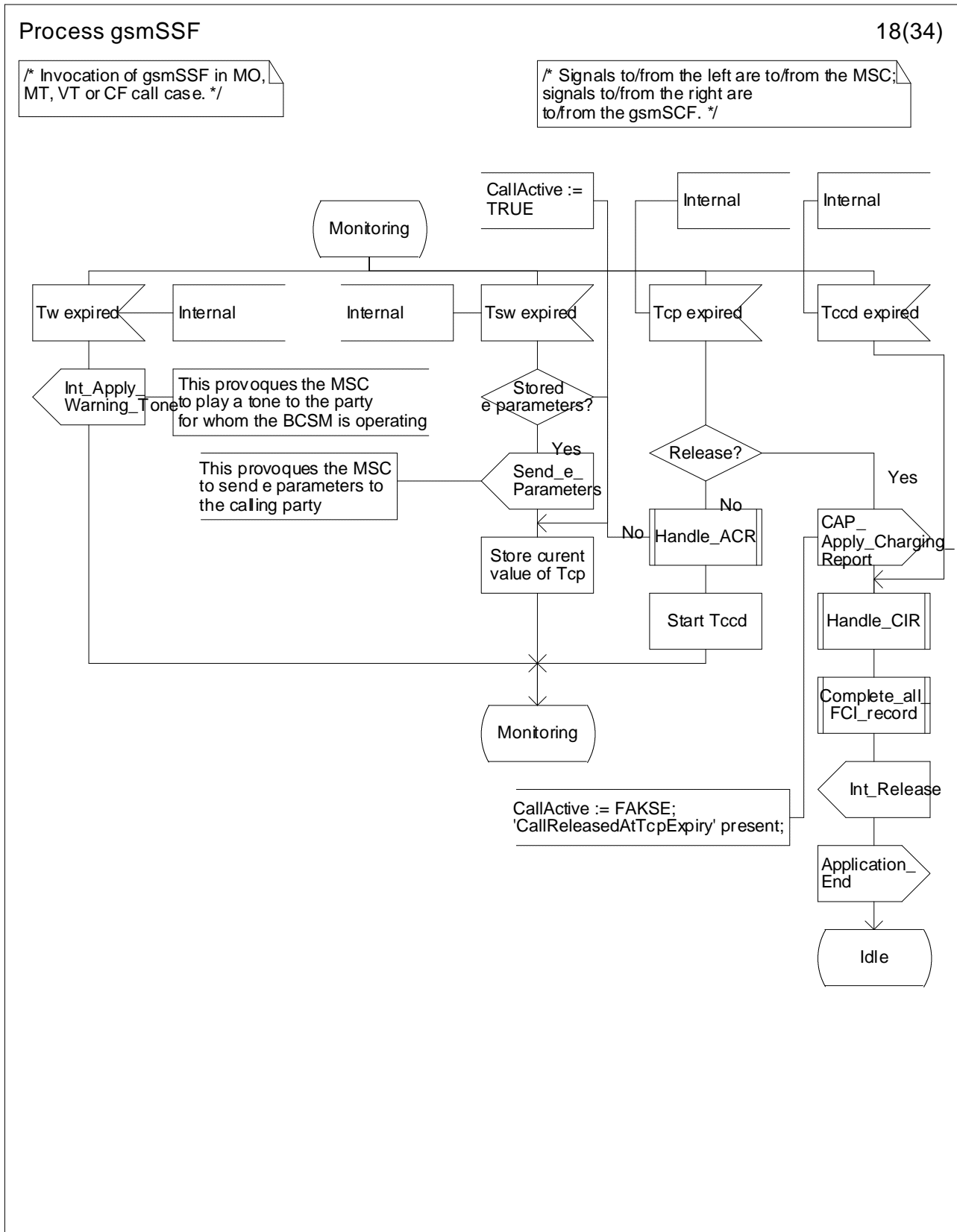


Figure 4.57q: Process gsmSSF (sheet 17)



Process gsmSSF

18(35)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the left are to/from the MSC; signals to/from the right are to/from the gsmSCF. \*/

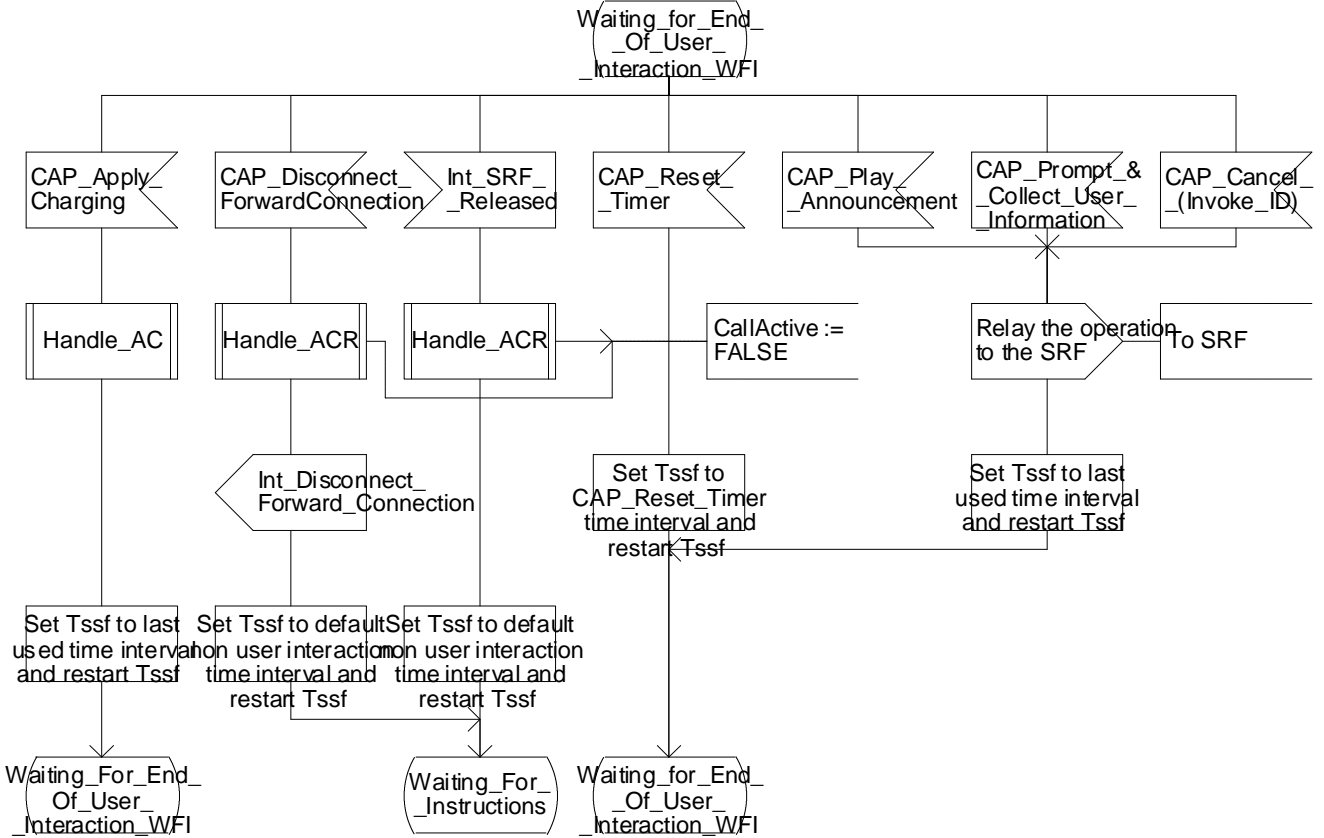


Figure 4.57r: Process gsmSSF (sheet 18)

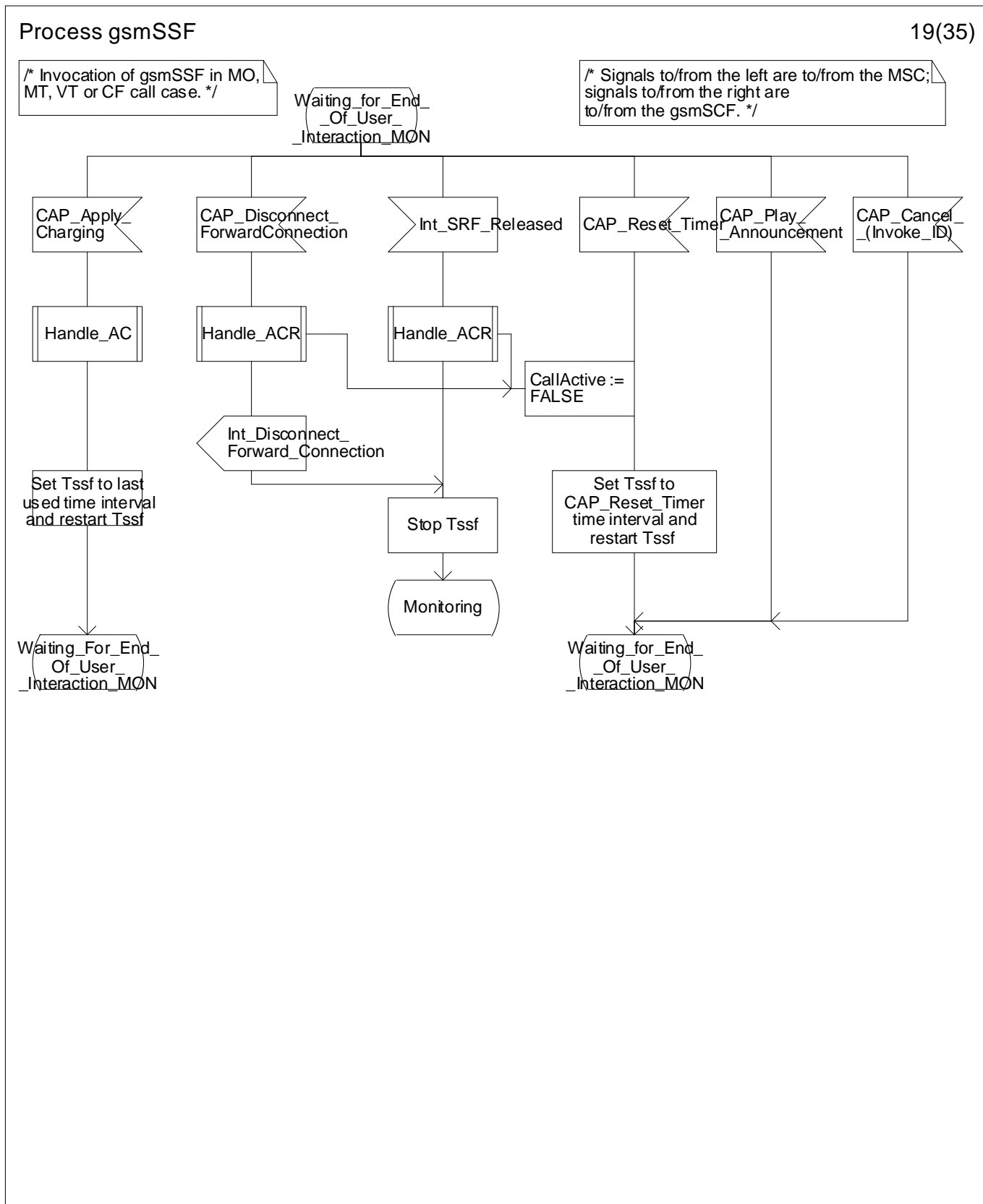


Figure 4.57s: Process gsmSSF (sheet 19)

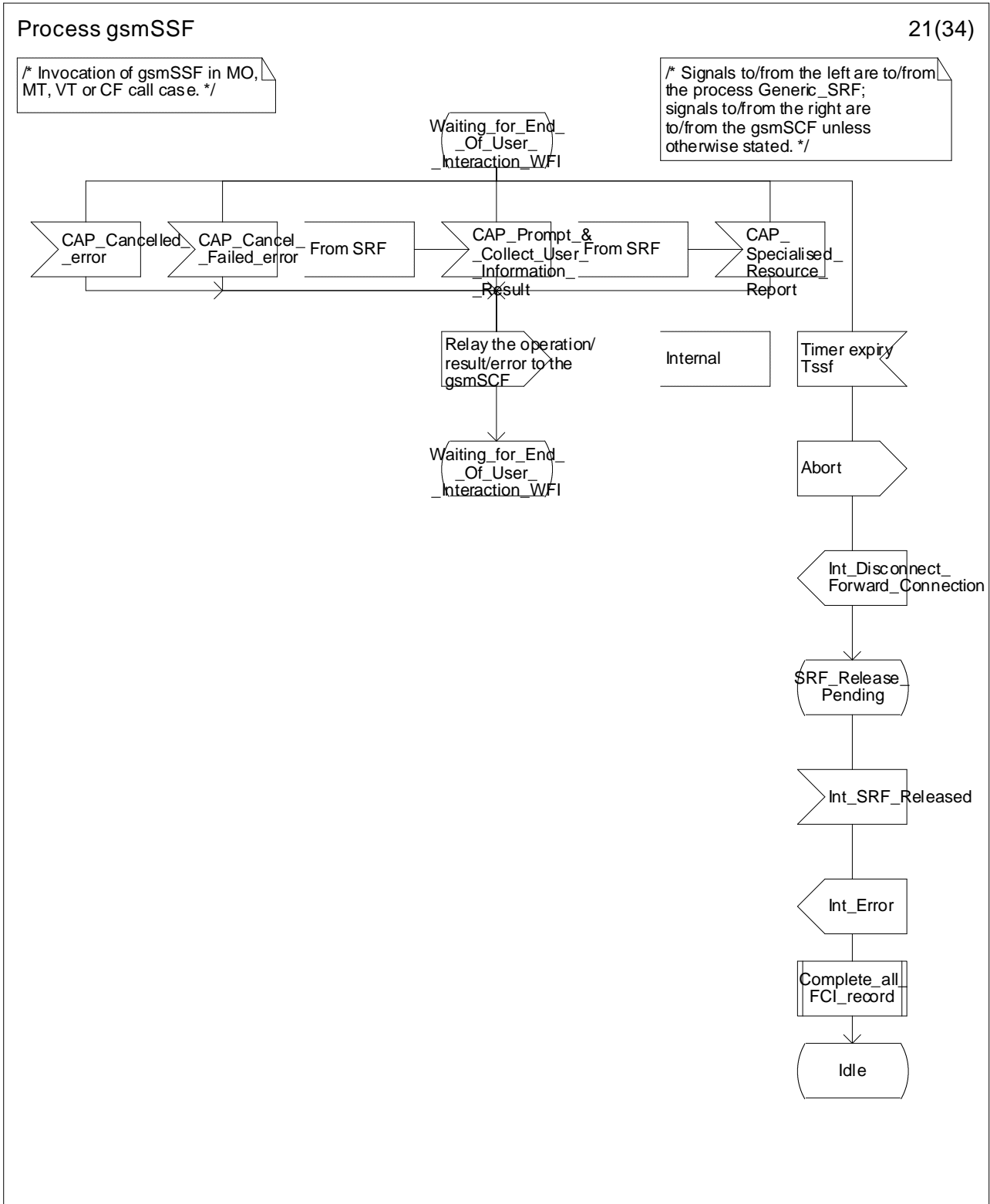


Figure 4.57t: Process gsmSSF (sheet 20)

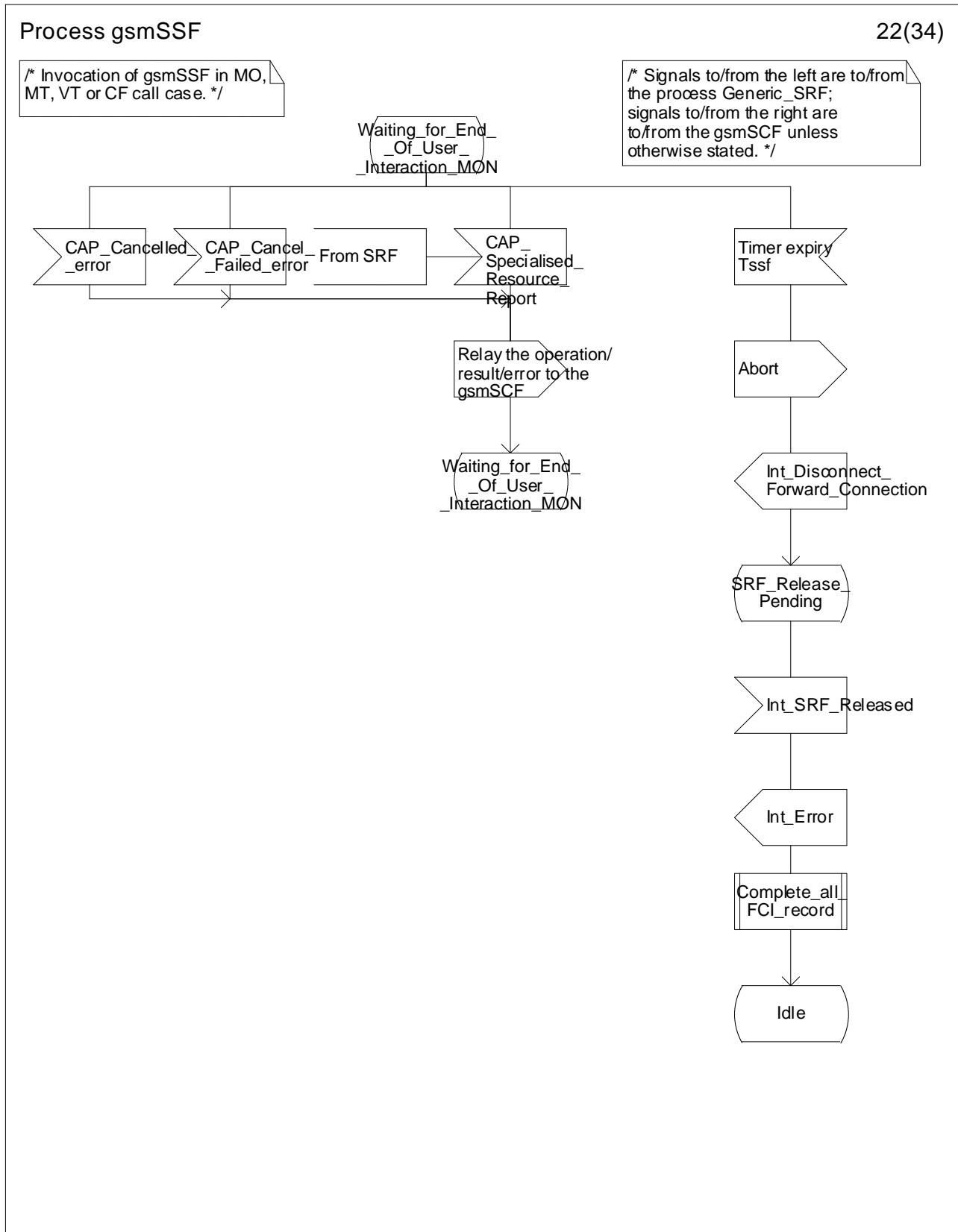


Figure 4.57u: Process gsmSSF (sheet 21)

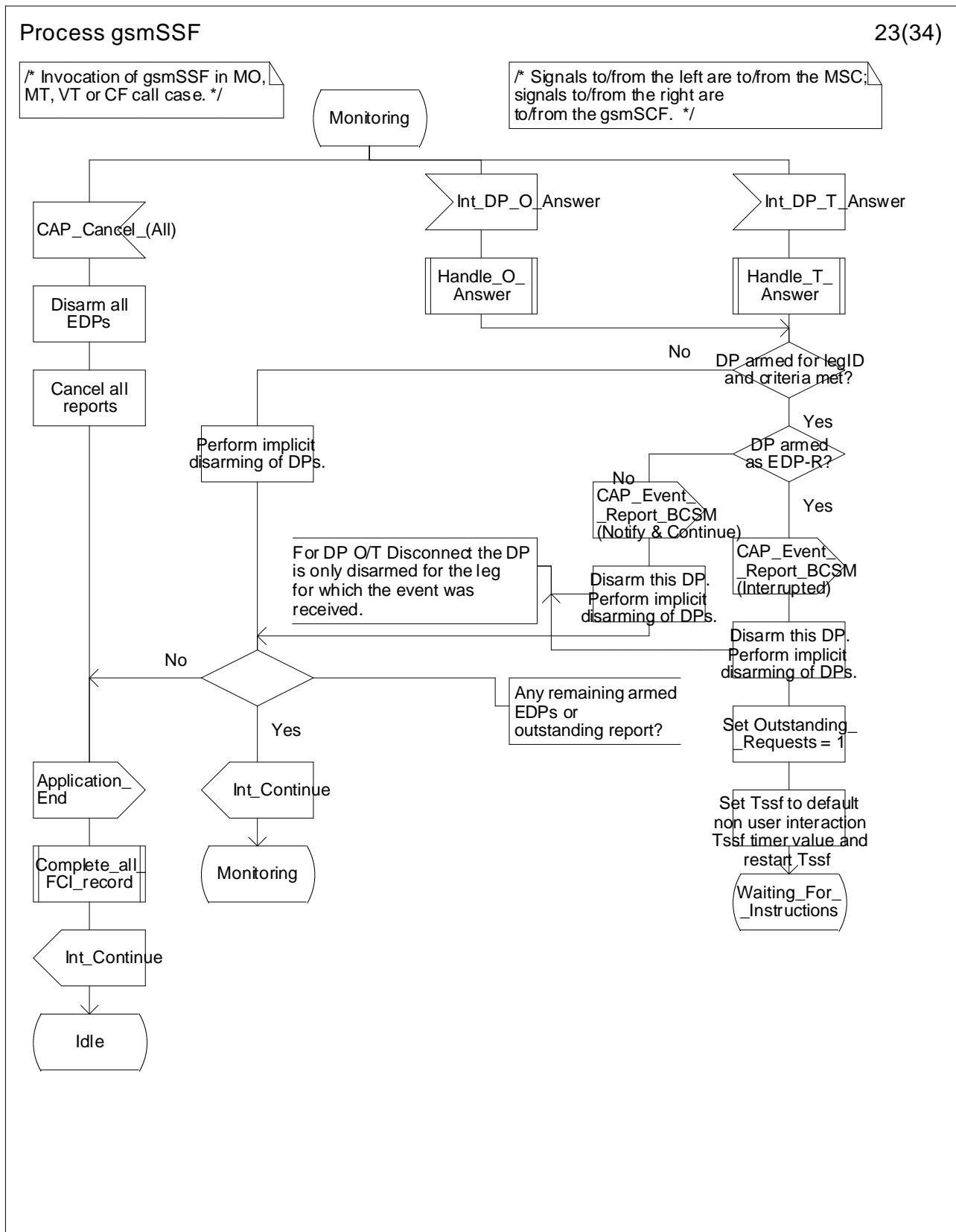


Figure 4.57v: Process gsmSSF (sheet 22)

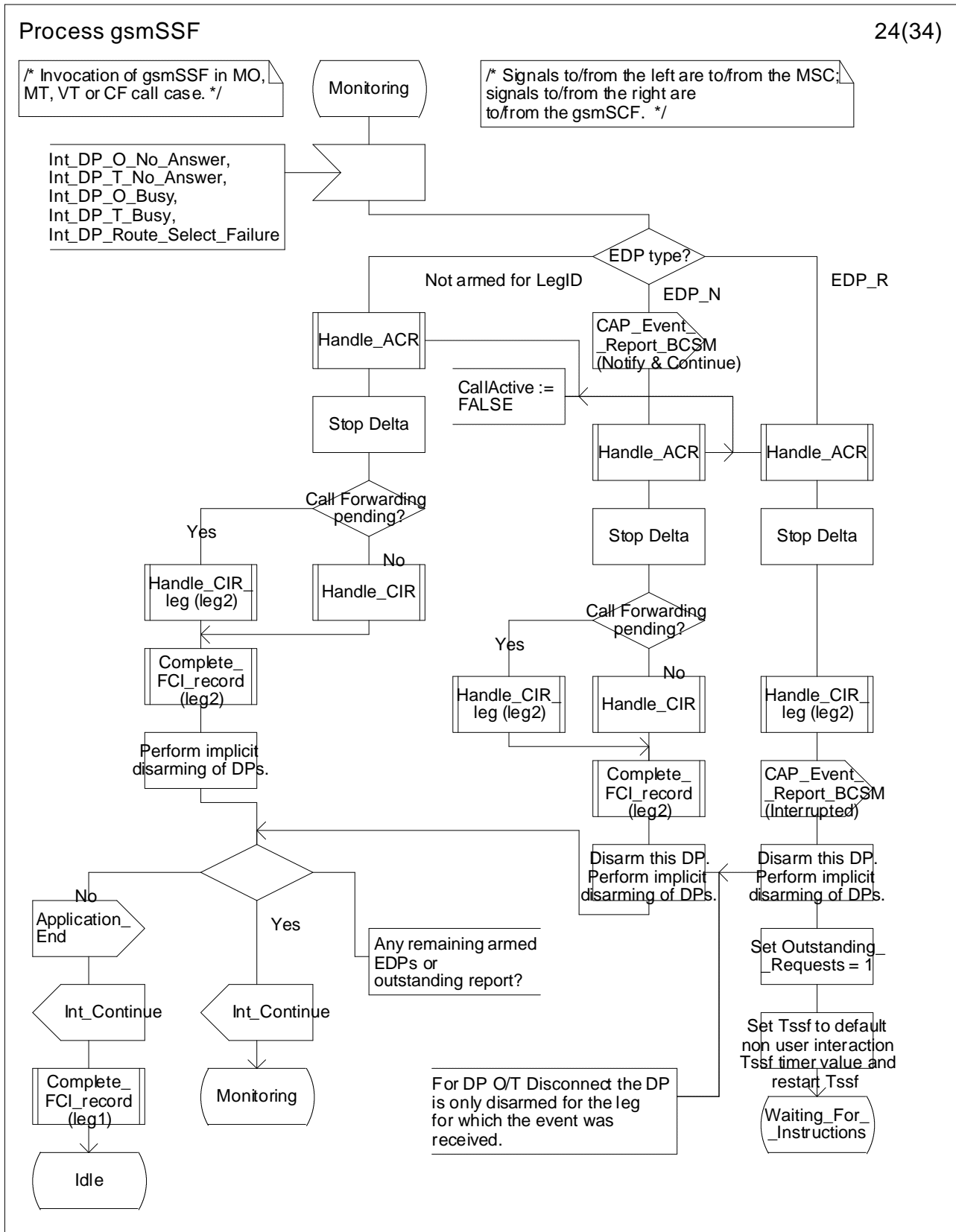


Figure 4.57w: Process gsmSSF (sheet 23)

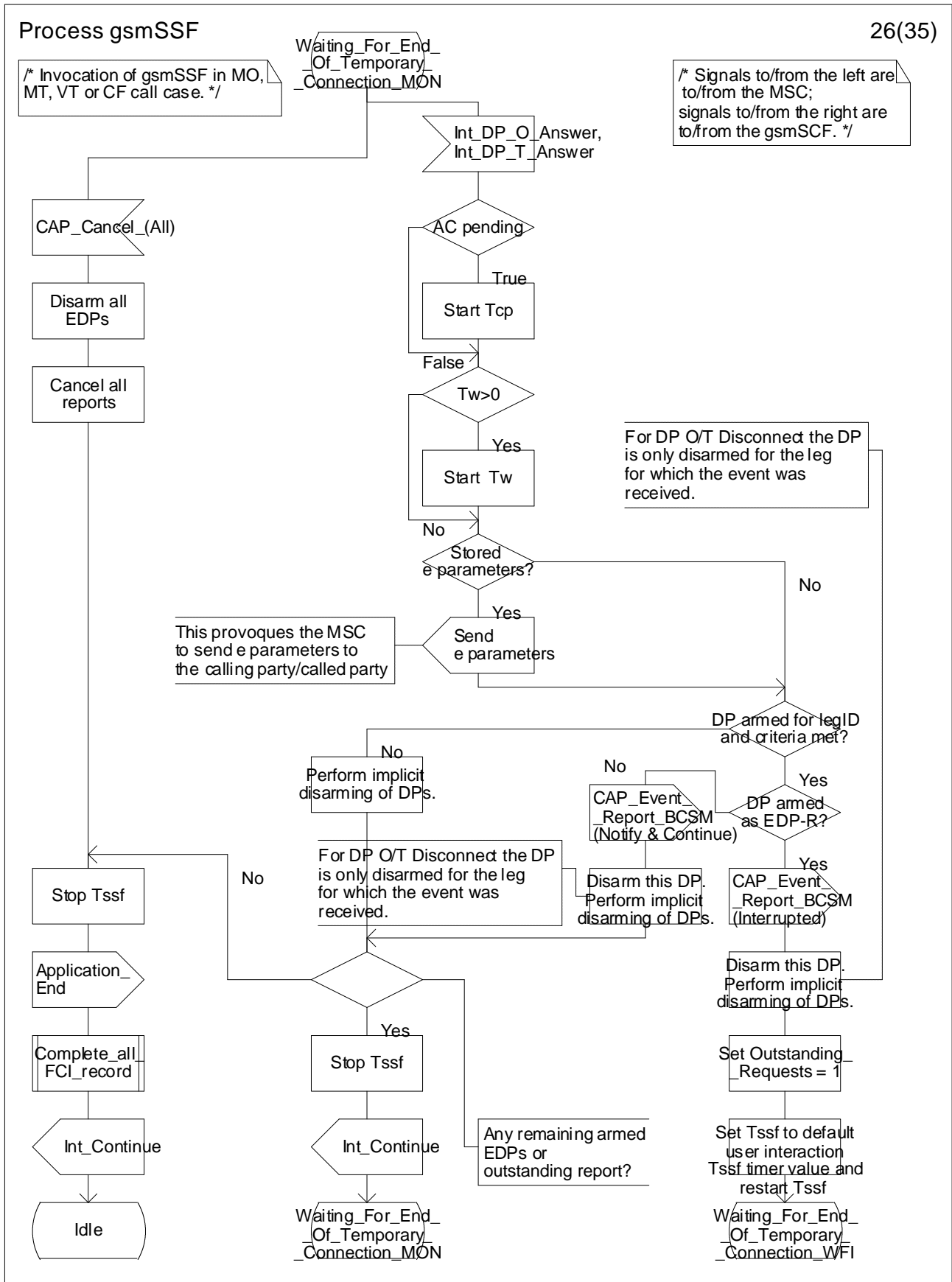


Figure 4.57x: Process gsmSSF (sheet 24)

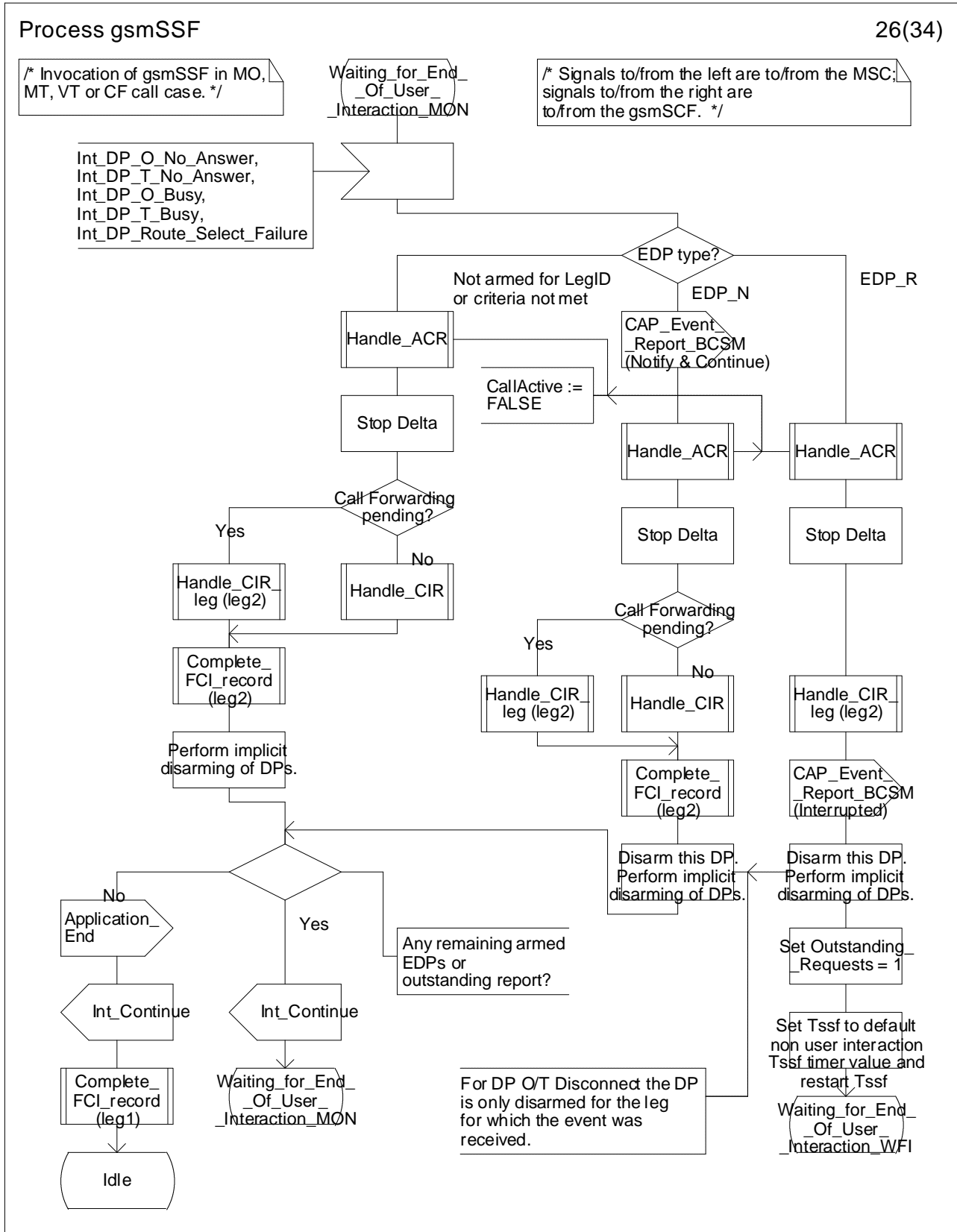


Figure 4.57y: Process gsmSSF (sheet 25)





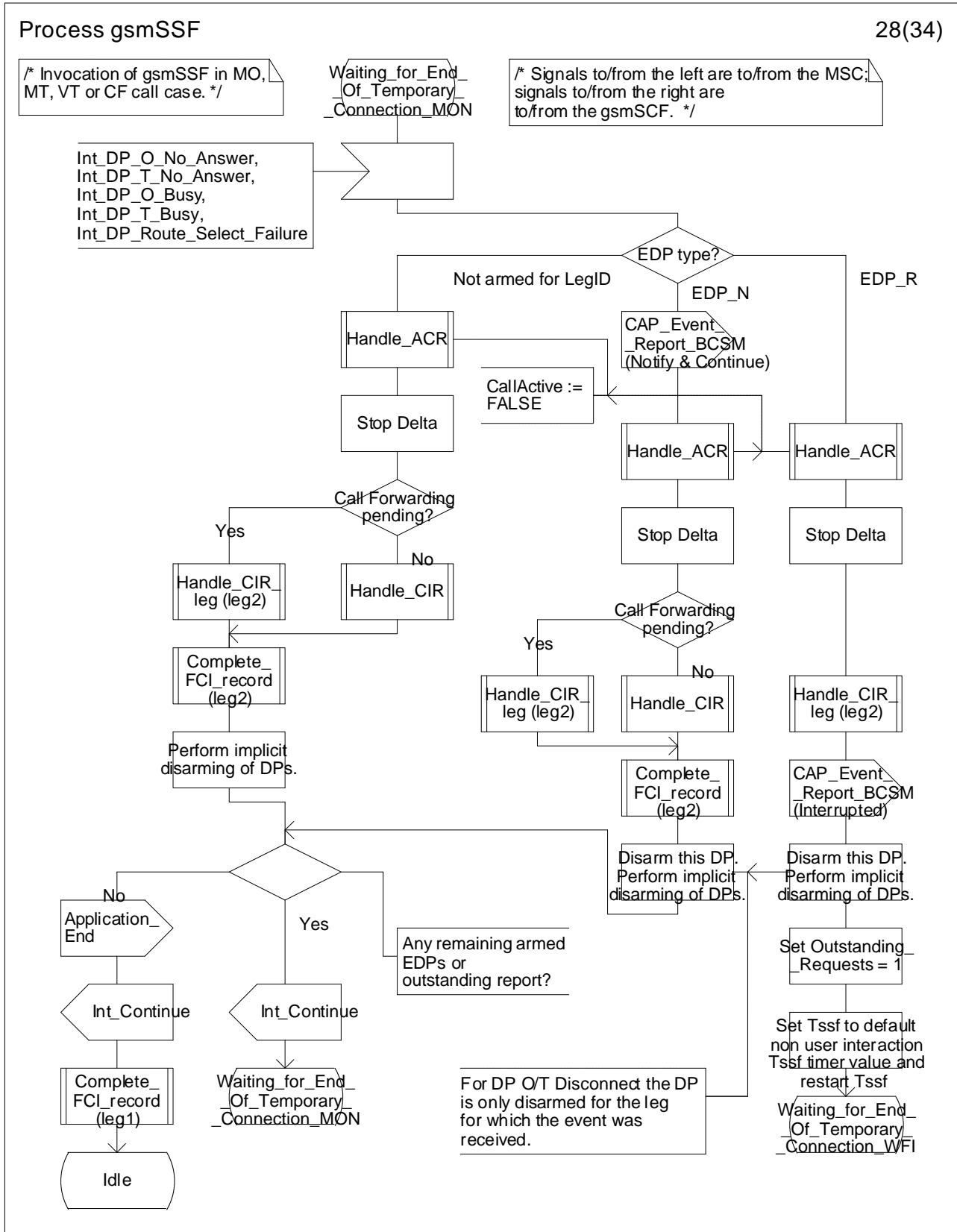


Figure 4.57aa: Process gsmSSF (sheet 27)

Process gsmSSF

29(34)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the left are to/from the MSC; signals to/from the right are to/from the gsmSCF. \*/

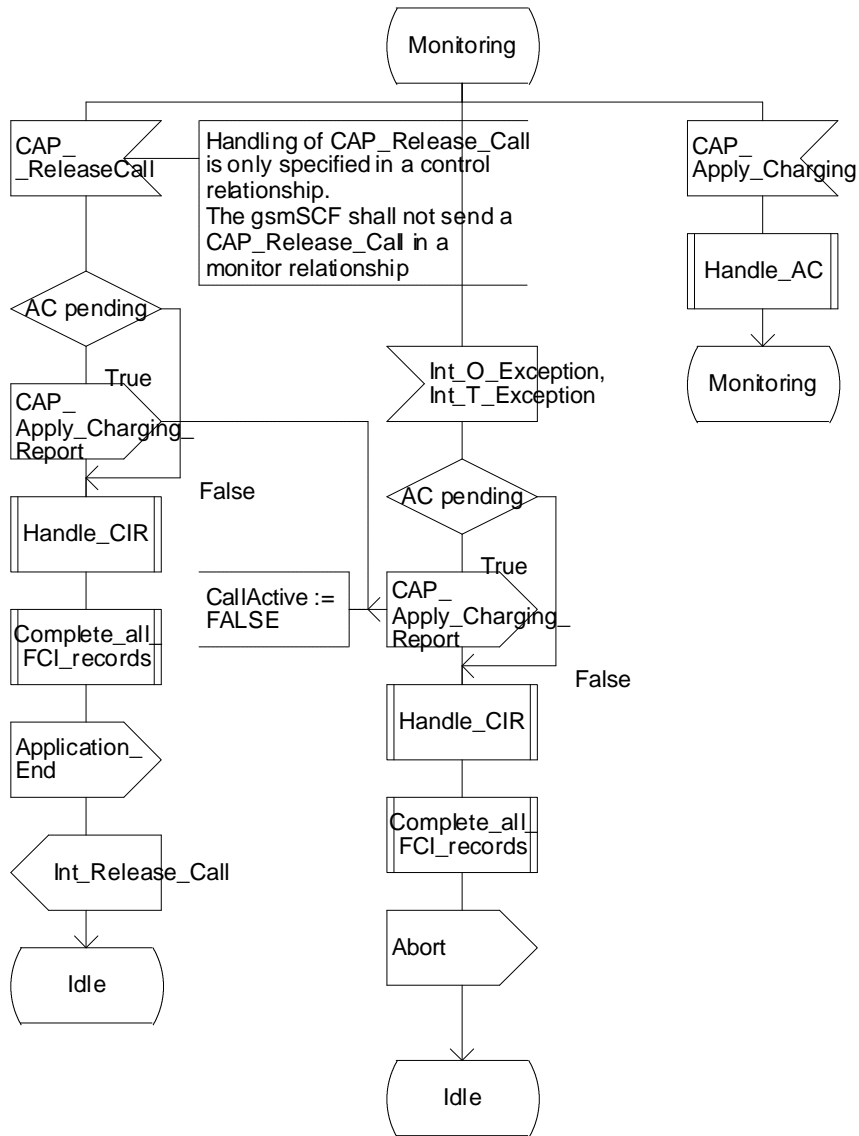


Figure 4.57bb: Process gsmSSF (sheet 28)

Process gsmSSF

30(34)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the right are to/from the gsmSCF. \*/

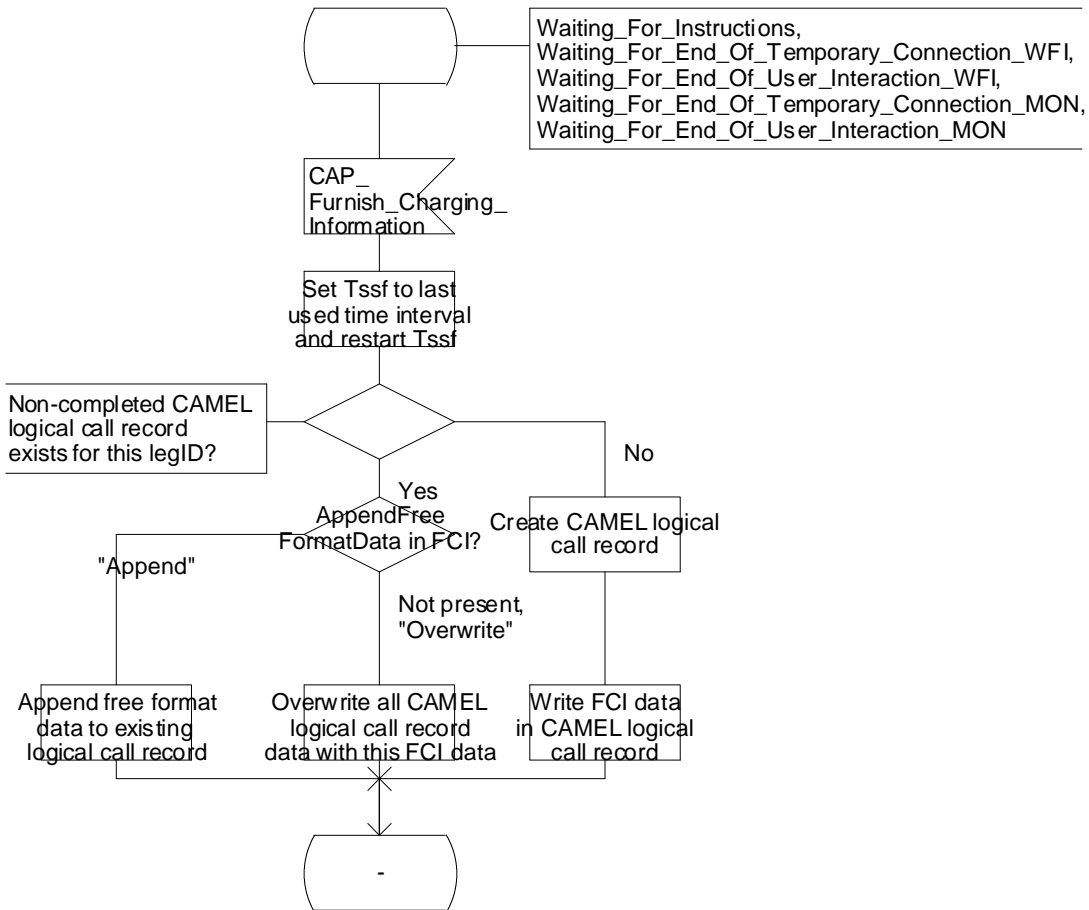


Figure 4.57cc: Process gsmSSF (sheet 29)

### Process gsmSSF

31(34)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the right are to/from the gsmSCF. \*/

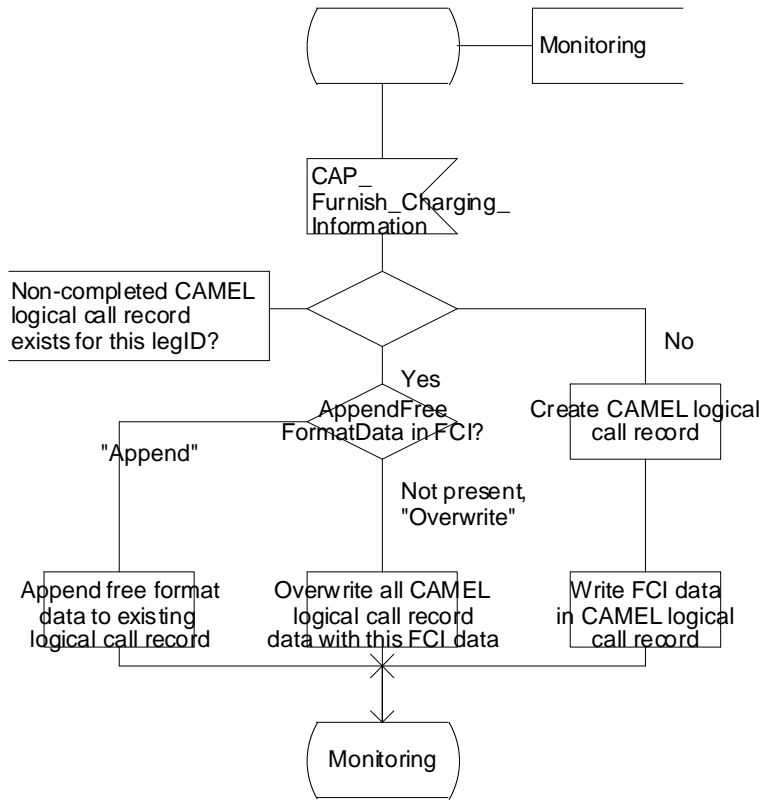


Figure 4.57dd: Process gsmSSF (sheet 30)

### Process gsmSSF

32(36)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the right are to/from the gsmSCF. \*/

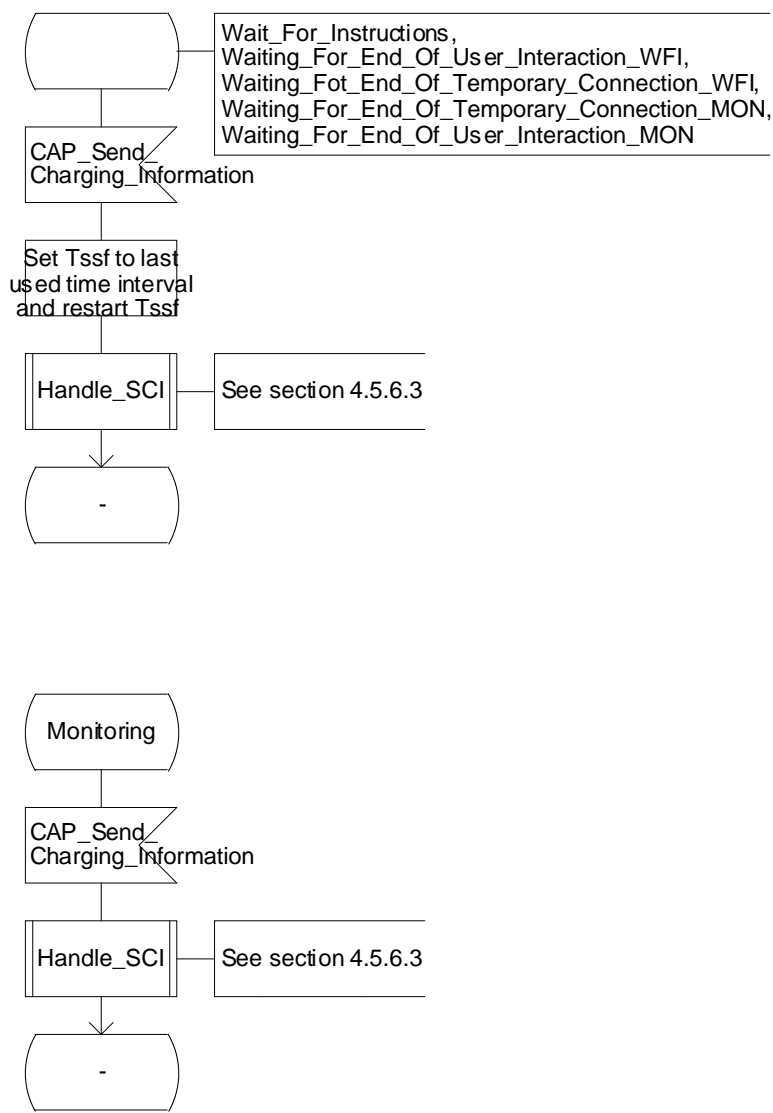


Figure 4.57ee: Process gsmSSF (sheet 31)

### Process gsmSSF

33(34)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the right are to/from the gsmSCF. \*/

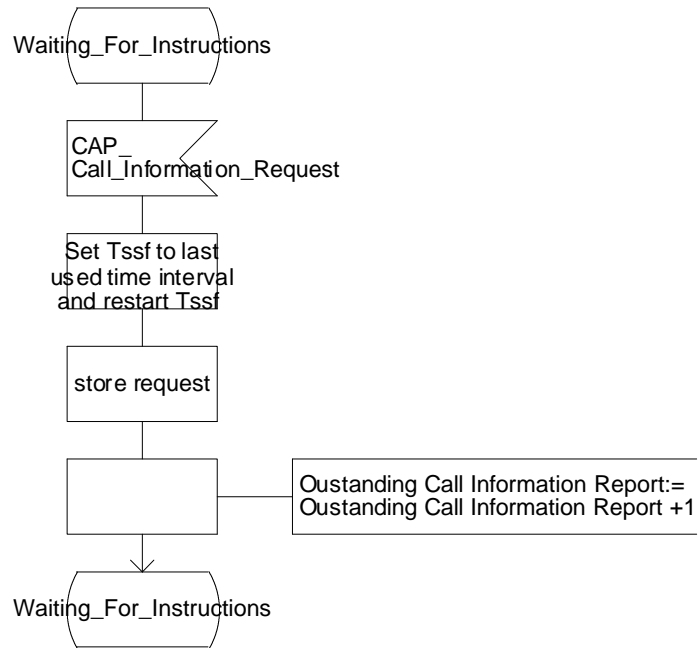


Figure 4.57ff: Process gsmSSF (sheet 32)

Process gsmSSF

34(34)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the left are to/from the MSC. \*/

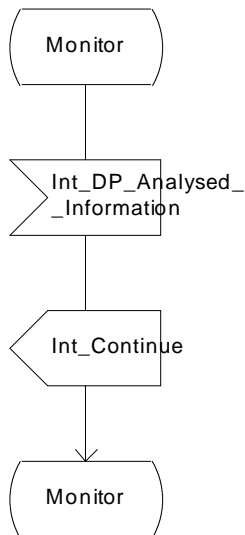


Figure 4.57gg: Process gsmSSF (sheet 33)



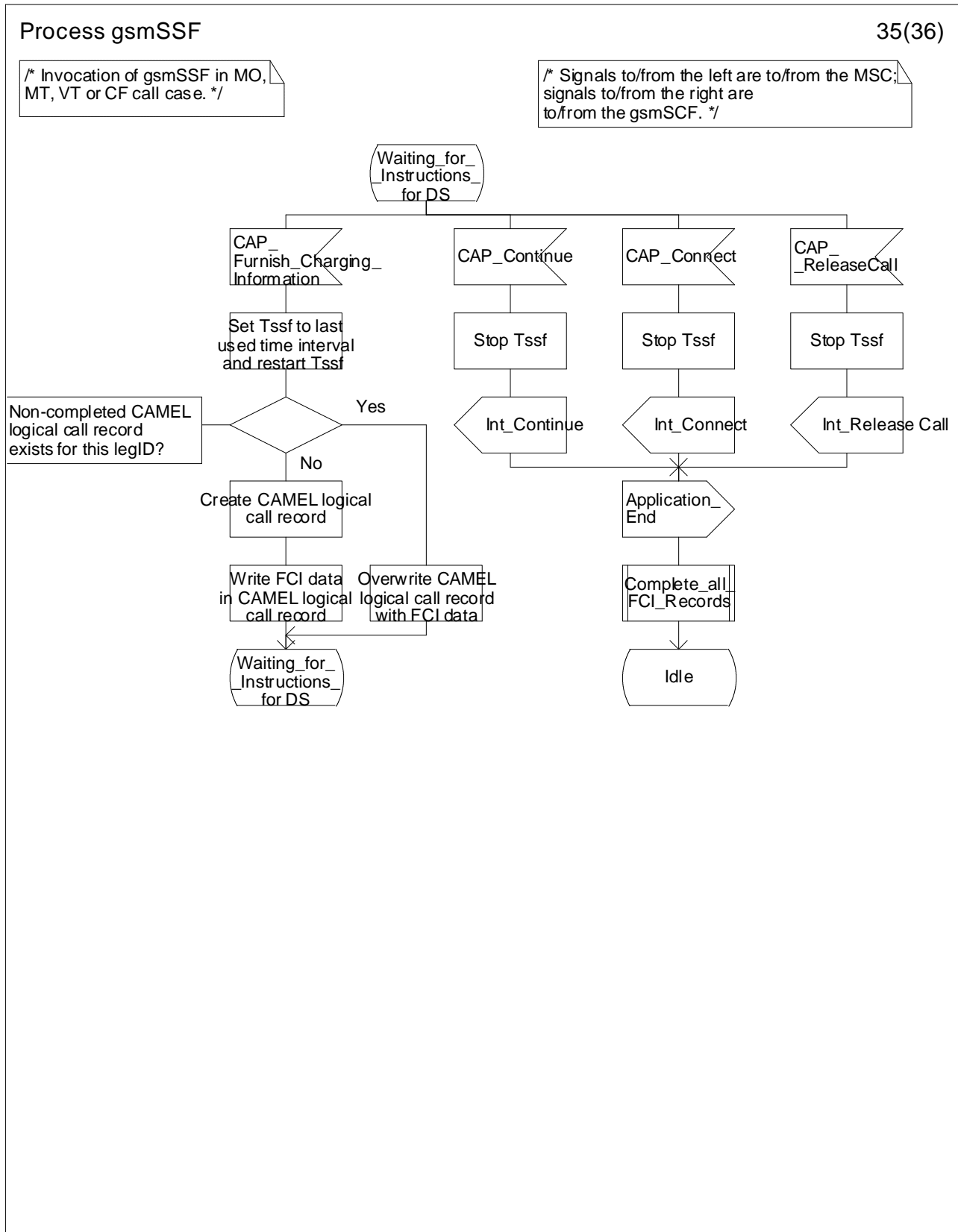


Figure 4.57hh: Process gsmSSF (sheet 34)

Process gsmSSF

36(36)

/\* Invocation of gsmSSF in MO, MT, VT or CF call case. \*/

/\* Signals to/from the left are to/from the MSC; signals to/from the right are to/from the gsmSCF. \*/

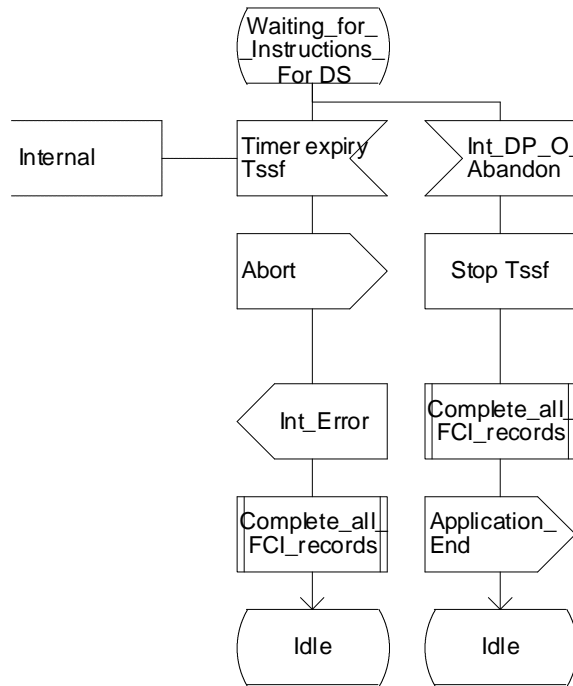


Figure 4.57ii: Process gsmSSF (sheet 35)

### Procedure Check\_Criteria\_Collected\_Info

1(1)

*/\* Procedure to check the criteria in the gsmSSF \*/*

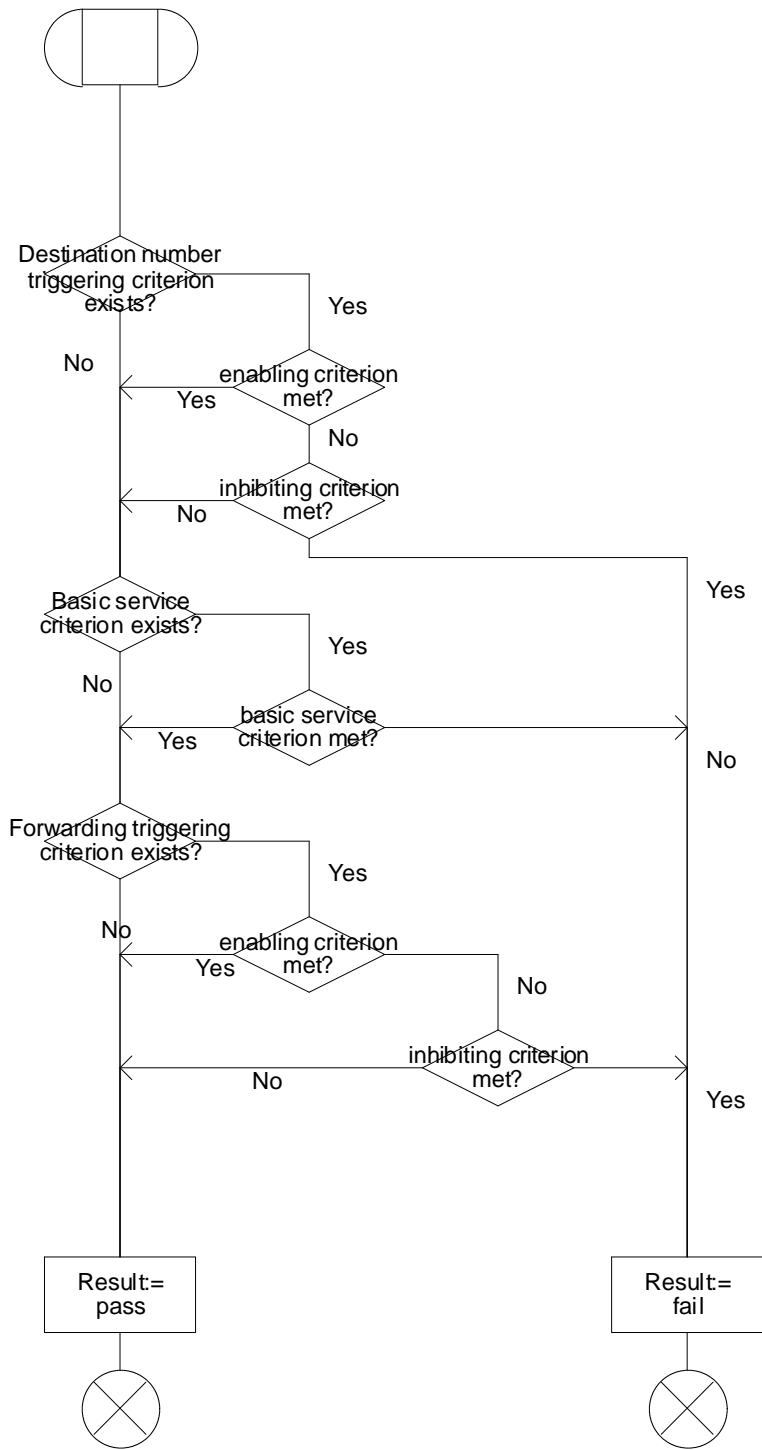


Figure 4.58a: Procedure Check\_Criteria\_Collected\_Info(sheet 1)

### Procedure Check\_Criteria\_Analysed\_Info

1(1)

*/\* Procedure to check the criteria in the gsmSSF \*/*

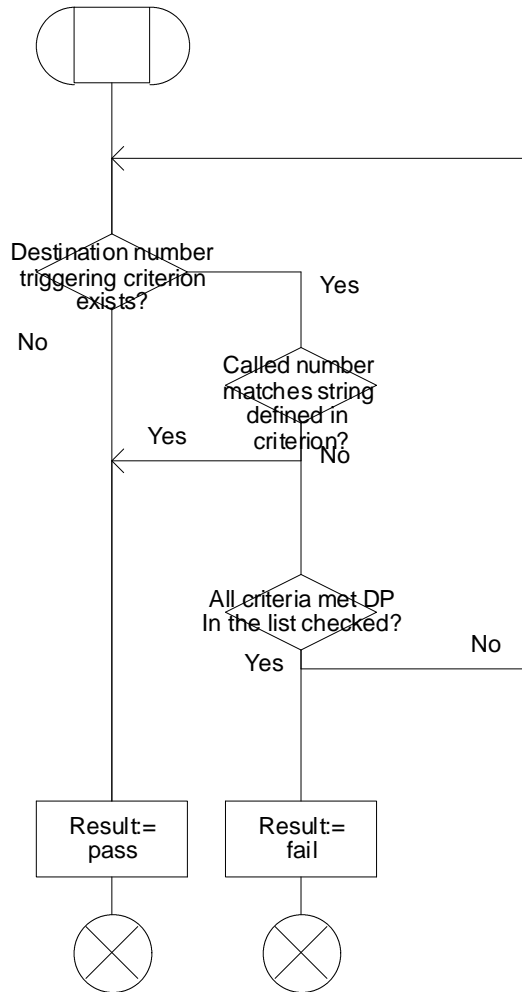


Figure 4.59a: Procedure Check\_Criteria\_Analysed\_Info(sheet 1)

Procedure Check\_Criteria\_Unsuccessful

1(1)

/\* Procedure to check the criteria in the gsmSSF \*/

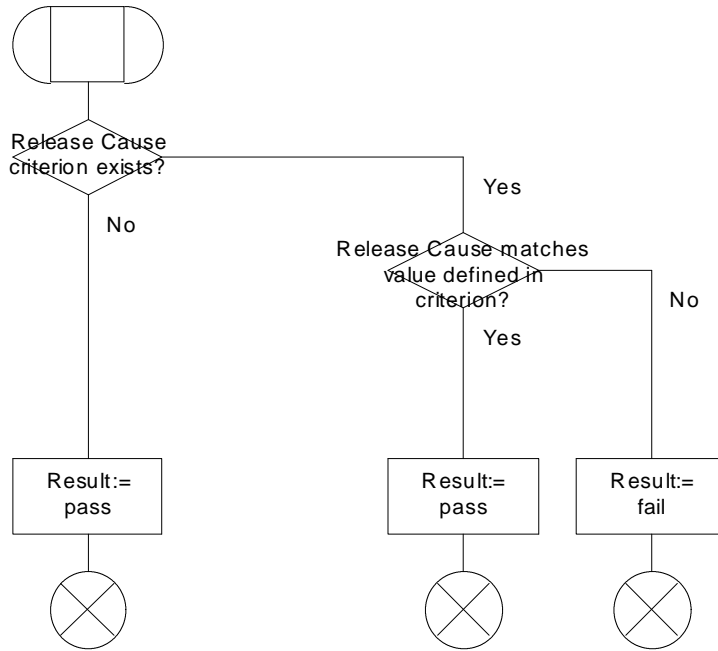


Figure 4.60a: Procedure Procedure Check\_Criteria\_Unsuccessful(sheet 1)

Procedure Connect\_To\_Resource

1(1)

This procedure is called, when the ConnectToResource request is received in Wfl or Mon state.

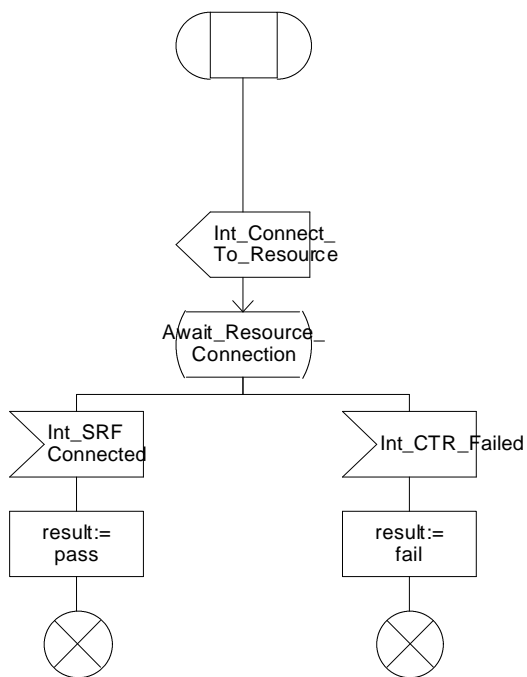


Figure 4.61a: Procedure Connect\_To\_Resource (sheet 1)

Procedure Handle\_AC

1(1)

/\* This procedure shows the handling in the gsmSSF for the operation CAP Apply Charging. \*/

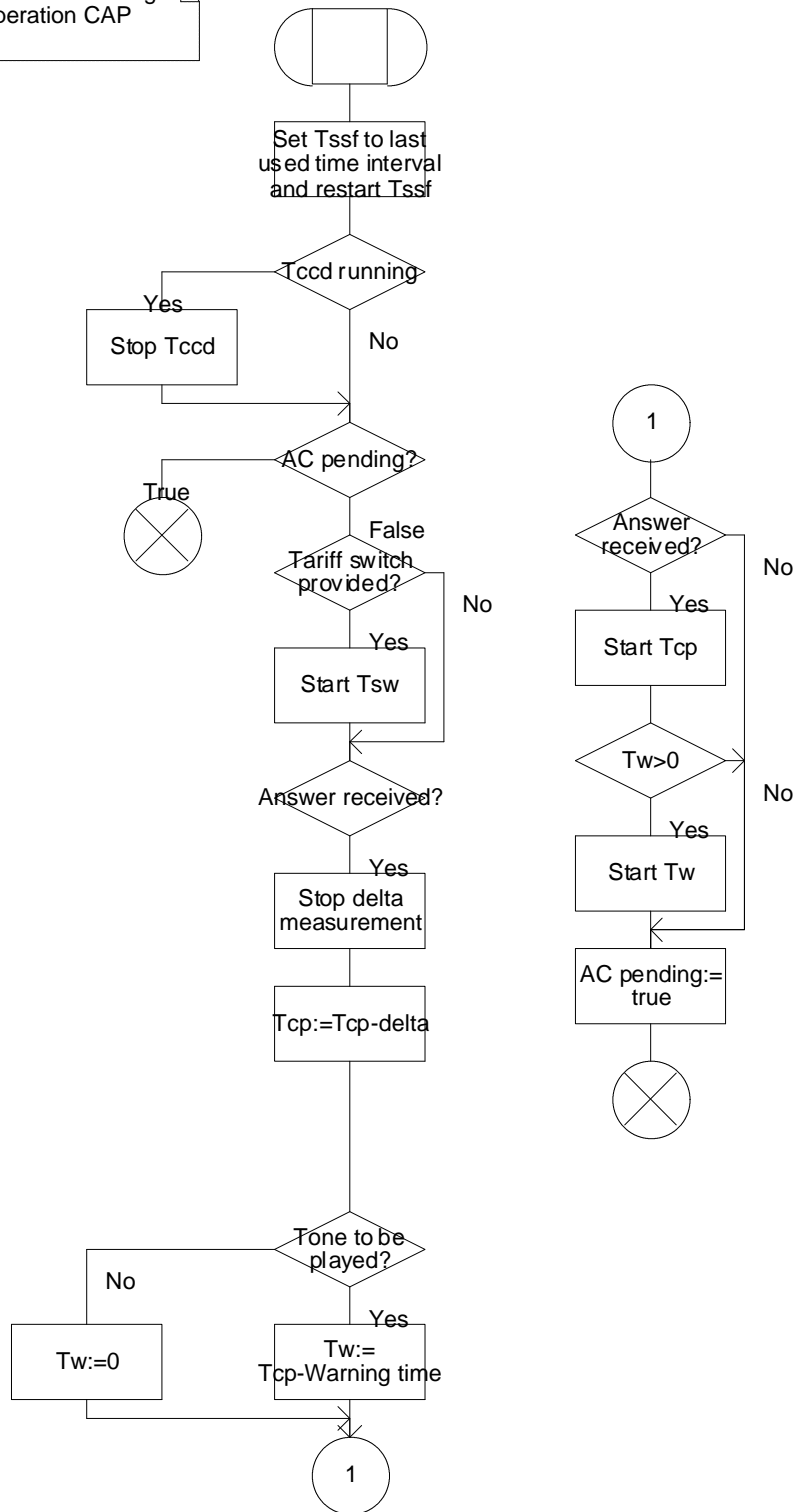


Figure 4.62a: Procedure Handle\_AC (sheet 1)

Procedure Handle\_ACR

1(1)

This procedure is only called at the end of connection to an outgoing leg, a temporary connection or a connection to a SRF when the call can be continued

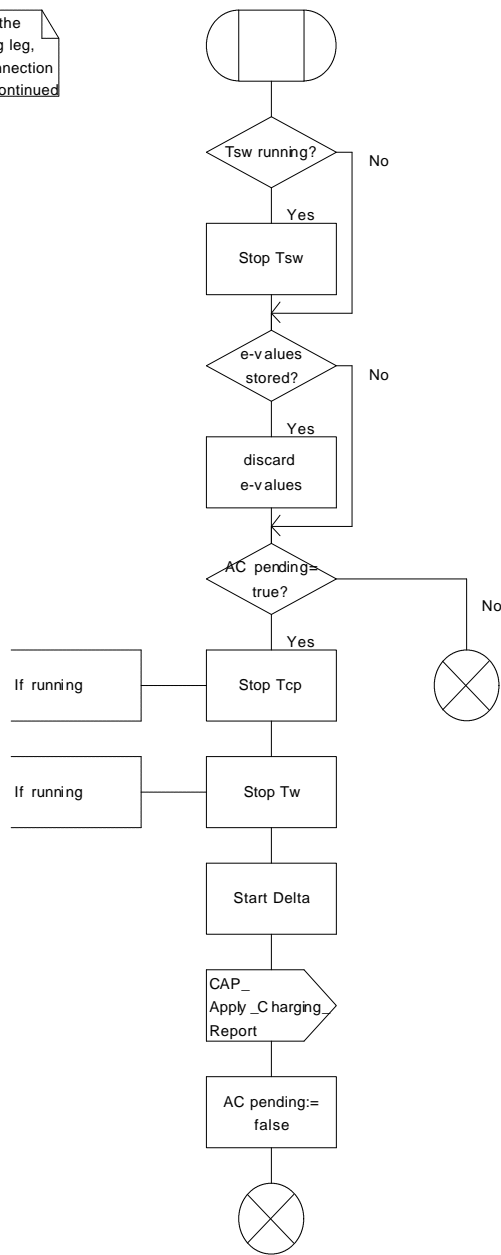


Figure 4.63a: Procedure Handle\_ACR (sheet 1)



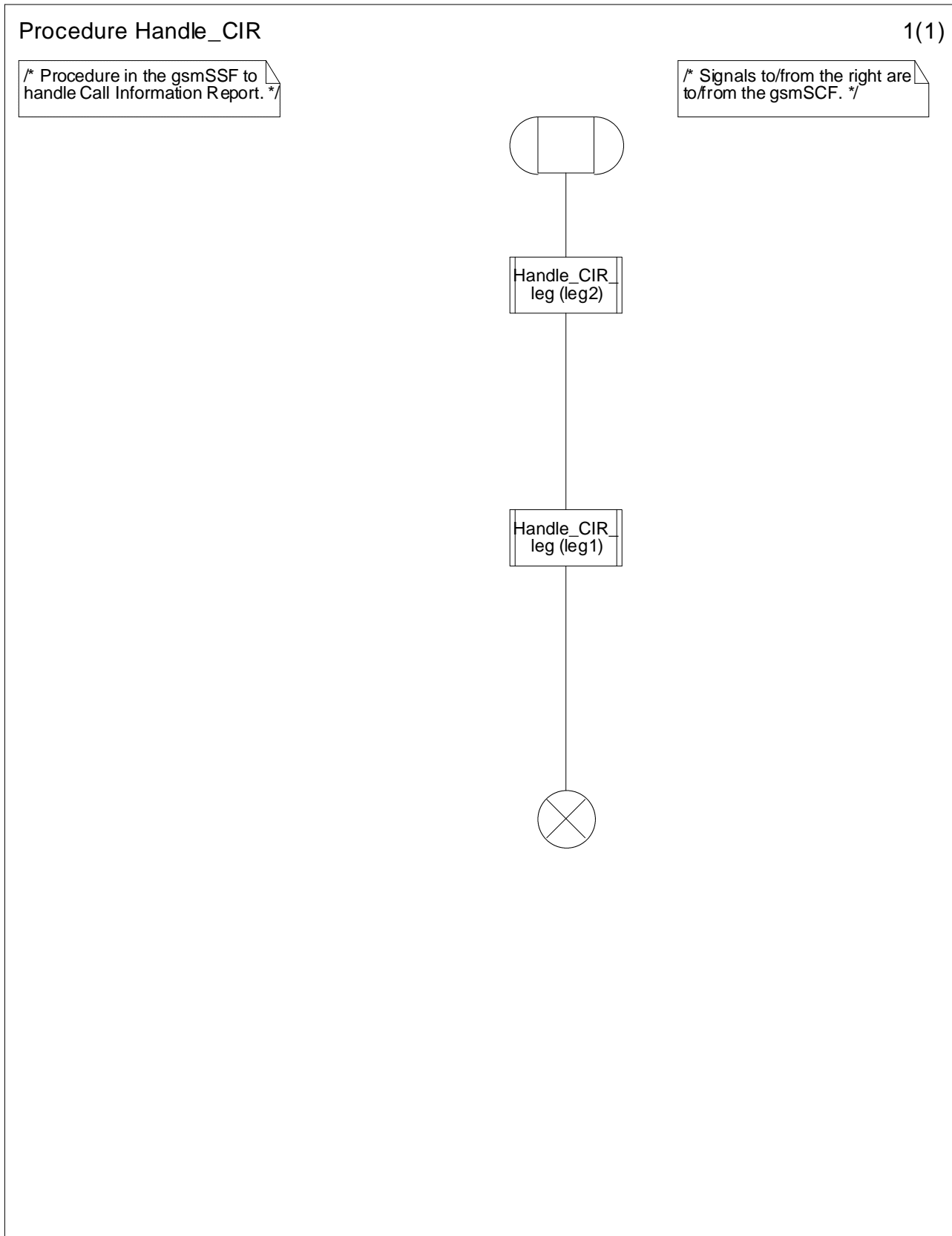


Figure 4.64a: Procedure Handle\_CIR (sheet 1)

### Procedure Handle\_CIR\_leg

1(1)

/\* Procedure in the gsmSSF to handle Call Information Report for the specified leg. \*/  
;FPAR IN LegID LegType;

/\* Signals to/from the right are to/from the gsmSCF. \*/

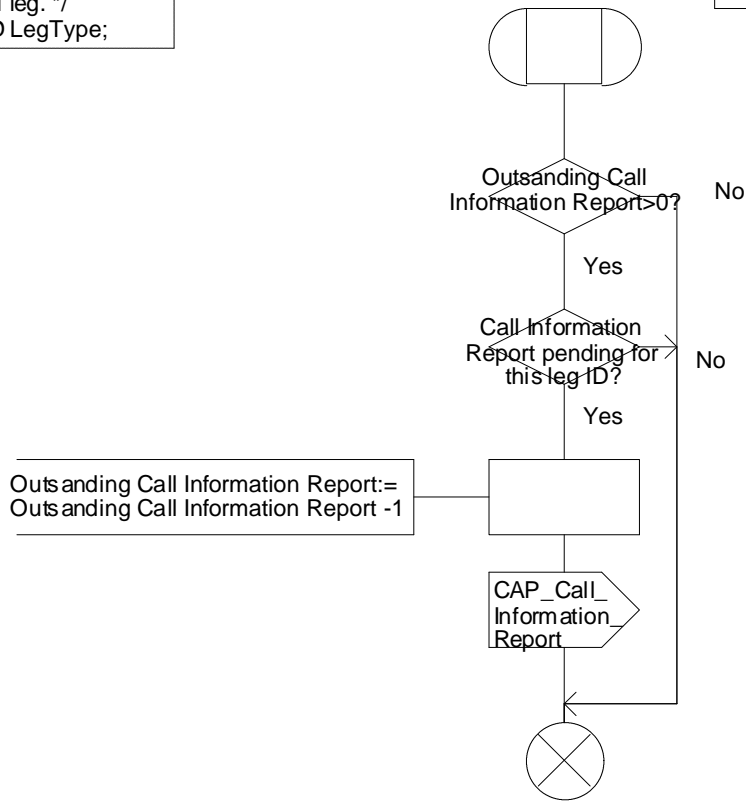


Figure 4.65a: Procedure Handle\_CIR\_leg (sheet 1)

### Procedure Complete\_FCI\_record

1(1)

/\* Procedure in the gsmSSF to write Furnish Charging Information data to CDR for the specified LegID. \*/  
;FPAR IN LegID LegType;

/\* Signals to/from the right are to/from the gsmSCF. \*/

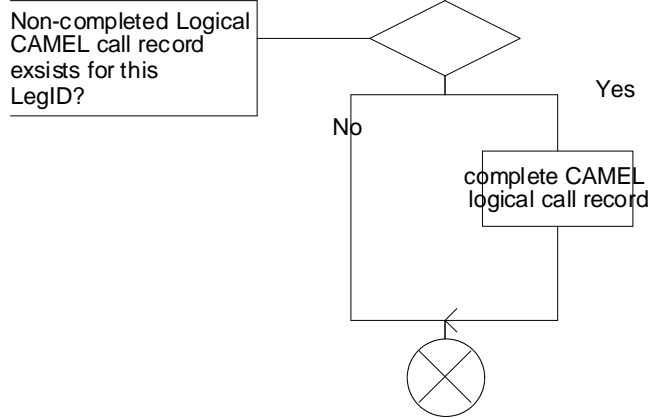


Figure 4.66a: Procedure Complete\_FCI\_record (sheet 1)

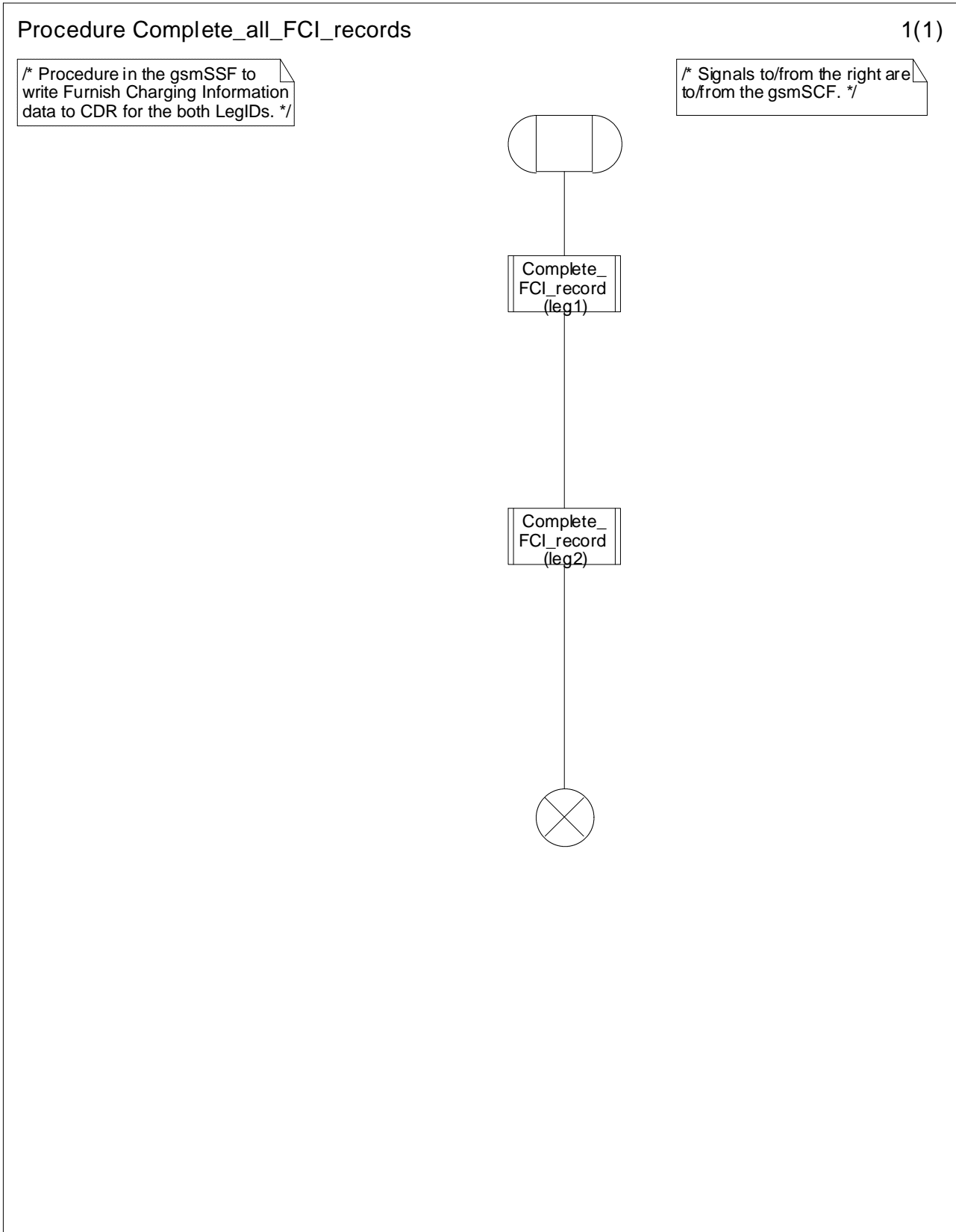


Figure 4.67a: Procedure Complete\_all\_FCI\_records (sheet 1)

### 4.5.7 Assisting case

Assisting case involves the following processes :

- CAMEL\_Assisting\_MSC,
- Assisting\_gsmSSF.

The detailed error handling for these 2 processes is specified in 3G TS 29.078 [5].

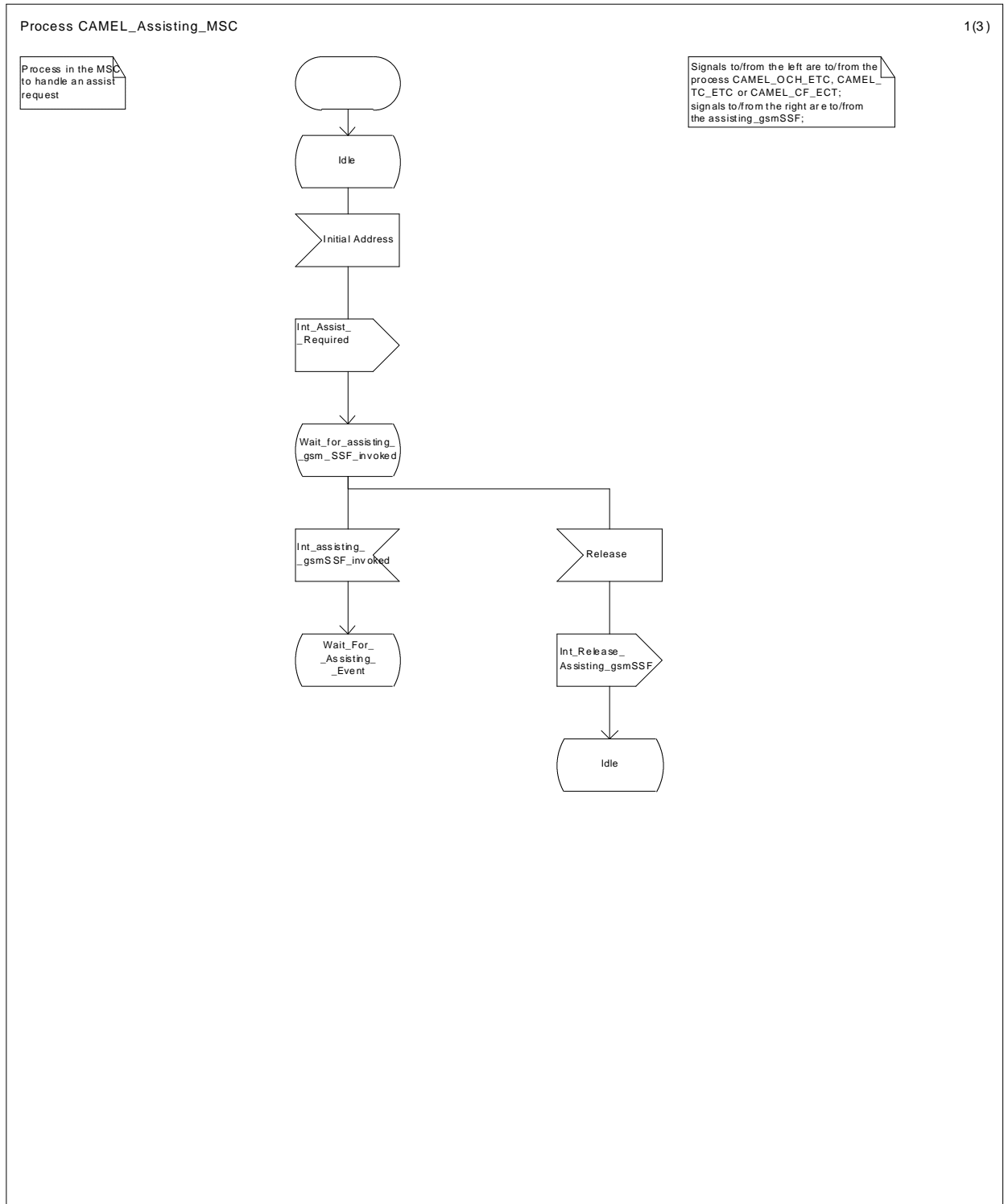


Figure 4.68a: Process CAMEL\_Assisting\_MSC (sheet 1)

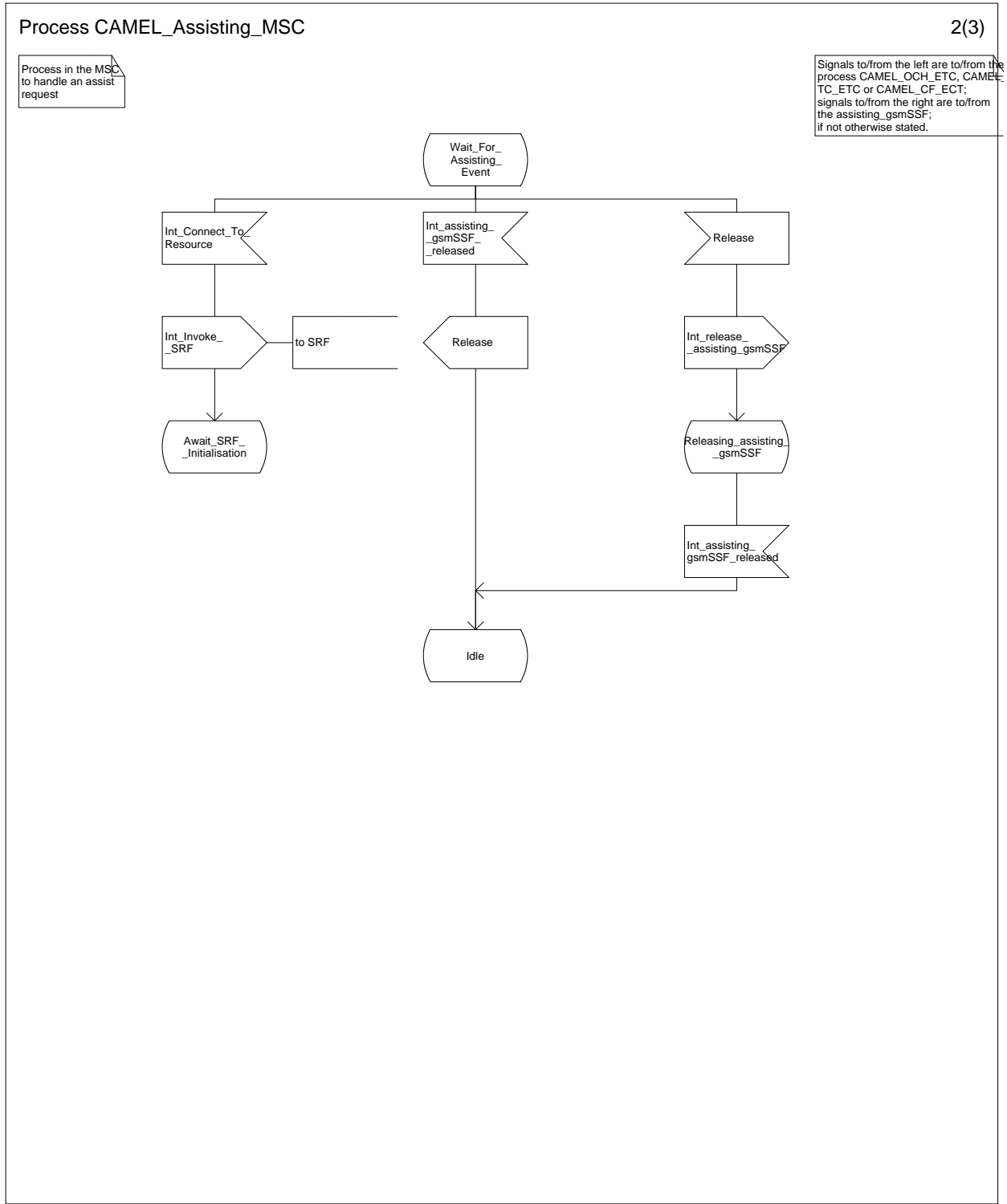


Figure 4.68b: Process CAMEL\_Assisting\_MSC (sheet 2)

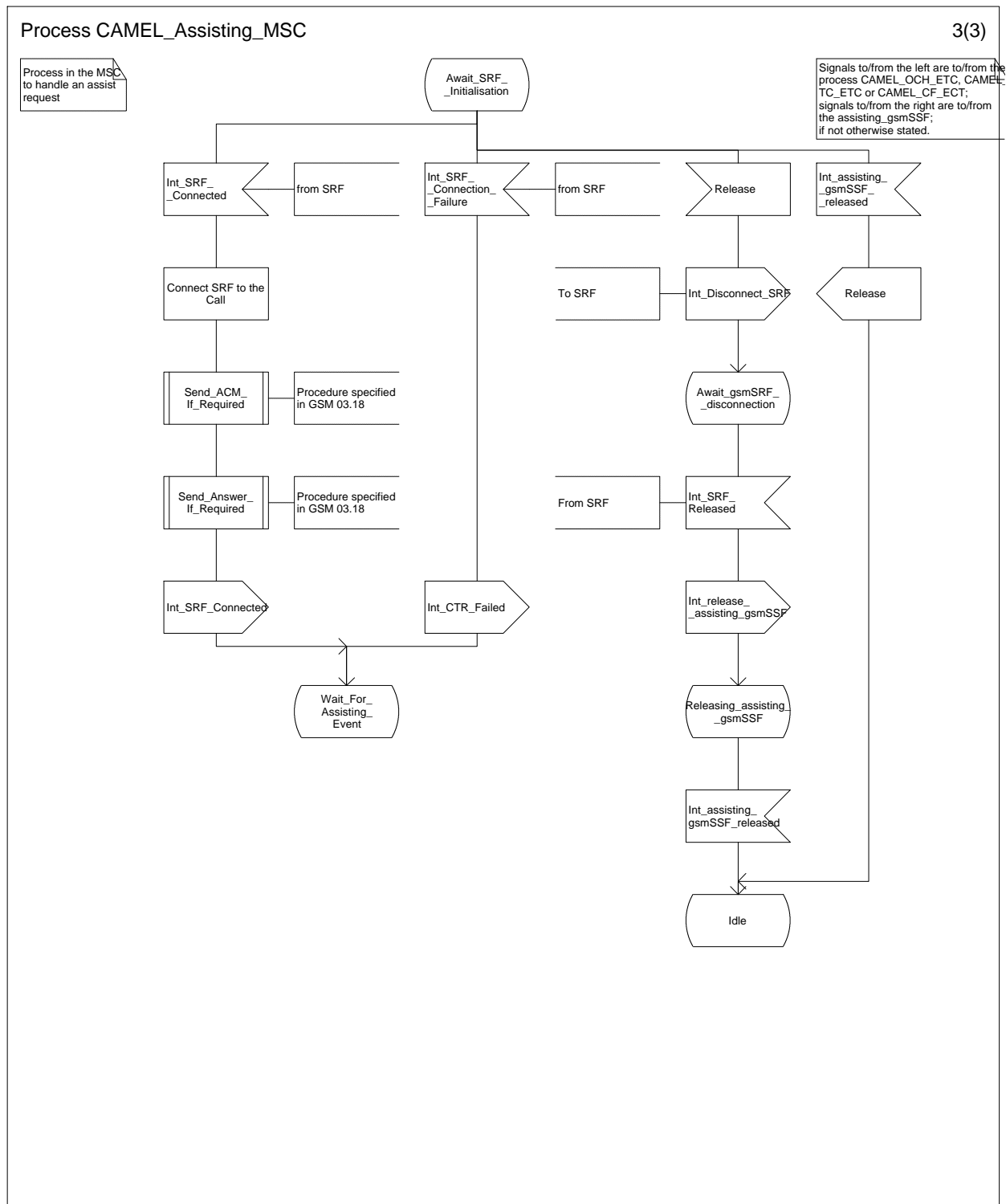


Figure 4.68c: Process CAMEL\_Assisting\_MSC (sheet 3)

Process assisting\_gsmSSF

1(6)

/\* Invocation of gsmSSF in MO, MT or CF call case. \*/

Signals to/from the left are to/from the process CAMEL\_Assisting\_MSC; signals to/from the right are to/from the gsmSCF, unless otherwise indicated.

/\* Timers used in the assisting gsmSSF process:  
 Tssf: Application timer in the ssf.  
 Ranges for the default values for Tssf.  
 - non user interaction Tssf timer value: 1 second to 20 seconds  
 - user interaction Tssf timer value: 1 minute to 30 minutes  
 \*/

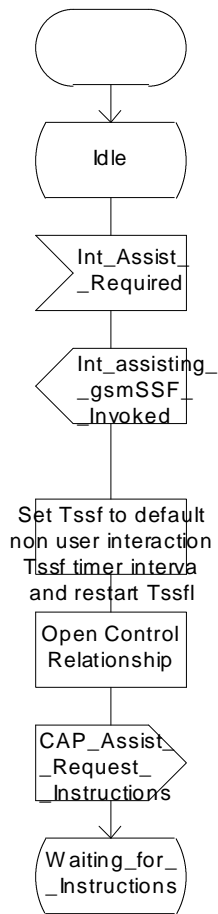


Figure 4.69a: Process Assisting\_gsmSSF (sheet 1)



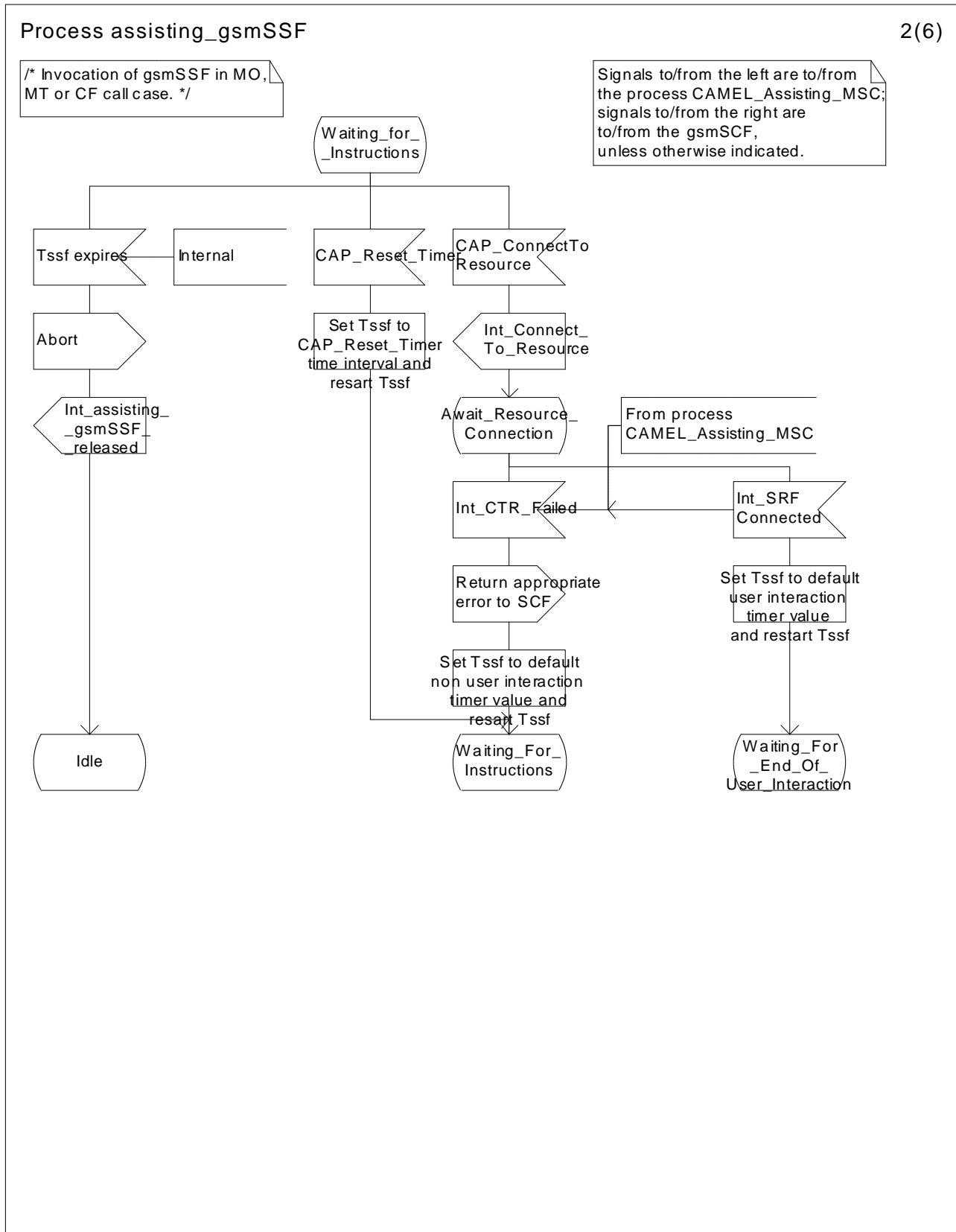


Figure 4.69b: Process Assisting\_gsmSSF (sheet 2)

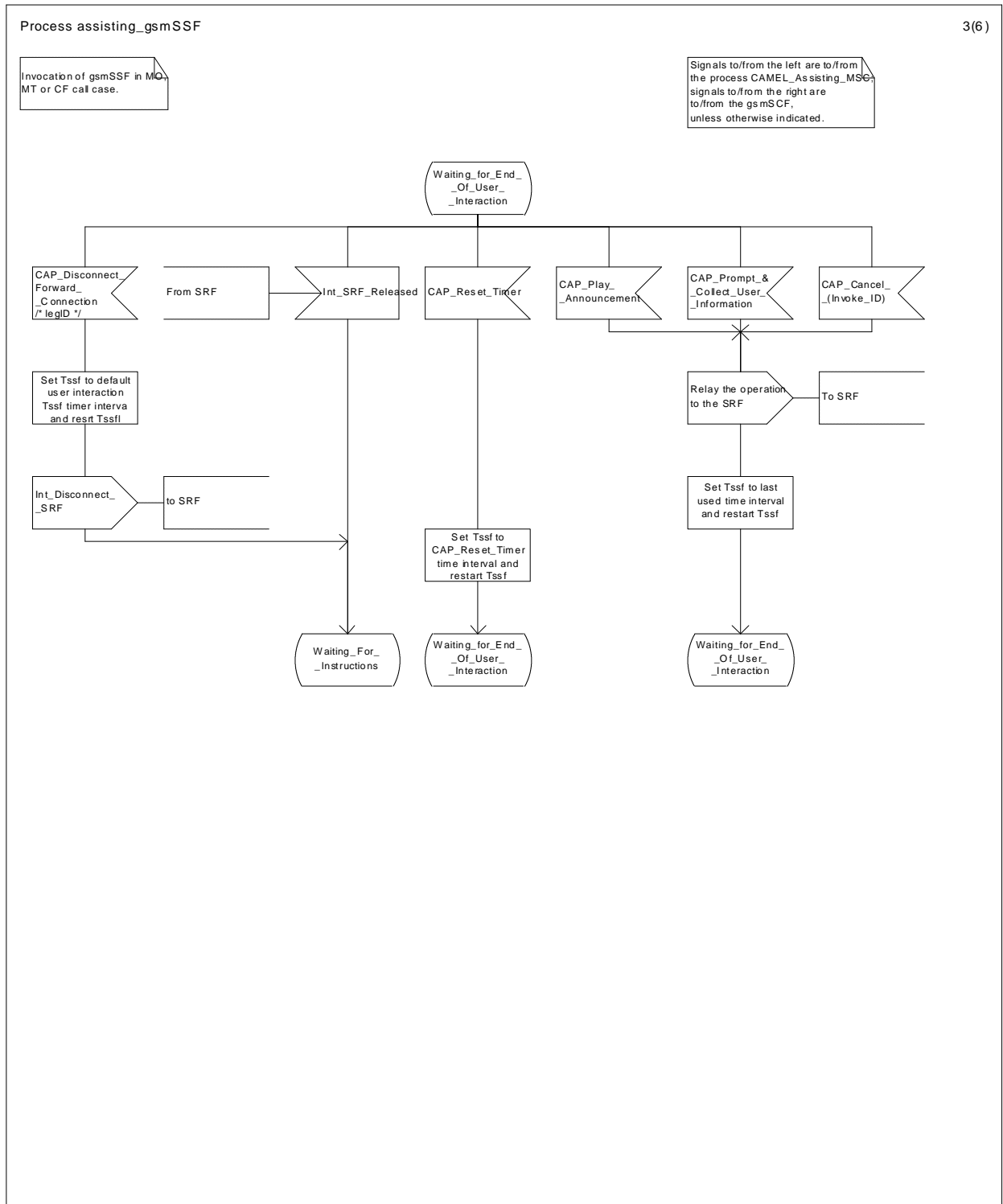


Figure 4.69c: Process Assisting\_gsmSSF (sheet 3)

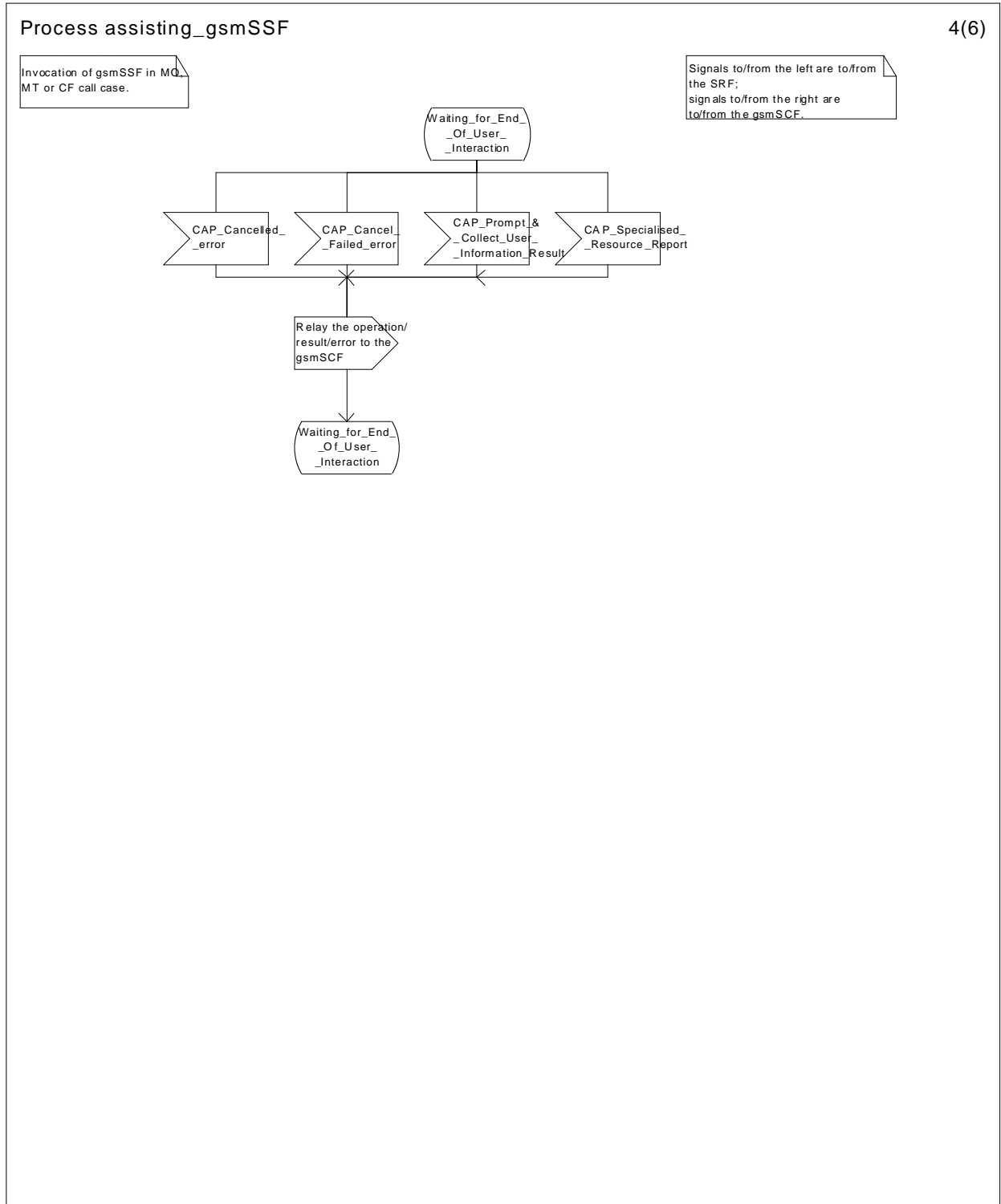


Figure 4.69d: Process Assisting\_gsmSSF (sheet 4)

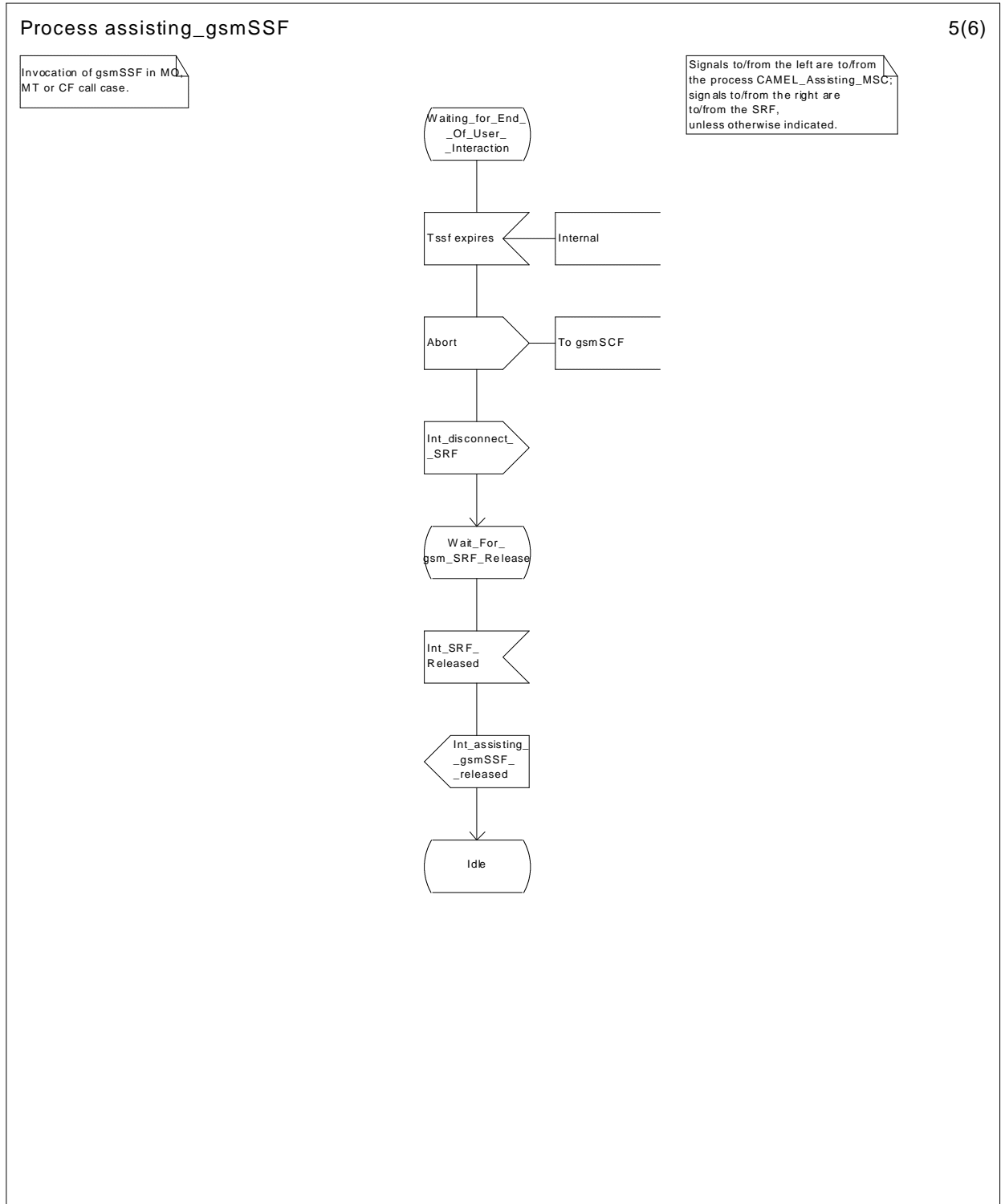


Figure 4.69e: Process Assisting\_gsmSSF (sheet 5)

### Process assisting\_gsmSSF

6(6)

/\* Invocation of gsmSSF in MO, MT or CF call case. \*/

Signals to/from the right are to/from the process CAMEL\_Assisting\_MSC.

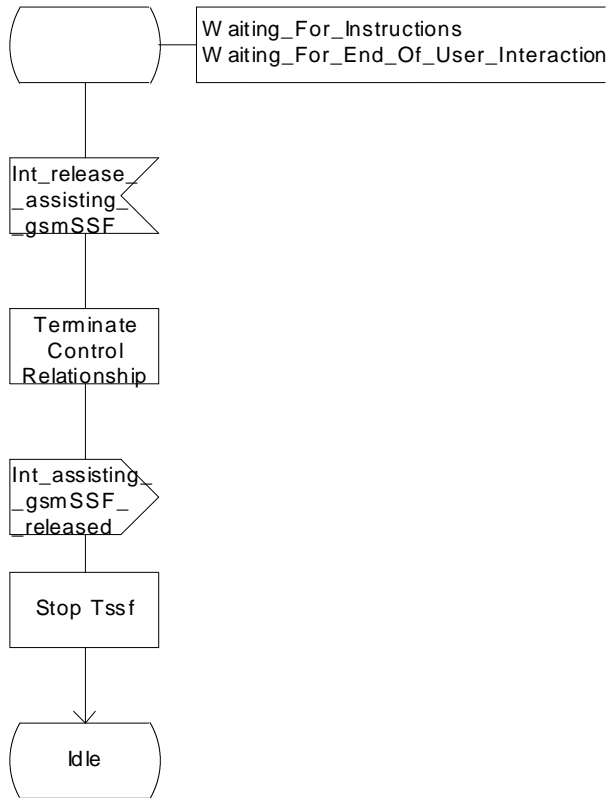


Figure 4.69f: Process Assisting\_gsmSSF (sheet 6)

Procedure Handle\_O\_Answer

1(1)

/\* Procedure in the gsmSSF to handle notification of originating answer from the MSC \*/

/\* Signals to/from the left are to/from the MSC. \*/

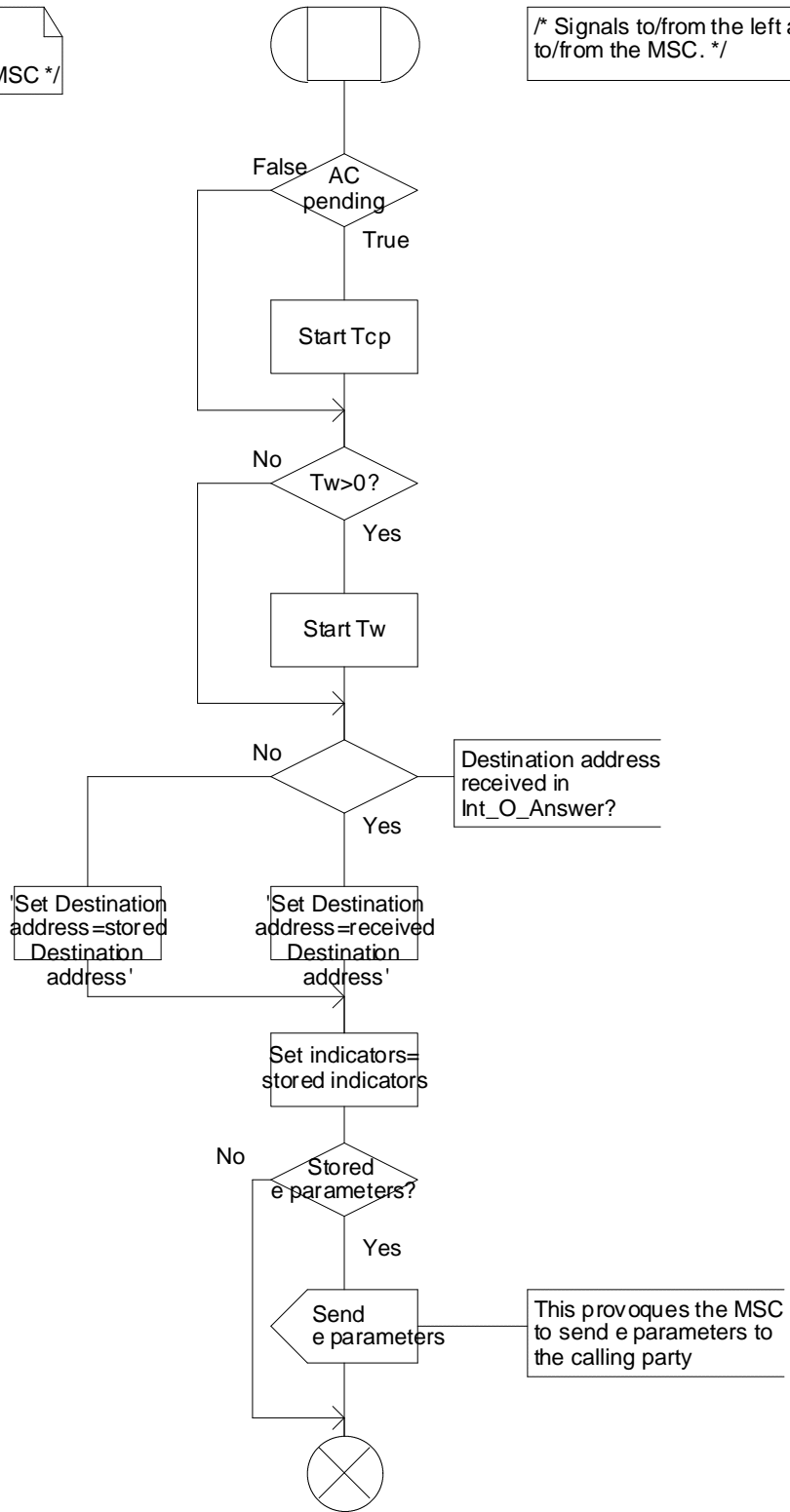


Figure 4.70a: Procedure Handle\_O\_Answer (sheet 1)

### Procedure Handle\_T\_Answer

1(1)

*/\* Procedure in the gsmSSF to handle notification of terminating answer from the MSC \*/*

*/\* Signals to/from the left are to/from the MSC. \*/*

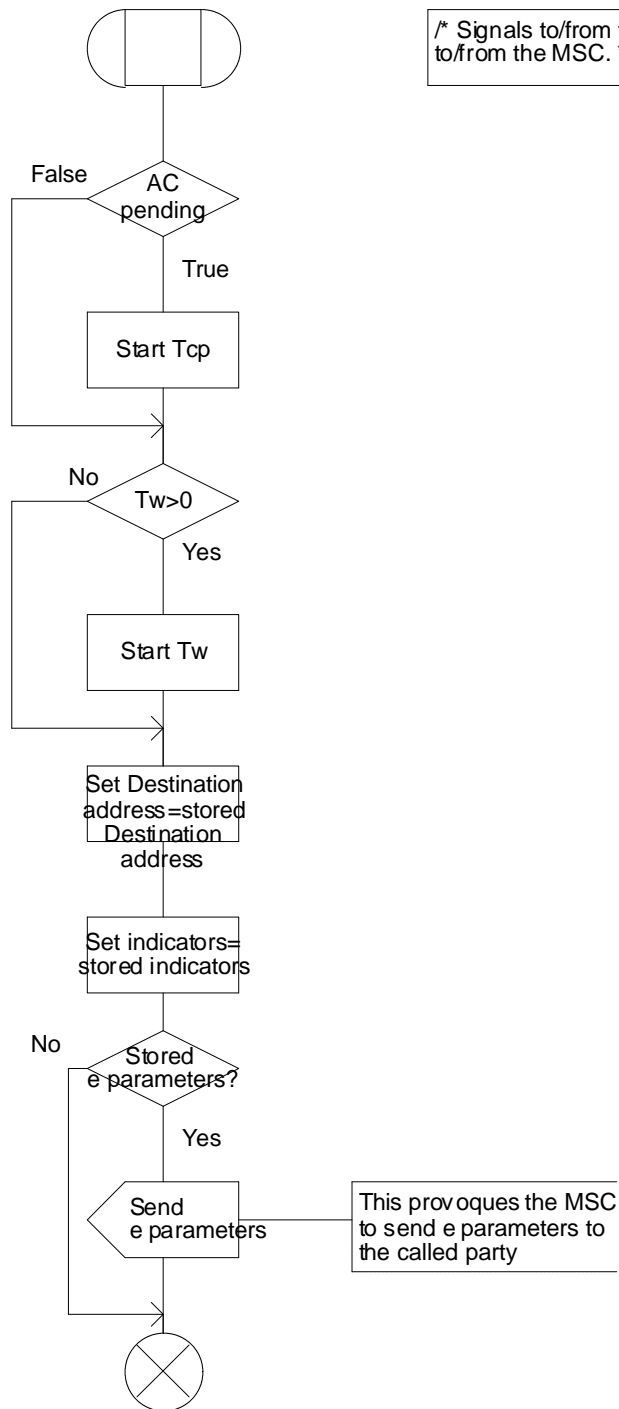


Figure 4.71a: Procedure Handle\_T\_Answer (sheet 1)

## 4.5.8 Procedure CAMEL\_Provide\_Subscriber\_Info

### 4.5.8.1 MS reachable

A Provide\_Subscriber\_Info Request is sent to VLR and the HLR waits in state Wait\_For\_Information.

If the VLR returns a Provide\_Subscriber\_Info ack, the HLR uses the returned information to set the Subscriber Info to be returned to the gsmSCF. As a network option, the HLR may use the returned Cell Id or Location Area to derive the location number and/or Geographical Info. The mapping from cell ID and location area to location number is network-specific and outside the scope of the GSM standard.

NOTE: The handling in the VLR of Provide\_Subscriber\_Info Request is defined in 3G TS 23.018 [3].

### 4.5.8.2 MS not reachable

#### 4.5.8.2.1 Location Information requested

If VLR number is available in the HLR, then the Location Information is set to this parameter only.

If location information is not available in the HLR, no location information is set.

#### 4.5.8.2.2 Subscriber State requested

The Subscriber State is set to "Network determined not reachable".

### 4.5.8.3 Actions at state Wait\_For\_Information

The following actions are possible in state Wait\_For\_Information depending on the result of the Provide\_Subscriber\_Info Request sent to VLR.

#### 4.5.8.3.1 Provide\_Subscriber\_Info ack

The Location Information or/and the Subscriber State are set to the received information.

#### 4.5.8.3.2 Provide\_Subscriber\_Info Negative Response

If location information was requested the VLR number is provided as location information. If the subscriber state was requested the subscriber state is set to "not provided from VLR".



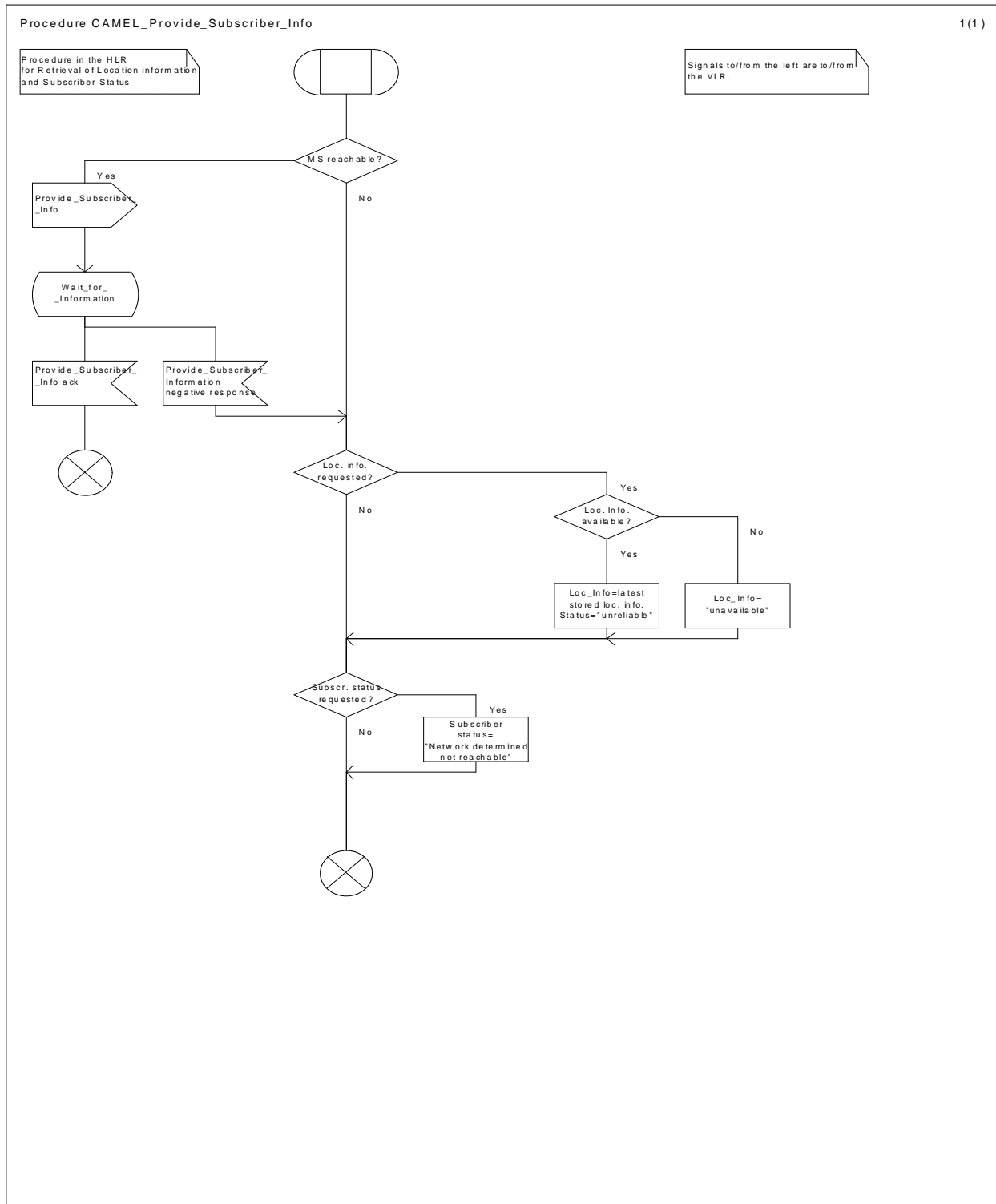


Figure 4.72a: Procedure CAMEL\_Provide\_Subscriber\_Info (sheet 1)

### 4.5.9 CAMEL specific handling of location updating and data restoration

When requesting location updating or data restoration the VLR shall indicate to the HLR which CAMEL phases it supports.

The CAMEL phase 2 HLR shall then send to the VLR CAMEL subscription data for one of the CAMEL phases supported by the VLR or, if some different handling is required, data for substitute handling.

When location update has been completed, the MSC/VLR in which the subscriber is registered after the location update, shall check the M-CSI. If a Mobility Management notification to the gsmSCF is required for this subscriber, then the MSC/VLR shall now send the notification to the gsmSCF.

Refer to subclause 9.2.1 for a description of M-CSI and the conditions under which a notification shall be sent.

#### 4.5.10 Cross phase compatibility

To avoid a case by case fallback between the gsmSSF and the gsmSCF, the gsmSSF shall use the CAP phase corresponding to the CAMEL phase negotiated on the HLR-VLR interface when it opens a dialogue with the gsmSCF. The HLR-VLR negotiation of CAMEL phase is per subscriber.

#### 4.5.11 Handling of North American Carrier Information

The following procedures apply only when the HPLMN of the CAMEL subscriber and either the VPLMN (for a mobile originated or forwarded call) or the IPLMN (for a mobile terminated call or forwarded call) are both North American. A gsmSCF may then provide the gsmSSF with any of the following North American (NA) carrier related information items.

- NA Carrier Information
- NA Originating Line Information
- NA Charge Number

A gsmSSF shall use the received information items both to select any long distance carrier needed for the call and to provide certain information needed by this carrier. Any required information items not received shall be defaulted to those that would normally apply to the call in the absence of an interaction with a gsmSCF.

If any NA information item received from the gsmSCF is found to be invalid, the gsmSSF may either, as an operator option, release the call or behave as if the invalid information item had not been sent.

If the carrier specified in the NA Carrier Information parameter is not supported in the VPLMN or IPLMN, the gsmSSF may either, as an operator option, release the call or substitute for the unsupported carrier a preferred carrier of the VPLMN or IPLMN.

Support of the NA Originating Line Information and NA Charge Number parameters is an operator option in a VPLMN based on roaming agreements with the operators of other PLMNs, A gsmSSF may ignore these items when received from certain or all gsmSCFs located in other PLMNs and replace them with the corresponding default items for an MO, MF, MT or VT call.

### 4.6 Description of information flows

This clause contains the detailed description of the information flows used by CAMEL.

Each Information Element, IE is marked as Mandatory (M), Conditional (C), Optional (O) or Not applicable (-) for each different traffic case, Mobile Originating call (MO), Mobile Forwarded call (MF), Mobile Terminating call in the GMSC (MT) and Mobile Terminating call in the VMSC (VT). This categorisation is a functional classification, i.e., stage 2 information and not a stage 3 classification to be used for the ASN.1 syntax of the protocol. This distinction between MO, MF, and MT and VT calls is not applicable to all Information Flows.

The following principles apply for the handling of the IEs by the receiving entity :

- The gsmSSF shall functionally support all IEs which can be sent to it.
- The gsmSCF may silently discard any IE which it does not functionally support
- The gsmSRF shall return an error if it does not functionally support a IE which it receives.
- The HLR may silently discard any IE which it does not functionally support.

Details of errors and exceptions to these rules are specified in are specified in 3G TS 29.078.

## 4.6.1 gsmSSF to gsmSCF information flows

### 4.6.1.1 Activity Test ack

#### 4.6.1.1.1 Description

This IF is the response to the Activity Test.

#### 4.6.1.1.2 Information Elements

This IF contains no information elements.

### 4.6.1.2 Apply Charging Report

#### 4.6.1.2.1 Description

This IF is used by the gsmSSF to report to the gsmSCF the information requested in the Apply Charging IF.

#### 4.6.1.2.2 Information Elements

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Call Result	M	M	M	M	This IE contains the charging information to be provided by the gsmSSF.

M Mandatory (The IE shall always be sent)

Call Result contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Time Duration Charging Result	M	M	M	M	This IE is a list defined in the next table.

M Mandatory (The IE shall always be sent)

Time Duration Charging Result contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Time Information	M	M	M	M	This IE is a choice between Time if No Tariff Switch and Time if Tariff Switch.
Party To Charge	M	M	M	M	This IE is received in the related ApplyCharging operation to correlate the result to the request. This IE shall be a copy of the corresponding IE received in the Apply Charging operation.
Call Active	M	M	M	M	This IE indicates whether the call is active or not.
Call Released at Tcp Expiry	C	C	C	C	This element is an indication that the gsmSSF has released the call and terminated the dialogue, due to Tcp expiry. It shall be present when ACR is sent due to Tcp expiry and the gsmSSF has released the call (because 'ReleaselfExceeded' was present in ACH operation). In all other circumstances, this element shall be absent.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

Time Information contains one of the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Time If No Tariff Switch	C	C	C	C	This IE will be present if no tariff switch has occurred since the detection of Answer for the connection to the Called Party, the Temporary Connection, or the SRF connection, otherwise it will be absent.
Time If Tariff Switch	C	C	C	C	This IE will be present if a tariff switch has occurred since the detection of Answer for the connection to the Called Party, the Temporary Connection, or the SRF connection, otherwise it will be absent.

C Conditional (The IE shall be sent, if available)

### 4.6.1.3 Call Information Report

#### 4.6.1.3.1 Description

This IF is used to send specific call information for a single call to the gsmSCF as requested from the gsmSCF in a previous Call Information Request.

#### 4.6.1.3.2 Information Elements

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Requested Information List	M	M	M	M	This IE specifies a list of Requested information Values which are requested.
Leg ID	M	M	M	M	This IE indicates the party in the call for which information shall be collected. When absent, it indicates the 'outgoing' leg created with Connect, Continue or Continue With Argument.

M Mandatory (The IE shall always be sent)

### 4.6.1.4 Event Report BCSM

#### 4.6.1.4.1 Description

This IF is used to notify the gsmSCF of a call-related event (i.e., BCSM events as answer and disconnect) previously requested by the gsmSCF in a Request Report BCSM Event IF.

#### 4.6.1.4.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Event type BCSM	M	M	M	M	This IE specifies the type of event that is reported.
Event Specific Information BCSM	C	C	C	C	This IE indicates the call related information specific to the event.
Leg ID	M	M	M	M	This IE indicates the party in the call for which the event is reported.
Misc Call Info	M	M	M	M	This IE indicates the DP type.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

Event Specific Information BCSM contains the following information for the O Answer and T Answer cases:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Destination address	M	M	M	M	This IE specifies the destination address for the call leg.
OR	-	C	C	-	This IE indicates that the call was subject to basic Optimal Routeing as specified in GSM 03.79.
Forwarded call	-	M	C	C	This IE indicates that the call has been subject to GSM call forwarding.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent if its value is True, otherwise it shall not be sent)

- Not applicable

#### 4.6.1.5 Initial DP

##### 4.6.1.5.1 Description

This IF is generated by the gsmSSF when a trigger is detected at a DP in the BCSM, to request instructions from the gsmSCF.

##### 4.6.1.5.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Additional Calling Party Number	-	C	C	C	The calling party number provided by the access signalling system of the calling user.
Bearer Capability	M	C	C	C	This IE indicates the type of the bearer capability connection to the user.
Called Party Number	-	M	M	M	This IE contains the number used to identify the called party in the forward direction. For the VT calls this is the MSISDN received in the Provide Roaming Number; if the MSISDN is not available, the basic MSISDN is used.
Called Party BCD Number	M	-	-	-	This IE contains the number used to identify the called party in the forward direction. The number contained in this IE shall be identical to the number received over the access network. It may e.g. include service selection information, such as * and # digits, or carrier selection information dialled by the subscriber.
Calling Party Number	M	C	C	C	This IE carries the calling party number to identify the calling party or the origin of the call.
Calling Partys Category	M	C	C	C	Indicates the type of calling party (e.g., operator, pay phone, ordinary subscriber).

Information element name	MO	MF	MT	VT	Description
Call Reference Number	M	M	M	M	<p>This IE may be used by the gsmSCF for inclusion in a network optional gsmSCF call record. It has to be coupled with the identity of the MSC which allocated it in order to define unambiguously the identity of the call.</p> <p>For MO calls, the call reference number is set by the serving VMSC and included in the MO call record.</p> <p>For MT calls, the call reference number is set by the GMSC and included in the RCF call record in the GMSC and in the MT call record in the terminating MSC.</p> <p>For VT calls, the call reference number is set by the GMSC and included in the RCF call record in the GMSC and in the MT call record in the terminating MSC.</p> <p>For CF calls, the call reference number is set by the GMSC and included in the CF record in the forwarding MSC.</p>
Cause	C	C	C	C	<p>This IE indicates the cause specific to the armed BCSM DP event. This IE is applicable to DP Route_Select_Failure and DP T_Busy. The cause may be used by the SCF to decide about the further handling of the call.</p>
Event Type BCSM	M	M	M	M	<p>This IE indicates the armed BCSM DP event, resulting in the Initial DP IF.</p>
Ext-Basic Service Code	C	C	C	C	<p>This IE indicates the type of basic service i.e., teleservice or bearer service.</p>
High Layer Compatibility	C	C	C	C	<p>This IE indicates the type of the high layer compatibility, which will be used to determine the ISDN-teleservice of a connected ISDN terminal.</p>
IMSI	M	M	M	M	<p>This IE identifies the mobile subscriber.</p>
IP SSP Capabilities	C	C	C	C	<p>This IE indicates which SRF resources are supported within the gsmSSF and are available. If this IE is absent, this indicates that no gsmSRF is attached and available.</p>
Location Information	M	-	C	M	<p>This IE is described in the next table.</p>
Location Number	M	C	C	C	<p>For mobile originated calls this IE represents the location of the calling party. For all other call scenarios this IE contains the location number received in incoming ISUP signalling.</p>
MSC Address	M	M	M	M	<p>For MO calls, the MSC Address carries the international E.164 address of the serving VMSC.</p> <p>For MT calls, the MSC Address carries the international E.164 address of the GMSC.</p> <p>For VT calls, the MSC Address carries the international E.164 address of the serving VMSC.</p> <p>For CF calls, the MSC Address carries the international E.164 address of the forwarding MSC.</p>
GMSC Address	-	M	-	M	<p>For CF calls, the GMSC Address carries the international E.164 address of the GMSC.</p> <p>For VT calls, the GMSC Address carries the international E.164 address of the GMSC.</p>

Information element name	MO	MF	MT	VT	Description
NA Carrier Information	C	C	C	C	<p>The content of this IE is described in the next table.</p> <p>The IE may be sent when the VPLMN and the HPLMN of the subscriber are both North American.</p> <p>For MO calls, this IE shall contain any carrier that was dialed by the calling subscriber. If no carrier was dialed, the IE shall contain the calling subscriber's subscribed carrier.</p> <p>For MT and VT calls, the IE shall contain the carrier subscribed to by the called subscriber.</p> <p>For CF calls, the IE shall contain the carrier subscribed to by the forwarding subscriber.</p>
Original Called Party ID	-	C	C	C	This IE carries the dialed digits if the call has met call forwarding on the route to the gsmSSF.
Redirecting Party ID	-	M	C	C	This IE indicates the directory number the call was redirected from.
Redirection Information	-	M	C	C	This IE contains forwarding related information, such as redirection counter.
Service Key	M	M	M	M	This IE identifies for the gsmSCF the requested set of one or more CAMEL services. It is used to address the correct application/SLP within the gsmSCF.
Subscriber State	-	-	C	C	<p>This IE indicates the status of the MS. The states are:</p> <ul style="list-style-type: none"> <li>- CAMELBusy: The MS is engaged on a transaction for a mobile originating or terminated circuit-switched call.</li> <li>- NetworkDeterminedNotReachable: The network can determine from its internal data that the MS is not reachable.</li> <li>- AssumedIdle: The state of the MS is neither "CAMELBusy" nor "NetworkDeterminedNotReachable".</li> <li>- Not provided from VLR.</li> </ul>
Time And Timezone	M	M	M	M	This IE contains the time that the gsmSSF was triggered, and the time zone the gsmSSF resides in.
GSM Forwarding Pending	-	-	C	C	This parameter indicates that a forwarded-to-number was received and the call will be forwarded due to GSM supplementary service call forwarding in the GMSC/VMSC.
Service Interaction Indicators Two	C	C	C	C	This IE is sent if it is received in the ISUP message or due to previous CAMEL processing. The IE is described in a table below.
CUG Information	-	C	C	C	See 3G TS 23.085 [9] for details of this IE.
CUG Index	C	-	-	-	See 3G TS 23.085 [9] for details of this IE.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

- Not applicable

Location Information contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Location Number	-	-	C	C	See 3G TS 23.018 [3].
CellIdOrLAI	M	-	C	C	See 3G TS 23.018 [3].
Geographical Information	C	-	C	C	See 3G TS 23.018 [3].
Geodetic Information	C	-	C	C	See 3G TS 23.018 [3].
Age Of Location Information	M	-	C	C	See 3G TS 23.018 [3].
VLR number	M	-	C	M	See 3G TS 23.018 [3].
Selected LSA Identity	C	-	C	C	This IE indicates the LSA identity associated with the current position of the MS. Send if the LSA ID of subscription and LSA ID of the used cell matches. In the case of multiple matches the one with the highest priority is sent. See 3G TS 23.073 [23].  The IE shall only be sent, if SoLSA is supported.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available. Further conditions are in the description column.)

- Not applicable

NA Carrier Information contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
NA Carrier Identification Code	M	M	M	M	This IE uniquely identifies a North American long distance carrier.
NA Carrier Selection Information	M	M	M	M	This IE indicates the way the carrier was selected e.g.: – dialled – subscribed

M Mandatory (The IE shall always be sent)

Service Interaction Indicators Two contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Forward Service Interaction Indicator	C	C	C	C	This IE is described in a table below.
HOLD Treatment Indicator	C	C	C	C	This IE indicates whether the CAMEL subscriber can invoke HOLD for the call.
CW Treatment Indicator	C	C	C	C	This IE indicates whether CW can be applied for a call to the CAMEL subscriber whilst this call is ongoing.
ECT Treatment Indicator	C	C	C	C	This IE indicates whether the call leg can become part of an ECT call initiated by the calling subscriber.
Call Completion Treatment Indicator	C	C	C	C	This IE indicates whether a CCBS request can be made for the call.

C Conditional (The IE shall be sent, if available)

- Not applicable

Forward Service Interaction Indicator contains the following information:



<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Conference Treatment Indicator	C	C	C	C	This IE indicates whether the call leg can become part of a MPTY call initiated by the called subscriber.
Call Diversion Treatment Indicator	C	C	C	C	This IE indicates whether the call can be forwarded using the Call Forwarding or Call Deflection Supplementary Services.

## 4.6.2 gsmSCF to gsmSSF information flows

### 4.6.2.1 Activity Test

#### 4.6.2.1.1 Description

This IF 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.

#### 4.6.2.1.2 Information Elements

This IF contains no information elements.

### 4.6.2.2 Apply Charging

#### 4.6.2.2.1 Description

This IF is used for interacting from the gsmSCF with the gsmSSF charging mechanisms to control the call duration.

#### 4.6.2.2.2 Information Elements

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
ACh Billing Charging Characteristics	M	M	M	M	This IE specifies the charging related information to be provided by the gsmSSF and the conditions on which this information has to be provided back to the gsmSCF.
Party To Charge	M	M	M	M	This IE shall be reflected in the corresponding IE of the Apply Charging Report operation. This IE has no effect on the charging procedures in the MSC.

M Mandatory (The IE shall always be sent)

ACh Billing Charging Characteristics contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Time Duration Charging	M	M	M	M	This IE is described in the next table.

M Mandatory (The IE shall always be sent)

Time Duration Charging contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Max Call Period Duration	M	M	M	M	This IE indicates the maximum call period duration timer.
Tariff Switch Interval	O	O	O	O	This IE indicates the tariff switch time until the next tariff switch applies.
Release If Duration Exceeded	O	O	O	O	This IE indicates that the call shall be released when the Max call Period Duration expires, with a warning tone if the Play Tone IE is present. The cause used in the release message shall be "normal unspecified". Default is to continue the call.
Play Tone	O	-	O	O	This IE is set if a tone has to be played to the party for whom the BCSM is operating. If present, this IE indicates that 30 seconds before the Max Call Period Duration timer expires, a triple tone of 900 Hz (200 milliseconds tone, 200 milliseconds pause) shall be played.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

- Not applicable

### 4.6.2.3 Call Information Request

#### 4.6.2.3.1 Description

This IF is used to request the gsmSSF to record specific information about a single call and report it to the gsmSCF (with a CallInformationReport)

#### 4.6.2.3.2 Information Elements

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Requested Information Type List	M	M	M	M	This IE specifies a list of specific items of information which are requested.
Leg ID	M	M	M	M	This IE indicates the party in the call for which information shall be collected. When absent, it indicates the 'outgoing' leg created with Connect, Continue or Continue With Argument.

M Mandatory (The IE shall always be sent)

Requested Information Type List contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Call Attempt Elapsed Time	O	O	O	O	This IE indicates that the Call Attempt Elapsed Time is requested in the Call Information Report. Call Attempt Elapsed Time is the duration between the end of the CAMEL processing initiating call setup (Connect, Continue or Continue With Argument IF) and the received answer indication from the called party side. For the Calling Party, the value of Call Attempt Elapsed Time in the Call Information Report shall be set to 0.
Call Stop Time	O	O	O	O	This IE indicates that the Call Stop Time is requested in the Call Information Report. Call Stop Time is the time stamp when the connection is released.
Call Connected Elapsed Time	O	O	O	O	This IE indicates that the Call Connected Elapsed Time is requested in the Call Information Report. Call Connected Elapsed Time is the duration between the received answer indication from the called party side and the release of the connection. For a Calling Party, it indicates the duration between the sending of IDP and the release of that party
Release Cause	O	O	O	O	This IE indicates that the Release Cause is requested in the Call Information Report. Release Cause is the release cause for the call.

O Optional (Service logic dependent)

#### 4.6.2.4 Cancel

##### 4.6.2.4.1 Description

This IF is used by the gsmSCF to request the gsmSSF to cancel all EDPs and reports.

##### 4.6.2.4.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
All Requests	M	M	M	M	This IE indicates that all active requests for EventReportBCSM, ApplyChargingReport and CallInformationReport shall be cancelled.

M Mandatory (The IE shall always be sent)

#### 4.6.2.5 Connect

##### 4.6.2.5.1 Description

This IF is used to request the gsmSSF to perform the call processing actions to route a call to a specific destination. To do so, the gsmSSF may use destination information from the calling party and existing call set-up information depending on the information provided by the gsmSCF.

## 4.6.2.5.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Alerting Pattern	-	-	O	O	This parameter indicates the kind of Alerting Pattern to be applied.
Calling Partys Category	O	O	O	O	This IE indicates the type of calling party (e.g., operator, pay phone, ordinary subscriber).
Destination Routing Address	M	M	M	M	This IE contains the called party number towards which the call is to be routed.
Generic Number	O	O	O	O	This IE contains the generic number. Its used to convey the additional calling party number, which e.g. could be used to modify the calling line ID presented to the called user.
NA Carrier Information	O	O	O	O	This IE is described in the next table.
NA Originating Line Information	O	O	O	O	This IE identifies the type of number in the NA Charge Number (e.g. subscriber versus PLMN operator number).
NA Charge Number	O	O	O	O	This IE identifies the chargeable number for the usage of a North American carrier.
O-CSI Applicable	-	-	O	O	This IE indicates that the O-CSI, if present shall be applied on the outgoing leg.
Original Called Party ID	O	O	O	O	This IE carries the dialled digits if the call has met call forwarding on route to the gsmSSF or is forwarded by the gsmSCF.
Redirecting Party ID	O	O	O	O	This IE indicates the directory number the call was redirected from.
Redirection Information	O	O	O	O	This IE contains forwarding related information, such as redirecting counter.
Suppression Of Announcements	-	-	O	O	This IE indicates that announcements or tones generated as a result of unsuccessful call setup shall be suppressed.
Service Interaction Indicators Two	O	O	O	O	This IE is described in a table below.
CUG Interlock Code	O	O	O	O	See 3G TS 23.085 [9] for details of this IE.
Outgoing Access Indicator	O	O	O	O	See 3G TS 23.085 [9] for details of this IE.

O Optional (Service logic dependent)

- Not applicable

NA Carrier Information contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
NA Carrier Identification Code	M	M	M	M	This IE uniquely identifies a North American long distance carrier.
NA Carrier Selection Information	M	M	M	M	This IE indicates the way the carrier was selected e.g.: – dialled – subscribed

M Mandatory (The IE shall always be sent)

Service Interaction Indicators Two contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Forward Service Interaction Indicator	O	O	O	O	This IE is described in a table below.
Backward Service Interaction Indicator	O	O	O	O	This IE is described in a table below.
HOLD Treatment Indicator	O	-	-	O	This IE indicates whether the CAMEL subscriber can invoke HOLD for the call.
CW Treatment Indicator	O	-	-	O	This IE indicates whether CW can be applied for a call to the CAMEL subscriber whilst this call is ongoing.
ECT Treatment Indicator	O	-	-	O	This IE indicates whether the call leg can become part of an ECT call initiated by the CAMEL subscriber.
Call Completion Treatment Indicator	O	-	-	O	This IE indicates whether a CCBS request can be made for the call.

O Optional (Service logic dependent)

- Not applicable

Forward Service Interaction Indicator contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Conference Treatment Indicator	O	O	O	O	This IE indicates whether the call leg can become part of a MPTY call initiated by the called subscriber.
Call Diversion Treatment Indicator	O	O	O	O	This IE indicates whether the call can be forwarded using the Call Forwarding or Call Deflection Supplementary Services.
Calling Party Restriction Indicator	O	-	-	-	This IE indicates whether the CLI shall be marked as Restricted by CAMEL action for the call.

O Optional (Service logic dependent)

- Not applicable

Backward Service Interaction Indicator contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Conference Treatment Indicator	O	O	O	O	This IE indicates if the call leg can become part of a MPTY call initiated by the calling subscriber.

O Optional (Service logic dependent)

- Not applicable

#### 4.6.2.6 Connect To Resource

##### 4.6.2.6.1 Description

This IF is used to connect a call from the gsmSSF to a gsmSRF.

##### 4.6.2.6.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	VT	Description
Service Interaction Indicators Two	O	O	O	O	This parameter indicates whether or not a bothway through connection is required between the Calling party and the gsmSRF. The handling when this IE is not present is defined in EN 301 070-1 ([7]).
Resource Address	O	O	O	O	This IE indicates the physical location of the gsmSRF.

O Optional (Service logic dependent)

Resource Address contains the following information:

Information element name	MO	MF	MT	VT	Description
IP Routing Address	C	C	C	C	This IE indicates the routeing address to set up a connection towards the gsmSRF.
None	C	C	C	C	This parameter indicates that the call party is to be connected to a predefined gsmSRF.

C Conditional

#### 4.6.2.7 Continue

##### 4.6.2.7.1 Description

This IF requests the gsmSSF to proceed with call processing at the DP at which it previously suspended call processing to await gsmSCF instructions. The gsmSSF completes DP processing, and continues basic call processing (i.e., proceeds to the next point in call in the BCSM) without substituting new data from the gsmSCF.

##### 4.6.2.7.2 Information Elements

This IF contains no information elements.

#### 4.6.2.8 Continue With Argument

##### 4.6.2.8.1 Description

This information flow requests the gsmSSF to proceed the call processing with modified information at the DP at which it previously suspended call processing to await gsmSCF instructions. The gsmSSF completes DP processing, and continues basic call processing (i.e., proceeds to the next point in call in the BCSM) with the modified call setup information as received from the gsmSCF.

## 4.6.2.8.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Alerting Pattern	-	-	O	O	This parameter indicates the kind of Alerting Pattern to be applied.
Calling Party's Category	O	O	O	O	This IE indicates the type of calling party (e.g., operator, pay phone, ordinary subscriber).
Generic Number	O	O	O	O	This IE contains the generic number. Its used to convey the additional calling party number, which e.g. could be used to modify the calling line ID presented to the called user.
NA Carrier Information	O	O	O	O	This IE is described in the next table.
NA Originating Line Information	O	O	O	O	This IE identifies the type of number in the NA Charge Number (e.g. subscriber versus PLMN operator number).
NA Charge Number	O	O	O	O	This IE identifies the chargeable number for the usage of a North American carrier.
Original Called Party ID	O	O	O	O	This IE carries the dialled digits if the call has met call forwarding on route to the gsmSSF or is forwarded by the gsmSCF.
Redirecting Party ID	O	O	O	O	This IE indicates the directory number the call was redirected from.
Redirection Information	O	O	O	O	This IE contains forwarding related information, such as redirecting counter.
Suppression Of Announcements	-	-	O	O	This IE indicates that announcements or tones generated as a result of unsuccessful call setup shall be suppressed.
Service Interaction Indicators Two	O	O	O	O	See the Information Flow table of the Connect operation for an explanation of this parameter. For Mobile Terminated calls, this parameter may only be sent to the VMSC.
CUG Interlock Code	O	O	O	O	See 3G TS 23.085 [9] for details of this IE.
Outgoing Access Indicator	O	O	O	O	See 3G TS 23.085 [9] for details of this IE.

O Optional (Service logic dependent)

- Not applicable

NA Carrier Information contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
NA Carrier Identification Code	M	M	M	M	This IE uniquely identifies a North American long distance carrier.
NA Carrier Selection Information	M	M	M	M	This IE indicates the way the carrier was selected e.g.: - dialled - subscribed

M Mandatory (The IE shall always be sent)

## 4.6.2.9 Disconnect Forward Connection

### 4.6.2.9.1 Description

This IF is used :

- to disconnect a connection with a gsmSRF previously established with a Connect To Resource IF,
- to disconnect an initiating gsmSSF from an assisting gsmSSF and its associated gsmSRF. The IF is sent to the initiating gsmSSF

### 4.6.2.9.2 Information Elements

This IF contains no information elements.

## 4.6.2.10 Establish Temporary Connection

### 4.6.2.10.1 Description

This IF is used to create a connection between an initiating gsmSSF and an assisting gsmSSF as a part of the assist procedure. It can also be used to create a connection between a gsmSSF and a gsmSRF.

### 4.6.2.10.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Assisting SSP IP Routing Address	M	M	M	M	This parameter indicates the destination address of the gsmSRF or assisting gsmSSF for the assist procedure. As a network operator option, the Assisting SSP IP Routing Address may contain embedded within it, a "Correlation ID" and "Scf ID", but only if "Correlation ID" and "Scf ID" are not specified separately.
Correlation ID	O	O	O	O	This parameter is used for : - the correlation of dialogues from the initiating gsmSSF->gsmSCF with dialogues from gsmSRF -> gsmSCF - the correlation of dialogues from the initiating gsmSSF->gsmSCF with dialogues from assisting gsmSSF -> gsmSCF.
NA Carrier Information	O	O	O	O	This IE is described in the next table.
NA Originating Line Information	O	O	O	O	This IE identifies the type of number in the NA Charge Number (e.g. subscriber versus PLMN operator number).
NA Charge Number	O	O	O	O	This IE identifies the chargeable number for the usage of a North American carrier.
Scf ID	O	O	O	O	This parameter indicates the gsmSCF identifier
Service Interaction Indicators Two	O	O	O	O	This parameter indicates whether or not a bothway through connection is required between the Calling party and the gsmSRF. The handling when this IE is not present is defined in EN 301 070-1 ([7]).

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

NA Carrier Information contains the following information:



<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
NA Carrier Identification Code	M	M	M	M	This IE uniquely identifies a North American long distance carrier.
NA Carrier Selection Information	M	M	M	M	This IE indicates the way the carrier was selected e.g.: – dialled – subscribed

M Mandatory (The IE shall always be sent)

#### 4.6.2.11 Furnish Charging Information

##### 4.6.2.11.1 Description

This IF is used to request the gsmSSF to include call related information in the CAMEL specific logical call record. The logical call record is created when FCI is received and a logical call record for that leg does not exist. For modelling purposes the logical call record is buffered in the gsmSSF. The gsmSSF completes logical call records as defined in the SDLs. Once the logical call record is completed, then its free format data is moved to the corresponding CDR and the logical call record is deleted.

The CSE can send multiple concatenated FCIs per leg for completion. The total maximum of free format data is 160 octets per leg. The 160 octets may be sent in one or more FCI operations. If there is non-completed free format data and new FCI operation(s) is/are received to overwrite the non-completed data, then the non-completed data is discarded and the gsmSCF can send another 160 octets per leg. The SDLs of 3GPP TS 23.078 define when Logical CDRs are completed. After the completion the gsmSCF can send another 160 octets of free format data in one or more FCI operations for the called leg.

##### 4.6.2.11.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
FCI Billing Charging Characteristics	M	M	M	M	This IE is described in the next table.

M Mandatory (The IE shall always be sent)

FCI Billing Charging Characteristics contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
FCIBCCCAMEL Sequence 1	M	M	M	M	This IE is described in the next table.

M Mandatory (The IE shall always be sent)

FCIBCCCAMEL Sequence 1 contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Free Format Data	M	M	M	M	This IE is a free format data to be inserted in the CAMEL logical call record.
Party To Charge	M	M	M	M	This IE indicates the party for whom a CAMEL logical call record will be created.
Append Free Format Data	O	O	O	O	<p>This IE indicates that the gsmSSF shall append the free format data to the Logical call record.</p> <ul style="list-style-type: none"> <li>- If this IE is present and indicates "Append", the gsmSSF shall append the free format data received in this IF to the free format data already present in the Logical call record for that leg of the call.</li> <li>- If this IE is absent or in value "Overwrite", then the gsmSSF shall overwrite all free format data already present in the Logical call record for that leg of the call, by the free format data received in this IF.</li> </ul> <p>If no Logical call record exists yet for that leg of the call, then the gsmSSF shall ignore this IE.</p>

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

#### 4.6.2.12 Release Call

##### 4.6.2.12.1 Description

This IF is used to tear down by the gsmSCF an existing call at any phase of the call for all parties involved in the call.

##### 4.6.2.12.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Release Cause	M	M	M	M	A number giving an indication to the gsmSSF about the reason of releasing this specific call. This may be used by MSC/GMSC for generating specific tones to the different parties in the call or to fill in the "cause" in the release message.

M Mandatory (The IE shall always be sent)

#### 4.6.2.13 Request Report BCSM Event

##### 4.6.2.13.1 Description

This IF 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 (see Event Report BCSM).

#### 4.6.2.13.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
BCSM Event	M	M	M	M	This IE specifies the event or events of which a report is requested.

M Mandatory (The IE shall always be sent)

BCSM Event contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Event type	M	M	M	M	This IE specifies the type of event of which a report is requested.
Leg ID	C	C	C	C	This IE indicates the party in the call for which the event shall be reported.
Monitor Mode	M	M	M	M	When this IE is "interrupted", the event shall be reported as a request, if it is "notifyAndContinue", the event shall be reported as a notification, if the IE is "transparent", the event shall not be reported.
DP Specific Criteria	O	O	O	O	This IE is described in the next table.

M Mandatory (The IE shall always be sent)

C Conditional

O Optional (Service logic dependent)

DP Specific Criteria is defined as:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Application Timer	O	O	O	O	This IE carries additional timer duration information (timer values for No Answer event) required for arming No_Answer EDPs in the gsmSSF. The TNRY timer (value defined between 10s and 40s) shall be shorter than the network no answer timer.

O Optional (Service logic dependent)

#### 4.6.2.14 Reset Timer

##### 4.6.2.14.1 Description

This IF is used to refresh a timer.

##### 4.6.2.14.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Timer Value	M	M	M	M	This IE specifies the value to which the timer Tssf shall be set.
Timer ID	O	O	O	O	This IE has a default value indicating the Tssf value.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

## 4.6.2.15 Send Charging Information

### 4.6.2.15.1 Description

This IF is used to send e-parameters from the gsmSCF to the gsmSSF. If charge advice information is received from the gsmSCF, it shall replace the charge advice information which would be generated by the MSC and inhibit any further generation of CAI by the MSC. Further processing of the charge advice information by the MSC shall be in accordance with the GSM Advice of Charge Supplementary Service.

The IF is only used in the MO case or in the VT case.

NOTE: If charge advice information is received from the gsmSCF after charge information has been generated by the MSC and sent to the MS, the behaviour of the service may be unpredictable or incorrect ; the service designer should therefore ensure that the first set of charge advice information is sent to the gsmSSF before charge information is sent to the MS.

### 4.6.2.15.2 Information Elements

The following information elements are only used for the MO case and for the VT case:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
SCI Billing Charging Characteristics	M	-	-	M	This IE defines the Advice Of Charge related information to be provided to the Mobile Station
Leg ID	M	-	-	M	This IE indicates where the charging information shall be sent.

M Mandatory (The IE shall always be sent)

SCI Billing Charging Characteristics is defined as:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
AOC After Answer	C	-	-	C	This IE is sent after an Answer from event has been detected from the called party, the current connected SRF or the temporary connection.
AOC Before Answer	C	-	-	C	This IE is sent before an Answer event has been detected from the called party, the current connected SRF or the temporary connection.

C Conditional (only one of these IEs may be sent)

AOC Before Answer is defined as:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
AOC Initial	M	-	-	M	This IE contains CAI elements as defined in GSM 02.24.
AOC Subsequent	O	-	-	O	See definition in the next table.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

AOCSubsequent is defined as:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
CAI Elements	M	-	-	M	This IE contains CAI elements as defined in GSM 02.24
Tariff Switch Interval	O	-	-	O	This IE indicates the tariff switch time until the next tariff switch applies.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

AOCAfterAnswer is defined as:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
CAI Elements	M	-	-	M	This IE contains CAI elements as defined in GSM 02.24
Tariff Switch Interval	O	-	-	O	This IE indicates the tariff switch time until the next tariff switch applies.

M Mandatory (The IE shall always be sent)

### 4.6.3 Optional (Service logic dependent) gsmSCF to gsmSRF information flows

#### 4.6.3.1 Activity Test

##### 4.6.3.1.1 Description

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

##### 4.6.3.1.2 Information Elements

This IF contains no information elements.

#### 4.6.3.2 Cancel

##### 4.6.3.2.1 Description

This IF is used by the gsmSCF to request the gsmSRF to cancel a correlated previous operation.

##### 4.6.3.2.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Invoke ID	M	M	M	M	This IE specifies the operation to be cancelled.

M Mandatory (The IE shall always be sent)

#### 4.6.3.3 Play Announcement

##### 4.6.3.3.1 Description

This IF is used for inband interaction.

## 4.6.3.3.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Information To Send	M	M	M	M	This IE indicates an announcement or a tone to be sent to the end user by the gsmSRF.
Disconnect From IP Forbidden	M	M	M	M	This IE indicates whether or not the gsmSRF may be disconnected from the user when all information has been sent.
Request Announcement Complete	M	M	M	M	This IE indicates whether or not a SpecializedResourceReport shall be sent to the gsmSCF when all information has been sent.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

Information To Send contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Inband Info	O	O	O	O	This IE indicates the inband information to be sent.
Tone	O	O	O	O	This IE indicates the tone to be sent. The mapping from the code points of this IE to tones is a matter for agreement between the gsmSCF operator and the gsmSRF operator.

O Optional (Service logic dependent)

Inband Info contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Message ID	M	M	M	M	This IE is described in the next table.
Number Of Repetitions	M	M	M	M	This IE indicates the maximum number of times the message shall be sent to the end-user.
Duration	O	O	O	O	This IE indicates the maximum duration time in seconds that the message shall be played/repeated. Zero indicates endless repetition.
Interval	O	O	O	O	This IE indicates the time interval in seconds between two repetitions.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

Message ID contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Elementary Message ID	O	O	O	O	This IE indicates a single announcement
Text	O	O	O	O	This IE indicates a text to be sent. The text shall be transformed to inband information (speech) by the gsmSRF.
Elementary Message IDs	O	O	O	O	This IE indicates a sequence of announcements
Variable Message	O	O	O	O	This IE indicates an announcement with one or more variable parts.

O Optional (Service logic dependent)

Tone contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Tone ID	M	M	M	M	This IE indicates the tone to be sent.
Duration	O	O	O	O	This IE indicates the maximum duration time in seconds that the message shall be played/repeated. Zero indicates endless repetition.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

#### 4.6.3.4 Prompt And Collect User Information (received information)

##### 4.6.3.4.1 Description

This IF is used to interact with a call party in order to collect information.

##### 4.6.3.4.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Collected Info	M	M	M	M	This IE is described in the next table.
Information To Send	O	O	O	O	This IE indicates an announcement or a tone to be sent to the end user by the gsmSRF.
Disconnect From IP Forbidden	O	O	O	O	This IE indicates whether the gsmSRF should be disconnected from the user when all information has been sent.

O Optional (Service logic dependent)

Collected Info contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Collected Digits	M	M	M	M	This IE is described in the next table.

O Optional (Service logic dependent)

Collected Digits contains the following information:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Minimum Number Of Digits	M	M	M	M	This IE indicates the minimum number of valid digits to be collected.
Maximum Number Of Digits	M	M	M	M	This IE specifies the maximum number of valid digits to be collected
End Of Reply Digit	O	O	O	O	This IE indicates the digit(s) used to signal the end of input.
Cancel Digit	O	O	O	O	If this IE is present, the cancel digit can be entered by the user to request a possible retry
Start Digit	O	O	O	O	If this IE is present, the start digit(s) indicates the start of the valid digits to be collected.
First Digit Time Out	O	O	O	O	If this IE is present, the first digit shall be received before the expiration of the first digit timer expiration
Inter Digit Time Out	O	O	O	O	If this IE is present, any subsequent valid or invalid digit shall be received by the gsmSRF before the inter digit timer expires.
Error Treatment	O	O	O	O	This IE indicates what specific action shall be taken by the gsmSRF in the event of error conditions occurring.
Interruptable Ann Ind	O	O	O	O	If this IE is set to TRUE (default value) the announcement is interrupted after the first valid or invalid digit received by the gsmSRF. If this IE is present and explicitly set to FALSE, the announcement will not be interrupted after the first digit is received by the gsmSRF
Voice Information	O	O	O	O	This IE is optional, where the default value is specified being FALSE. If the VoiceInformation IE is set to FALSE, all valid or invalid digits are entered by DTMF If this IE is present and explicitly set to TRUE, calling user is required to provide all valid or invalid information by speech
Voice Back	O	O	O	O	This IE is optional, where the default value is specified being FALSE. If the VoiceBack IE is set to FALSE, no voice back information is given by the gsmSRF If this IE is present and explicitly set to TRUE, the valid input digits received by the gsmSRF will be announced back to the calling user immediately after the end of input is received

O Optional (Service logic dependent)

InformationToSend is defined in subclause 4.6.3.3.

## 4.6.4 gsmSRF to gsmSCF information flows

### 4.6.4.1 Activity Test ack

#### 4.6.4.1.1 Description

This IF is the response to the Activity Test.

#### 4.6.4.1.2 Information Elements

This IF contains no information elements.



#### 4.6.4.2 Assist Request Instructions

##### 4.6.4.2.1 Description

This IF is sent to the gsmSCF by a gsmSSF which is acting as the assisting gsmSSF or by a gsmSRF

##### 4.6.4.2.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
CorrelationID	M	M	M	M	This IE is used to associate the AssistRequestInstructions IF from an assisting gsmSSF or by a gsmSRF with the InitialDP from the initiating gsmSSF.
IP SSP Capabilities	M	M	M	M	This IE indicates which SRF resources are attached, available and supported within the MSC where the gsmSSF resides or the IP in which the gsmSRF resides.

M Mandatory (The IE shall always be sent)

#### 4.6.4.3 Prompt And Collect User Information ack (received information)

##### 4.6.4.3.1 Description

This IF is used by the gsmSRF to indicate the result a Prompt And Collect User Information IF.

##### 4.6.4.3.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>MO</u>	<u>MF</u>	<u>MT</u>	<u>VT</u>	<u>Description</u>
Digits Response	C	C	C	C	This IE indicates the digit sequence received from the end user

C Conditional (The IE shall be sent, if available)

#### 4.6.4.4 Specialized Resource Report

##### 4.6.4.4.1 Description

This IF is used to response to a PlayAnnouncement IF when the announcement complete indication is set.

##### 4.6.4.4.2 Information Elements

This IF contains no information elements.

#### 4.6.5 gsmSCF to Assisting SSF information flows

##### 4.6.5.1 Activity Test

##### 4.6.5.1.1 Description

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

#### 4.6.5.1.2 Information Elements

This IF contains no information elements.

#### 4.6.5.2 Cancel

##### 4.6.5.2.1 Description

This IF is described in section 4.6.3.

#### 4.6.5.3 Connect To Resource

##### 4.6.5.3.1 Description

This IF is described in section 4.6.2.

#### 4.6.5.4 Play Announcement

##### 4.6.5.4.1 Description

This IF is described in section 4.6.3..

#### 4.6.5.5 Prompt And Collect User Information

##### 4.6.5.5.1 Description

This IF is described in section 4.6.3.

#### 4.6.5.6 Reset Timer

##### 4.6.5.6.1 Description

This IF is described in section 4.6.2.

### 4.6.6 Assisting SSF to gsmSCF information flows

#### 4.6.6.1 Activity Test ack

##### 4.6.6.1.1 Description

This IF is the response to the Activity Test.

##### 4.6.6.1.2 Information Elements

This IF contains no information elements.

#### 4.6.6.2 Assist Request Instructions

##### 4.6.6.2.1 Description

This IF is defined in subclause 4.6.4.

### 4.6.6.3 Prompt And Collect User Information ack (received information)

#### 4.6.6.3.1 Description

This IF is described in section 4.6.4.

### 4.6.6.4 Specialized Resource Report

#### 4.6.6.4.1 Description

This IF is described in section 4.6.4.

## 4.6.7 HLR to VLR information flows

### 4.6.7.1 Delete Subscriber Data

#### 4.6.7.1.1 Description

This IF is used by an HLR to remove certain subscriber data from a VLR if the subscription of one or more supplementary services or basic services is withdrawn. Note that this IF is not used in case of erasure or deactivation of supplementary services. This IF is specified in 3G TS 29.002 [4].

#### 4.6.7.1.2 Information Elements

The Delete Subscriber Data contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
CAMEL Subscription Info Withdraw	C	This IE identifies that all CSIs shall be deleted from the subscriber data in VLR.

C Conditional (The IE shall be sent when deletion is requested)

### 4.6.7.2 Insert Subscriber Data

#### 4.6.7.2.1 Description

This IF is used by an HLR to update a VLR with certain subscriber data. This IF is specified in 3G TS 29.002 [4].

#### 4.6.7.2.2 Information Elements

Insert Subscriber Data contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
O-CSI	C	This IE identifies the subscriber as having originating CAMEL services.
VT-CSI	C	This IE identifies the subscriber as having terminating CAMEL services in the VMSC.

C Conditional (The IE shall be sent, if required)

O-CSI contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
gsmSCF Address	M	This IE is described in section 4.3.1
Service Key	M	This IE is described in section 4.3.1.
Default Call Handling	M	This IE is described in section 4.3.1.
TDP List	M	This IE is described in section 4.3.1.
DP Criteria	O	This IE is described in section 4.3.1.
CAMEL Capability Handling	C	This IE is described in section 4.3.1. If this IE is absent, this indicates that CAMEL phase 1 is asked.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent when required)

O Optional (service logic dependant)

VT-CSI contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
gsmSCF Address	M	This IE is described in section 4.3.4.
Service Key	M	This IE is described in section 4.3.4.
Default Call Handling	M	This IE is described in section 4.3.4.
TDP List	M	This IE is described in section 4.3.4.
DP Criteria	O	This IE is described in section 4.3.4.
CAMEL Capability Handling	M	This IE is described in section 4.3.4. The CAMEL Capability Handling shall indicate CAMEL phase 3 or higher.

M Mandatory

O Optional (service logic dependant)

### 4.6.7.3 Provide Subscriber Info

#### 4.6.7.3.1 Description

This IF is used by the HLR to request information (subscriber state and location) from the VLR at any time.

#### 4.6.7.3.2 Information Elements

Provide Subscriber Info contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Requested Info	M	This IE indicates the type of subscriber information to the gsmSCF. - subscriber location - subscriber state - currentLocation (currentLocation shall not be present if locationInformation is not present in the RequestedInfo parameter)
Subscriber Identity	M	This IE identifies the subscriber for which the information is requested. The identity can be: - IMSI: The IMSI shall be accompanied by a LMSI if one was provided by the VLR.

M Mandatory (The IE shall always be sent)

#### 4.6.7.4 Provide Roaming Number

##### 4.6.7.4.1 Description

This IF is specified in 3G TS 23.018 [3] and used by the HLR to request a roaming number from the VLR.

##### 4.6.7.4.2 Information Elements

Provide Roaming Number contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Suppression Of Announcements	C	This IE indicates that announcements or tones generated as a result of unsuccessful call setup shall be suppressed.
Call Reference Number	M	This IE carries the Call Reference Number provided by the GMSC in the Send Routeing Info IF..
GMSC Address	M	This IE is the E.164 address of the GMSC
Alerting Pattern	C	This IE indicates the kind of Alerting Pattern to be applied.
GMSC CAMEL Phases	C	This IE indicates the CAMEL Phases supported in the GMSC.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if received from the GMSC in the Send Routeing Info)

#### 4.6.8 VLR to HLR information flows

##### 4.6.8.1 Insert Subscriber Data ack

##### 4.6.8.1.1 Description

This IF is used by the VLR to indicate to the HLR the result of the Insert Subscriber Data IF. This IF is specified in 3G TS 29.002 [4].

#### 4.6.8.1.2 Information Elements

Insert Subscriber Data ack contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Supported CAMEL Phases	C	This IE identifies which CAMEL phases are supported by the MSC/VLR.

C Conditional (The IE shall always be sent when a CSI has been included in the ISD)

#### 4.6.8.2 Provide Subscriber Info ack

##### 4.6.8.2.1 Description

This IF is used by the VLR to provide the requested information to the HLR.

##### 4.6.8.2.2 Information Elements

Provide Subscriber Info ack contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Location Information	C	This IE indicates the location of the served subscriber. The elements contained in this IE are specified in 3G TS 23.018 ([3]).
Subscriber State	C	This IE indicates the status of the MS. The states are: <ul style="list-style-type: none"> <li>- CAMELBusy: The MS is engaged on a transaction for a mobile originating or terminated circuit-switched call.</li> <li>- NetworkDeterminedNotReachable: The network can determine from its internal data that the MS is not reachable.</li> <li>- AssumedIdle: The state of the MS is neither "CAMELBusy" nor "NetworkDeterminedNotReachable".</li> </ul>

C Conditional (The IE shall be sent, if requested and available)

#### 4.6.8.3 Update Location

##### 4.6.8.3.1 Description

This IF is used by the VLR to provide the information about supported CAMEL phases to the HLR.

##### 4.6.8.3.2 Information Elements

Update Location contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Supported CAMEL phases	C	This IE indicates which phases of CAMEL are supported. It shall be present if a CAMEL phase different from phase 1 is supported. Otherwise may be absent.

#### 4.6.8.4 Restore Data

##### 4.6.8.4.1 Description

This IF is used by the VLR to provide the information about supported CAMEL phases to the HLR.

#### 4.6.8.4.2 Information Elements

Restore Data contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Supported CAMEL phases	C	This IE indicates which phases of CAMEL are supported. It shall be present if a CAMEL phase different from phase 1 is supported. Otherwise may be absent.

#### 4.6.9 HLR to GMSC information flows

##### 4.6.9.1 Send Routeing Info ack

###### 4.6.9.1.1 Description

This IF is specified in 3G TS 23.018 [3] and is used by the HLR to transfer the requested routing information to the GMSC.

###### 4.6.9.1.2 Information Elements

Send Routeing Info ack contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Location Information	C	This IE indicates the location of the served subscriber.
O-CSI	C	This IE identifies the subscriber as having originating CAMEL services.  Shall be sent if O-CSI is active, and CFU or CFNRc has been invoked, or if both O-CSI and T-CSI are active.
Subscriber State	C	This IE indicates the status of the MS. The possible values of the IE are:  -CAMELBusy: The VLR has indicated that the MS is engaged on a transaction for a mobile originating or terminated circuit-switched call.  -NetworkDeterminedNotReachable: The VLR has indicated that the network can determine from its internal data that the MS is not reachable.  -AssumedIdle: The VLR has indicated that the state of the MS is neither "CAMELBusy" nor "NetworkDeterminedNotReachable".  -NotProvidedFromVLR: The VLR did not provide any information on subscriber state even though it was requested.
T-CSI	C	This IE identifies the subscriber as having terminating CAMEL services.  Shall be sent if T-CSI is active and no Suppress T-CSI indicator is present in the SRI.
Basic Service Code	C	This IE indicates the type of basic service i.e., teleservice or bearer service.
CUG Subscription Flag	C	This IE indicates if the called party has a CUG subscription. It shall only be sent if the T-CSI is active and included in the Send Routing Information ack.

C Conditional (The IE shall be sent, if available)

Location Information contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Location Number	C	See 3G TS 23.018 [3]. The IE shall be sent, if available and indicated by Subscriber Information in Send Routeing Information ack indicator.
CellIdOrLAI	C	See 3G TS 23.018 [3]. The IE shall be sent, if available and indicated by Subscriber Information in Send Routeing Information ack indicator.
Geographical Information	C	See 3G TS 23.018 [3]. The IE shall be sent, if available and indicated by Subscriber Information in Send Routeing Information ack indicator.
Geodetic Information	C	See 3G TS 23.018 [3]. The IE shall be sent, if available and indicated by Subscriber Information in Send Routeing Information ack indicator.
Age Of Location Information	C	See 3G TS 23.018 [3]. The IE shall be sent, if available and indicated by Subscriber Information in Send Routeing Information ack indicator.
VLR number	C	See 3G TS 23.018 [3].
Selected LSA Identity	C	See 3G TS 23.018 [3]. The IE shall be sent, if available and indicated by Subscriber Information in Send Routeing Information ack indicator.

C Conditional (The IE shall be sent, if available. Further conditions are in the description column.)

O-CSI is defined in section 4.3.1.

T-CSI contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
gsmSCF Address	M	This IE is described in section 4.3.3.
Service Key	M	This IE is described in section 4.3.3.
Default Call Handling	M	This IE is described in section 4.3.3.
TDP List	M	This IE is described in section 4.3.3.
CAMEL Capability Handling	C	This IE is described in section 4.3.3. If this IE is absent, this indicates that CAMEL phase 1 is asked.

M Mandatory

C Conditional

## 4.6.10 GMSC to HLR information flows

### 4.6.10.1 Send Routeing Info

#### 4.6.10.1.1 Description

This IF is described in 3G TS 23.018 [3] and is used to request information from the HLR to route an MT call.



#### 4.6.10.1.2 Information Elements

Send Routing Info contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Alerting Pattern	C	This IE indicates the kind of Alerting Pattern to be applied.
Suppression Of Announcement	C	This IE indicates that announcements or tones generated as a result of unsuccessful call setup shall be suppressed. Shall be sent in the second interrogation if available, i.e., when it has been received from the gsmSCF.
Suppress T-CSI	C	This IE indicates that T-CSI shall be suppressed. Shall always be sent in the second interrogation
Supported CAMEL Phases	M	This IE lists the supported CAMEL phases.
Call Reference Number	M	This IE carries the Call Reference Number allocated for the call by the GMSC. Shall be allocated once per call and sent in both first and second interrogations.
GMSC Address	M	This IE is the E.164 address of the GMSC
Call Diversion Treatment Indicator	C	This IE indicates if the call can be forwarded using the Call Forwarding or Call Deflection Supplementary Services. Shall be sent if received within Forward Service Interaction Indicator in Service Interaction Indicators Two from IAM or previous CAMEL processing.

C Conditional (The IE shall be sent, if received from the gsmSCF or set by the gsmSSF)

M Mandatory (The IE shall always be sent when the GMSC supports CAMEL)

### 4.6.11 VMSC to GMSC information flows

#### 4.6.11.1 Resume Call Handling

##### 4.6.11.1.1 Description

This IF is described in GSM 03.79 [4] and is used to request the GMSC to take over handling the call so that it can be forwarded from the GMSC.

##### 4.6.11.1.2 Information Elements

Resume Call Handling contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
O-CSI	C	This IE contains O-CSI without triggering criteria. It indicates that CAMEL handling applies for a forwarded call. Shall be present if CAMEL handling applies; otherwise shall be absent.

C Conditional (The IE shall be sent if applicable)

## 4.6.12 MSC to VLR information flows

### 4.6.12.1 Send Info For Outgoing Call

#### 4.6.12.1.1 Description

This IF is described in 3G TS 23.018 [3] and is used to request the VLR to provide information to handle an outgoing call.

#### 4.6.12.1.2 Information Elements

Send Info For Outgoing Call contains the following CAMEL specific IE

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Suppress O-CSI	C	This IE indicates that O-CSI shall be suppressed. Shall always be sent in the second interrogation.

C Conditional (The IE shall be sent if applicable)

### 4.6.12.2 Send Info For Reconnected Call

#### 4.6.12.2.1 Description

This IF is used to request the VLR to provide information to handle a reconnected call.

#### 4.6.12.2.2 Information Elements

Send Info For Reconnected Call contains the following IE

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Called number	M	E.164 number of the call destination.
Bearer service	C	Bearer service required for the MO call, derived from the GSM bearer capability information received in the setup request from the MS. One of bearer service or teleservice shall be present.
Teleservice	C	Teleservice required for the MO call, derived from the GSM bearer capability information received in the setup request from the MS or from the emergency setup request from the MS. One of bearer service or teleservice shall be present.
CUG index	C	For the definition of this IE, see ETS 300 546 [9]. Shall be present if it was received in the setup request from the MS.
Suppress preferential CUG	C	For the definition of this IE, see ETS 300 546 [9]. Shall be present if it was received in the setup request from the MS.
Suppress CUG outgoing access	C	For the definition of this IE, see ETS 300 546 [9]. Shall be present if it was received in the setup request from the MS.
Suppress O-CSI	C	This IE indicates that O-CSI shall be suppressed. Shall always be sent in the second interrogation.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent if applicable)

## 4.6.13 VLR to MSC information flows

### 4.6.13.1 Complete Call

#### 4.6.13.1.1 Description

This IF is described in 3G TS 23.018 [3] and is used to instruct the MSC to continue the connection of a call.

#### 4.6.13.1.2 Information Elements

Complete Call contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
O-CSI	C	This IE indicates that CAMEL handling applies for an MO call. Shall be present in the response to the first interrogation for an MO call if CAMEL handling applies; otherwise shall be absent. Shall be absent in the response to the second interrogation for an MO call and in the response to the interrogation for an MT call.
VT-CSI	C	This IE identifies the subscriber as having terminating CAMEL services in the VMSC.
Call Reference Number	M	This IE carries the Call Reference Number provided by the HLR in the Provide Roaming Number IF.
GMSC Address	M	This IE is the E.164 address of the GMSC.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent if applicable)

### 4.6.13.2 Process Call Waiting

#### 4.6.13.2.1 Description

This IF is described in GSM 03.18 [3] and is used to instruct the MSC to continue the connection of a waiting call.

#### 4.6.13.2.2 Information Elements

Process Call Waiting contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Call Reference Number	M	This IE carries the Call Reference Number provided by the HLR in the Provide Roaming Number IF.
GMSC Address	M	This IE is the E.164 address of the GMSC.

M Mandatory (The IE shall always be sent)

### 4.6.13.3 Send Info For Incoming Call ack

#### 4.6.13.3.1 Description

This IF is described in 3G TS 23.018 [3] and is used to indicate that the incoming call for which the MSC requested subscription information shall be forwarded.

#### 4.6.13.3.1 Information Elements

Send Info For Incoming Call ack contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
O-CSI	C	This IE indicates that CAMEL handling applies for a forwarded call. Shall be present if CAMEL handling applies; otherwise shall be absent.
VT-CSI	C	This IE identifies the subscriber as having terminating CAMEL services in the VMSC.
Suppression Of Announcement	C	This IE indicates that announcements or tones generated when the call is forwarded shall be suppressed. Shall be sent if it was received in the Provide Roaming Number for this call.
SS-CSI	C	This IE indicates that SS invocation notification applies for the call.  This IE is described in section 8.2.1.1.  Shall be present if SS invocation notification is required if Call Deflection is invoked; otherwise shall be absent.
Call Reference Number	M	This IE carries the Call Reference Number provided by the HLR in the Provide Roaming Number IF.
GMSC Address	M	This IE is the E.164 address of the GMSC.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent if applicable)

#### 4.6.13.4 Send Info For Incoming Call negative response

##### 4.6.13.4.1 Description

This IF is described in 3G TS 23.018 [3] and is used to indicate that the incoming call for which the MSC requested subscription information shall not be connected.

##### 4.6.13.4.2 Information Elements

Send Info For Incoming Call negative response contains the following CAMEL specific IE which may be attached as a IE to any of the negative response values defined in 3G TS 23.018 [3]:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Suppression Of Announcement	C	This IE indicates that announcements or tones generated as a result of unsuccessful call setup shall be suppressed. Shall be sent if it was received in the Provide Roaming Number for this call.

C Conditional (The IE shall be sent if applicable)

## 4.7 Interaction with supplementary services

### 4.7.1 Line identification

For an MO call subject to CAMEL interactions, the gsmSCF shall have the option to include the the Calling Party Restriction Indicator parameter in the Connect message to the gsmSSF. This will be sent to the MSC and shall indicate whether the CLI Presentation Indicator present in the Calling Party Number Parameter shall be set by CAMEL action to Restricted.

## 4.7.2 Call forwarding services

### 4.7.2.1 Registration of Call Forwarding

The functional behaviour for the registration of the Call Forwarding supplementary service is defined in GSM 03.82. The procedure specific to CAMEL is defined in this subclause:

- CAMEL\_Check\_CF\_Interaction

### 4.7.2.2 Invocation of Call Forwarding

The functional behaviour for the invocation of the Call Forwarding supplementary service is defined in 3G TS 23.018. The following additional requirements apply.

When call forwarding is invoked for a CAMEL subscriber with O-CSI, the gsmSSF shall send the FTN to the gsmSCF in the format in which it was received from the HLR. If the Service Interaction Indicators Two parameter was included in the Initial Address Message, ContinueWithArgument or the Connect message, these shall be applied for the forwarded call.

An HLR shall not send an FTN which is not in international E.164 format to a GMSC which does not support CAMEL phase 2, i.e. if the HLR is handling a request from a GMSC for routing information and the forwarded-to number is registered a format other than international E.164, the service logic in the HLR shall behave as if the call forwarding is provisioned but not registered.

## 4.7.3 Call Barring services

When a CAMEL subscriber with O-CSI and TIF-CSI attempts to activate a conditional call barring service (BOIC,BOIC-exHC), the HLR shall not check the interactions with call forwarding.

Procedure CAMEL\_Check\_CF\_Interaction

1(1)

Procedure in the HLR to check the provision of TIF-CSI

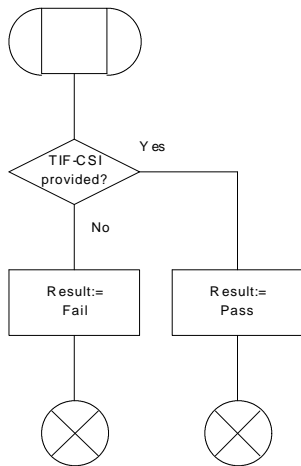


Figure 4.73: Procedure CAMEL\_Check\_CF\_Interaction

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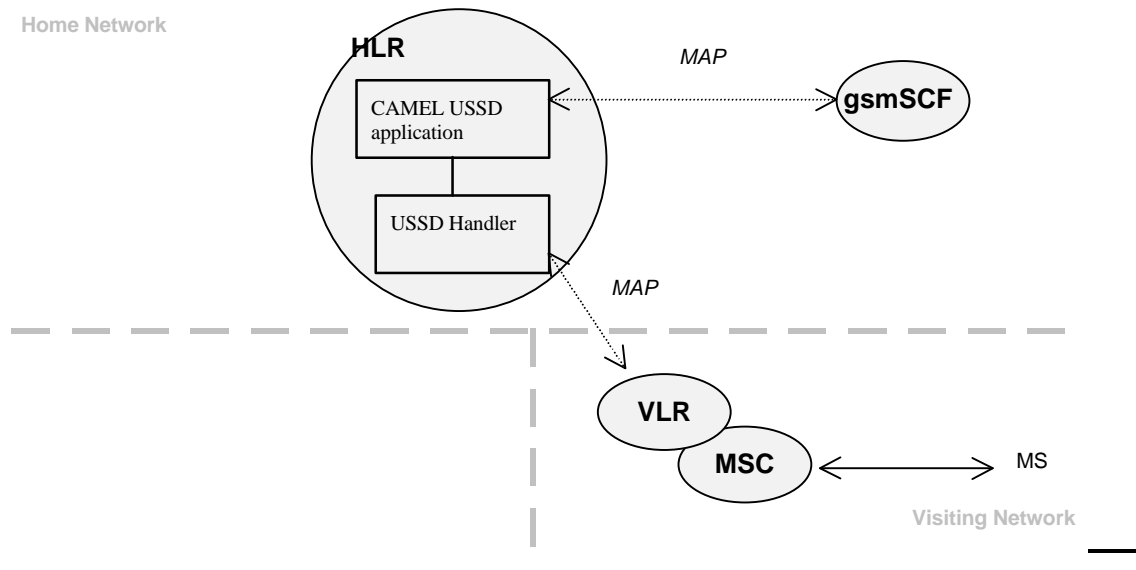
## 5 USSD to/from gsmSCF

### 5.1 Architecture

#### 5.1.1 Functional Entities used for CAMEL

This subclause describes the functional architecture needed to support CAMEL handling of USSD to/from gsmSCF. The functional model of USSD in an HLR that supports CAMEL is shown in figure

5.1. The phase 2 USSD handler is defined in 3G TS 23.090 [8]. Phase 1 USSD messages may be relayed from the HLR to the gsmSCF. CAMEL introduces a "CAMEL USSD application" which is invoked by the USSD handler. The CAMEL USSD functional entities and application behaviour is specified in this section.



Figure



## 5.1: Handling of USSD to and from a CAMEL subscriber

**HLR:** The HLR stores for subscribers requiring CAMEL support the information relevant to the current subscription regarding U-CSI. The UG-CSI is stored as global data applicable to all CAMEL subscribers. The U-CSI and the UG-CSI are stored in the HLR only.

**gsmSCF:** see subclause 3.1.

### 5.1.2 Interfaces defined for CAMEL

This subclause describes the different interfaces applicable to CAMEL. It specifies on a high level the functions specific to CAMEL.

#### 5.1.2.1 HLR - VLR interface

This interface is used to send the CAMEL related subscriber data to the visited PLMN.

#### 5.1.2.2 gsmSCF - HLR interface

This interface is used for USSD operations, both for gsmSCF-initiated dialogues and MS-initiated dialogues (relayed via HLR). It is a network operator option whether to support or not USSD operations on this interface.

## 5.2 Description of CAMEL Subscriber Data

### 5.2.1 USSD CAMEL Subscription Information (U-CSI)

The subscription information specified in this subclause is for information only.

This subclause defines the contents of the USSD CAMEL Subscription Information (U-CSI). The U-CSI consists of a list of pairs of the following two parameters.

#### 5.2.1.1 Service Code

Service code for a specific application in a gsmSCF which interacts with the user by USSD.

#### 5.2.1.2 gsmSCF address

Address to be used to access the gsmSCF for a particular subscriber and a particular service code. The address shall be an E.164 number to be used for routing.

## 5.3 Content of the USSD General CAMEL Service Information (UG-CSI)

The service information specified in this subclause is for information only.

This subclause defines the contents of the USSD General CAMEL Service Information (UG-CSI). The allocation of the UG-CSI is independent from a particular subscriber.

The UG-CSI consists of a list of pairs of the following two parameters.

### 5.3.1 Service Code

Service code for a specific application in a gsmSCF which interacts with the user by USSD.

### 5.3.2 gsmSCF address

Address to be used to access the gsmSCF for a particular service code. The address shall be an E.164 number to be used for routing.

## 5.4 Procedures

### 5.4.1 MS Initiated USSD

For the behaviour of the USSD handler in HLR when receiving a MS initiated USSD see 3G TS 23.090 [8].

When the USSD handler has determined that the service code present in the received USSD does not indicate that an USSD application in the HLR shall be invoked it shall route the USSD to the USSD application specific for CAMEL, i.e. the CAMEL USSD application.

The procedure at the CAMEL USSD application at the HLR is implementation dependent. The following text describes a recommended procedure.

The CAMEL USSD application shall check the U-CSI data assigned to the specific subscriber. If the service code is present in the U-CSI the USSD is routed to the gsmSCF given by the gsmSCF address stored against the service code in the U-CSI.

If the service code is not present in the U-CSI (or the subscriber does not have U-CSI defined) then the CAMEL USSD application shall check the UG-CSI data assigned to the HLR. If the service code is present in the UG-CSI then the USSD is routed to the gsmSCF given by the gsmSCF address stored against the service code in the UG-CSI.

If the service code is not present in U-CSI or UG-CSI an error (unknown application) is returned to the USSD handler.

### 5.4.2 gsmSCF Initiated USSD

The HLR may at any time receive a USSD operation from the gsmSCF. If the subscriber can be contacted, the HLR shall set up a transaction to the VLR and forward the operation unchanged. Any further information exchange between the gsmSCF and MSC shall be transparent to the VLR and the HLR. When one transaction is released, the HLR shall release the other. If an error is received from the MSC, the VLR shall release the transaction to the HLR and the HLR shall release the transaction to the gsmSCF.

## 5.5 Description of information flows

This clause contains the detailed description of the information flows used by CAMEL.

Each Information Element, IE is marked as Mandatory (M), Conditional (C), Optional (O) or Not applicable (-). This categorisation is a functional classification, i.e., stage 2 information and not a stage 3 classification to be used for the ASN.1 syntax of the protocol.

The following principles apply for the handling of the IEs by the receiving entity :

- The gsmSCF may silently discard any IE which it does not functionally support
- The HLR shall return an error if it does not functionally support a IE which it receives.

Details of errors and exceptions to these rules are specified in 3G TS 29.002.

## 5.5.1 gsmSCF to HLR information flows

### 5.5.1.1 Unstructured SS Request

#### 5.5.1.1.1 Description

This IF is used for the gsmSCF to request data from the MS via the HLR.

#### 5.5.1.1.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
USSD String	M	This IE contains the string that will be sent to the MS.
Data Coding Scheme	M	This IE indicates the characteristics of the USSD string
IMSI	C	This IE identifies the subscriber for which the information is requested
Alerting Pattern	O	This IE indicates an alerting pattern to be sent to the MS.

M Mandatory (The IE shall always be sent)

C Conditional (This IE shall be sent if this IF is the first IF in a USSD dialogue)

O Optional (Service Logic dependent)

### 5.5.1.2 Unstructured SS Notify

#### 5.5.1.2.1 Description

This IF is used for the gsmSCF to send data to the MS via the HLR.

#### 5.5.1.2.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
USSD String	M	This IE contains the string that will be sent to the MS.
Data Coding Scheme	M	This IE indicates the characteristics of the USSD string
IMSI	C	This IE identifies the subscriber for which the information is requested.
Alerting Pattern	O	This IE indicates an alerting pattern to be sent to the MS.

M Mandatory (The IE shall always be sent)

C Conditional (This IE shall be sent if this IF is the first IF in a USSD dialogue)

O Optional (Service Logic dependent)

### 5.5.1.3 Process Unstructured SS Data ack

#### 5.5.1.3.1 Description

This IF is used for the gsmSCF to send the response to the MS via the HLR for the MS initiated operation.

#### 5.5.1.3.2 Information Elements

The following information element is required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
SS User Data	C	This IE contains the string that will be sent to the MS.

C Conditional (The IE shall be sent, if requested and available)

#### 5.5.1.4 Process Unstructured SS Request ack

##### 5.5.1.4.1 Description

This IF is used for the gsmSCF to send the response to the MS via the HLR for the MS initiated operation.

##### 5.5.1.4.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
USSD String	C	This IE contains the string that will be sent to the MS.
Data Coding Scheme	C	This IE indicates the characteristics of the USSD string

C Conditional (the presence of the IE depends on the application. Both IEs shall be sent.)

#### 5.5.2 HLR to gsmSCF information flows

##### 5.5.2.1 Unstructured SS Request ack

##### 5.5.2.1.1 Description

This IF is used for the MS to via the HLR send the response to the gsmSCF for the gsmSCF initiated operation.

##### 5.5.2.1.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
USSD String	C	This IE contains the string that will be sent to the gsmSCF.
Data Coding Scheme	C	This IE indicates the characteristics of the USSD string

C Conditional (The presence of the IE depends on the application. Both IEs shall be sent.)

##### 5.5.2.2 Unstructured SS Notify ack

##### 5.5.2.2.1 Description

This IF is used for the MS to via the HLR acknowledge to the gsmSCF that the notification was received.

##### 5.5.2.2.2 Information Elements

This IE contains no information element.

##### 5.5.2.3 Process Unstructured SS Data

##### 5.5.2.3.1 Description

This IF is used for the gsmSCF to request data from the MS via the HLR.

### 5.5.2.3.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
SS User Data	M	This IE contains the string that will be sent to the MS.

M Mandatory (The IE shall always be sent)

### 5.5.2.4 Process Unstructured SS Request

#### 5.5.2.4.1 Description

This IF is used for the MS to request data from the gsmSCF via the HLR.

#### 5.5.2.4.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
USSD String	M	This IE contains the string that will be sent to the gsmSCF, including the Service Code.
Data Coding Scheme	M	This IE indicates the characteristics of the USSD string
IMSI	M	This IE identifies the subscriber.
MSISDN	O	This IE contains the basic MSISDN of the subscriber who has requested the USSD operation. This IE is used as an operator option.
Originating Entity Number	M	This IE identifies the functional entity initiating the information flow. In this case, this shall be the address of the HLR.

M Mandatory (The IE shall always be sent)

O Optional (Operator option)

### 5.5.2.5 Begin Subscriber Activity

#### 5.5.2.5.1 Description

This IF is used by the HLR to start subscriber activity towards the gsmSCF for USSD purposes.

#### 5.5.2.5.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>IMSI</u>	<u>M</u>	<u>This IE identifies the subscriber.</u>
<u>Originating Entity Number</u>	<u>M</u>	<u>This IE identifies the functional entity initiating the subscriber activity. In this case, this shall be the address of the HLR.</u>

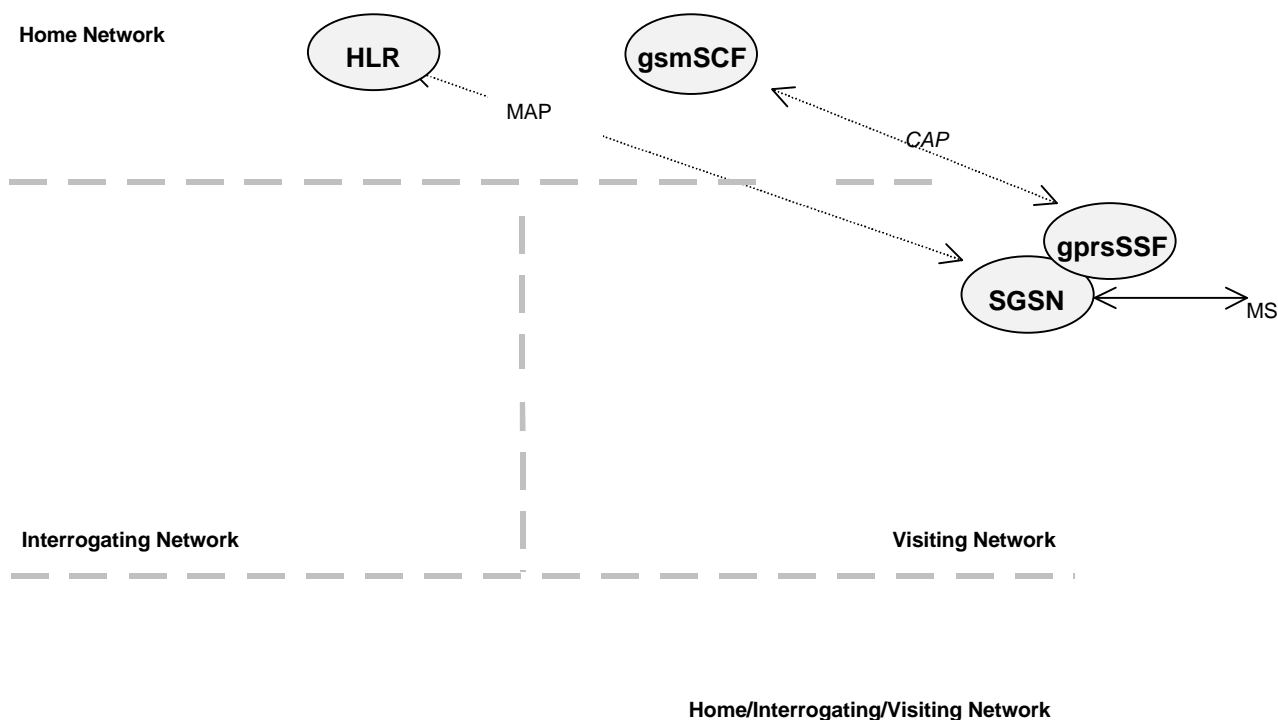
M Mandatory (The IE shall always be sent)

## 6 GPRS interworking

### 6.1. Architecture

#### 6.1.1 Functional Entities used for CAMEL

This subclause describes the functional architecture needed to support GPRS interworking for CAMEL. Figure 6.1 shows the functional entities involved in sessions requiring CAMEL support. The architecture is applicable to the third phase of CAMEL.



**Figure 6.1 Functional architecture for support of CAMEL**

**HLR:** The HLR stores for subscribers requiring CAMEL support the information relevant to the current subscription GPRS-CSI. The GPRS-CSI is stored in the HLR only. The HLR may provide an interface towards the gsmSCF for the Any Time Interrogation procedure.

**SGSN:** When processing GPRS Attach requests, PDP Context Activations or Inter-SGSN Routing Area Updates for subscribers requiring CAMEL support, the SGSN receives a GPRS-CSI from the HLR, indicating the SGSN to request instructions from the gprsSSF. The SGSN monitors on request the GPRS events and informs the gprsSSF of these events during processing, enabling the gprsSSF to control the execution of the GPRS session or individual PDP contexts in the SGSN.

**gprsSSF:** see subclause 3.1.

**gsmSCF:** see subclause 3.1.

#### 6.1.2 Interfaces defined for CAMEL

##### 6.1.2.1 SGSN - gprsSSF interface

This is an internal interface. The interface is described in the specification to make it easier to understand the handling of DPs (arming/disarming of DPs, DP processing etc.).

### 6.1.2.2 gprsSSF - gsmSCF interface

This interface is used by the gsmSCF to control a GPRS session or an individual PDP Context in a certain gprsSSF. Relationships on this interface are opened as a result of the gprsSSF sending a request for instructions to the gsmSCF.

### 6.1.2.3 HLR -SGSN interface

This interface is used to send CAMEL related subscriber data to a visited GPRS network, e.g. GPRS-CSI.

## 6.2 Detection Points (DPs)

See subclause 4.2.

## 6.3 Description of CAMEL Subscriber Data

### 6.3.1 GPRS CAMEL Subscription Information (GPRS-CSI)

This subclause defines the contents of the GPRS CAMEL Subscription Information.

#### 6.3.1.1 gsmSCF Address

Address to be used to access the gsmSCF for a particular subscriber. The address shall be an E.164 number to be used for routing.

#### 6.3.1.2 Service Key

The Service Key identifies to the gsmSCF the service logic that shall apply.

#### 6.3.1.3 Default Session Handling

The Default Session Handling indicates whether the session shall be released or continued as requested in case of error in the gprsSSF to gsmSCF dialogue.

#### 6.3.1.4 TDP List

The TDP List indicates on which detection point triggering shall take place.

#### 6.3.1.5 CAMEL Capability Handling

CAMEL Capability Handling indicates the phase of CAMEL which is asked by the gsmSCF for the service.

#### 6.3.1.6 CSI state

The CSI state indicates whether the GPRS-CSI is active or not.

#### 6.3.1.7 Notification flag

The notification flag indicates whether the change of the GPRS-CSI shall trigger Notification on Change of Subscriber Data or not.

## 6.4 Description of CAMEL State Models

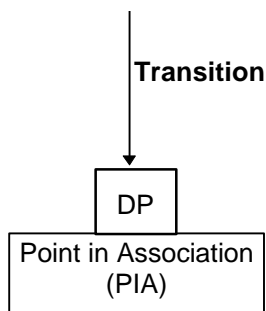
GPRS can support multiple PDP contexts simultaneously for an attached subscriber, requiring the behaviour of a GPRS session to be modelled by two state machines, one for the attach/detach procedures (GPRS Attach/Detach FSM) and the other for modelling individual PDP Contexts (GPRS PDP Context FSM).

### 6.4.1 General Handling

The GPRS SM is used to describe the actions in an SGSN during processing of GPRS sessions or PDP Contexts.

The GPRS SM identifies the points in basic GPRS processing when Operator Specific Service (OSS) logic instances (accessed through the gsmSCF) are permitted to interact with basic GPRS control capabilities.

Figure shows the components that have been identified to describe a GPRS SM.



**Figure 6.3: GPRS SM Components**

### 6.4.2 GPRS Attach/Detach FSM

The GPRS Attach/Detach FSM is used to model the behaviour of the GPRS attach/detach procedures.

When encountering a DP the Attach/Detach FSM processing is suspended at the DP and the SGSN indicates this to the gprsSSF which determines what action, if any, shall be taken in case the DP is armed.



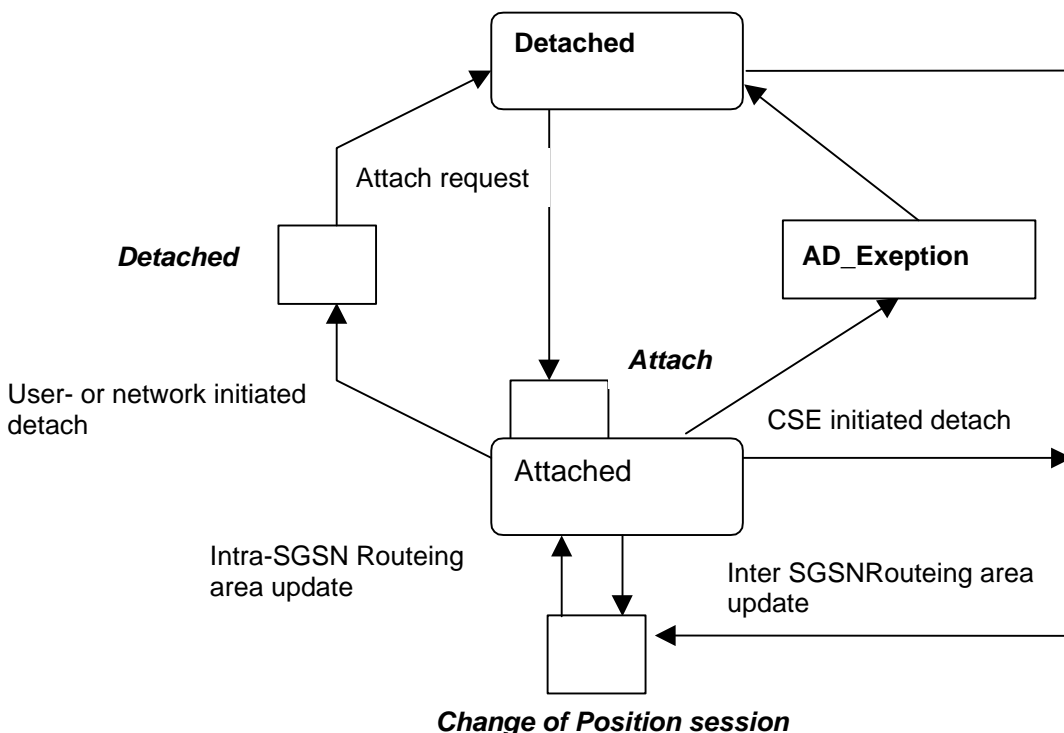


Figure 6.4: GPRS Attach/Detach FSM

Table 5: Description of GPRS Attach/Detach DPs in the SGSN

CAMEL Detection Point:	DP Type	Description:
DP Attach	TDP-R	A request to attach is received.
DP Change of position session	TDP-R <sup>1)</sup> , EDP-N, EDP-R	Routeing Area Update is accepted.
DP Detached	EDP-N, EDP-R	A detach request is received either from the MS, the SGSN or a 'Cancel Location' received from HLR.
Note 1:Change of Position session is reported as TDP-R in the case of Inter-SGSN Routeing Area Update (provided that this DP is statically armed in GPRS-CSI). Change of Position session is reported as EDP-N in the case of Intra-SGSN Routeing Area Update (provided that this DP is dynamically armed by the Service Logic).		

6.4.2.1 Description of the session model (PIAs)

This subclause describes the session model for the attach and detach of GPRS sessions in the SGSN. For each PIA a description can be found of the entry events, actions, information available and exit events.

6.4.2.1.1 Detached

Entry events

- Detach (user or network initiated) and clearing of a previous GPRS session.
- Processing of exceptional conditions, e.g. STANDBY timer expiry in the SGSN.

Actions

- Interface is idled.
- Attach request is received from MS containing the IMSI/P-TMSI and the type of attach requested and, the identity of the MS is established (IMSI) (DP Attach), or Inter-SGSN Routeing Area Update Request is accepted (DP Change of position).
- Information being analyzed, e.g. GPRS-CSI is analyzed.

#### Exit events

- GPRS-CSI is analyzed (DP Attach or DP Change of position).

### 6.4.2.1.2 Attached

#### Entry events

- GPRS-CSI is analyzed (DP Attach).

#### Actions

- MM contexts are established at the MS and the SGSN.

#### Exit events

- A GPRS Detach request is received from the MS or the GGSN (DP Detach).
- Intra-SGSN Routeing Area Update is accepted (DP Change of position).
- An exception is encountered, e.g. STANDBY timer expiry.

The GPRS Attach/Detach FSM shall only have one or more GPRS PDP Context FSMs associated with it when in the Attached state. A GPRS PDP Context FSM cannot exist without its associated GPRS Attach/Detach FSM being in the Attached state. Closure of the GPRS Attach/Detach FSM via a detach will result in the idling of all associated GPRS PDP Context FSMs and the release of the associated GPRS PDP Contexts.

It shall not be necessary to trigger a relationship from the GPRS Attach/Detach FSM to the gsmSCF in order for triggering to occur in an associated GPRS PDP Context FSM. However, in this latter case a GPRS Attach/Detach FSM shall still exist at the SGSN. This is so that CSE-initiated detach events sent within a given GSM PDP Context relationship shall result in the GPRS Attach/Detach FSM transiting to the Detached state. As noted above, in this state no PDP Contexts can exist and so all associated GSM PDP Context FSMs will transit to state Idle.

## 6.4.3 GPRS PDP Context FSM

The GPRS PDP Context FSM is used to model the behaviour for the GPRS PDP Context procedures.

When encountering a DP the PDP Context FSM processing is suspended at the DP and the SGSN indicates this to the gprsSSF which determines what action, if any, shall be taken in case the DP is armed.

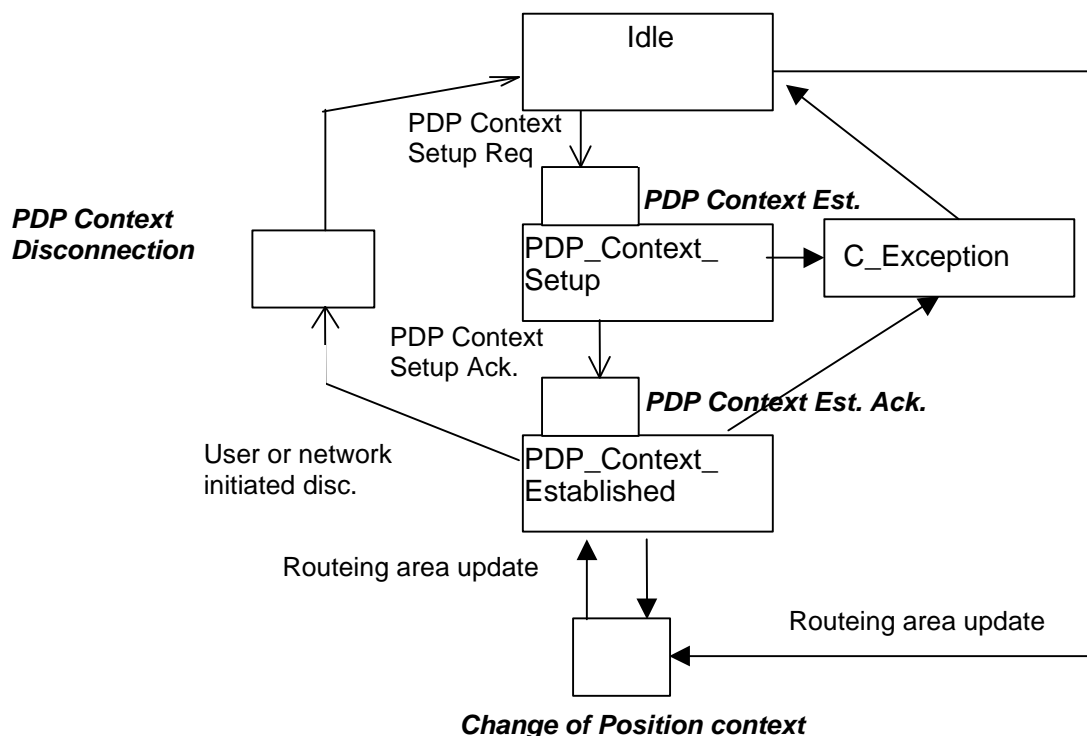


Figure 6.5: GPRS PDP Context FSM

Table 6: Description of GPRS PDP Context DPs in the SGSN

CAMEL Detection Point:	DP Type	Description:
DP PDP Context Establishment	TDP-R, EDP-R	Activate PDP Context request is received from the MS.
DP PDP Context Establishment Acknowledgement	TDP-R <sup>1)</sup> , EDP-R, EDP-N	Create PDP Context response is received from the GGSN.
DP PDP Context disconnection	EDP-N, EDP-R	Deactivate PDP Context Request is received from the MS, Delete PDP Context request is received from the GGSN.
DP Change of position context	TDP-R <sup>2)</sup> , EDP-N, EDP-R	Routeing Area Update is accepted.
<p>NOTE 1: The PDP Context Establishment Acknowledgment shall be reported as TDP-R if there is no relationship with gsmSCF for this PDP context. Otherwise, it shall be reported as EDP-R or EDP-N if armed so.</p> <p>NOTE 2: Change of Position context is reported as TDP-R in the case of Inter-SGSN Routeing Area Update (provided that this DP is statically armed in GPRS-CSI). Change of Position context is reported as EDP-N in the case of Intra-SGSN Routeing Area Update (provided that this DP is dynamically armed by the Service Logic).</p>		

6.4.3.1 Description of the session model (PIAs)

This subclause describes the session model for PDP Context FSM in the SGSN. For each PIA a description can be found of the entry events, actions, information available and exit events.

#### 6.4.3.1.1 Idle

##### Entry events

- Deactivation (user or network initiated) and clearing of a previous PDP Context.
- Processing of exceptional conditions.

##### Actions

- Interface is idled.
- Activate PDP Context request is received from MS (containing NSAPI, PDP Type, PDP Address, Access Point Name, QoS Requested, PDP Configuration Options), or Inter-SGSN Routeing Area Update is accepted (DP Change of position).
- Information being analyzed, e.g. GPRS-CSI is analyzed.

##### Exit events

- GPRS-CSI is analyzed (DP PDP Context Establishment or DP Change of position).

#### 6.4.3.1.2 PDP Context Setup

##### Entry events

- GPRS-CSI is analyzed (DP PDP Context Establishment).

##### Actions

- GGSN address is derived from the Access Point Name by interrogation of a DNS.
- Create PDP Context Request is sent to the GGSN.

##### Exit events

- Create PDP Context Response is received from the the GGSN (DP PDP Context Establishment Acknowledgement).
- An exception is encountered.

#### 6.4.3.1.3 PDP Context Established

##### Entry events

- GPRS-CSI is analyzed (DP PDP Context Establishment Acknowledgement or DP Change of position).

##### Actions

- PDP context is established at the MS and the SGSN.

##### Exit events

- Deactivation of the PDP Context is received from the MS or the GGSN, or initiated by the SGSN via READY timer expiry (DP PDP Context disconnection).
- Intra-SGSN Routeing Area Update Request is received from the MS (DP Change of position).
- An exception is encountered.

### 6.4.4 Rules for Implicit Disarming of Detection Points'

The following table gives the rules for implicit disarming of event detection points.

Implicit EDP disarming rules are specified in the table below for the Attach/Detach and PDP context FSM. The table specifies which EDP's shall be disarmed (i.e. MonitorMode set to Transparent) if/when each EDP is encountered, irrespective of the EDP's MonitorMode (Transparent, NotifyAndContinue, or Request).

When EDP's are armed with MonitorMode 'Request' (EDP-R's) are encountered, any implicit EDP disarming shall take place before reporting the EDP and transiting the gprsSSF to the WFI state (if not already suspended in the WFI state).

The table entry 'X' means that if one DP occurs (independently of arming and reporting to the gsmSCF) the marked one is implicitly disarmed. It shall be possible to rearm explicitly an implicitly disarmed DP.

**Table 3: Implicit disarmed DPs in the Attach/Detach FSM and PDP context FSM**

Encountered DP	Implicit disarmed DPs						
	DP Attach	DP Change of position session	DP Change of position context	DP Detached	DP PDP Context Establishment	DP PDP Context Establishment Acknowledgement	DP PDP Context disconnection
DP Attach	X						
DP Change of position session	X	Note	Note	Note	Note	Note	Note
DP Change of position context	X	Note	Note	Note	Note	Note	Note
DP Detached	X	X	X	X	X	X	X
DP PDP Context Establishment	X				X		
DP PDP Context Establishment Acknowledgement	X				X	X	
DP PDP Context disconnection	X						X

Note: Disarmed in case of inter SGSN Routing Area update.

## 6.5 Procedures for CAMEL GPRS

The functional behaviour of the SGSN is specified in 3G TS 29.002 [4]. The procedures specific to CAMEL are specified in this subclause :

- Procedure CAMEL\_GPRS\_Attach\_Request,
- Procedure CAMEL\_GPRS\_Detach,
- Procedure CAMEL\_GPRS\_Routeing\_Area\_Update
- Procedure CAMEL\_GPRS\_SGSN\_Context\_Acknowledge
- Procedure CAMEL\_GPRS\_SGSN\_Create\_PDP\_Context
- Procedure CAMEL\_GPRS\_Activate\_PDP\_Context
- Procedure CAMEL\_GPRS\_Deactivate\_PDP\_Context
- Procedure CAMEL\_GPRS\_exception\_procedure
- Procedure CAMEL\_GPRS\_Modify\_PDP\_Context

Note: In the SDLs in the following subclauses, Handle\_AC and Handle\_ACR shall be renamed Handle\_AC\_GPRS and Handle\_ACR\_GPRS respectively, Handle\_SCI shall be renamed Handle\_SCI\_GPRS, Complete\_FCI\_Record shall be renamed Complete\_FCI\_Record\_GPRS.

### 6.5.1 Actions of the SGSN on receipt of Int\_Error

The SGSN checks the default GPRS Handling parameter in GPRS-CSI.

If the default GPRS handling is release, a Detach indication is sent to the MS. The SGSN then releases all resources and the invoked CAMEL procedure ends.

If the default GPRS handling is continue, the SGSN continues processing without CAMEL support.

### 6.5.2 Actions of the SGSN on receipt of Int\_Continue

The SGSN continues processing without any modification of GPRS parameters.

### 6.5.3 Overall SDL Architecture

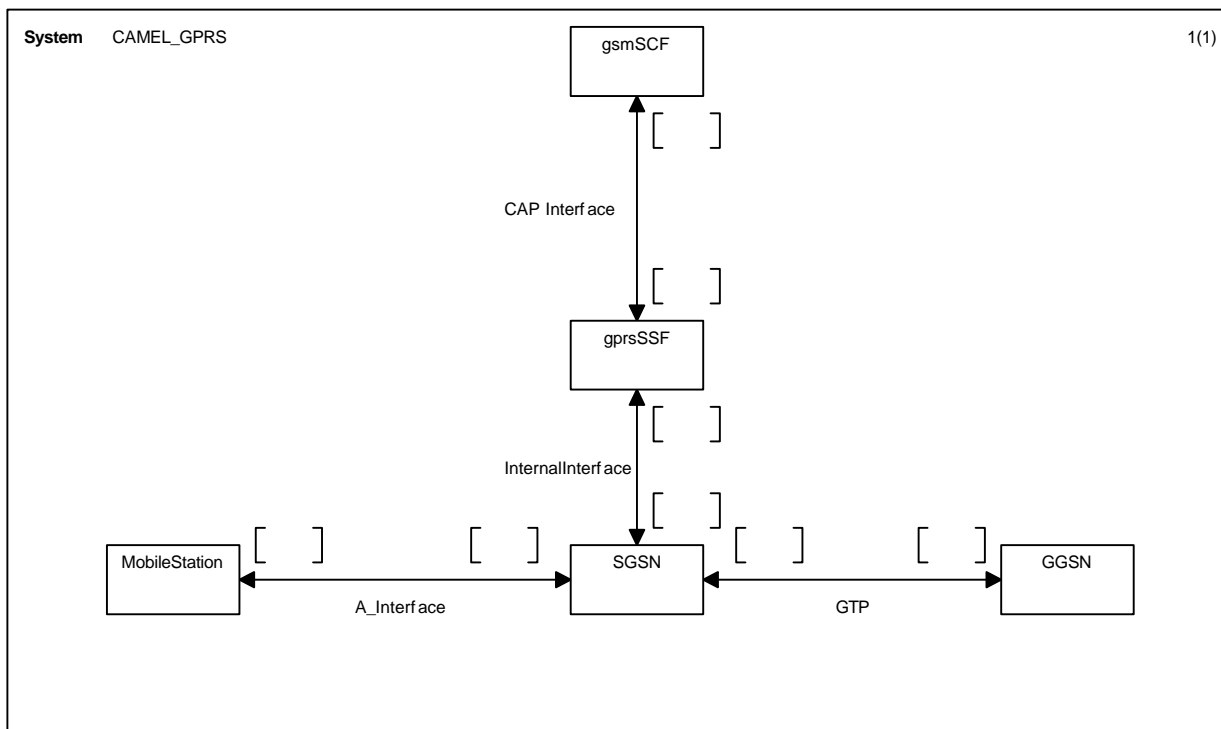


Figure 6.6: Architecture for CAMEL/GPRS interworking.

### 6.5.4 Handling of GPRS Attach/Detach

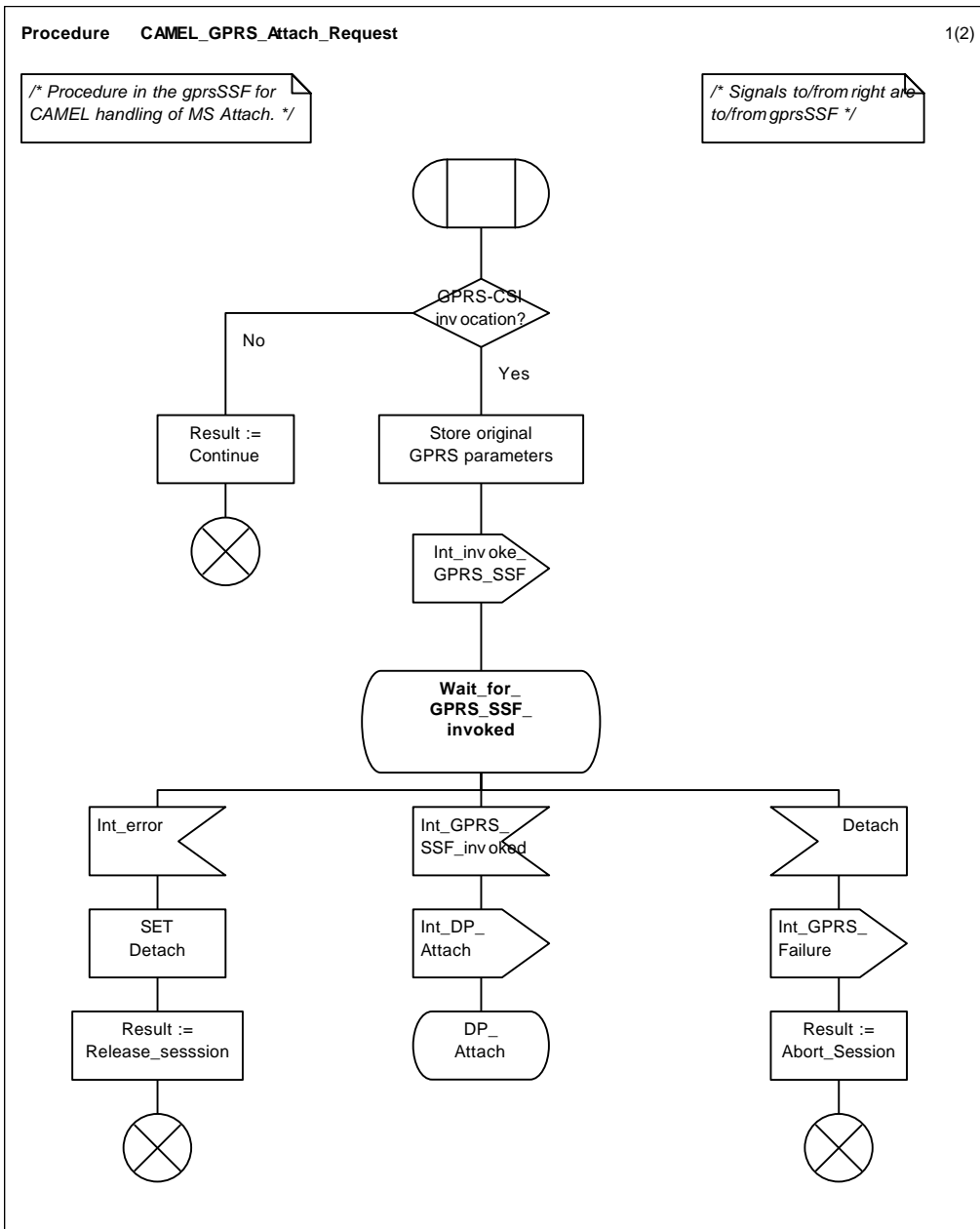


Figure 6.7 a: Procedure CAMEL\_GPRS\_Attach\_Request (sheet 1)

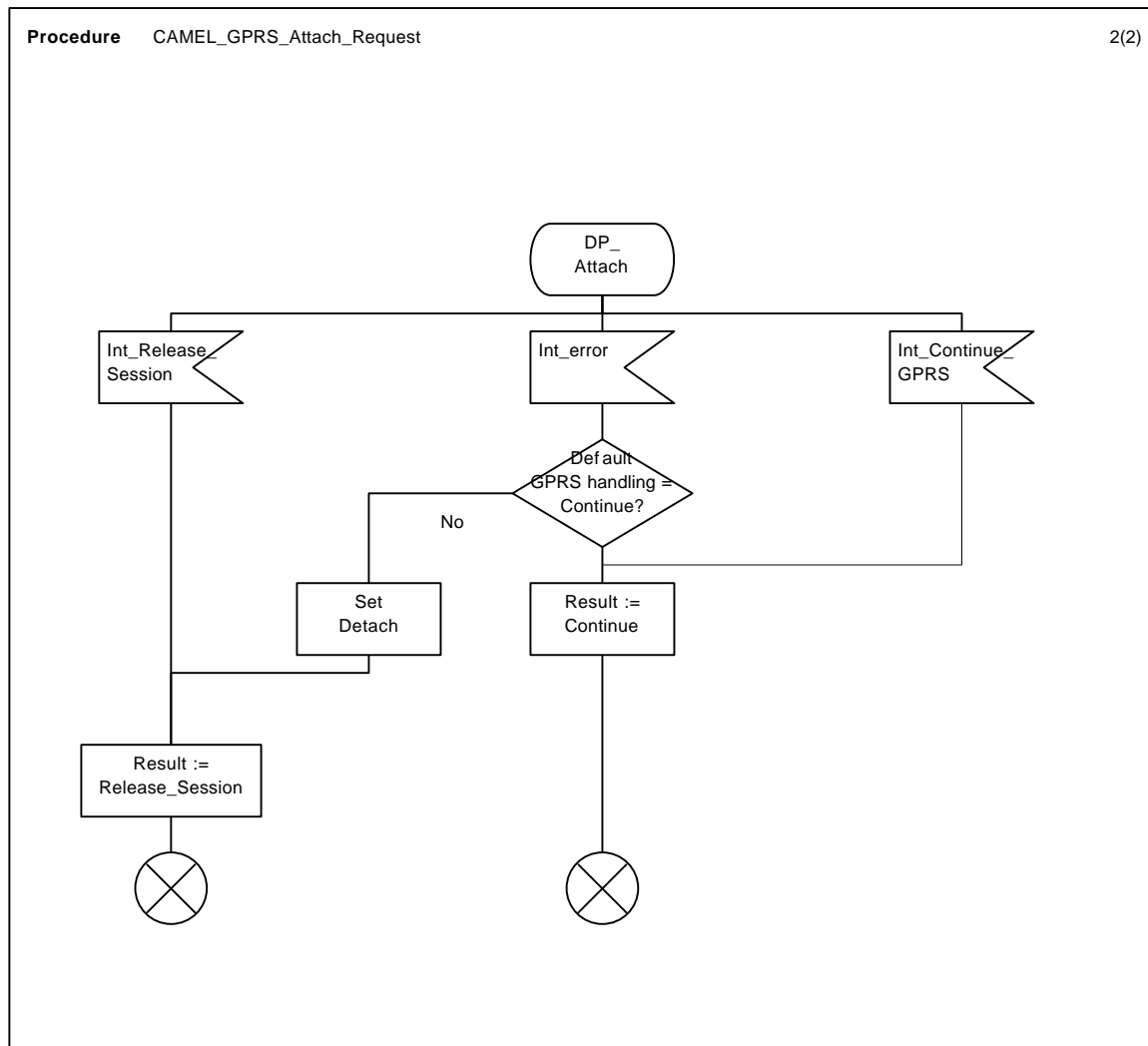


Figure 6.7 b: Procedure CAMEL\_GPRS\_Attach\_Request (sheet 2)



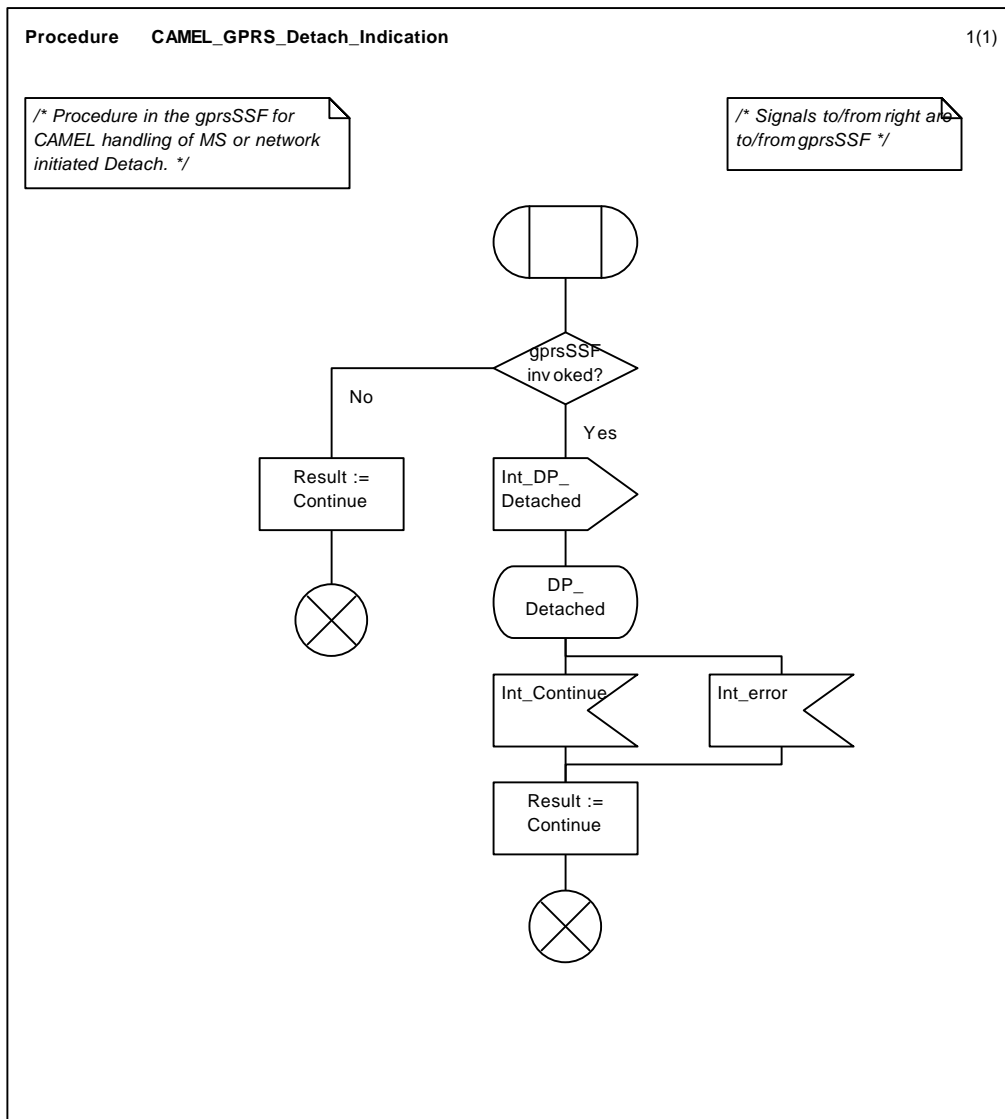


Figure 6.8: Procedure CAMEL\_GPRS\_Detach\_Indication

### 6.5.5 Handling of GPRS Routing Area Update

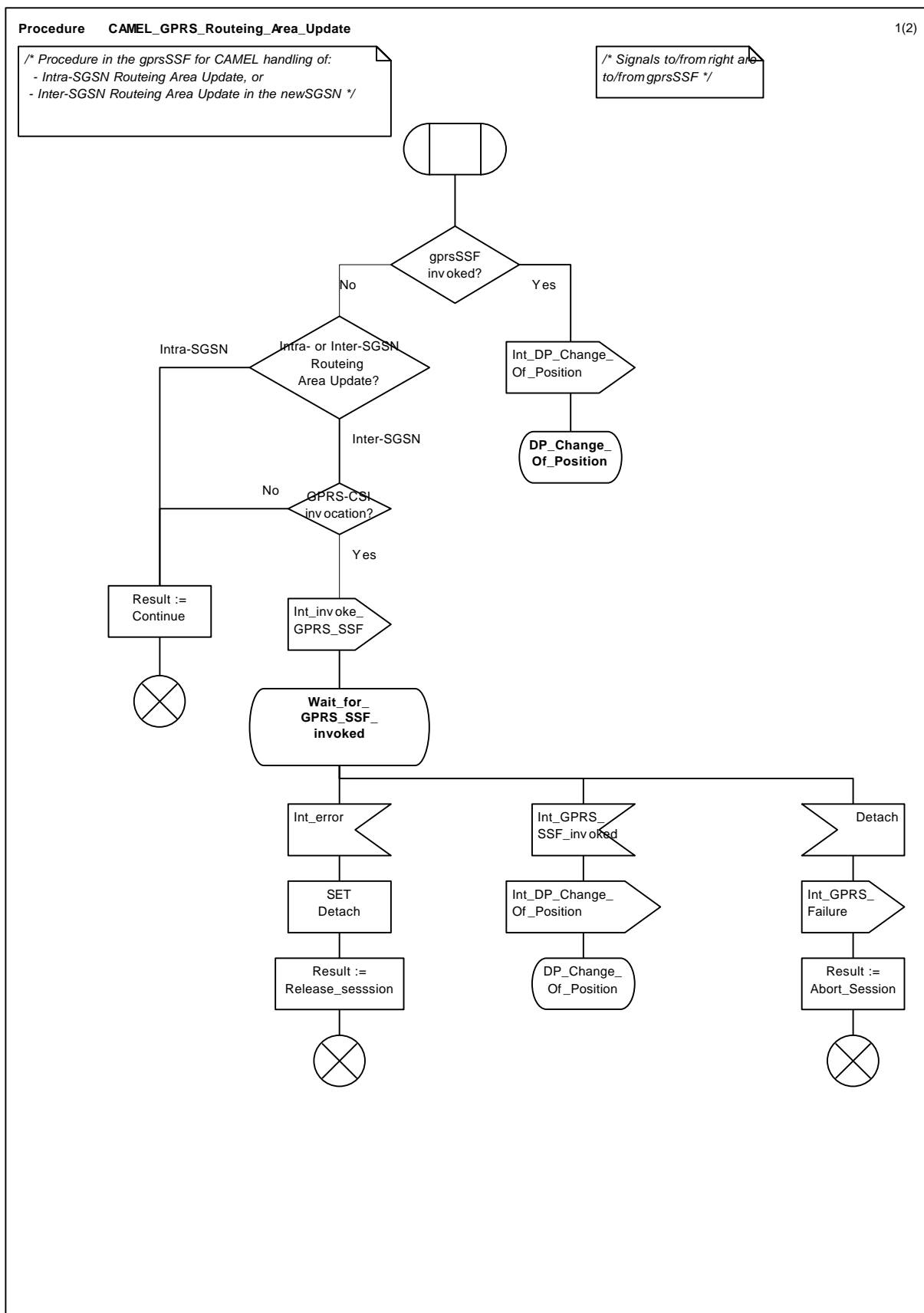


Figure 6.9 a: Procedure CAMEL\_GPRS\_Routeing\_Area\_Update (sheet 1)

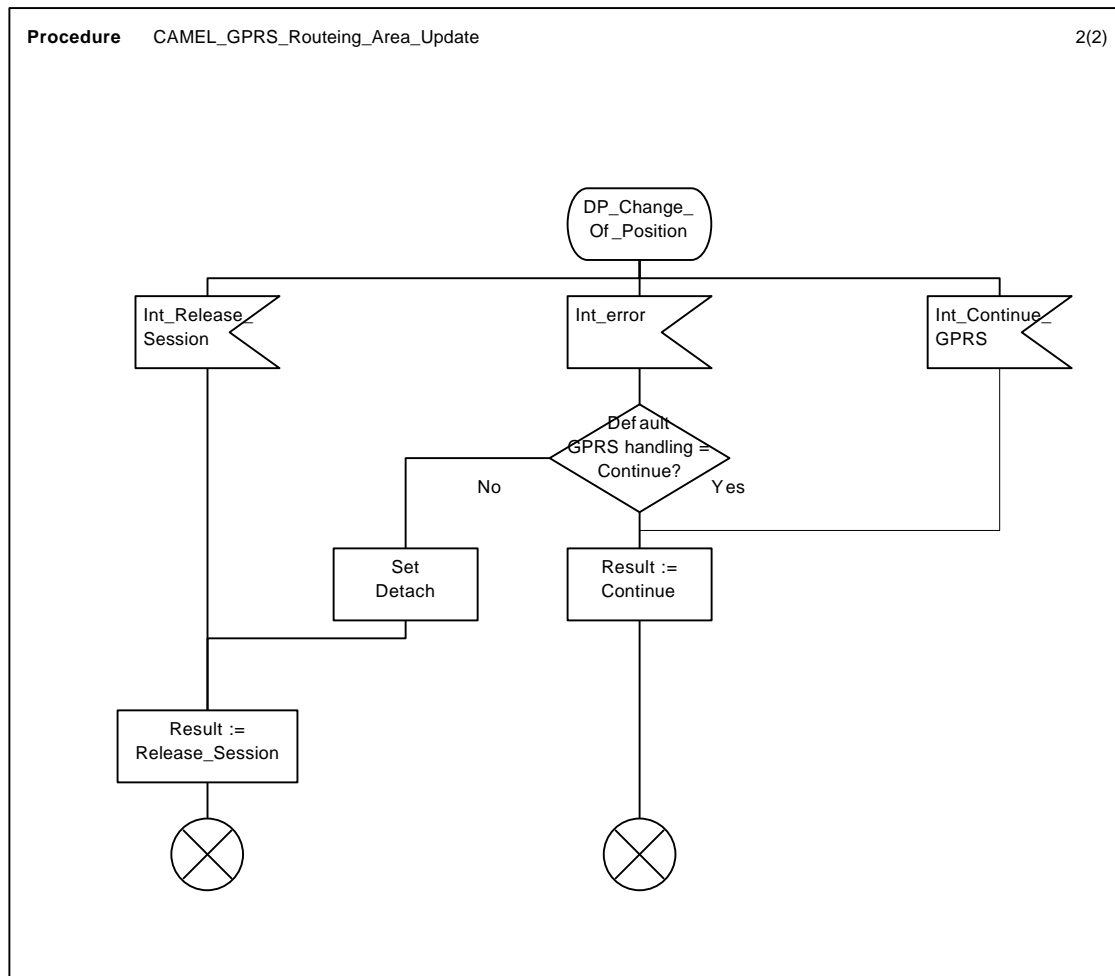
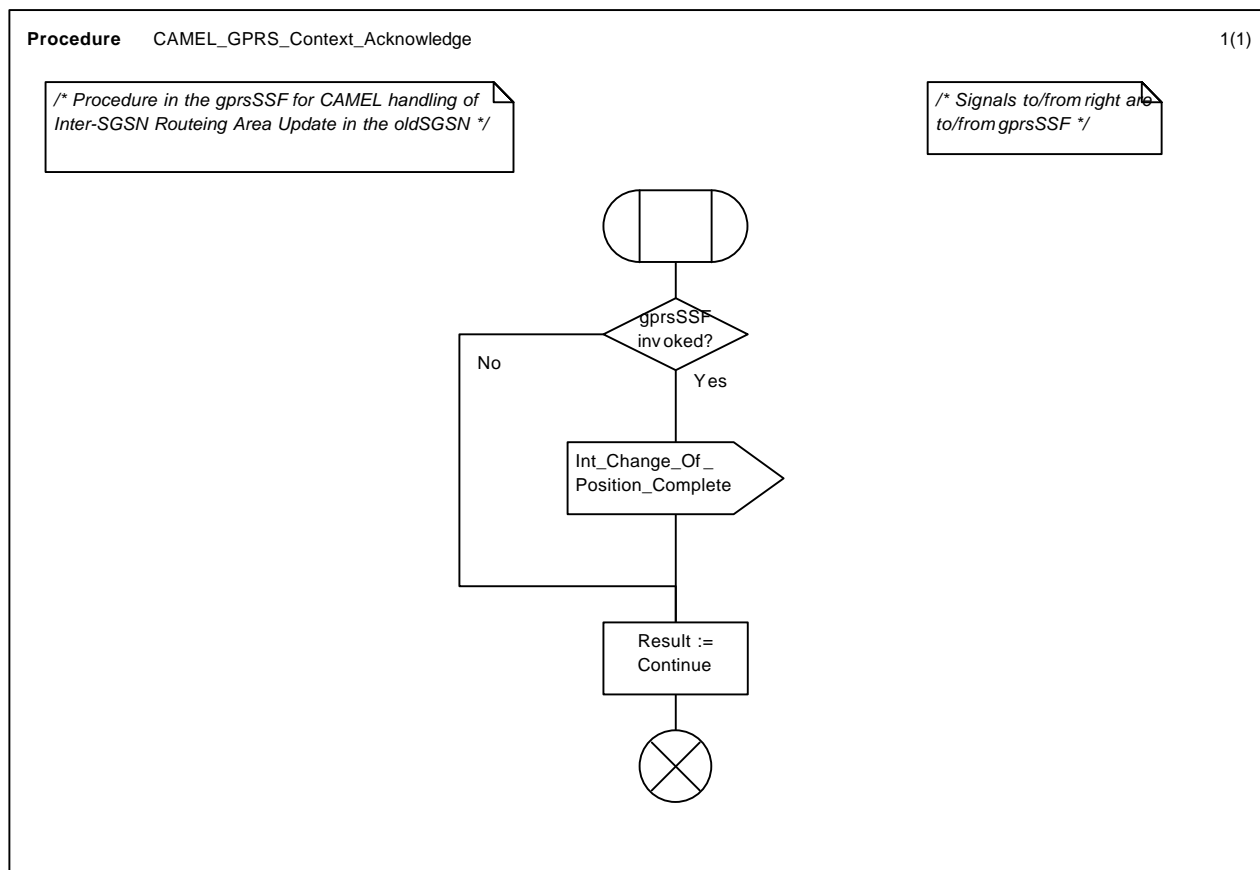


Figure 6.9 b: Procedure CAMEL\_GPRS\_Routeing\_Area\_Update (sheet 2)



**Figure 6.10: Procedure CAMEL\_GPRS\_Context\_Acknowledge**

### 6.5.6 Handling of PDP Context establishment and deactivation

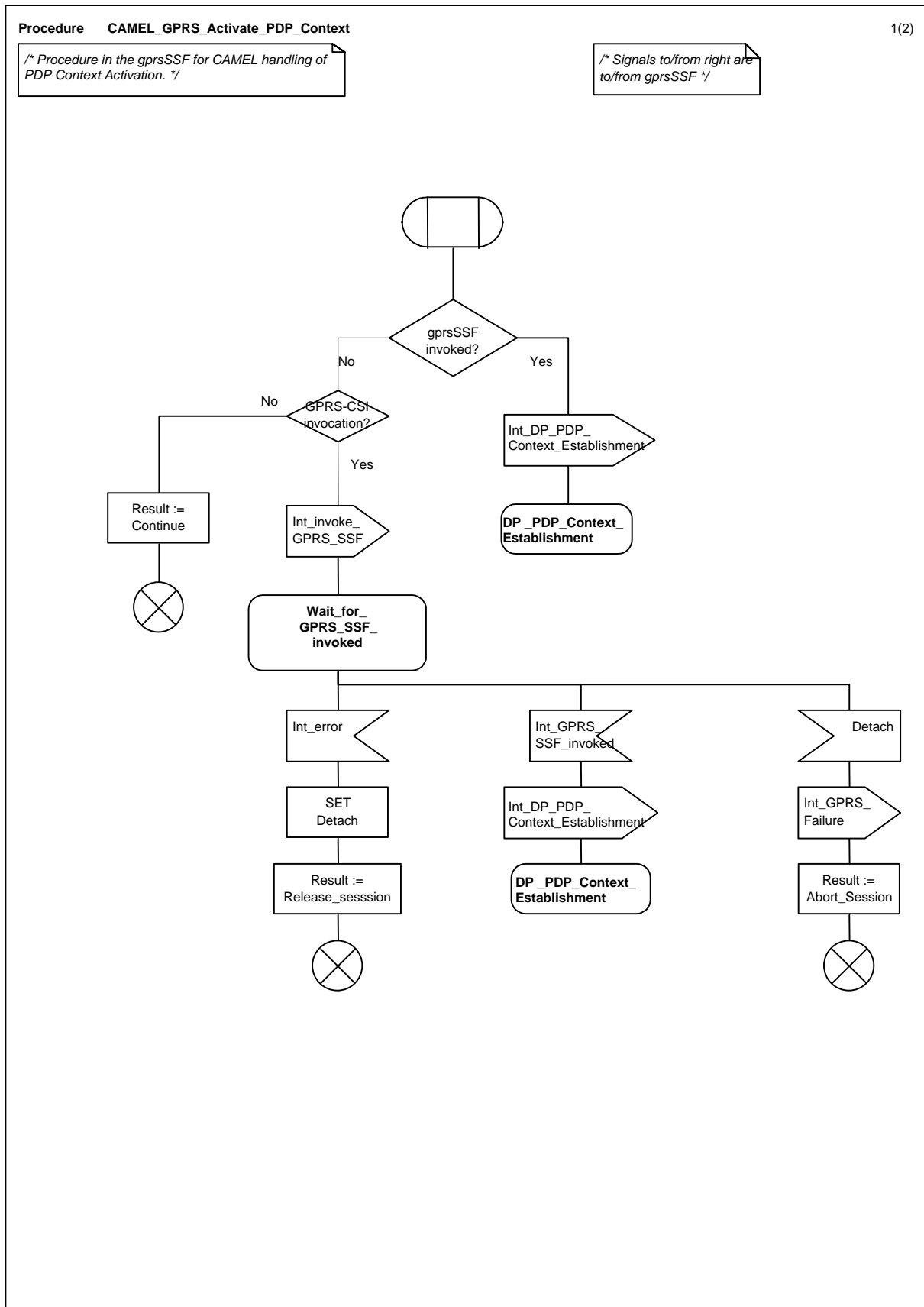


Figure 6.11 a: Procedure CAMEL\_GPRS\_Activate\_PDP\_Context (sheet 1)

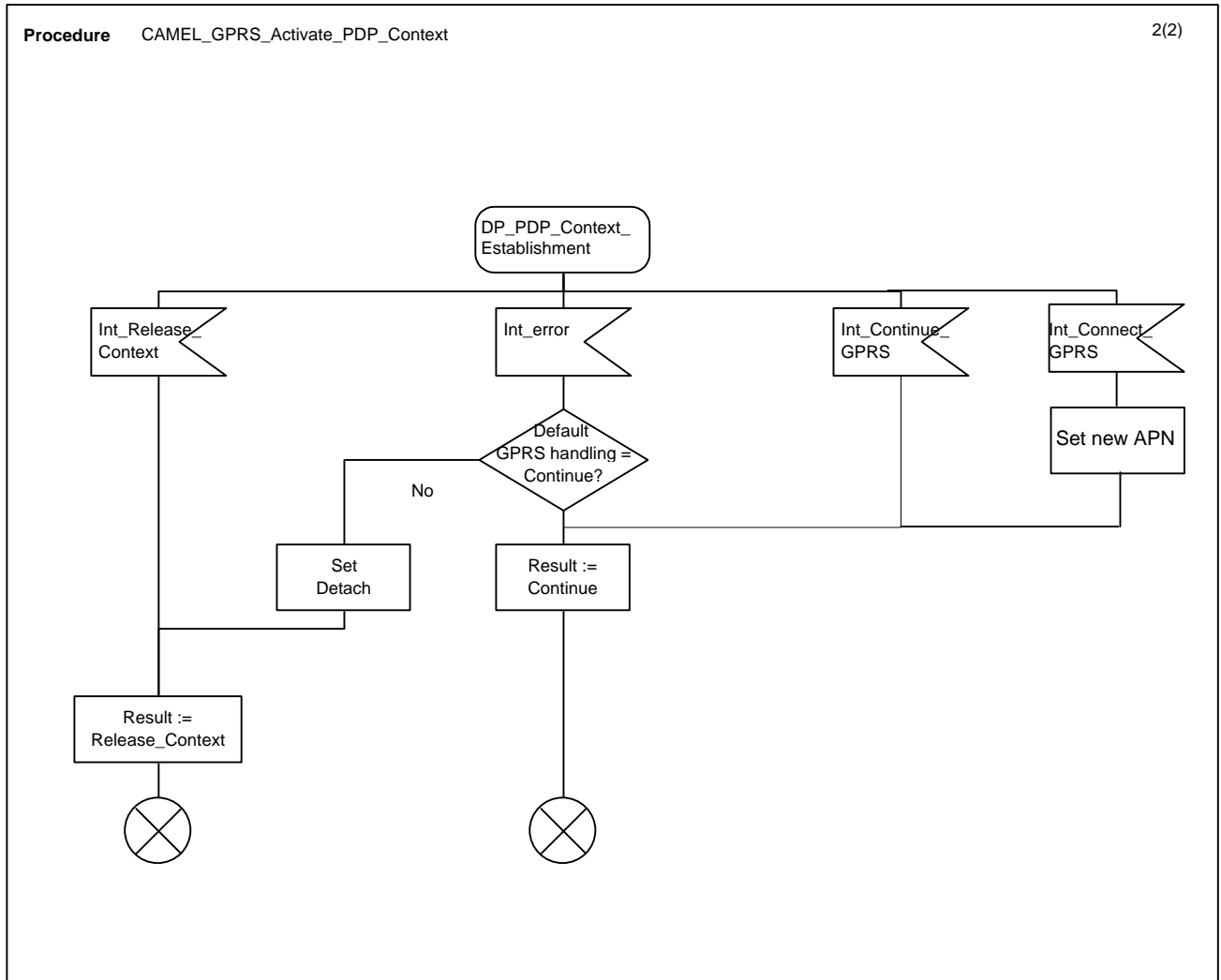


Figure 6.11 b: Procedure CAMEL\_GPRS\_Activate\_PDP\_Context (sheet 2)

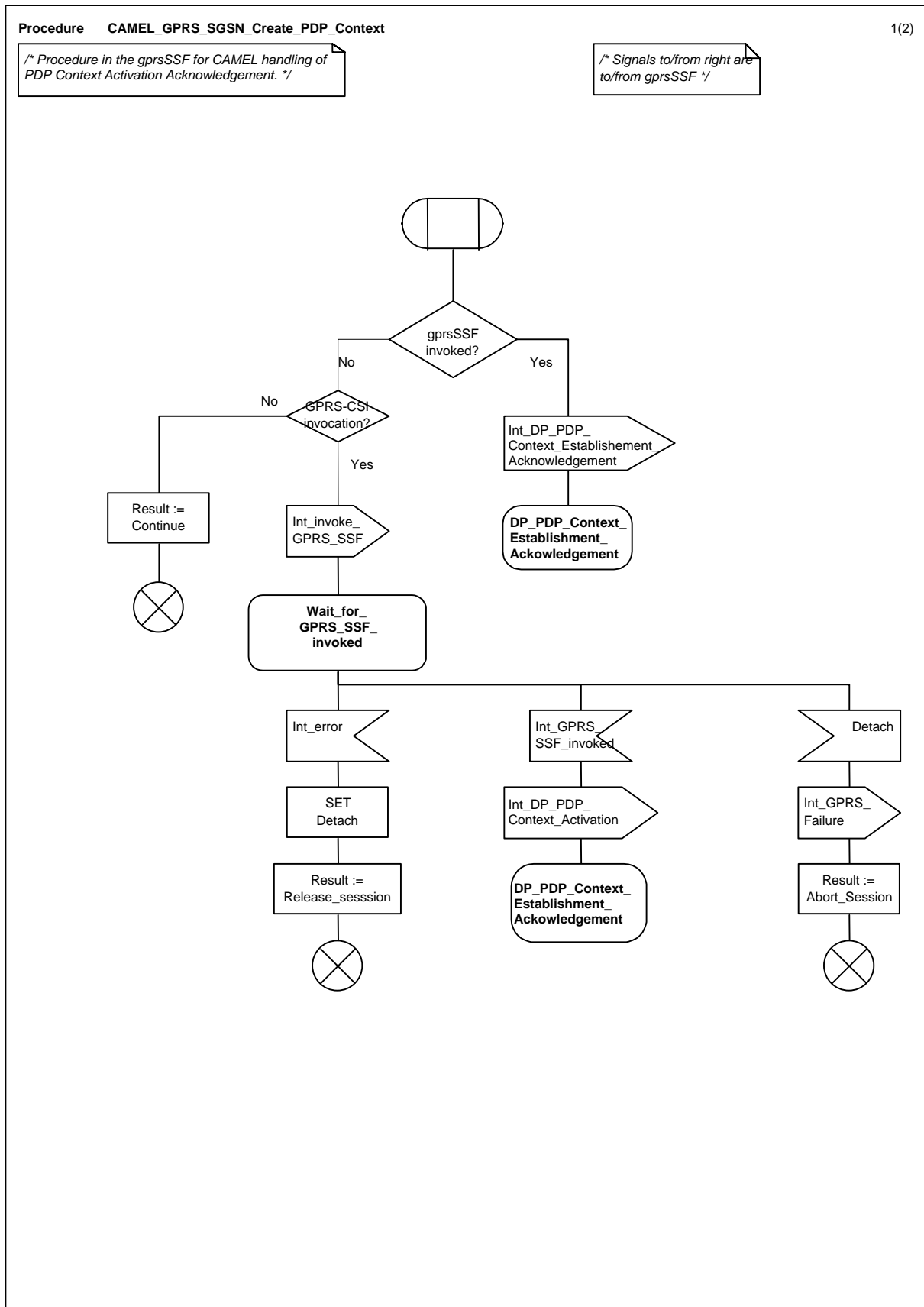


Figure 6.12 a: Procedure CAMEL\_SGSN\_Create\_PDP\_Context (sheet 1)

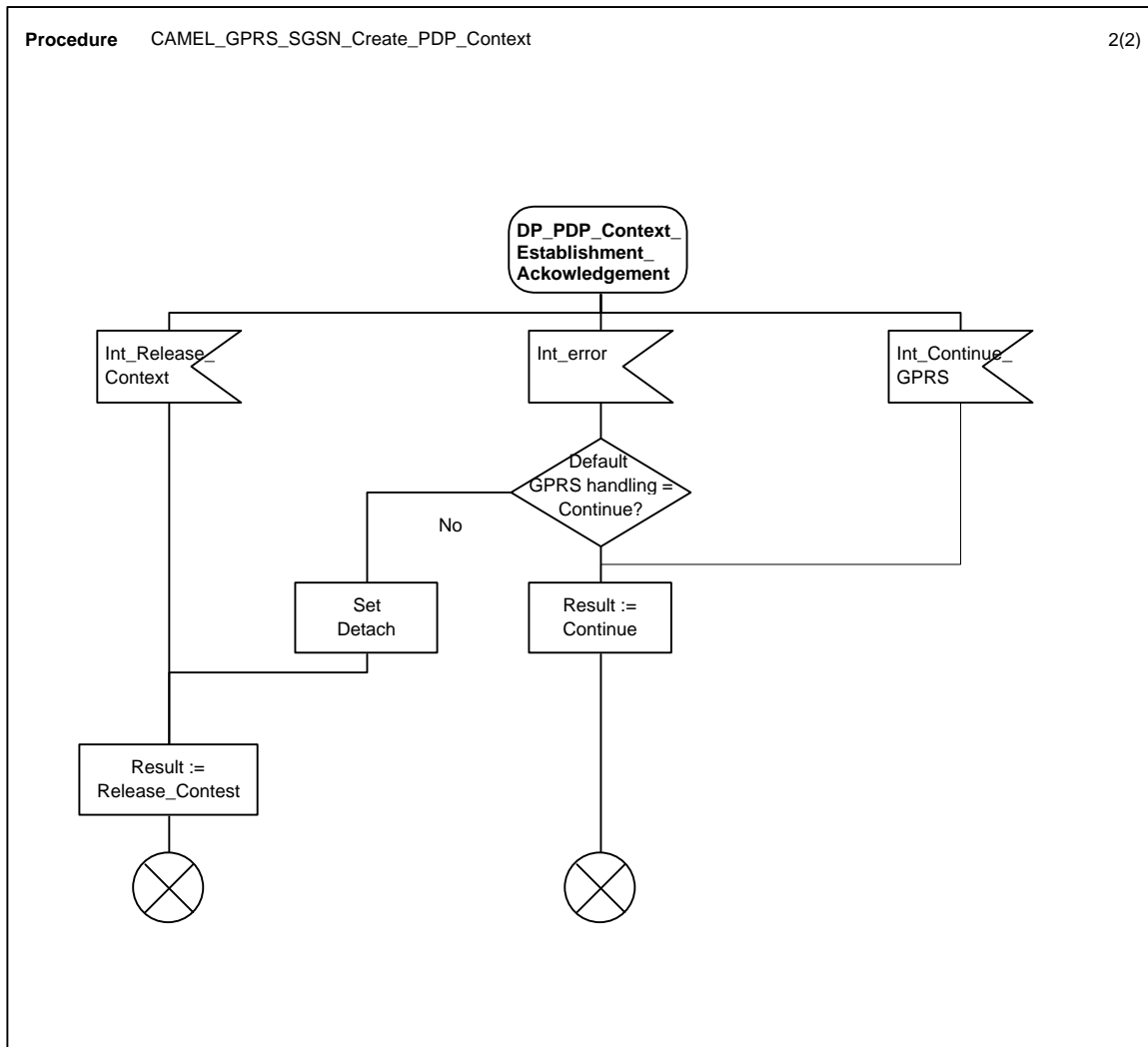
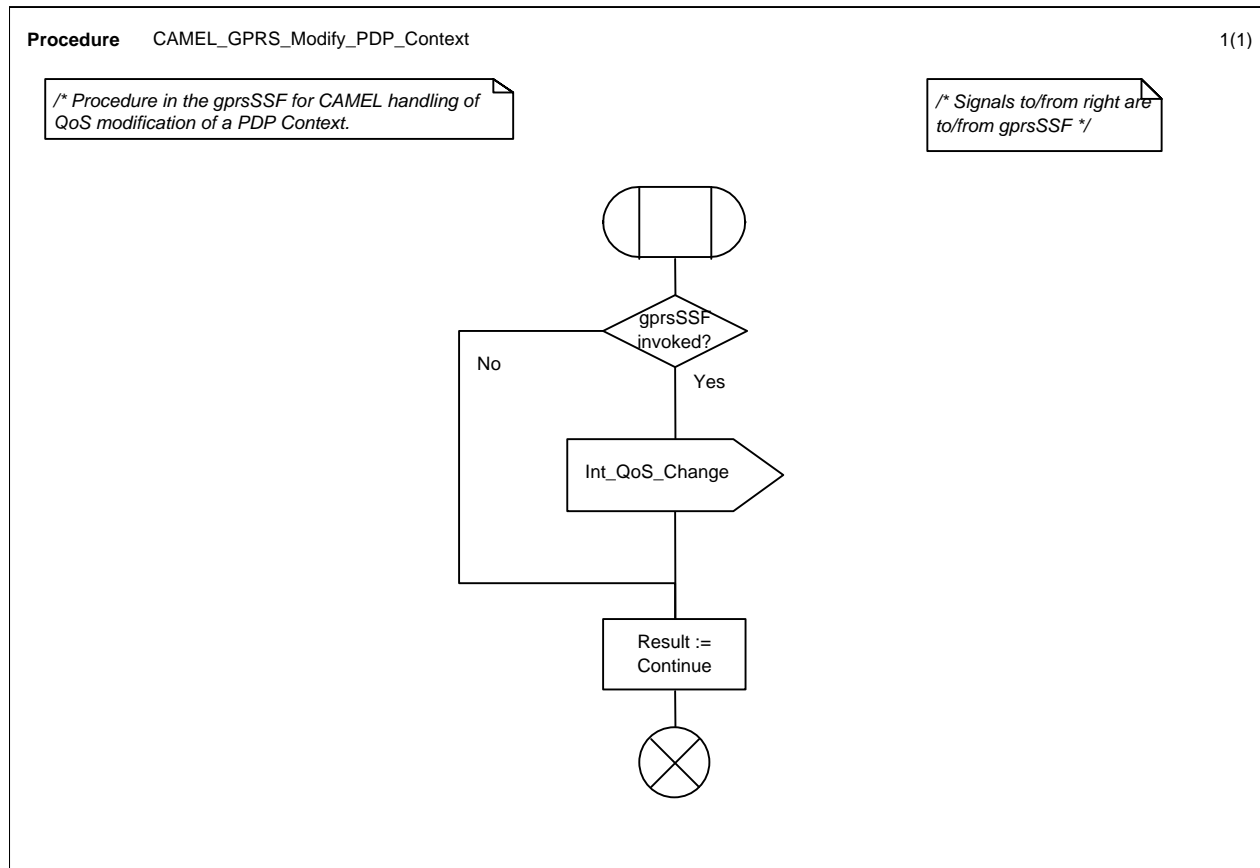


Figure 6.12 b: Procedure CAMEL\_SGSN\_Create\_PDP\_Context (sheet 2)





**Figure 6.13: Procedure CAMEL\_GPRS\_Modify\_PDP\_Context**

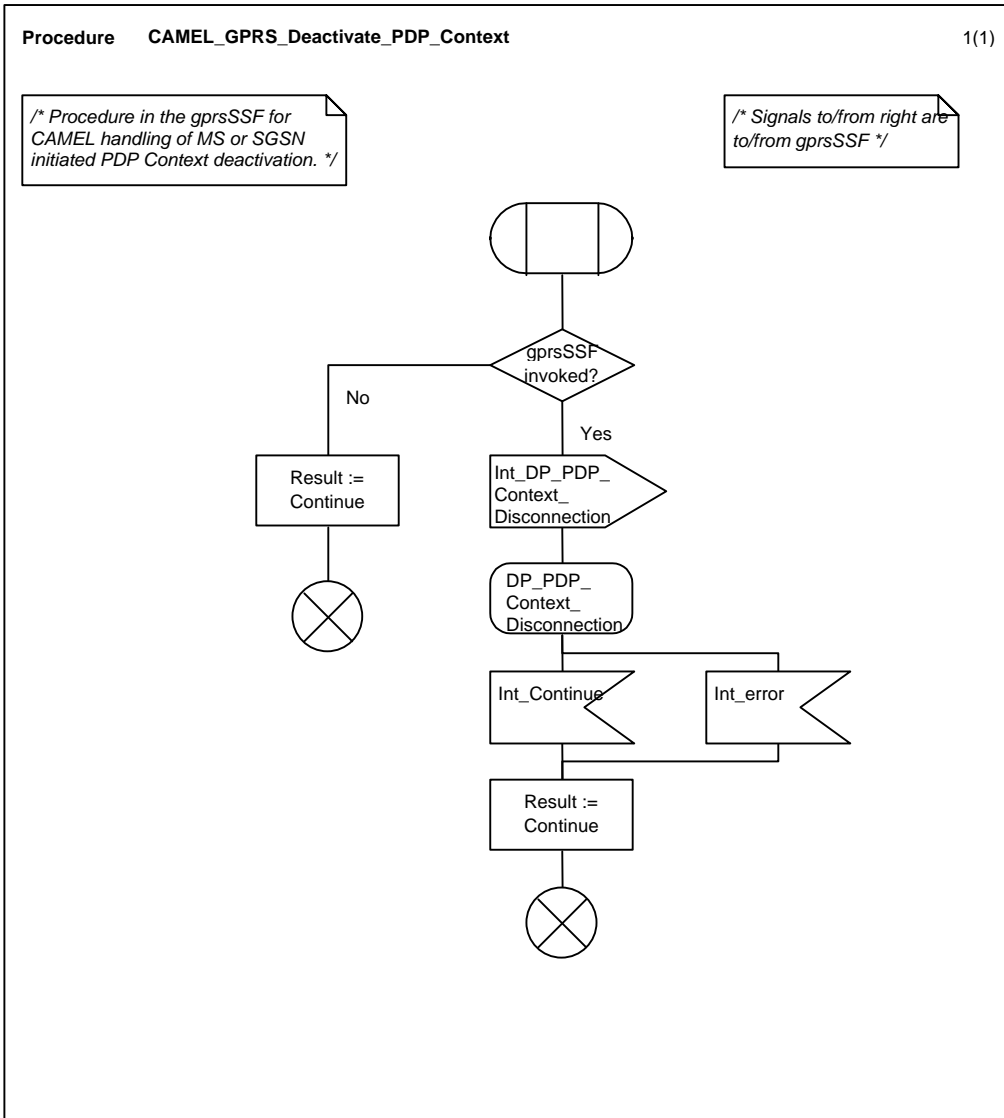


Figure 6.14: Procedure CAMEL\_SGSN\_Deactivate\_PDP\_Context

### 6.5.6 GPRS SSF

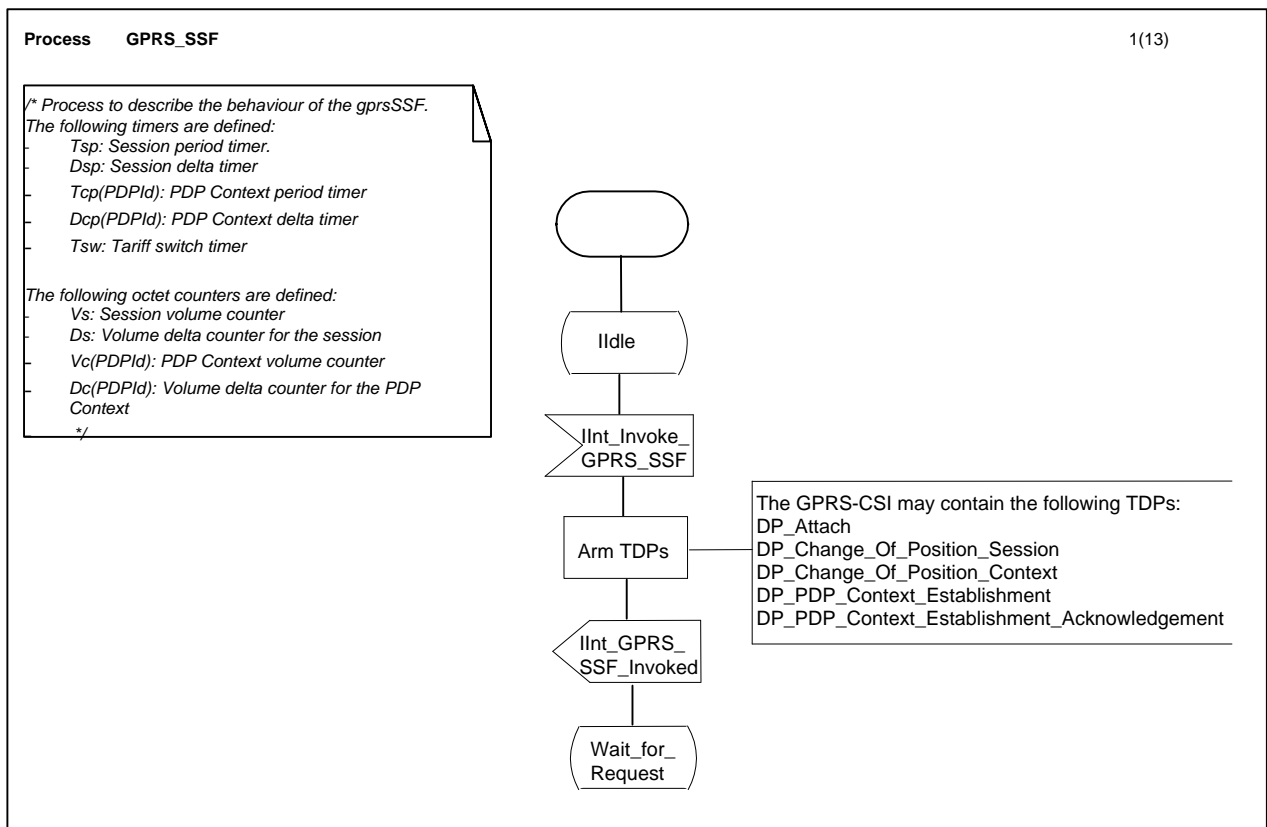


Figure 6.15 a: Process GPRS\_SSF (sheet 1)

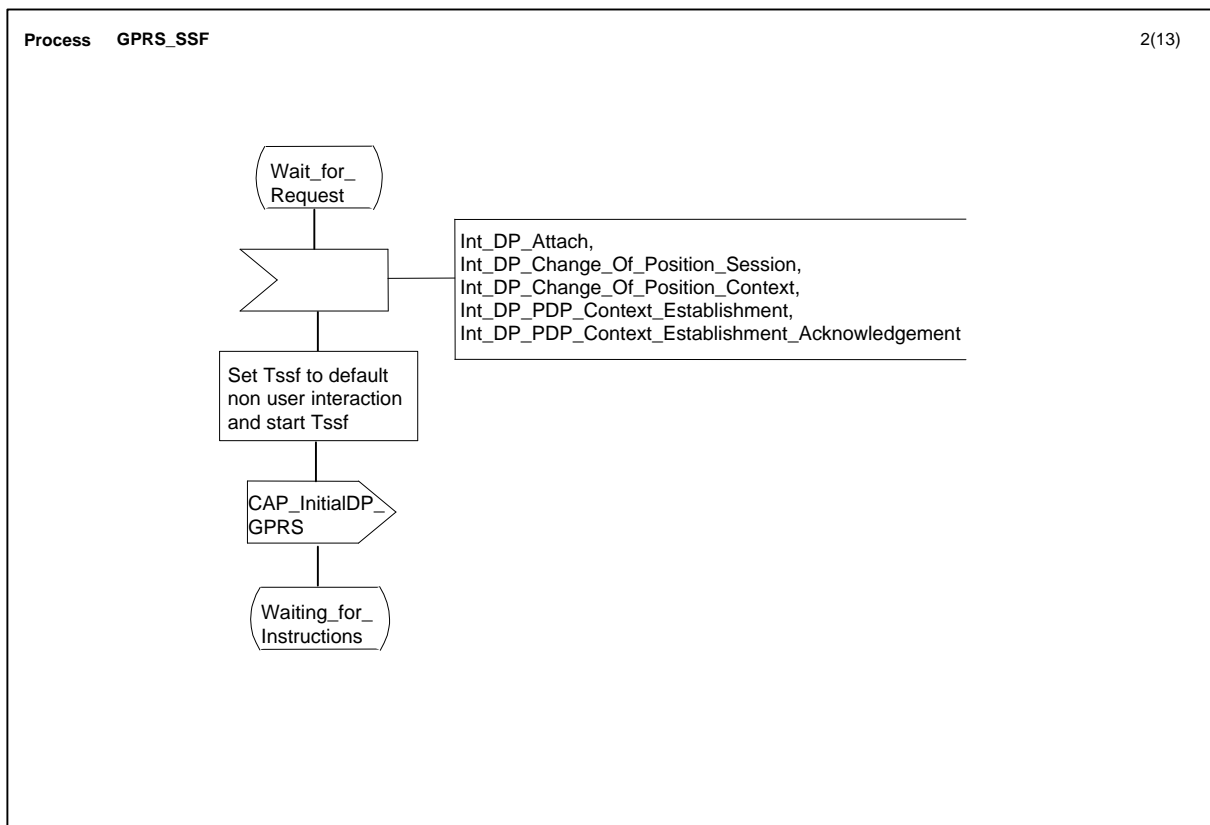


Figure 6.15 b: Process GPRS\_SSF (sheet 2)

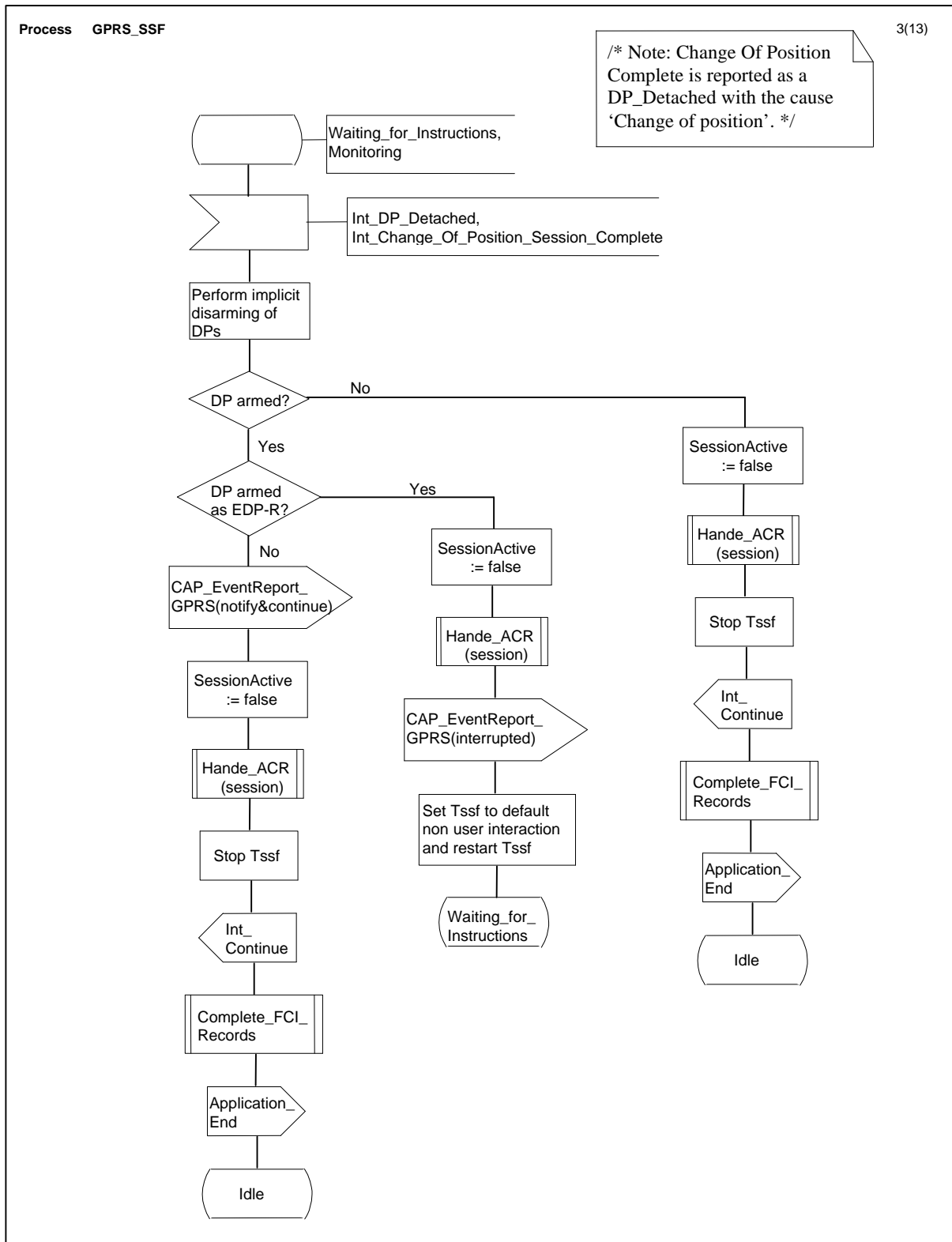


Figure 6.15 c: Process GPRS\_SSF (sheet 3)

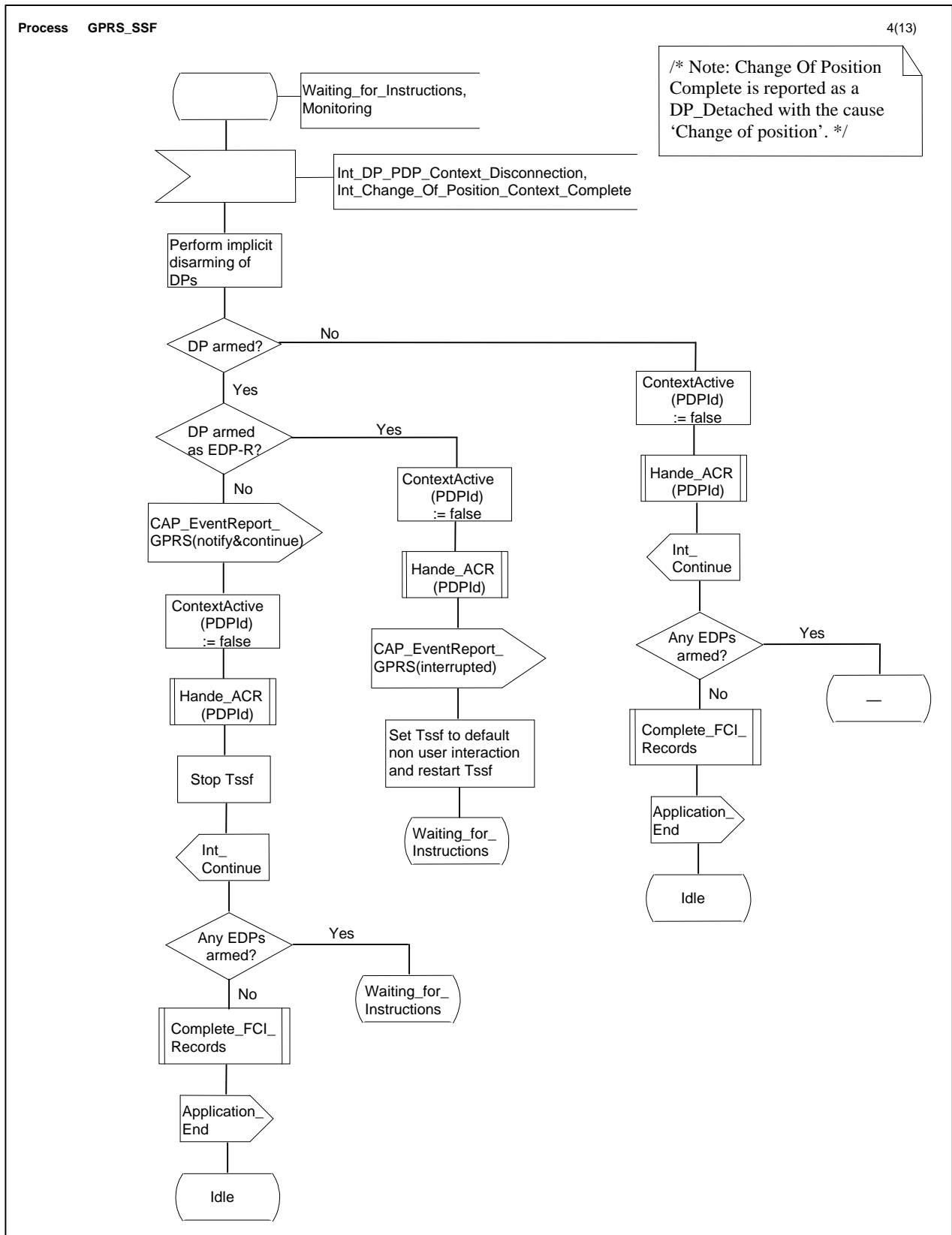


Figure 6.15 d: Process GPRS\_SSF (sheet 4)

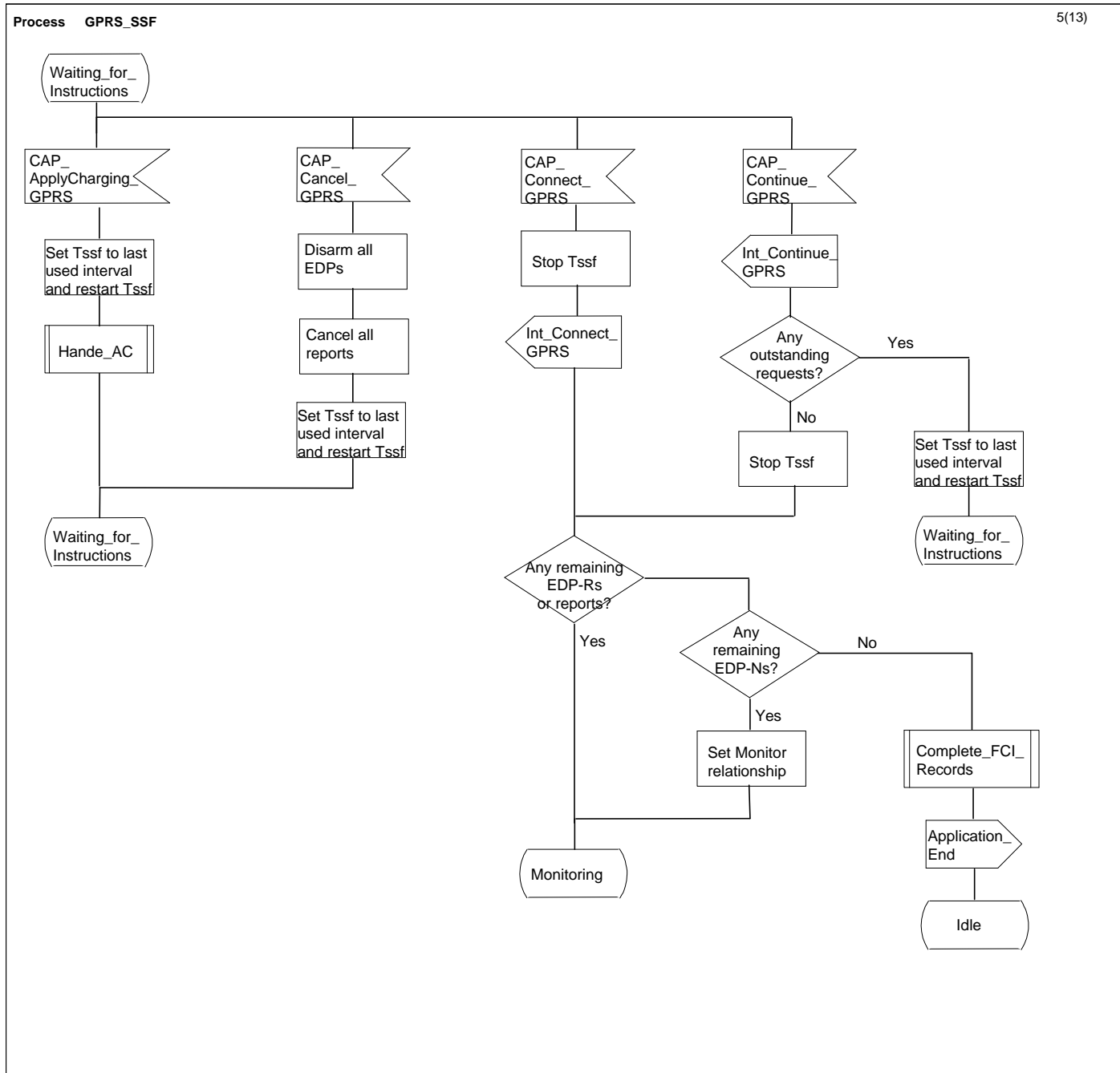


Figure 6.15 e: Process GPRS\_SSF (sheet 5)

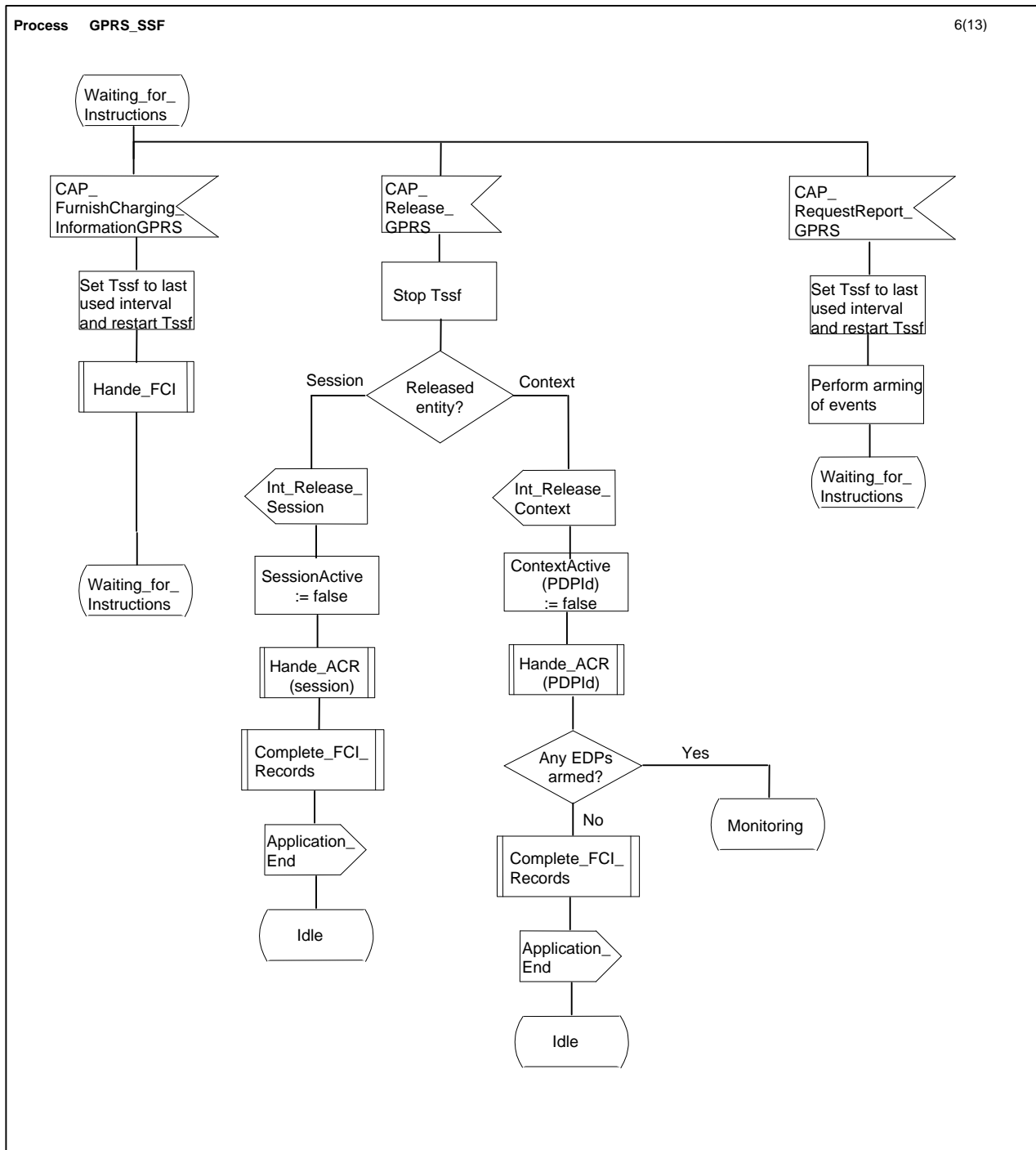


Figure 6.15 f: Process GPRS\_SSF (sheet 6)

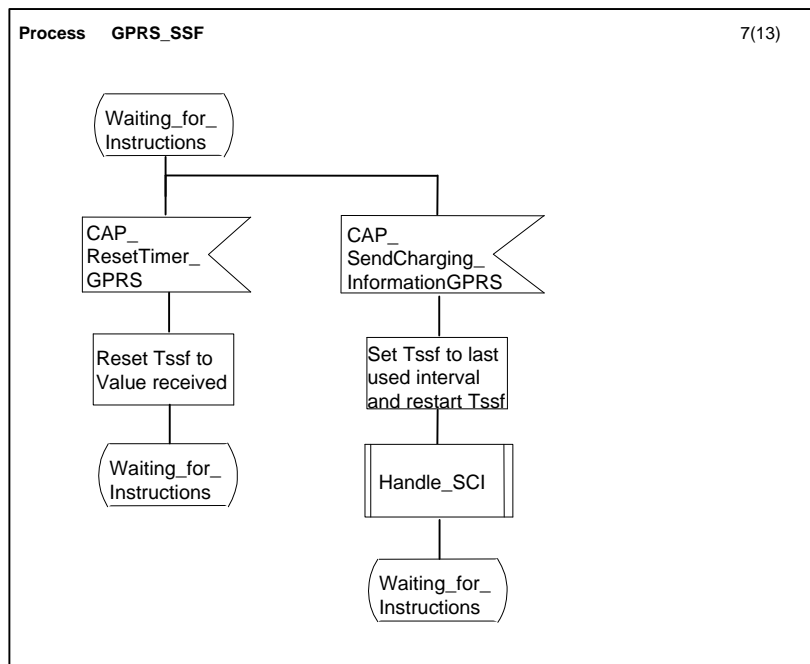


Figure 6.15 g: Process GPRS\_SSF (sheet 7)



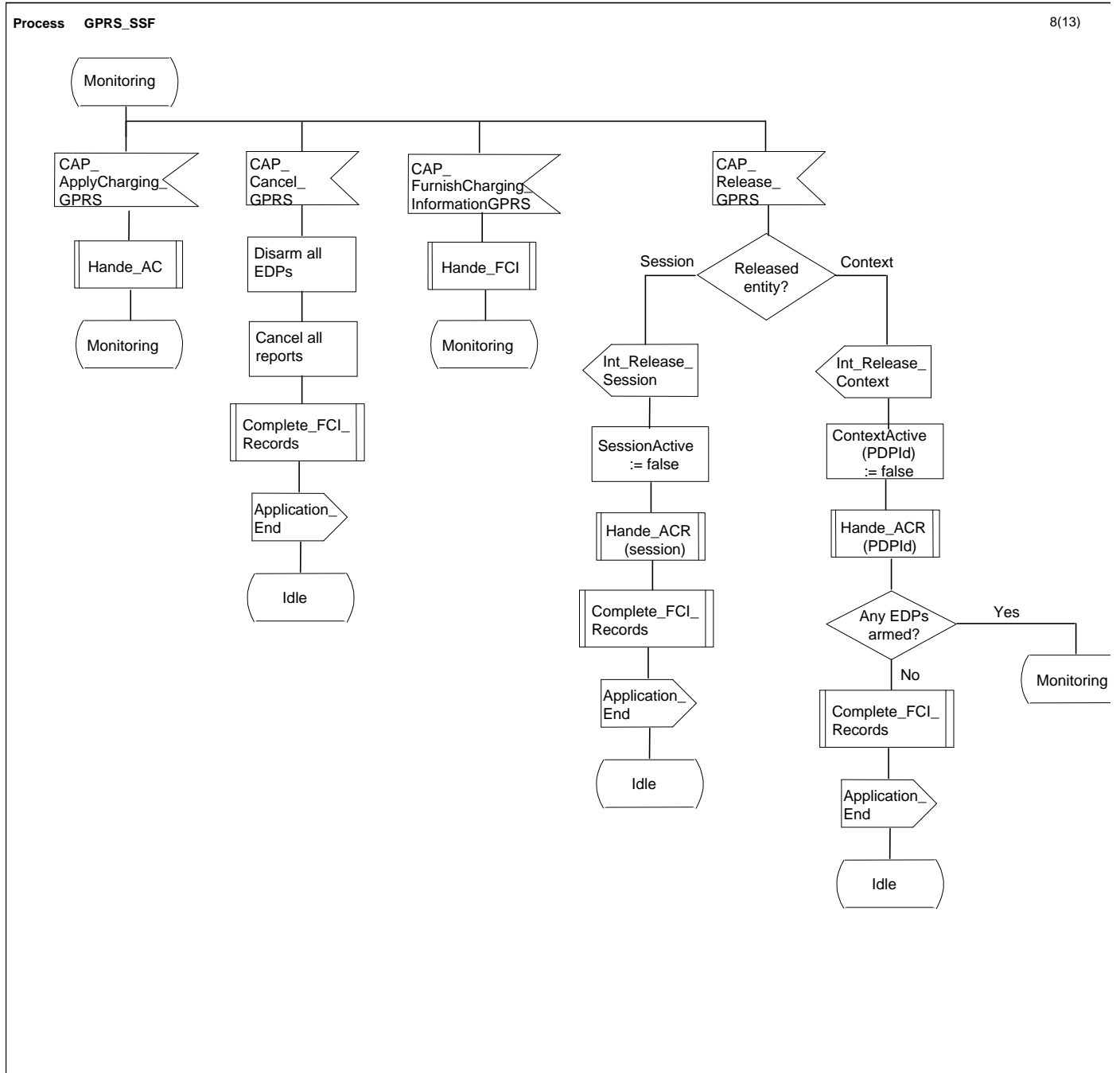


Figure 6.15 h: Process GPRS\_SSF (sheet 8)

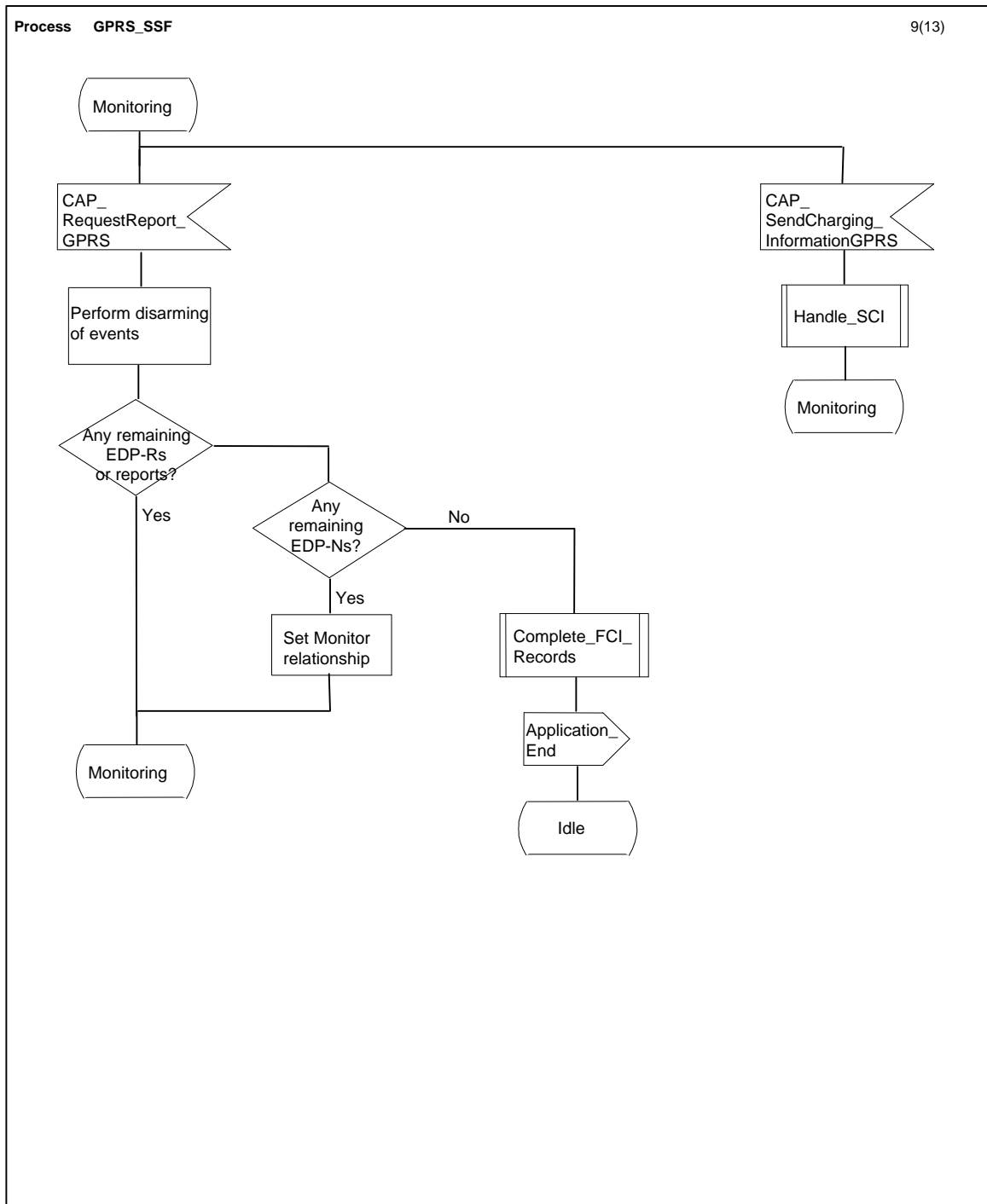


Figure 6.15 i: Process GPRS\_SSF (sheet 9)

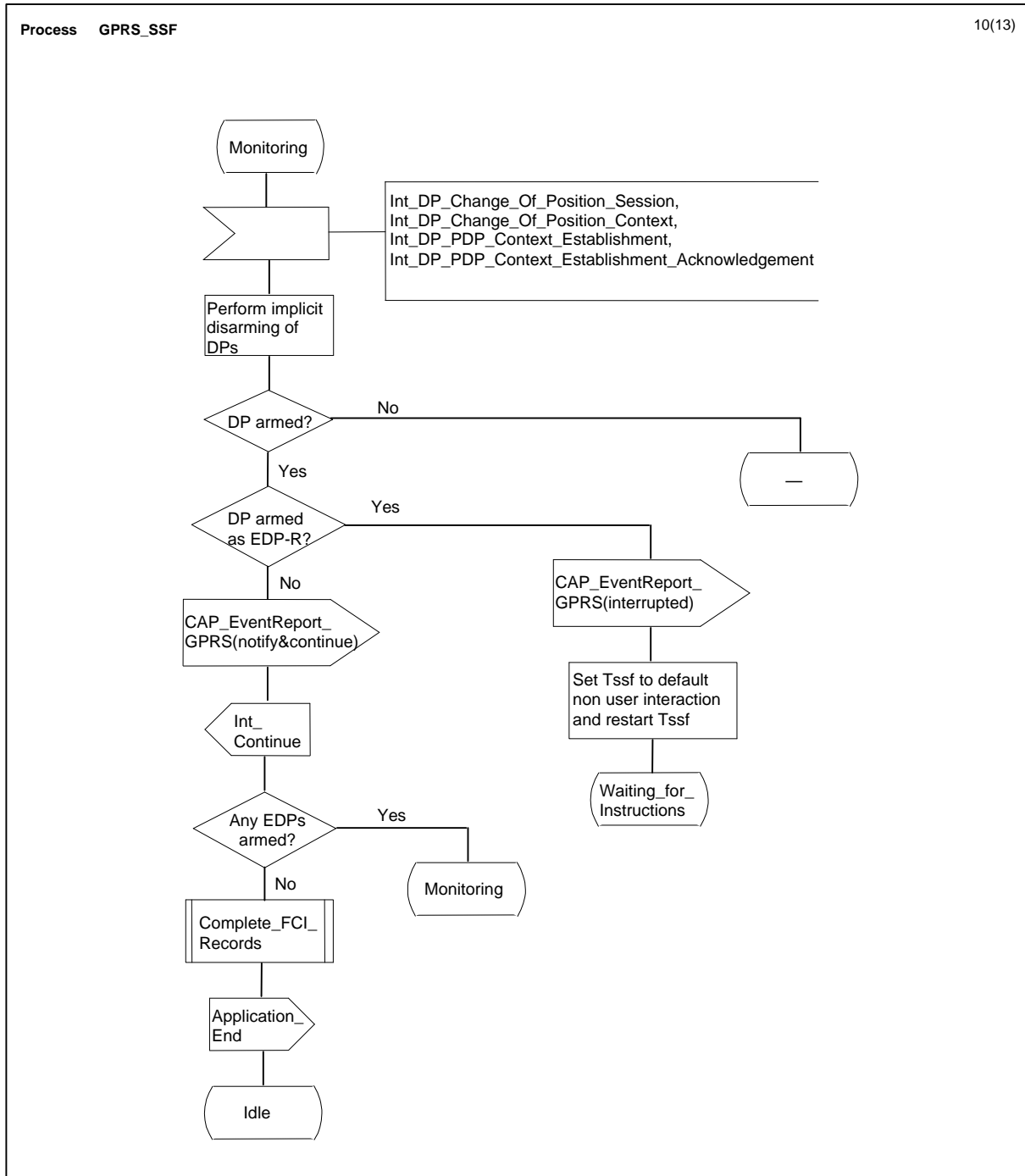


Figure 6.15 j: Process GPRS\_SSF (sheet 10)

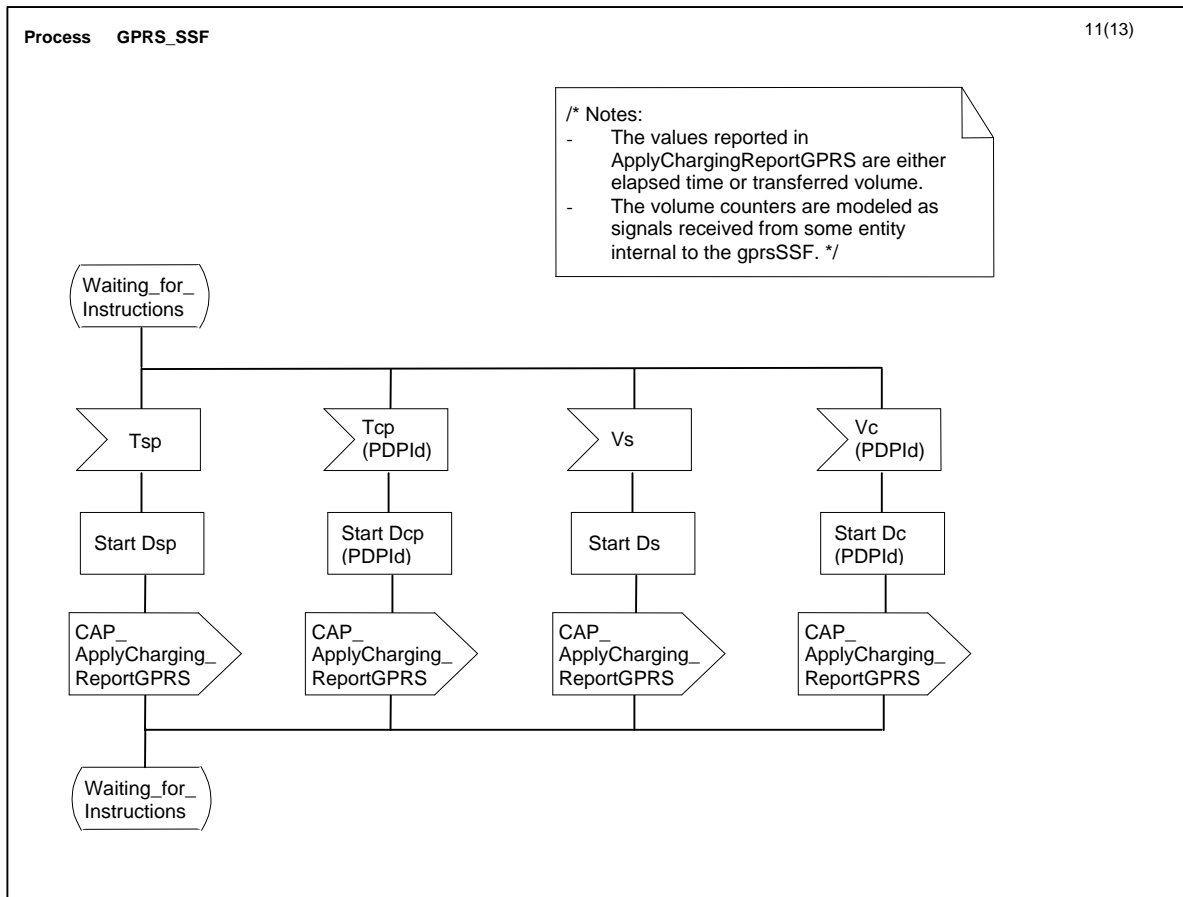


Figure 6.15 k: Process GPRS\_SSF (sheet 11)

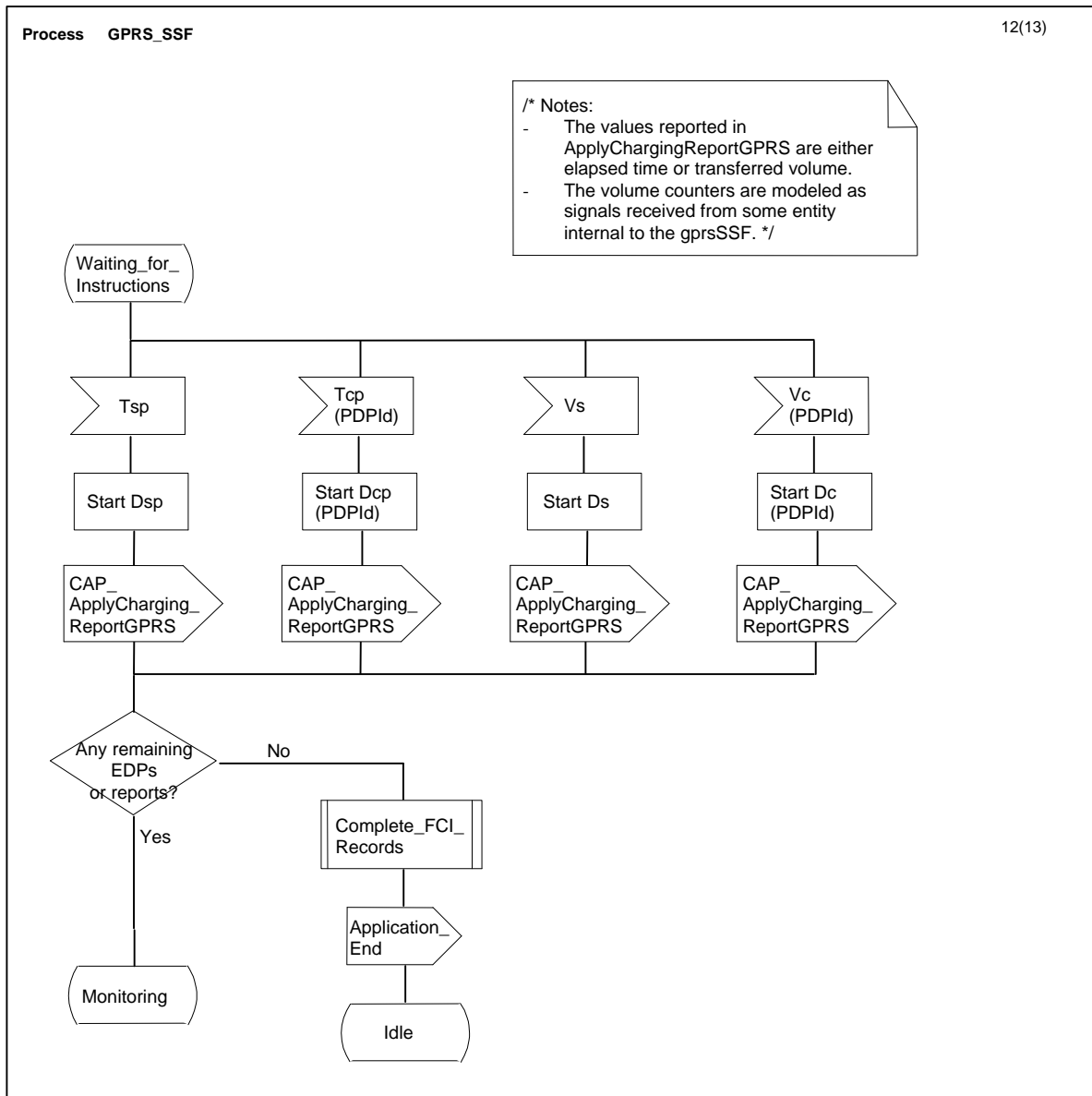


Figure 6.15 I: Process GPRS\_SSF (sheet 12)

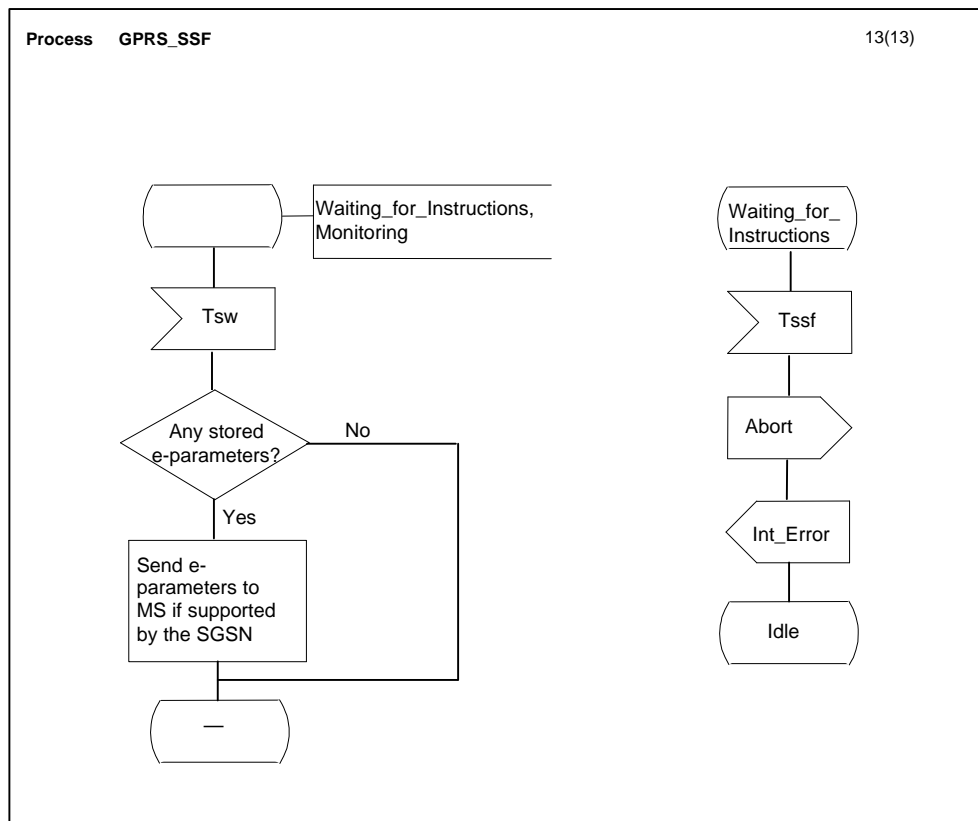


Figure 6.15 m: Process GPRS\_SSF (sheet 13)

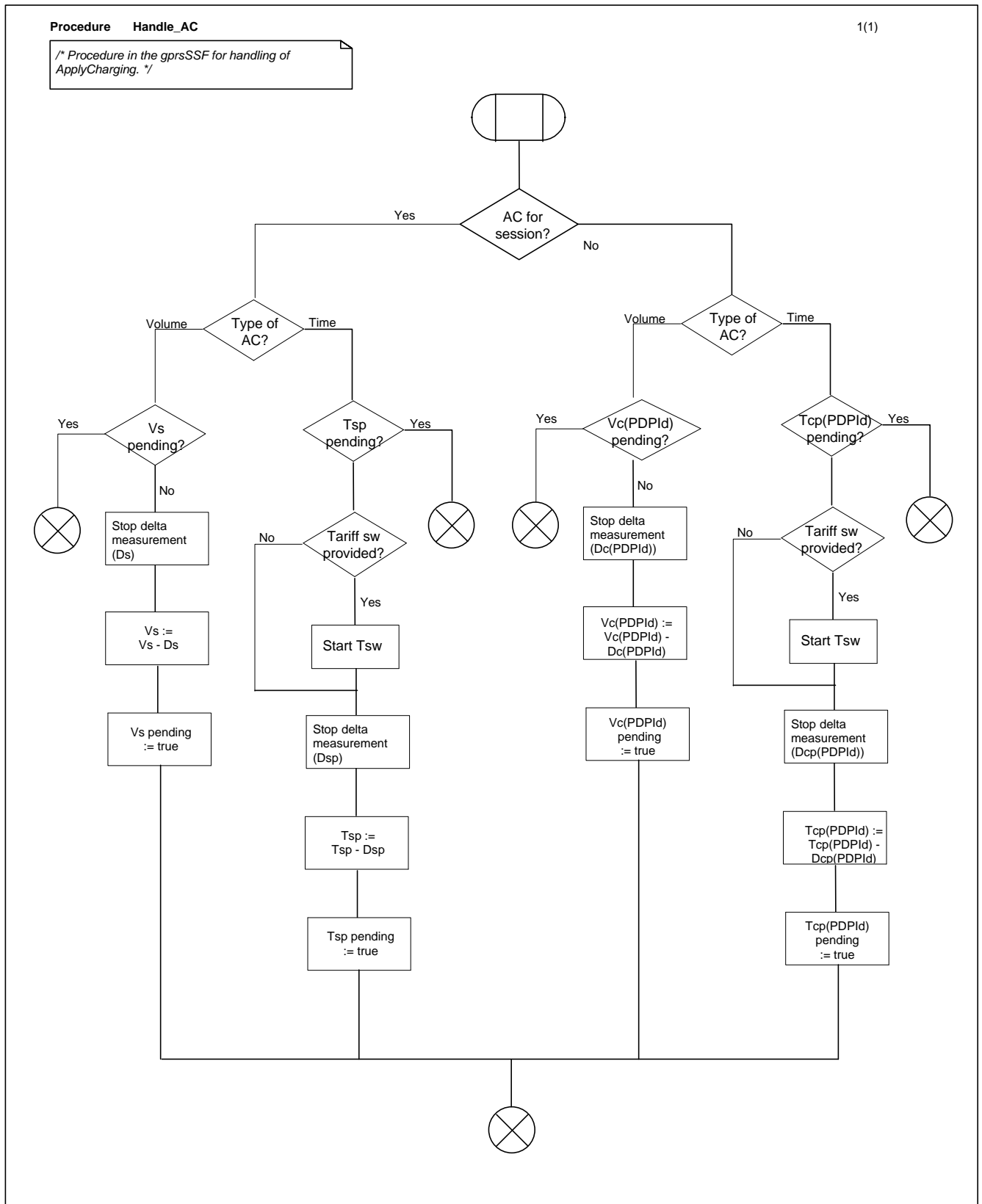


Figure 6.16: Procedure Handle\_AC\_GPRS

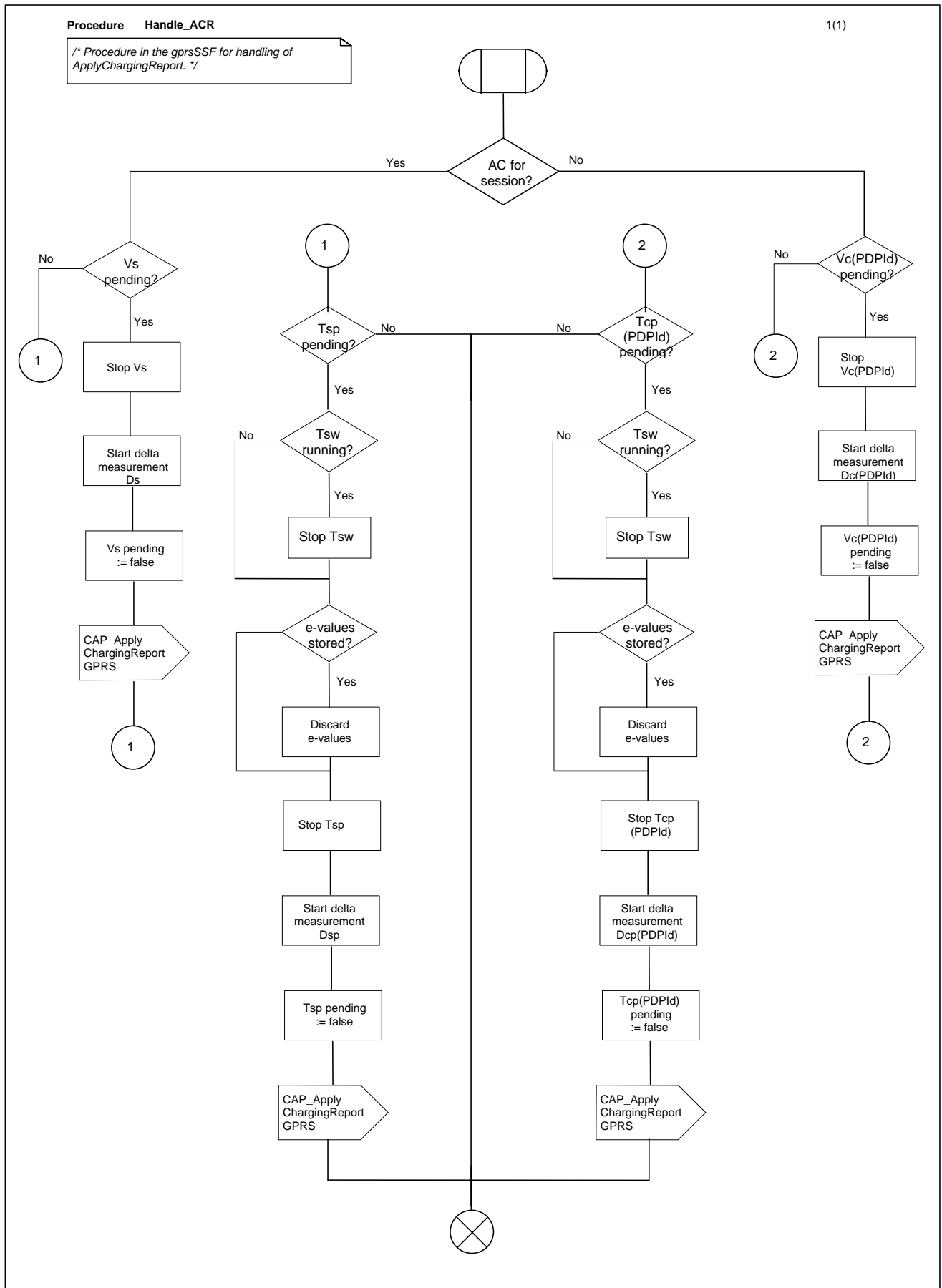


Figure 6.17: Procedure Handle\_ACR\_GPRS



## 6.6 Description of information flows

### 6.6.1 gprsSSF to gsmSCF Information Flows

#### 6.6.1.1 Activity Test GPRS Ack

##### 6.6.1.1.1 Description

This IF is the response to the Activity Test GPRS.

##### 6.6.1.1.2 Information Elements

This IF contains no information elements.

#### 6.6.1.2 Apply Charging Report GPRS

##### 6.6.1.2.1 Description

This IF is used by the gprsSSF to report to the gsmSCF the information requested in the Apply Charging GPRS IF. In addition, this IF is used to notify the gsmSCF of user initiated change in QoS. Note that there are several possible QoS profiles defined by the combinations of the different QoS attributes as defined in 3G TS 23.060, see reference [11]. A PLMN may only support and charge on a limited subset of those QoS. It is recommended that changes in QoS are only reported in Apply Charging Report GPRS for those QoS profiles.

##### 6.6.1.2.2 Information Elements

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Charging Result	M	This IE contains the charging information for the PDP provided by the gsmSSF. It is a choice between elapsed time and data volume.
Quality of Service	C	This IE identifies the QoS requested by the user and granted by the SGSN due to 'Modify PDP Context request. If not present the report is sent due to PDP context or GPRS session termination or Charging threshold reached.
Active	M	This IE indicates if the GPRS session or PDP context is still established e, or if it has been detached or deactivated.
PDP ID	C	This IE identifies the PDP context which the Apply Charging Report is applicable for. If not present the dialogue corresponds to the session or to one single PDP context.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

### 6.6.1.3 Entity Released GPRS

#### 6.6.1.3.1 Description

This IF is used by the gprsSSF to inform the gsmSSF at any phase that a PDP context within one dialogue has been terminated abnormally by the SGSN.

#### 6.6.1.3.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
GPRS Cause	M	This IE contains the Cause value indicating the reason for discontinuation of the PDP context.
PDP ID	M	This IE identifies the PDP context which has been terminated by the SGSN.

M Mandatory (The IE shall always be sent)

### 6.6.1.4 Event Report GPRS

#### 6.6.1.4.1 Description

This IF is used to notify the gsmSCF of a GPRS event (e.g. Attach or Detach) previously requested by the gsmSCF in a Request Report GPRS Event IF.

#### 6.6.1.4.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
GPRS Event type	M	This IE specifies the type of event that is reported.
Misc GPRS Info	M	This IE indicates the DP type (EDP-N or EDP-R).
GPRS Event Specific Information	C	This IE contains information specific to the reported event, e.g. new routing area in case of change of position or charging id in case of PDP Context Establishment Acknowledgement.
PDP ID	C	This IE identifies the PDP context, which the Report GPRS Event is applicable for. If not present the dialogue corresponds to the Attach/Detach FSM or to one single PDP context.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

## 6.6.1.5 Initial DP GPRS

### 6.6.1.5.1 Description

This IF is generated by the gprsSSF when a trigger is detected at a DP in the GPRS state machines, to request instructions from the gsmSCF.

### 6.6.1.5.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
ServiceKey	M	This IE identifies for the gsmSCF the requested set of one or more CAMEL services. It is used to address the correct application/SLP within the gsmSCF.
GPRS Event Type	M	This IE indicates the armed GPRS DP event resulting in the Initial Data Event IF.
MSISDN	M	This IE contains the basic MSISDN of the MS.
IMSI	M	This IE identifies the mobile subscriber.
Time and Time zone	M	This IE contains the time that the gprsSSF was triggered, and the time zone the gprsSSF resides in.
GPRS MS Class	C	This IE contains the MS network and radio access capabilities.
PDP Type	C	This IE identifies the PDP Type, e.g. X.25 or IP.
Quality of Service	C	This IE identifies the QoS (subscribed, requested or negotiated).
Access Point Name	C	This IE identifies the address Access Point Name the MS has requested to connect to.
Routeing Area Identity	C	This IE contains the location information of the MS.
Charging ID	C	This IE contains the Charging ID received from the GGSN for the PDP context.
SGSN Capabilities	C	This IE specifies the capabilities of the SGSN node to support the CAMEL interwork, e.g. support of Advice of Charge.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

## 6.6.2 gsmSCF to gprsSSF Information Flows

### 6.6.2.1 Activity Test GPRS

#### 6.6.2.1.1 Description

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

#### 6.6.2.1.2 Information Elements

This IF contains no information elements.

### 6.6.2.2 Apply Charging GPRS

#### 6.6.2.2.1 Description

This IF is used for interacting from the gsmSCF with the gprsSSF charging mechanisms to control the charging of a GPRS session or PDP Context.

#### 6.6.2.2.2 Information Elements

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Charging Characteristics	M	This IE specifies the charging related information to be provided by the gsmSSF and the conditions on which this information has to be provided back to the gsmSCF. It is a choice between granted volume and granted time for the data transfer.
Tariff Switch Interval	O	This information element specifies the time duration until the next tariff switch occurrence.
PDP ID	C	This IE identifies the PDP context, which the Apply GPRS Charging is applicable for. If not present the dialogue corresponds to the session or to one single PDP context.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent).

C Conditional (The IE shall be sent, if available)

### 6.6.2.3 Cancel GPRS

#### 6.6.2.3.1 Description

This IF is used by the gsmSCF to request the gprsSSF to cancel all EDPs and reports.

### 6.6.2.3.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
all requests	M	This IE indicates that all active requests for EventReportGPRS and ApplyCharging shall be cancelled.
PDP ID	C	This IE identifies the PDP context which is to be cancelled. If not present the dialogue corresponds to the session or to one single PDP context.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

### 6.6.2.4 Connect GPRS

#### 6.6.2.4.1 Description

This IF is used by the gsmSCF to request the gprsSSF to modify the APN used when establishing a PDP Context.

#### 6.6.2.4.2 Information Elements

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Access Point Name	M	This IE contains the Access Point Name to be used when establishing the PDP Context.
PDP Id	C	This IE identifies the PDP Context where the new Access Point Name shall be used.

M Mandatory (The IE shall always be sent)

### 6.6.2.5 Continue GPRS

#### 6.6.2.5.1 Description

This information flow requests the gprsSSF to proceed with processing at the DP at which it previously suspended processing to await gsmSCF instructions. The gprsSSF completes DP processing, and continues processing (i.e., proceeds to the next point in the Attach/Detach FSM or PDP Context FSM) without substituting new data from the gsmSCF.

#### 6.6.2.5.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
PDP ID	C	This IE identifies the PDP context which processing shall continue for. If not present the dialogue corresponds to the session or to one single PDP context.

C Conditional (The IE shall be sent, if available)

## 6.6.2.6 Furnish Charging Information GPRS

### 6.6.2.6.1 Description

This IF is used to request the gprsSSF to include information in the CAMEL specific logical call record.

The logical call record is created when FCI-GPRS is received and a logical call record for that FSM does not exist. For modelling purposes the logical call record is buffered in the gprsSSF. The gprsSSF completes logical call records as defined in the SDLs. Once the logical call record is completed, then its free format data is moved to the corresponding CDR and the logical call record is deleted.

In the SGSN there is a separate Logical call record for the attach/detach state model and for each PDP context.

The CSE can send multiple concatenated FCIs per Logical Call Record for completion. The total maximum of free format data is 160 octets per Logical Call Record. The 160 octets may be sent in one or more FCI operations. If there is non-completed free format data and new FCI operation(s) is/are received to overwrite the non-completed data, then the non-completed data is discarded and the gsmSCF can send another 160 octets per CDR.

### 6.6.2.6.2 Information Elements

Information element name	Required	Description
FCI GPRS Billing Charging Characteristics	M	This IE is described in the next table.

M Mandatory (The IE shall always be sent)

FCI GPRS Billing Charging Characteristics contains the following information:

Information element name	Required	Description
FCIBCCCAMEL Sequence 1	M	This IE is described in the next table.

M Mandatory (The IE shall always be sent)

FCIBCCCAMEL Sequence 1 contains the following information:

Information element name	Required	Description
Free Format Data	M	This IE is a free format data to be inserted in the CAMEL logical call record.
Append Free Format Data	O	<p>This IE indicates that the gprsSSF shall append the free format data to the Logical call record. In the SGSN there is a separate Logical call record for the attach/detach state model and for each PDP context.</p> <ul style="list-style-type: none"> <li>• If this IE is present indicating “Append”, the gprsSSF shall append the free format data received in this IF to the free format data already present in the Logical call record for that session or PDP Context.</li> <li>• If this IE is absent or in value “Overwrite”, then the gprsSSF shall overwrite all free format data already present in the Logical call record for that session or PDP Context, by the free format data received in this IF.</li> </ul> <p>If no Logical call record exists yet for that session or PDP Context, then the gprsSSF shall ignore this IE.</p>

PDP Id	C	This IE identifies the PDP context's Logical call record to which the free format data shall be appended or overwritten. If not present, the free format data belong to a Logical call record for a session or a single PDP context for the dialogue.
--------	---	---

M Mandatory (The IE shall always be sent)

O Optimal (Service logic dependent)

C Conditional (The IE shall be sent, if available)

## 6.6.2.7 Release GPRS

### 6.6.2.7.1 Description

This IF is used by the gsmSCF to tear down an existing GPRS session or PDP Context at any phase.

### 6.6.2.7.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
GPRS Cause	<u>M</u>	<u>This IE contains the Cause value indicating the reason for releasing the GPRS session or PDP context.</u>
PDP ID	C	This IE identifies the PDP context which shall be released. If not present the dialogue corresponds to the session or to one single PDP context.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

## 6.6.2.8 Request Report GPRS Event

### 6.6.2.8.1 Description

This IF is used to request the gprsSSF to monitor for an event and send a notification back to the gsmSCF when the event is detected (see Event Report Data).

### 6.6.2.8.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
GPRS Event	M	This IE specifies the event or events of which a report is requested.
PDP ID	C	This IE identifies the PDP context, which the Request Report GPRS Event is applicable for. If not present the dialogue corresponds to the session or to one single PDP context.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

Data Event contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
GPRS Event type	M	This IE specifies the type of event of which a report is requested.
Monitor Mode	M	This IE indicates how the event shall be reported.

M Mandatory (The IE shall always be sent)

### 6.6.2.9 Reset Timer GPRS

#### 6.6.2.9.1 Description

This IF is used to refresh the gprsSSF timer.

#### 6.6.2.9.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>Timer ID</u>	<u>M</u>	<u>This IE specifies the default value for the Tssf timer.</u>
Timer Value	M	This IE specifies the value to which the timer Tssf shall be set.
PDP ID	C	This IE identifies the PDP context, which the Reset of the timer is applicable for. If not present the dialogue corresponds to the session or to one single PDP context.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)



## 6.6.2.10 Send Charging Information GPRS

### 6.6.2.10.1 Description

This IF is used to send e-parameters from the gsmSCF to the gprsSSF. If charge advice information is received from the gsmSCF, it shall replace the charge advice information which would be generated by the SGSN and inhibit any further generation of CAI by the SGSN. Further processing of the charge advice information by the SGSN shall be in accordance with the GSM Advice of Charge Supplementary Service.

NOTE: If charge advice information is received from the gsmSCF after charge information has been generated by the SGSN and sent to the MS, the behaviour of the service may be unpredictable or incorrect; the service designer should therefore ensure that the first set of charge advice information is sent to the gprsSSF before charge information is sent to the MS.

### 6.6.2.10.2 Information Elements

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
SCI GPRS Billing ChargingCharacteristics	M	This IE defines the Advice Of Charge related information to be provided to the Mobile Station, if supported by the SGSN.

M Mandatory (The IE shall always be sent)

GPRS SCI Billing Charging Characteristics is defined as:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
AOC GPRS	M	This IE is sent after an Activate PDP Context Accept or Attach Accept has been received from the SGSN. This IE defines the Advice Of Charge related information to be provided to the Mobile Station, if supported by the SGSN.
PDP Id	C	This IE is included if the AoC is applicable to a PDP context. If not present the AoC is applicable to the session or for a single PDP context for the dialogue.

M Mandatory (The IE shall always be sent)

C Conditional (only one of these IEs may be sent)

C Conditional (The IE shall be sent, if available)

AOC GPRS is defined as:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
AOC Initial	M	This IE contains CAI elements as defined in 3G TS 22.024 [x].
AOC Subsequent	O	See definition in the next table.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

AOC Subsequent is defined as:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
CAI Elements	M	This IE contains CAI elements as defined in 3G TS 22.024 [x].
Tariff Switch Interval	O	This IE indicates the tariff switch time until the next tariff switch applies.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

## 6.6.3 HLR to SGSN Information Flows

### 6.6.3.1 Insert Subscriber Data

#### 6.6.3.1.1 Description

This IF is specified in 3G TS 29.002 [4] and used by the HLR to insert subscriber data in the SGSN.

#### 6.6.3.1.2 Information Elements

Insert Subscriber Data contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
GPRS-CSI	C	This IE identifies the subscriber as having CAMEL GPRS services.

C Conditional (The IE shall be sent, if required)

GPRS-CSI contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
GsmSCF Address	M	This IE is described in section 0
Service Key	M	This IE is described in section 0.
Default Session Handling	M	This IE is described in section 0.
TDP List	M	This IE is described in section 0.

M Mandatory (The IE shall always be sent)

## 6.6.4 SGSN to HLR Information Flows

### 6.6.4.1 Update GPRS Location

#### 6.6.4.1.1 Description

This IF is used by the SGSN to indicate to the HLR a GPRS location update. This IF is specified in 3G TS 29.002 [4].

### 6.6.4.1.2 Information Elements

Update GPRS location contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Supported CAMEL Phases	C	This IE identifies which CAMEL phases are supported by the SGSN. The SGSN may indicate support of CAMEL phase 3 or higher.

C Conditional (The IE shall always be sent when the SGSN supports CAMEL.)

## 6.6.5 SGSN to HLR Information Flows

### 6.6.5.1 Insert Subscriber Data ack

See section 4.6.8.

# 7 Short Message Service

## 7.1 Architecture

### 7.1.1 Functional Entities used for CAMEL

This subclause describes the functional architecture needed to support MO SMS interworking for CAMEL. Figures 7.1 and 7.2 show the functional entities involved in MO SM's requiring CAMEL support. The architecture is applicable to the third phase of CAMEL.

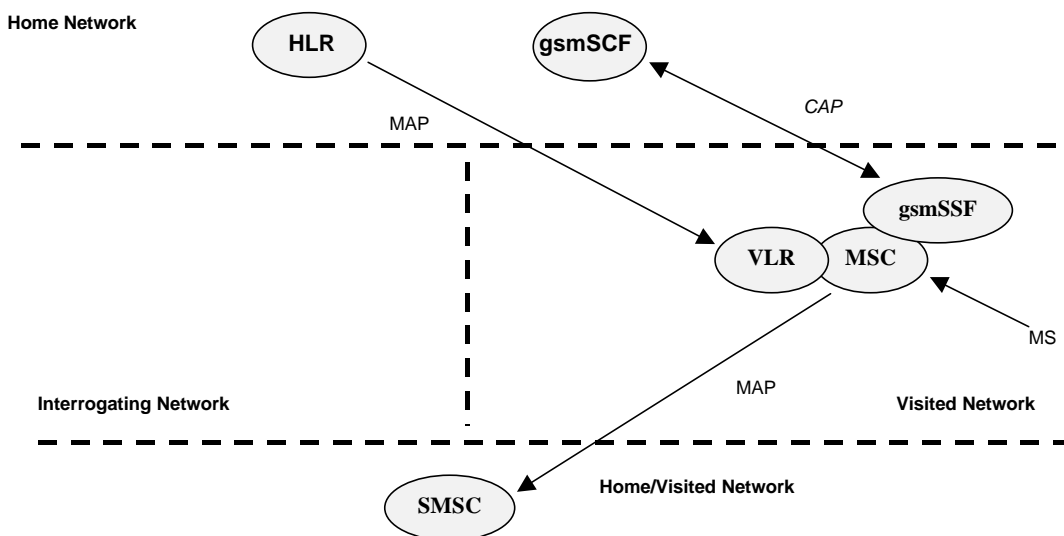


Figure 7.1: Functional architecture for support of CAMEL control of MSC switched MO SMS

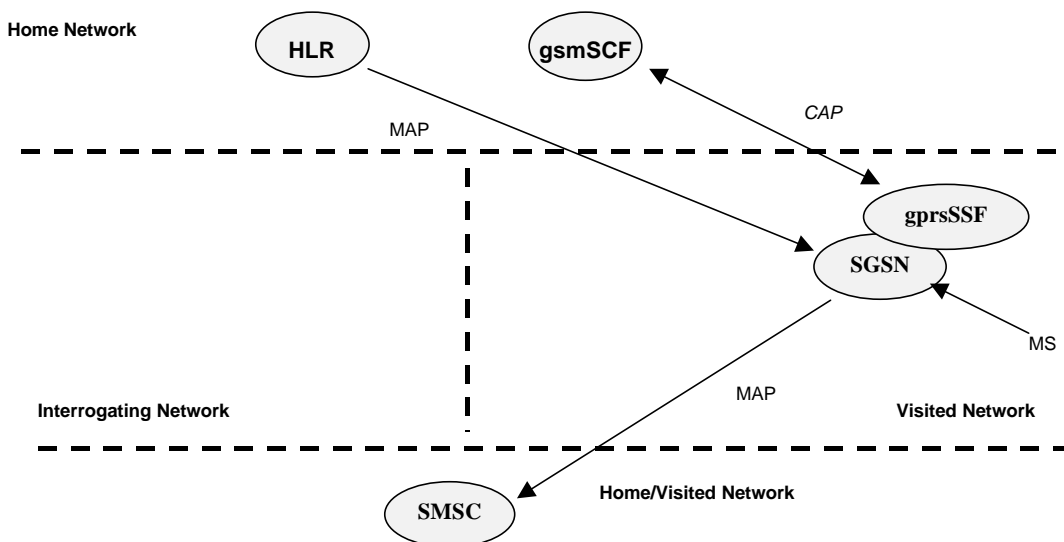


Figure 7.2: Functional architecture for support of CAMEL control of SGSN switched MO SMS

HLR: The HLR stores SMS-CSI. SMS-CSI contains subscription information for subscribers that require CAMEL support of MO SMS. SMS-CSI is transferred to the VLR or to the SGSN on Location Update and Restore Data or when SMS-CSI has changed.

VLR: The VLR receives the SMS-CSI for the subscriber from the HLR. SMS-CSI is used by the MSC to determine if a Service Logic shall be invoked for an MO SMS.

SGSN: The SGSN receives the SMS-CSI for the subscriber from the HLR. The SGSN uses the SMS-CSI to determine if a Service Logic shall be invoked for an MO SMS.

MSC: The MSC receives SMS-CSI from the VLR and uses this to determine if a Service Logic shall be invoked for an MO SMS.

gprsSSF: see subclause 4.1.

gsmSSF: see subclause 4.1.

gsmSCF: see subclause 4.1.

SMSC: Short Message Service Centre.

## 7.1.2 Interfaces defined for CAMEL

### 7.1.2.1 HLR –VLR interface

This interface is used to send CAMEL related subscriber data (SMS-CSI) to a visited MSC/VLR or to remove CAMEL related subscriber data from a visited MSC/VLR.

### 7.1.2.2 HLR –SGSN interface

This interface is used to send CAMEL related subscriber data (SMS-CSI) to a visited SGSN or to remove CAMEL related subscriber data from a visited SGSN.

### 7.1.2.3 gsmSSF - gsmSCF interface

This interface is used by the gsmSCF to control the handling of MO SMS in the MSC. A relationship on this interface is opened as a result of the gsmSSF sending a request for instructions to the gsmSCF.

### 7.1.2.4 gprsSSF - gsmSCF interface

This interface is used by the gsmSCF to control the handling of MO SMS in the SGSN. A relationship on this interface is opened as a result of the gprsSSF sending a request for instructions to the gsmSCF.

### 7.1.2.5 MSC - gsmSSF interface

This is an internal interface. The interface is described in the specification to make it easier to understand the handling of DPs (arming/disarming of DPs, DP processing etc.).

### 7.1.2.6 SGSN - gprsSSF interface

This is an internal interface. The interface is described in the specification to make it easier to understand the handling of DPs (arming/disarming of DPs, DP processing etc.).

### 7.1.2.7 MSC - VLR interface

This is an internal interface. The interface is described in the specification to make it easier to understand the internal information flow within the MSC/VLR.

### 7.1.2.8 MSC - SMSC interface

This interface is used by the MSC to submit a SM to the SMSC.

### 7.1.2.9 SGSN - SMSC interface

This interface is used by the SGSN to submit a SM to the SMSC.

## 7.2 Detection Points (DPs)

See subclause 4.2.

## 7.3 Description of CAMEL Subscriber Data

### 7.3.1 CAMEL Subscription Information for MO SMS (SMS-CSI)

This subclause defines the contents of the Short Message Service CAMEL Subscription Information.

#### 7.3.1.1 gsmSCF address

Address to be used to access the gsmSCF for a particular subscriber. The address shall be an E.164 number to be used for routing.

#### 7.3.1.2 Service Key

The Service Key identifies to the gsmSCF the service logic.

#### 7.3.1.3 Default SMS Handling

The Default SMS Handling indicates whether the Short Message submission shall be released or continued as requested in the case of error in the dialogue between gsmSCF and gsmSSF or gprsSSF.

#### 7.3.1.4 TDP List

The TDP List indicates on which detection point triggering shall take place. For SMS-CSI only DP - SMS\_Collected\_Info is used.

#### 7.3.1.5 CAMEL Capability Handling

CAMEL Capability Handling indicates the phase of CAMEL which is asked by the gsmSCF for the service.

#### 7.3.1.6 CSI state

The CSI state indicates whether the SMS-CSI is active or not.

### 7.3.1.7 Notification flag

The notification flag indicates whether the change of the SMS-CSI shall trigger Notification on Change of Subscriber Data or not.

## 7.4 Description of SMS State Model

### 7.4.1 General Handling

See subclause 4.4.1.

The State Model for MO SMS handling contains Points in Association (PIA's) instead of Points in Call (PIC's).

### 7.4.2 Originating State Model for SMS

#### 7.4.2.1 Description of SMS state model

The MO SMS state model is used to describe the actions in an MSC and in a SGSN during mobile originating SMS.

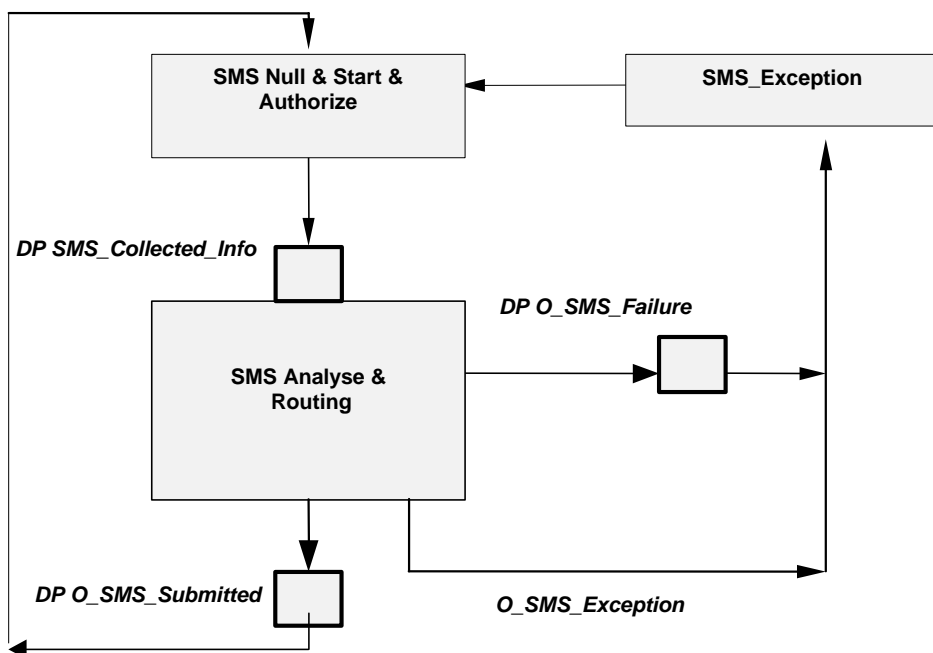


Figure 7.3: MO SMS State Model.

**Table 7: Description of MO SMS DPs in the MSC and SGSN**

<b>CAMEL Detection Point:</b>	<b>DP Type</b>	<b>Description:</b>
DP SMS_Collected_Info	TDP-R	Indication that the SMS-CSI is analysed and a mobile originated short message is received.
DP O_SMS_Failure	EDP-N, EDP-R	Indication that the SM submission to the Short Message Service Centre failed
DP O_SMS_Submitted	EDP-N, EDP-R	Indication that the SM has been successfully submitted to the Short Message Service Centre.

#### 7.4.2.1.1 Description of the state model for SMS (PIAs)

This subclause describes the state model for originating SMS transfer. For each PIA a description can be found of the entry events, functions and exit events.

##### 7.4.2.1.1.1 SMS Null & Start & Authorize

Entry events:

- Previous MO SMS transfer to the SMSC completed (DP - O\_SMS\_Submitted).
- Exception event is reported.

Actions:

- Interface is idled.
- Authentication.
- Ciphering.
- SMS subscription check.
- RP-MO-DATA message containing the User Data and the SMSC address is received from MS.
- The supplementary service "barring of all outgoing calls" is checked and invoked if necessary.
- The ODB category "barring of all outgoing calls" is checked and ODB is invoked if necessary.

Exit events:

- SMS-CSI is analysed.
- An exception condition is encountered

##### 7.4.2.1.1.2 SMS Analyse & Routing

Entry events:

- SMS - CSI is analysed. (SMS\_Collected\_Info).

Actions:

- Information being analysed and/or translated to determine routing address of the SMSC.
- Outgoing barring services and ODB categories not already applied are checked and invoked if necessary.
- The short message is sent to the SMSC.

Exit events:

- Acknowledge from the SMSC is received. (O\_SMS\_submitted)

A positive acknowledgement is sent to the MS.

- An exception condition is encountered - this leads to the SMS\_Exception PIA.



A negative acknowledgement is sent to the MS.

- Attempt to select the route for the SMS fails (O\_SMS\_Failure).

A negative acknowledgement is sent to the MS.

- Negative acknowledgement from the SMSC is received (O\_SMS\_Failure).

A negative acknowledgement is sent to the MS.

### 7.4.2.1.1.3 SMS\_Exception

Entry events:

- An exception condition is encountered. In addition to specific examples listed above, exception events include any type of failure, which means that the normal exit events for a PIA can not be met.

Actions:

- Default handling of the exception condition is applied. This includes general actions necessary to ensure that no resources remain inappropriately allocated such as:
  - If a relationship exists between the gsmSCF and gsmSSF or gprsSSF send an error information flow closing the relationship and indicating that any outstanding Short Message handling instructions will not run to completion
  - The MSC/gsmSSF or SGSN/gprsSSF shall make use of vendor-specific procedures to ensure release of internal resources.

Exit events:

- Default handling of the exception condition by MSC/gsmSSF or SGSN/gprsSSF completed.

## 7.5 Procedures for CAMEL SMS

### 7.5.1 Overall SDL architecture

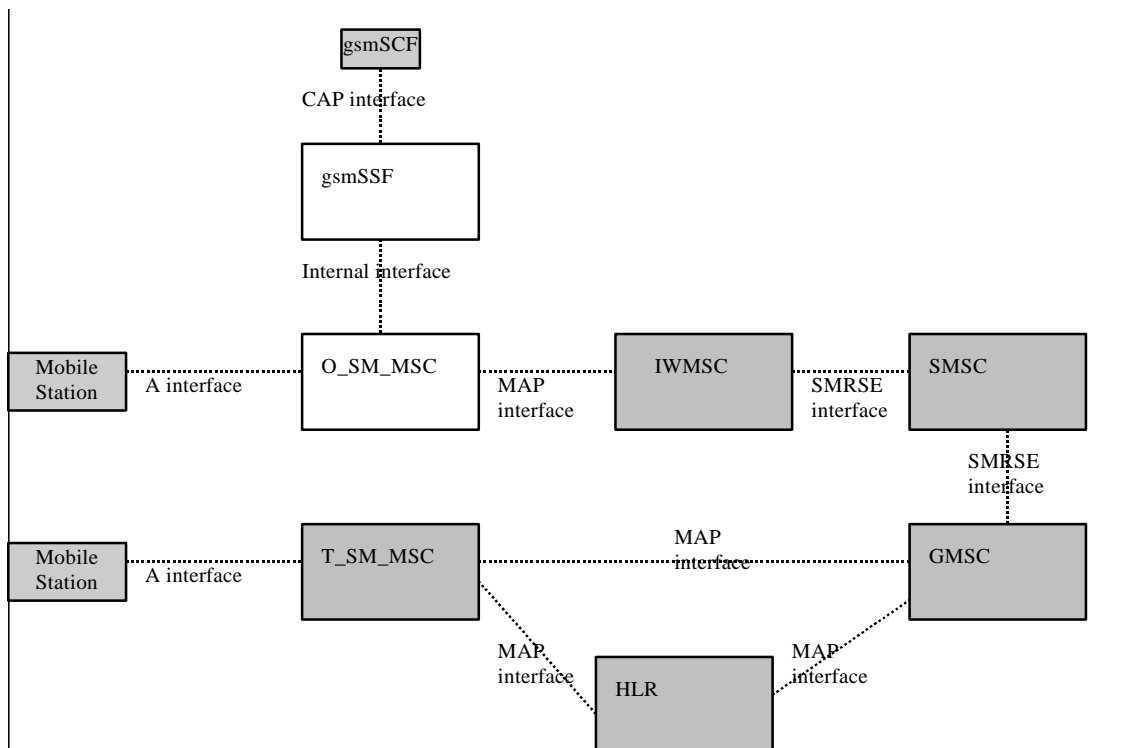


Figure 7.4: Case of MO SMS via MSC (separated IWMSC)

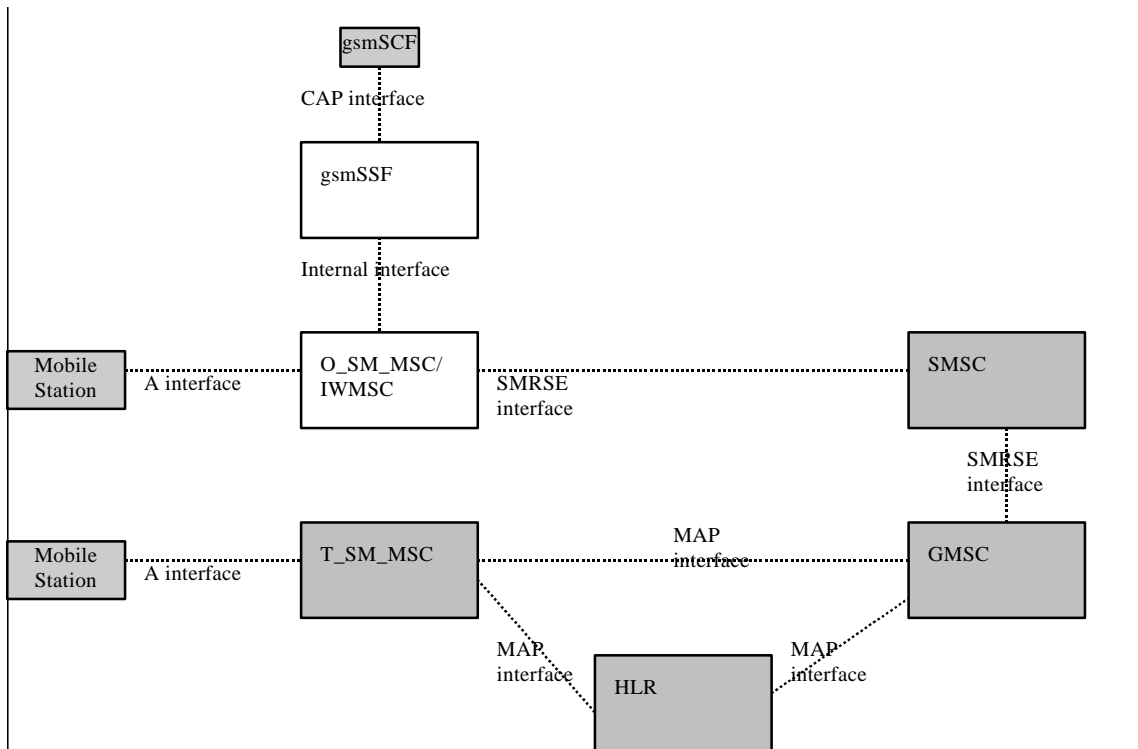


Figure 7.5: Case of MO SMS via MSC (integrated IWMSC)

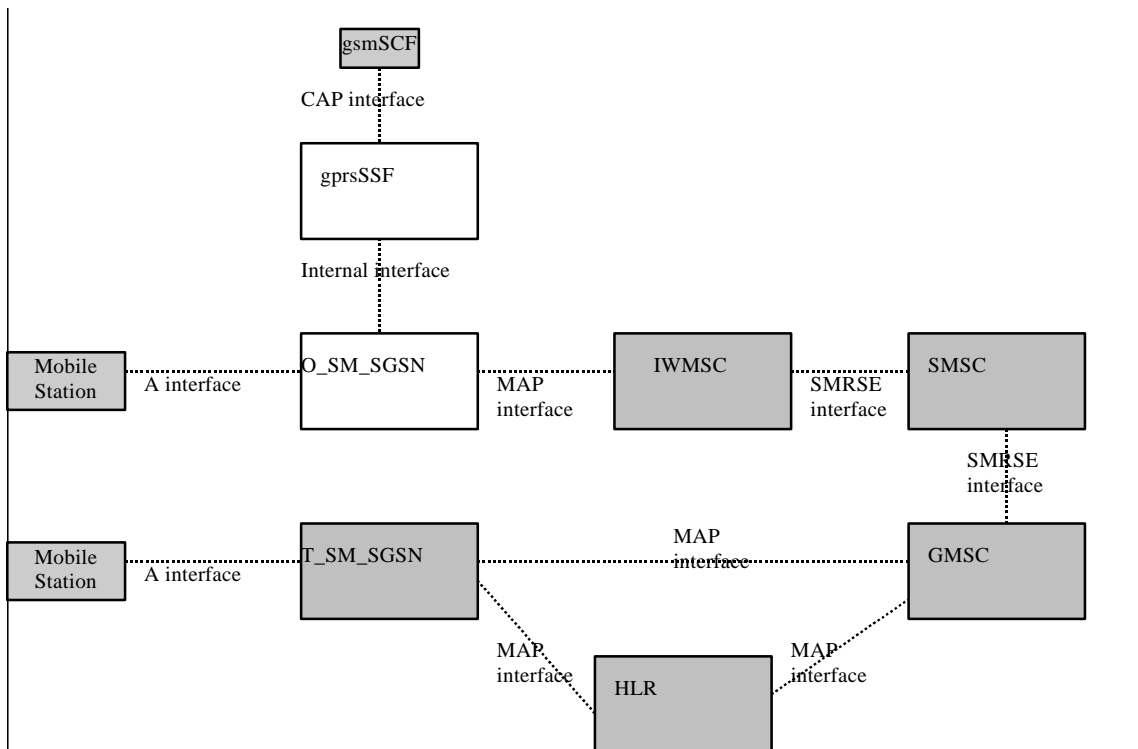


Figure 7.6: Case of MO SMS via GPRS SGSN

## 7.5.2 Handling of mobile originated SMS

### 7.5.2.1 Handling of mobile originated SMS in the originating MSC/SGSN

The functional behaviour of the originating VMSC/SGSN is specified in 3G TS 29.002 [4]. The procedures specific to CAMEL are specified in this subclause :

- Procedure CAMEL\_O\_SMS\_INIT,
- Procedure CAMEL\_O\_SMS\_SUBMITTED,
- Procedure CAMEL\_O\_SMS\_FAILURE

#### 7.5.2.1.1 Actions of the VMSC/SGSN on receipt of Int\_Error

The MSC checks the default SMS Handling parameter in SMS-CSI.

If the default SMS handling is release SM, a A\_RP\_ERROR is sent to the MS. The MSC/SGSN then releases all resources and the procedure CAMEL\_O\_SMS\_INIT ends.

If the default SMS handling is continue SMS submission, the MSC/SGSN continues processing without CAMEL support.

#### 7.5.2.1.2 Actions of the MSC/SGSN on receipt of Int\_Continue\_SMS

The MSC/SGSN continues processing with modified SM parameters. The MSC/SGSN shall transparently modify the SMS parameters with the received information. Parameters which are not included in the Int\_Continue\_SMS message are unchanged.

#### 7.5.2.1.3 Actions of the MSC/SGSN on receipt of Int\_Connect\_SMS

The MSC/SGSN continues processing with modified SM parameters. The MSC/SGSN shall transparently modify the SMS parameters with the received information. Barring is checked with the modified parameters. Parameters which are not included in the Int\_Connect\_SMS message are unchanged.

#### 7.5.2.1.4 Actions of the MSC/SGSN on receipt of Int\_Release\_SMS

A A\_RP\_ERROR is sent to the MS and SMS is deleted. The SMS cause received in the Int\_Release\_SMS is used. The MSC/SGSN then releases all resources and the procedure CAMEL\_O\_SMS\_INIT ends.

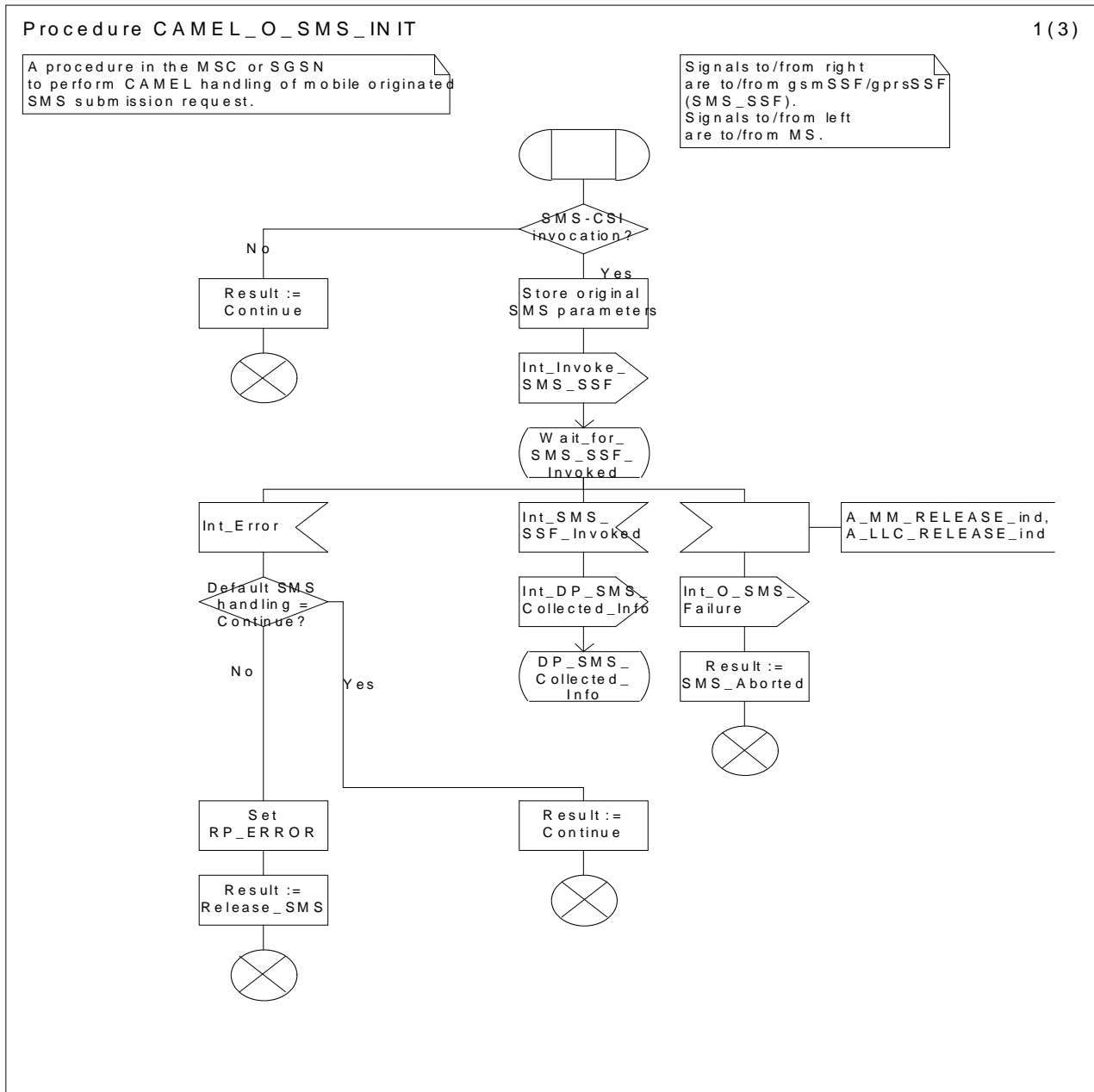


Figure 7.7 a: Procedure CAMEL\_O\_SMS\_INIT (sheet1)

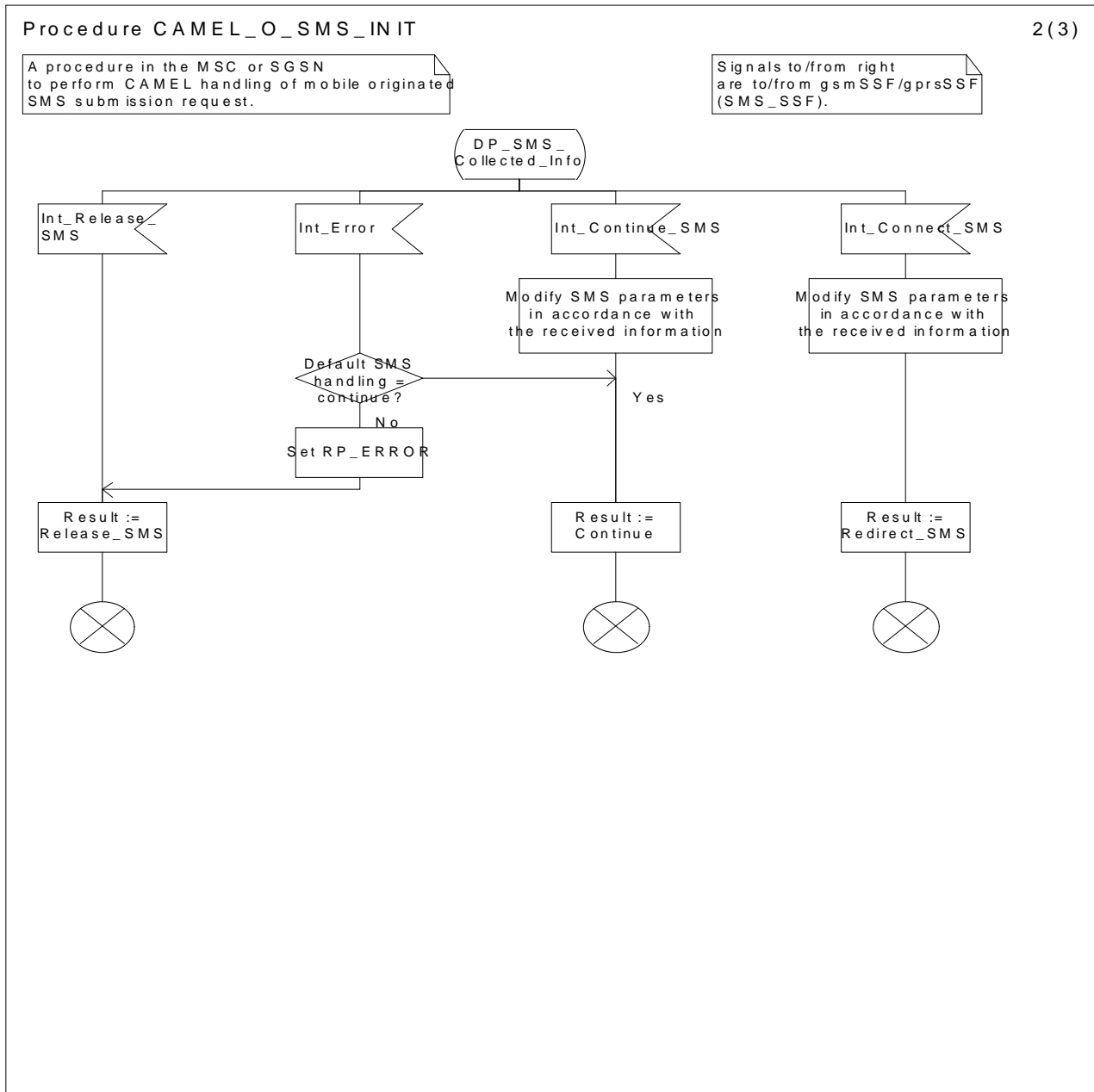


Figure 7.7 b: Procedure CAMEL\_O\_SMS\_INIT (sheet2)

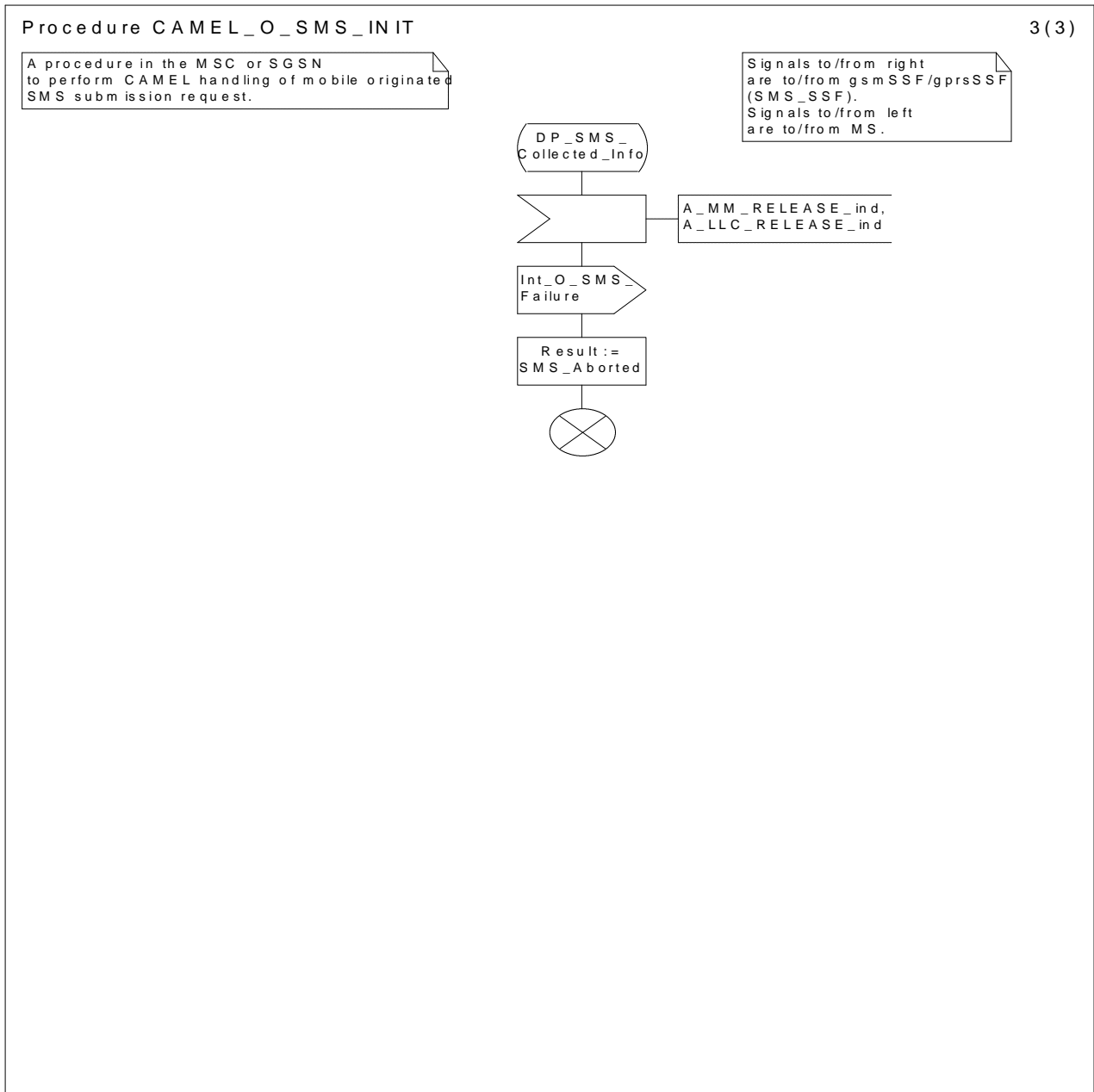


Figure 7.7 c: Procedure CAMEL\_O\_SMS\_INIT (sheet3)

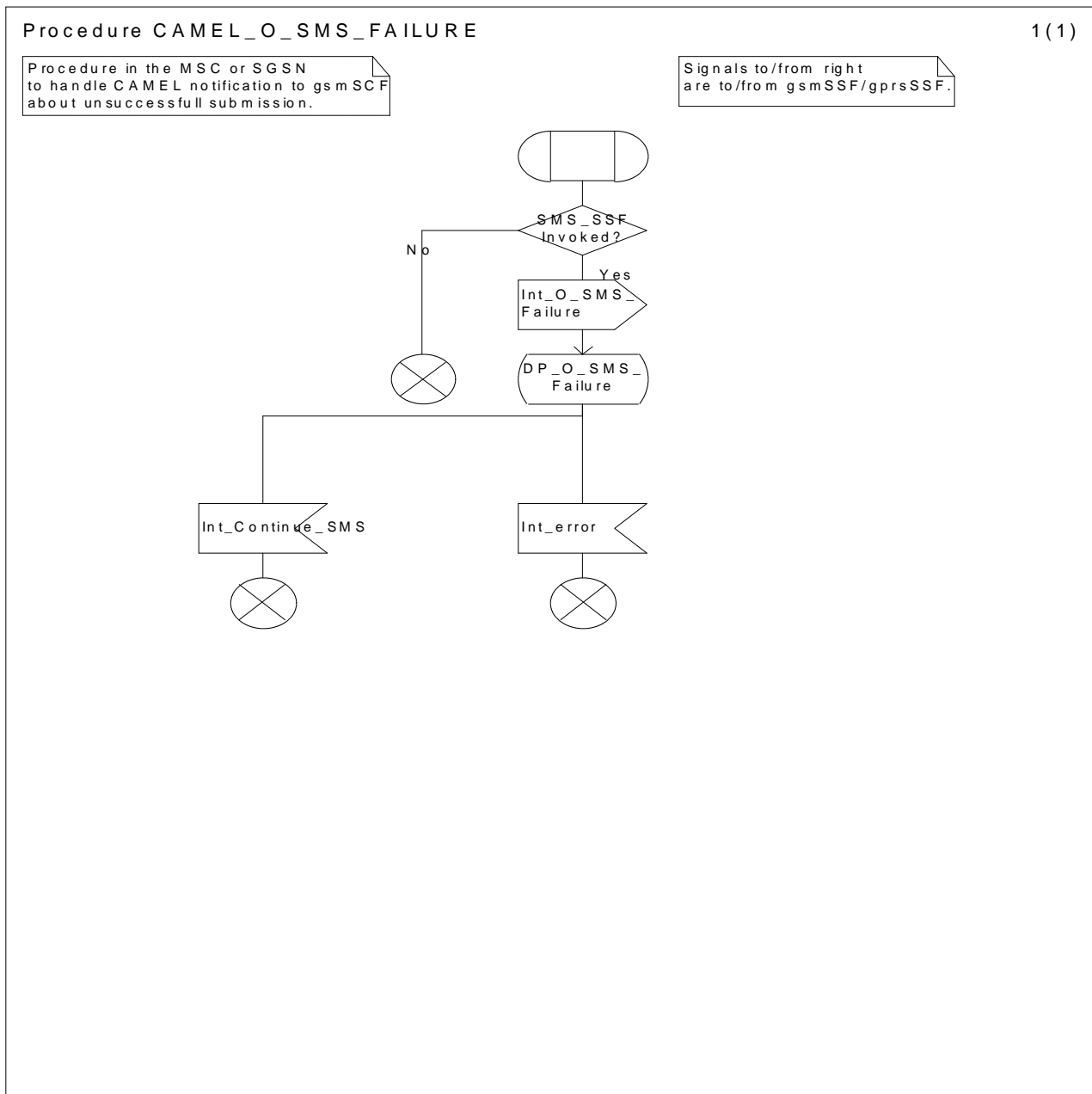


Figure 7.8: Procedure CAMEL\_O\_SMS\_FAILURE (sheet1)

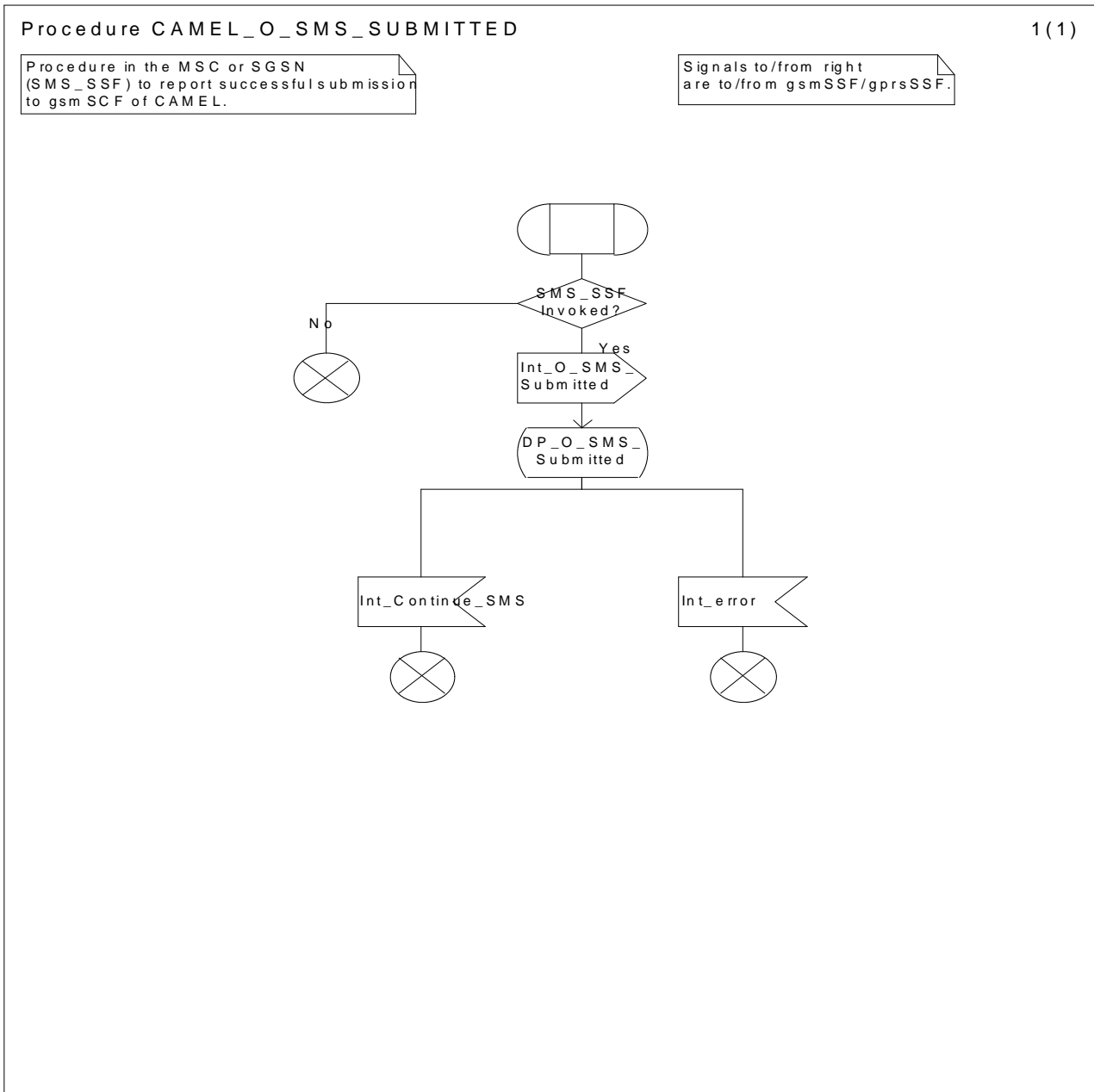


Figure 7.9: Procedure CAMEL\_O\_SMS\_SUBMITTED (sheet1)

### 7.5.3 Handling of mobile originated SMS in the gsmSSF/gprsSSF



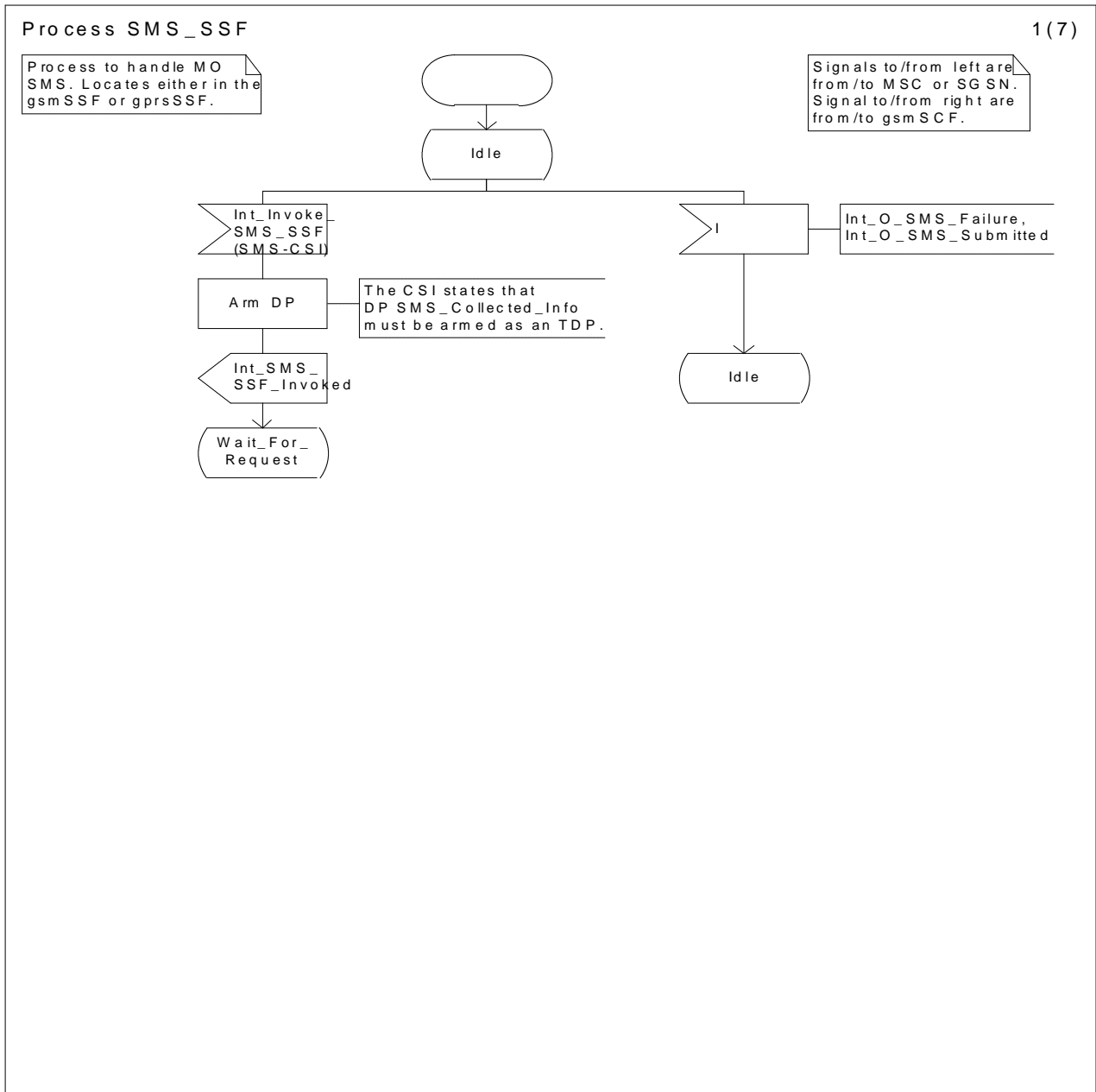


Figure 7.10 a: Process MO\_SMS (sheet 1)

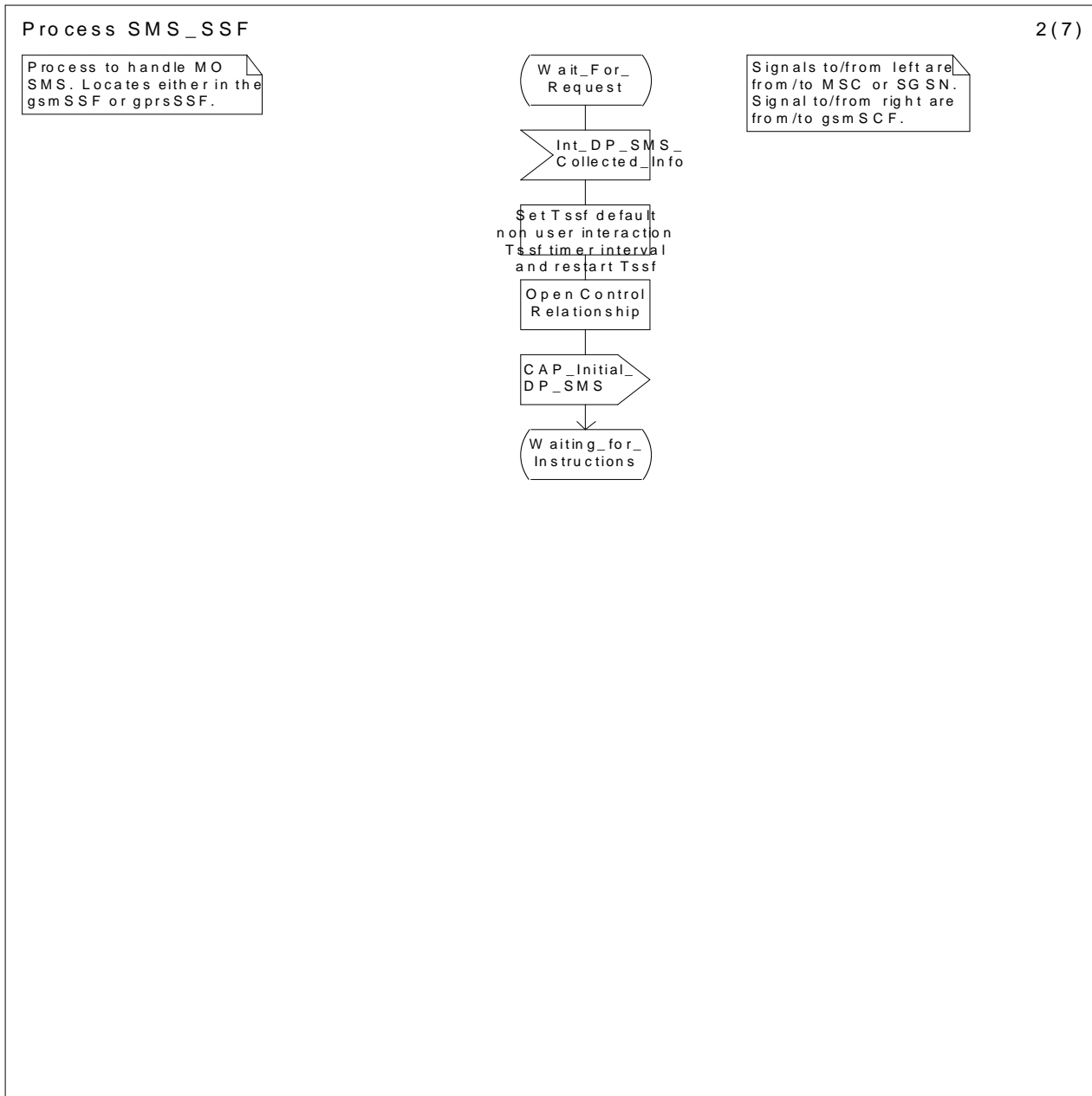


Figure 7.10 b: Process MO\_SMS (sheet 2)

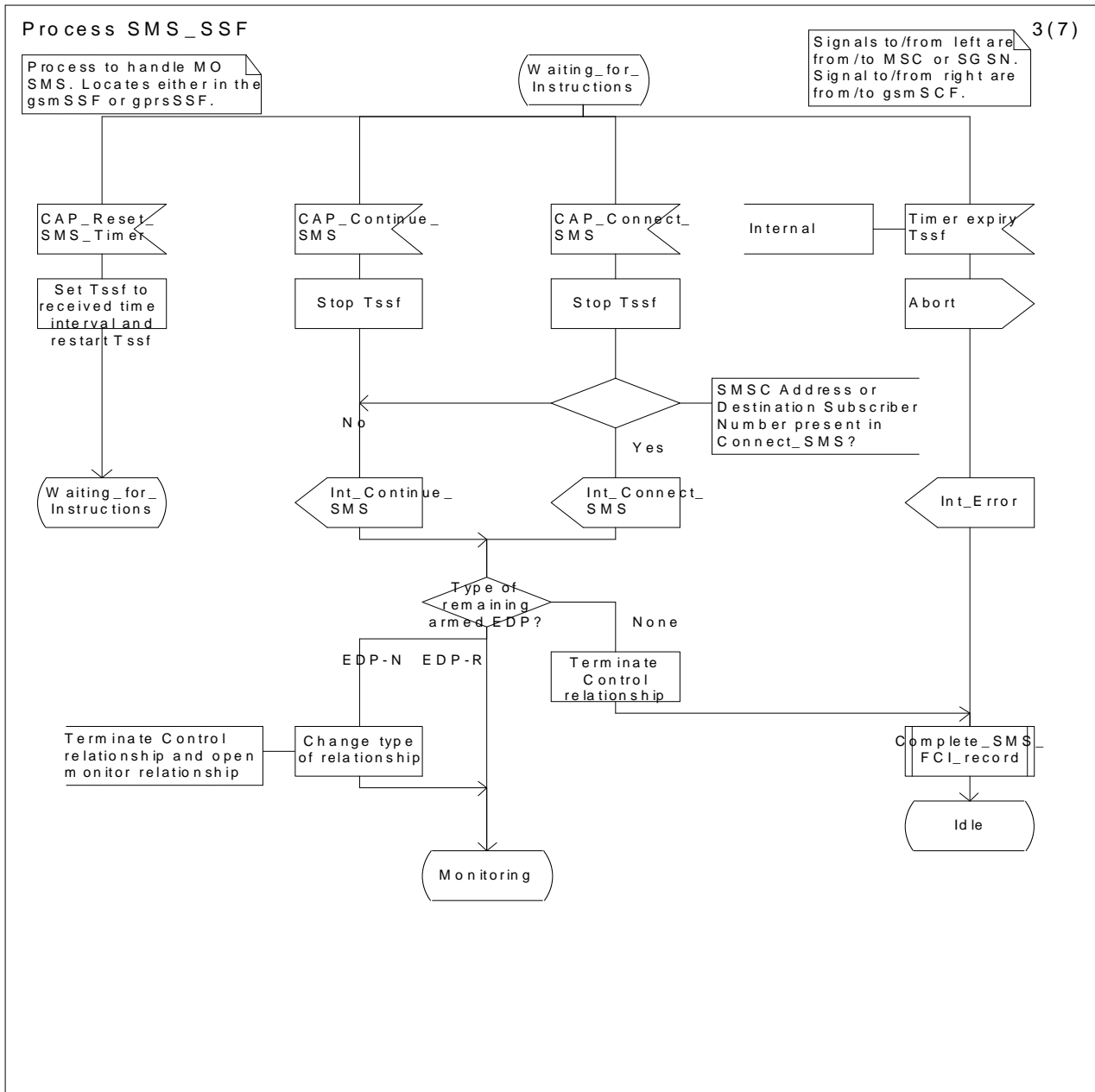


Figure 7.10 c: Process MO\_SMS (sheet 3)

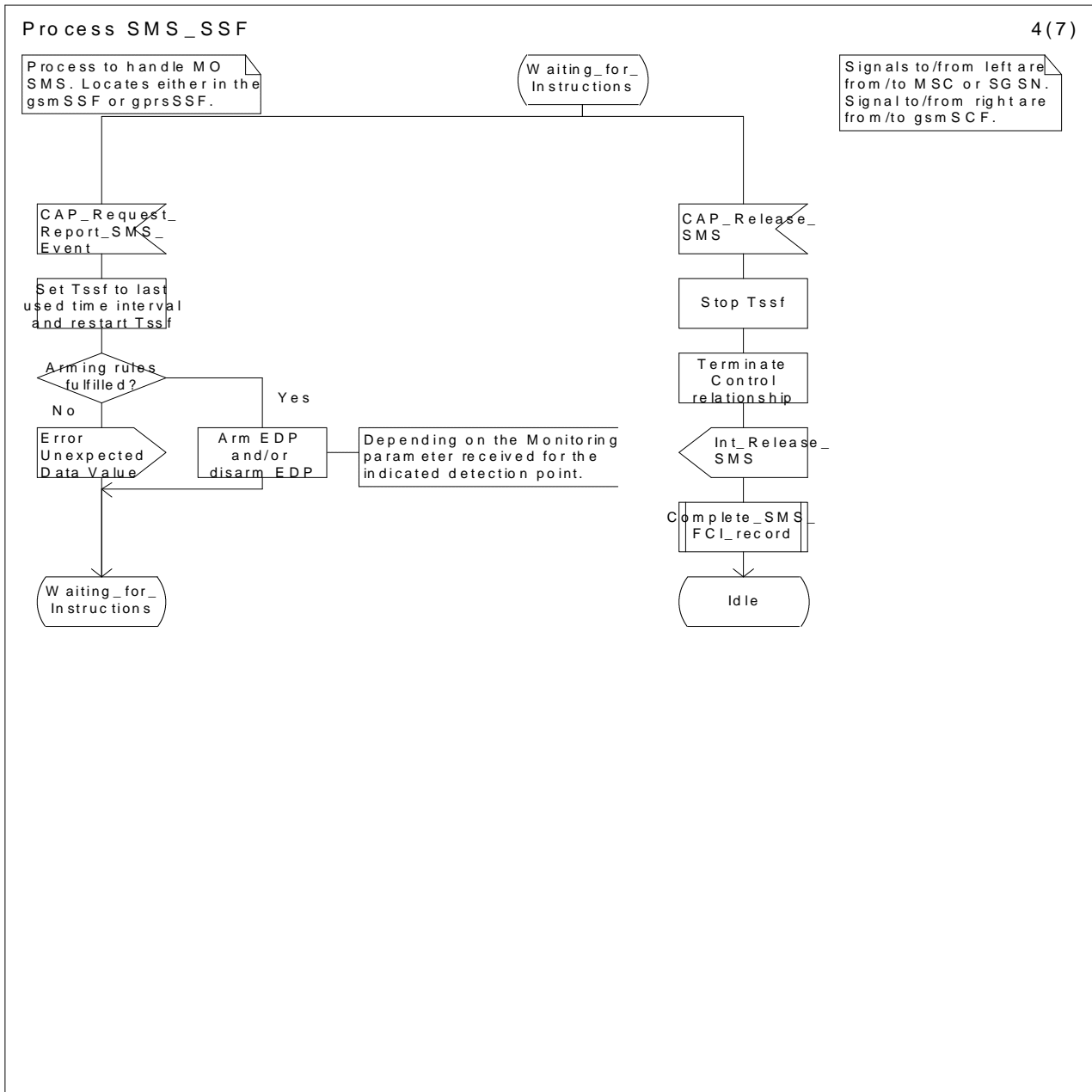


Figure 7.10 d: Process MO\_SMS (sheet 4)

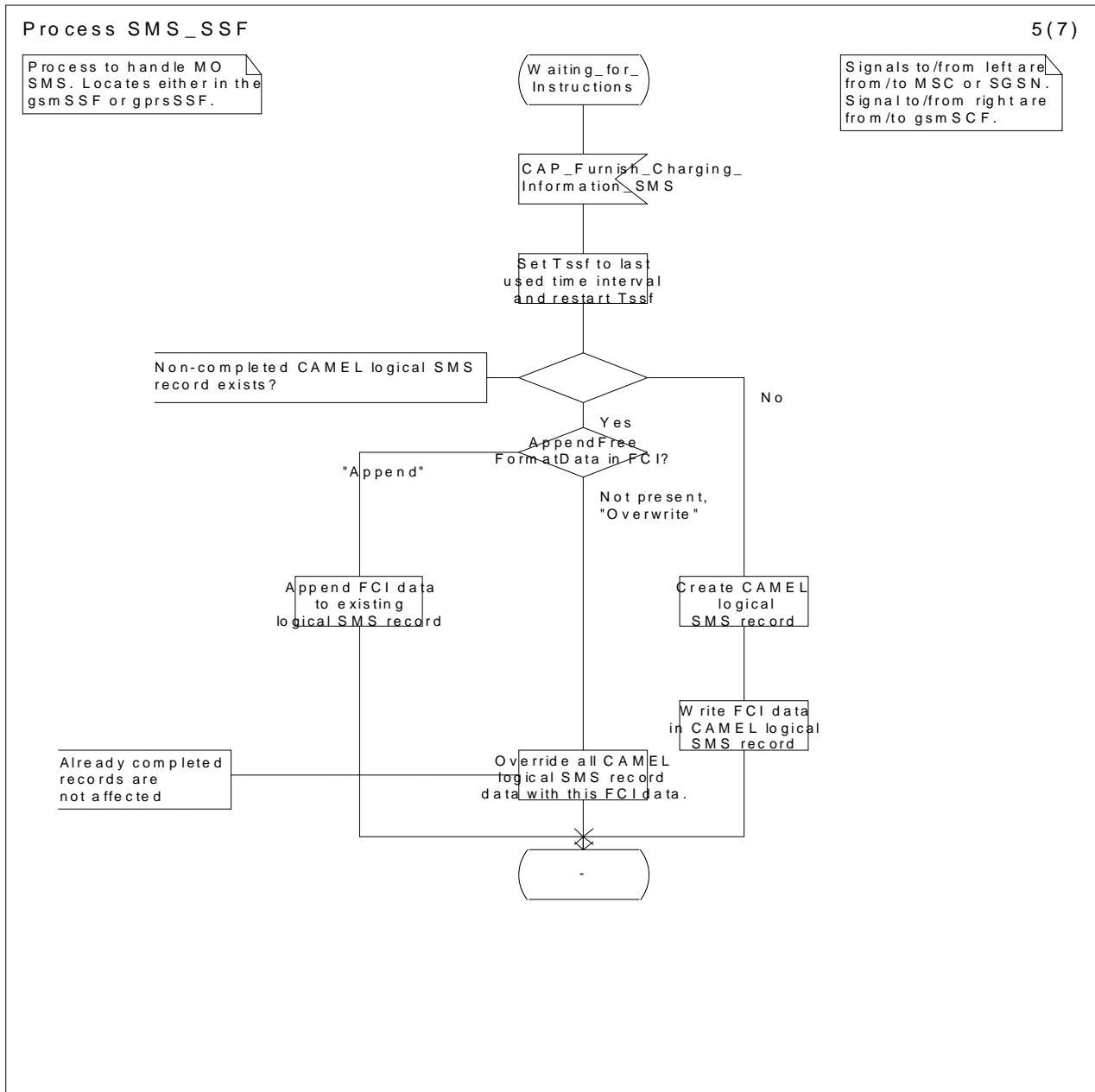


Figure 7.10 e: Process MO\_SMS (sheet 5)

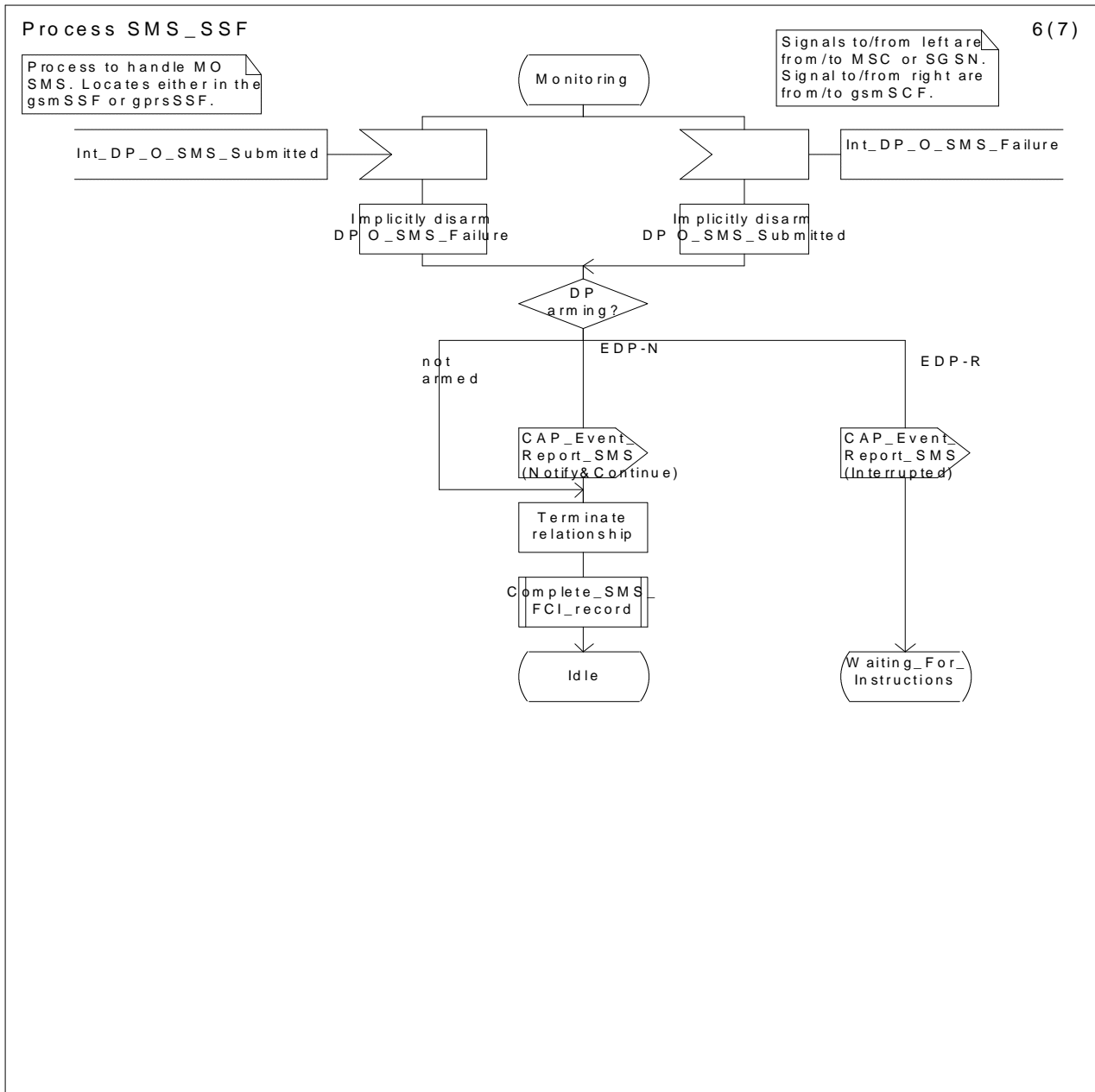


Figure 7.10 f: Process MO\_SMS (sheet 6)

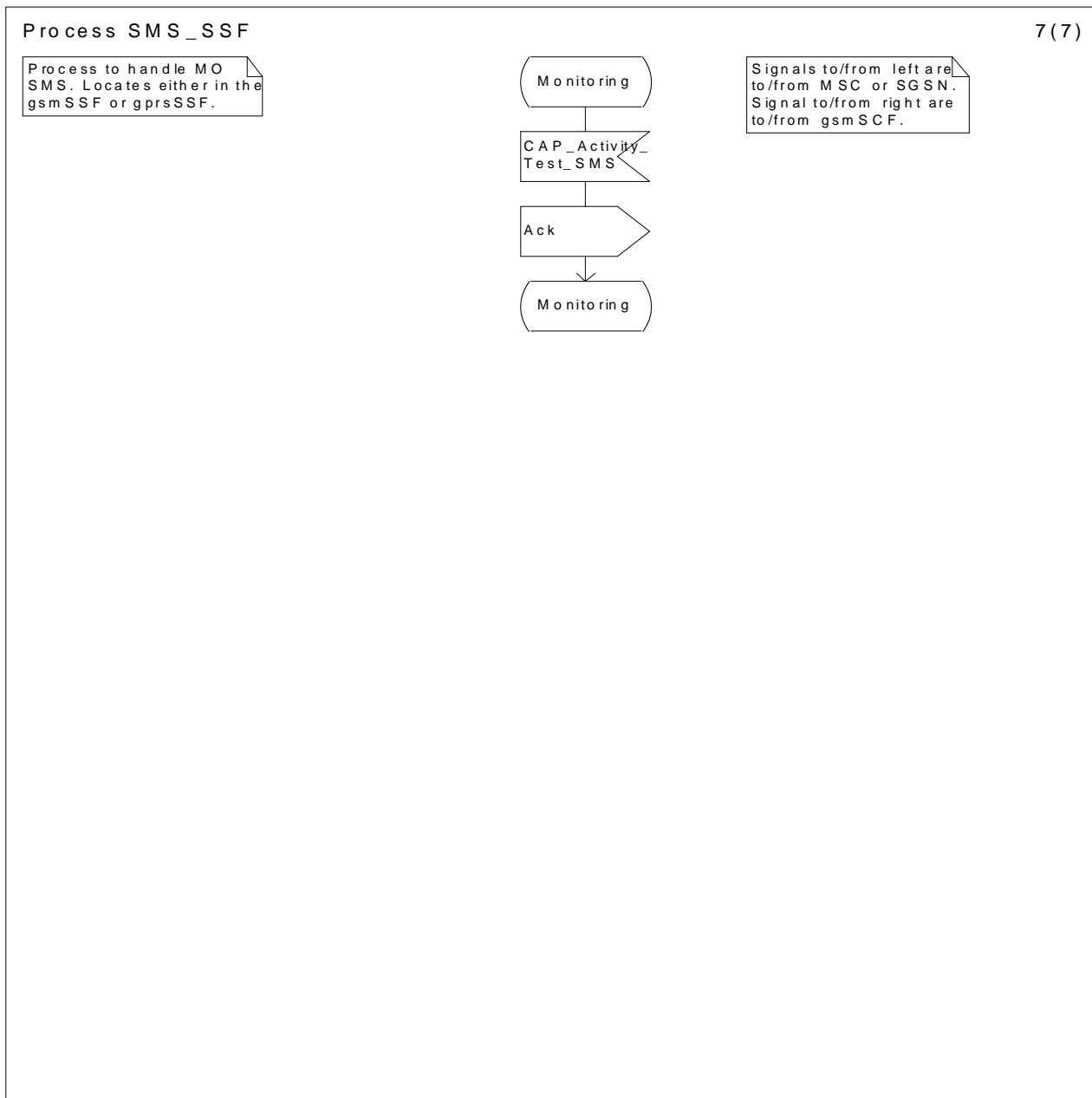


Figure 7.10 g: Process MO\_SMS (sheet 7)

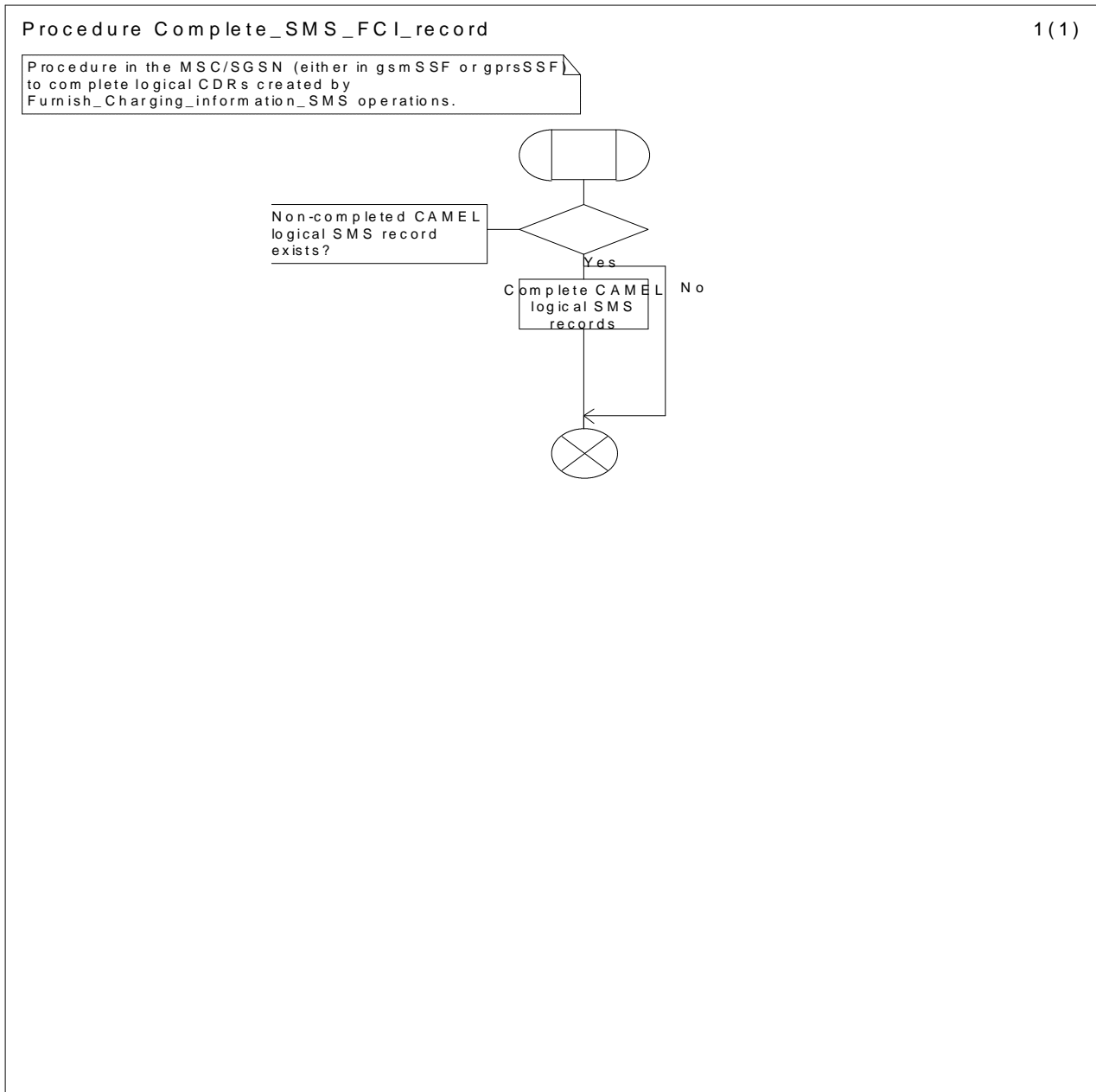


Figure 7.11: Procedure Complete\_SMS\_FCI\_record (sheet 1)

## 7.6 Description of information flows

### 7.6.1 gsmSSF/gprsSSF to gsmSCF information flows

#### 7.6.1.1 Activity Test SMS ack

##### 7.6.1.1.1 Description

This IF is the response to the Activity Test sent by the gsmSCF.



### 7.6.1.1.2 Information Elements

This IF contains no information elements.

### 7.6.1.2 Event Report SMS

#### 7.6.1.2.1 Description

This IF is used to notify the gsmSCF of an event previously requested by the gsmSCF in a Request Report SMS Event IF.

#### 7.6.1.2.2 Information Elements

Information element name	MO SMS	Description
Event type	M	This IE specifies the type of event that is reported.
Event Specific Information	C	This IE indicates the SMS related information specific to the event.
Misc SMS Info	M	This IE indicates the DP type.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

### 7.6.1.3 Initial DP SMS

#### 7.6.1.3.1 Description

This IF is generated by the gsmSSF/gprsSSF when a trigger is detected at a DP in the state model, to request instructions from the gsmSCF.

#### 7.6.1.3.2 Information Elements

Information element name	MO SMS	Description
Destination Subscriber Number	M	This IE contains a number to identify the Destination short message entity.  The Destination Subscriber Number shall be retrieved from the SMS-SUBMIT TPDU which is specified in 3G TS 23.040 [21].
Calling Party Number	M	This IE carries the MSISDN of the subscriber who sent the short message.
Event Type	M	This IE indicates the armed event (i.e., <i>SMS_Collected_Info</i> ) resulting in the Initial DP SMS IF.
IMSI	M	This IE identifies the mobile subscriber.
Location Information in MSC	C	This IE is described in the next table.
Location Information in SGSN	C	This IE is described in the table below.
Service Key	M	The Service Key identifies to the gsmSCF the service logic.
Time And Timezone	M	This IE contains the time that the gsmSSF/gprsSSF was triggered, and the time zone the gsmSSF/gprsSSF resides in.
TP Short Message Submission Specific Information	M	This IE contains the 1 <sup>st</sup> octet of the SMS-SUBMIT TPDU which is specified in 3G TS 23.040 [21].  The 1 <sup>st</sup> octet includes the following information: <ul style="list-style-type: none"> <li>– Message Type Indicator</li> <li>– Reject Duplicates</li> <li>– Validity Period Format</li> <li>– Status Report Request</li> <li>– User Data Header Indicator</li> <li>– Reply Path</li> </ul>
TP Protocol Identifier	M	This IE indicates the protocol used above SM-Transfer Layer.  The TP Protocol Identifier shall be retrieved from the SMS-SUBMIT TPDU which is specified in 3G TS 23.040 [21].
TP Data Coding Scheme	M	This IE indicates the data coding scheme of the TP-User Data field, and may indicate a message class. The message class may indicate e.g. the originator of Short Message.  The TP Data Coding Scheme shall be retrieved from the SMS-SUBMIT TPDU which is specified in 3G TS 23.040 [21].
TP Validity Period	C	This IE indicates the length of the validity period or the absolute time of the validity period termination.  The TP Validity Period shall be retrieved from the SMS-SUBMIT TPDU which is specified in 3G TS 23.040 [21].
SMSC Address	M	This I.E defines the address of the SMSC to which the MO short message is intended to be submitted.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

Location Information in MSC contains the following information:

Information element name	MO SMS	Description
CellIdOrLAI	M	See 3G TS 23.018 [3].
Geographical Information	C	See 3G TS 23.018 [3].
Geodetic Information	C	See 3G TS 23.018 [3].
VLR number	M	See 3G TS 23.018 [3].
Selected LSA Identity	C1	This IE indicates the LSA identity associated with the current position of the MS. Send if the LSA ID of subscription and LSA ID of the used cell matches. In the case of multiple matches the one with the highest priority is sent. See 3GPP TS 23.073[23]

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

C1 Conditional (The IE shall be sent, if available and SoLSA is supported)

Location Information in the GPRS case contains the following information:

Information element name	MO SMS	Description
CellIdOrRAI	M	See 3G TS 23.018 [3] and 3G TS 23.060 [11].
Geographical Information	C	See 3G TS 23.018 [3].
SGSN number	M	Global Title of the Serving GPRS Service Node. See 3G TS 23.060 [11].

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

## 7.6.2 gsmSCF to gsmSSF/gprsSSF information flows

### 7.6.2.1 Activity Test SMS

#### 7.6.2.1.1 Description

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

#### 7.6.2.1.2 Information Elements

This IF contains no information elements.

### 7.6.2.2 Connect SMS

#### 7.6.2.2.1 Description

This IF is used to request the gsmSSF/gprsSSF to perform the actions to route the SMS to a specific destination.

## 7.6.2.2.2 Information Elements

Information element name	MO SMS	Description
Calling Partys Number	O	This IE indicates the subscriber who sent the SMS; possibly changed by the gsmSCF..
Destination Subscriber Number	O	This IE identifies the Destination short message entity; possibly changed by the gsmSCF. The Destination Subscriber Number shall be placed in the header information of the TPDU.
SMSCAddress	O	Indicates the SMSC address where the MO short message shall be submitted to; possibly changed by the gsmSCF.

O Optional (Service logic dependent)

## 7.6.2.3 Continue SMS

## 7.6.2.3.1 Description

This information flow requests the gsmSSF/gprsSSF to proceed normally. The gsmSSF/gprsSSF completes DP processing, and continues SMS.

## 7.6.2.3.2 Information Elements

This IF contains no information elements.

## 7.6.2.4 Furnish Charging Information SMS

## 7.6.2.4.1 Description

This IF is used to request the gsmSSF/gprsSSF to include information in the CAMEL specific logical MO SMS record.

The logical call record is created when FCI-SMS is received and a logical call record for that short message does not exist. For modelling purposes the logical call record is buffered in the gsmSSF/gprsSSF. The gsmSSF/gprsSSF completes logical call records as defined in the SDLs. Once the logical call record is completed, then its free format data is moved to the corresponding CDR and the logical call record is deleted.

The CSE can send multiple concatenated FCIs per Short Message for completion. The total maximum of free format data is 160 octets per SM. The 160 octets may be sent in one or more FCI operations. If there is non-completed free format data and new FCI operation(s) is/are received to overwrite the non-completed data, then the non-completed data is discarded and the gsmSCF can send another 160 octets per SM.

## 7.6.2.4.1 Information Elements

Information element name	MO SMS	Description
FCI Billing Charging	M	This IE is described in the next table.

Characteristics		
-----------------	--	--

M Mandatory (The IE shall always be sent)

FCI Billing Charging Characteristics contains the following information:

Information element name	MO SMS	Description
FCIBCCCAMEL Sequence 1	M	This IE is described in the next table.

M Mandatory (The IE shall always be sent)

FCIBCCCAMEL Sequence 1 contains the following information:

Information element name	MO SMS	Description
Free Format Data	M	This IE indicates that the gsmSSF/gprsSSF shall insert the free format data in the CAMEL logical SM charging record without overwriting any free format data that may already have been received for that transaction. When this IE is not present then the gsmSSF/gprsSSF shall override free format data in a non-completed CAMEL logical SM record of the previous FCI operations.
Append Free Format Data	O	<p>This IE indicates that the gsmSSF/gprsSSF shall append the free format data to the Logical MO SMS record.</p> <ul style="list-style-type: none"> <li>• If this IE is present indicating “Append”, the gsmSSF/gprsSSF shall append the free format data received in this IF to the free format data already present in the Logical MO SMS record.</li> <li>• If this IE is absent or in value “Overwrite”, then the gsmSSF shall overwrite all free format data already present in the Logical MO SMS record, by the free format data received in this IF.</li> </ul> <p>If no Logical MO SMS record exists yet, then the gsmSSF/gprsSSF shall ignore this IE.</p>

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

## 7.6.2.5 Release SMS

### 7.6.2.5.1 Description

This IF is used to tear down by the gsmSCF an existing SMS transfer.

### 7.6.2.5.2 Information Elements

Information element name	MO SMS	Description
Cause	M	SMS Cause. Indicates the SMS specific cause of the release. The cause is reported to the MS.

M Mandatory (The IE shall always be sent)

## 7.6.2.6 Request Report SMS Event

### 7.6.2.6.1 Description

This IF is used to request the gsmSSF/gprsSSF to monitor for an event (i.e., O\_SMS\_Submitted or O\_SMS\_Failure), then send a notification back to the gsmSCF when the event is detected (see Event Report SMS).

### 7.6.2.6.2 Information Elements

Information element name	MO SMS	Description
SMS Event	M	This IE specifies the event or events of which a report is requested.

M Mandatory (The IE shall always be sent)

SMS Event contains the following information:

Information element name	MO SMS	Description
Event type	M	This IE specifies the type of event of which a report is requested.
Monitor Mode	M	This IE indicates how the event shall be reported.

M Mandatory (The IE shall always be sent)

## 7.6.2.7 Reset Timer SMS

### 7.6.2.7.1 Description

This IF is used to refresh a gsmSSF/gprsSSF timer.

### 7.6.2.7.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Timer Value	M	This IE specifies the value to which the indicated timer shall be set.
Timer ID	O	This IE indicates which timer shall be reset. It shall be set to 'Tssf'.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

## 7.6.3 HLR to VLR information flows

### 7.6.3.1 Delete Subscriber data

#### 7.6.3.1.1 Description

This IF is specified in 3G TS 29.002 [4] and is used by the HLR to delete subscriber data in the VLR.

#### 7.6.3.1.2 Information Elements

The Delete Subscriber Data contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
CAMEL Subscription Info Withdraw	C	This IE identifies that all CSIs shall be deleted from the subscriber data in VLR.

C Conditional (The IE shall be sent when deletion is requested)

### 7.6.3.2 Insert Subscriber Data

#### 7.6.3.2.1 Description

This IF is specified in 3G TS 29.002 [4] and is used by the HLR to insert subscriber data in the VLR.

#### 7.6.3.2.2 Information Elements

Insert Subscriber Data contains the following MO SMS specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
SMS-CSI	C	This IE identifies the subscriber having MO SMS CAMEL services.

C Conditional (The IE shall be sent, if required)

SMS-CSI contains the following information:

<b>Information element name</b>	<b>Required</b>	<b>Description</b>
gsmSCF Address	M	This IE is described in section x.
Service Key	M	This IE is described in section x.
Default SMS Handling	M	This IE is described in section x
CAMEL Capability Handling	M	This IE is described in section 4.3.1.
SMS Triggers	M	This IE is described in section x. It includes the following trigger: - <i>SMS_Collected_Info</i>

M Mandatory (the IE shall always be sent)

## 7.6.4 VLR to HLR information flows

### 7.6.4.1 Insert Subscriber Data ack

See section 4.6.8.

## 7.6.4.2 Update Location

See section 4.6.8.3.

## 7.6.5 HLR – SGSN information flows

This interface is used to send CAMEL related subscriber data to a visited GPRS network, e.g. GPRS-CSI.

### 7.6.5.1 Delete Subscriber data

#### 7.6.5.1.1 Description

This IF is specified in 3G TS 29.002 [4] and is used by the HLR to delete subscriber data in the SGSN.

#### 7.6.5.1.2 Information Elements

The Delete Subscriber Data contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
CAMEL Subscription Info Withdraw	C	This IE identifies that all CSIs shall be deleted from the subscriber data in SGSN.

C Conditional (The IE shall be sent when deletion is requested)

### 7.6.5.2 Insert Subscriber data

#### 7.6.5.2.1 Description

This IF is specified in 3G TS 29.002 [4] and used by the HLR to insert subscriber data in the SGSN.

#### 7.6.5.2.2 Information Elements

Insert Subscriber Data contains the following MO SMS specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
SMS-CSI	C	This IE identifies the subscriber having MO SMS CAMEL services.

C Conditional (The IE shall be sent, if required)

SMS-CSI contains the following information:



Information element name	Required	Description
gsmSCF Address	M	This IE is described in section x.
Service Key	M	This IE is described in section x.
Default SMS Handling	M	This IE is described in section x
CAMEL Capability Handling	M	This IE is described in section 4.3.1.
SMS Triggers	M	This IE is described in section x. It includes the following trigger: - <i>SMS_Collected_Info</i>

M Mandatory (The IE shall always be sent)

## 7.6.6 SGSN to HLR Information Flows

### 7.6.6.1 Insert Subscriber Data ack

See section 4.6.8.

### 7.6.6.2 Update GPRS Location

See section 6.6.4.1.

## 7.6.7 VLR to MSC Information Flows

### 7.6.7.1 Send Info For MO SMS Ack

#### 7.6.7.1.1 Description

This IF is specified in 3G TS 29.002 [4]. It is used to transport MO SMS related subscription data from the VLR to the MSC.

Send Info For MO SMS Ack contains the following information:

Information element name	Required	Description
SMS-CSI	C	This IE contains the CAMEL Subscription Information for MO-SMS.
ODB Data	C	This IE contains ODB data. This information is used to apply ODB for a reconnected Short Message, if needed.
CB SS Data	C	This IE contains CB SS data. This information is used to apply CB for a reconnected Short Message, if needed.

C Conditional (shall be sent if available)

---

## 8 SS Notifications

### 8.1 Architecture

#### 8.1.1 Functional Entities used for CAMEL

See subclassue 4.1

#### 8.1.2 Interfaces defined for CAMEL

This subclassue describes the different interfaces applicable to CAMEL. It specifies on a high level the functions specific to CAMEL.

##### 8.1.2.1 MSC - gsmSCF interface

This interface is used by the MSC to send supplementary service invocation notifications to the gsmSCF.

### 8.2 Description of CAMEL Subscriber Data

#### 8.2.1 Supplementary Service Invocation Notification CAMEL Subscription Information (SS-CSI)

##### 8.2.1.1 Content of the SS-CSI

This subclassue defines the contents of the Supplementary Service Invocation Notification CAMEL Subscription Information (SS-CSI).

###### 8.2.1.1.1 Notification criteria

This data indicates for which supplementary services notifications shall be sent. The supplementary services which may be indicated are ECT, CD, CCBS and MPTY.

###### 8.2.1.1.2 gsmSCF address

Address to be used to access the gsmSCF for a particular subscriber. The address shall be an E.164 number to be used for routeing.

###### 8.2.1.1.3 CSI state

The CSI state indicates whether the SS-CSI is active or not.

###### 8.2.1.1.4 Notification flag

The notification flag indicates whether the change of the SS-CSI shall trigger Notification on Change of Subscriber Data or not.

## 8.3 Procedures for CAMEL

### 8.3.1 Handling of Supplementary Service Invocation Notification

At the invocation of any of the services ECT, CD and MPTY the VLR checks whether the criteria for sending a notification are fulfilled, i.e. whether the subscriber is provisioned with the SS-CSI and the particular invoked supplementary service is marked in the SS-CSI. If this is the case a notification is sent to the gsmSCF given by the gsmSCF address contained in the SS-CSI. The processing of the particular SS invocation is not suspended. If the notification criteria are not fulfilled the processing of the particular supplementary service continues unchanged and no notification are sent.

The sending of the notification is independent of call related CAMEL processing, i.e. processing indicated by O/T/VT-CSI.

On invocation of ECT, the VLR shall include the SS-CSI in the Invoke ECT response message (see Process MAF027 in 3G TS 23.091 [29]) to the MSC if applicable for ECT.

On invocation of MPTY, the VLR shall include the SS-CSI in the Process MPTY message (see Process MPTY\_MAF026 in 3G TS 23.084 [28]) to the MSC if applicable for MPTY.

On invocation of CD, the VLR shall include the SS-CSI in the Send Info For Incoming Call ack message to the MSC if applicable to CD.

At the invocation of the CCBS supplementary service, the HLR checks whether the criteria for sending a notification are fulfilled, i.e. whether the subscriber is provisioned with the SS-CSI and the particular invoked supplementary service is marked in the SS-CSI. If this is the case, a notification is sent to the gsmSCF given by the gsmSCF address contained in the SS-CSI. The processing of the SS invocation is not suspended. If the notification criteria are not fulfilled the processing of the particular supplementary service continues unchanged and no notification are sent.

## 8.4 Description of information flows

This clause contains the detailed description of the information flows used by CAMEL.

Each Information Element, IE is marked as Mandatory (M), Conditional (C), Optional (O) or Not applicable (-). This categorisation is a functional classification, i.e., stage 2 information and not a stage 3 classification to be used for the ASN.1 syntax of the protocol.

The following principles apply for the handling of the IEs by the receiving entity :

- The gsmSCF may silently discard any IE which it does not functionally support

Details of errors and exceptions to these rules are specified in 3G TS 29.002

### 8.4.1 MSC to gsmSCF information flows

#### 8.4.1.1 SS Invocation Notification

##### 8.4.1.1.1 Description

This IF is generated by the MSC when it shall notify the gsmSCF of a supplementary service invocation.

### 8.4.1.1.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Notification Event	M	This IE indicates the supplementary service invocation, resulting in the SS Invocation Notification IF.  Only the following Supplementary Services are allowed : Explicit Call Transfer, Call Deflection, Multi Party.
Notification Event Specific Information	C	In the case of ECT, the sending entity shall include the called party for each call originated by the subscriber and relevant to the ECT invocation. Note : the subscriber may have originated zero, one or two calls relevant to the ECT service.  In the case of CD, the deflected to number shall be included in this information element.  In the case of MPTY, this IE shall be omitted.
IMSI	M	This IE identifies the mobile subscriber who has invoked the supplementary service to be notified.
MSISDN	M	This IE identifies the mobile subscriber who has invoked the supplementary service to be notified.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent if applicable)

## 8.4.2 HLR to VLR information flows

### 8.4.2.2 Insert Subscriber Data

#### 8.4.2.2.1 Description

This IF is used by an HLR to update a VLR with certain subscriber data. This IF is specified in 3G TS 29.002 [4].

#### 8.4.2.2.2 Information Elements

Insert Subscriber Data contains the following CAMEL specific IE for SS Notifications:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
SS-CSI	C	This IE identifies the subscriber as having supplementary service invocation notification services. It contains the Notification Criteria and gsmSCFAddress. This IE is described in section 8.2.1.1.

C Conditional (The IE shall be sent, if required)

## 8.4.3 HLR to gsmSCF information flows

### 8.4.3.1 SS Invocation Notification

This IF is generated by the HLR when it shall notify the gsmSCF of a supplementary service invocation.

## 8.4.3.1.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Notification Event	M	This IE indicates the supplementary service invocation, resulting in the SS Invocation Notification IF. Only the following Supplementary Services are allowed : Completion of Calls to Busy Subscriber
IMSI	M	This IE identifies the mobile subscriber who has invoked the supplementary service to be notified.
MSISDN	M	This IE identifies the mobile subscriber who has invoked the supplementary service to be notified.

M Mandatory (The IE shall always be sent)

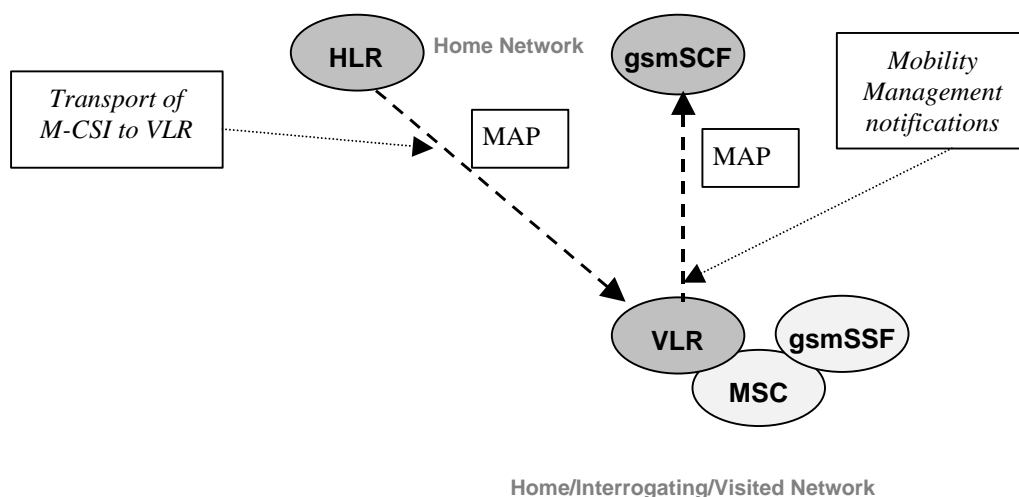
C Conditional (The IE shall be sent if applicable)

## 9 Mobility Management

### 9.1 Architecture

#### 9.1.1 Functional Entities used for CAMEL

This subclause describes the functional architecture required to support Mobility Management in CAMEL. Figure 9.1 shows the functional entities involved in CAMEL support of Mobility Management. The architecture is applicable to the third phase of CAMEL.



**Figure 9.1: Functional architecture for support of CAMEL**

**gsmSCF:** see subclause 4.1.

**HLR:** The HLR contains Mobility management CAMEL Subscription Information (M-CSI) for those subscribers that require CAMEL control (...use another word...) of Mobility Management events. M-CSI is sent to the VLR during the Location Update and Restore Data procedures or when M-CSI is modified in the HLR.

**MS:** Mobile Station (GSM terminal)

**MSC:** See subclause 4.1.

**VLR:** After having completed a Mobility Management event from a subscriber, the VLR may have to send a notification to the gsmSCF. The contents of M-CSI indicates which Mobility Management events shall be reported to the gsmSCF.

## 9.1.2 Interfaces defined for CAMEL

This subclause describes the different interfaces applicable to CAMEL control of Mobility Management events. It specifies on a high level the functions specific to CAMEL.

### 9.1.2.2 VLR - gsmSCF interface

This interface is used by the VLR to send supplementary service Mobility Management event notifications to the gsmSCF. When processing a mobility management event, the VLR may have to send a notification to the gsmSCF, depending on the presence of M-CSI for the subscriber and the contents of M-CSI.

## 9.2 Description of CAMEL Subscriber Data

### 9.2.1. Mobility Management CAMEL Subscription Information (M-CSI)

#### 9.2.1.1 Content of the M-CSI

This subclause specifies the contents of the Mobility Management CAMEL Subscription Information (M-CSI).

##### 9.2.1.1.1 Mobility Management Triggers

This data indicates which Mobility Management events shall result in a notification to the gsmSCF. One or more events may be marked per subscriber. One or more events may be marked per subscriber. One or more events may be marked per subscriber. The following events may be marked for a subscriber:

- Location update in the same VLR service area
- Location update to another VLR service area
- IMSI attach
- MS initiated IMSI detach (explicit detach)
- Network initiated IMSI detach (implicit detach)

##### 9.2.1.1.2 gsmSCF address

Address to be used to access the gsmSCF for a particular subscriber. The address shall be an E.164 number to be used for routing.

##### 9.2.1.1.3 Service Key

The Service Key is included in the notification message to the gsmSCF. It indicates to the gsmSCF which Service Logic shall be applied.

##### 9.2.1.1.4 CSI state

The CSI state indicates whether the M-CSI is active or not.

### 9.2.1.1.5 Notification flag

The notification flag indicates whether the change of the M-CSI shall trigger Notification on Change of Subscriber Data or not.

## 9.3 Procedures for Mobility management

Figures 9.2 to 9.6 show the functional entities involved in Mobility Management event notifications.

Figure 9.2: Location Update within a single VLR Service Area. The VLR Service area may be in the HPLMN or in the VPLMN.

Figure 9.3: Location Update from one VLR Service Area to another VLR Service Area. Both VLR Service Areas are in the HPLMN or in the same VPLMN.

Figure 9.4: Location Update from one PLMN to another PLMN:

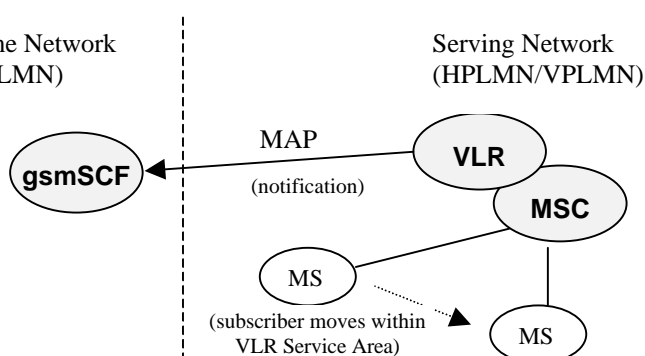
- update from HPLMN to VPLMN
- update from VPLMN to HPLMN
- update from one VPLMN to another VPLMN

Figure 9.5 IMSI Detach (in HPLMN or in VPLMN):

- explicit detach (the MS has been switched off by the subscriber)
- implicit detach (the network has not received a periodic paging update from the MS and assumes that the MS is switched off or unreachable)

Figure 9.6 IMSI Attach (in HPLMN or in VPLMN):

- attach (the MS has been switched on by the subscriber – subscription data is still available in the VLR, no location update is needed.)





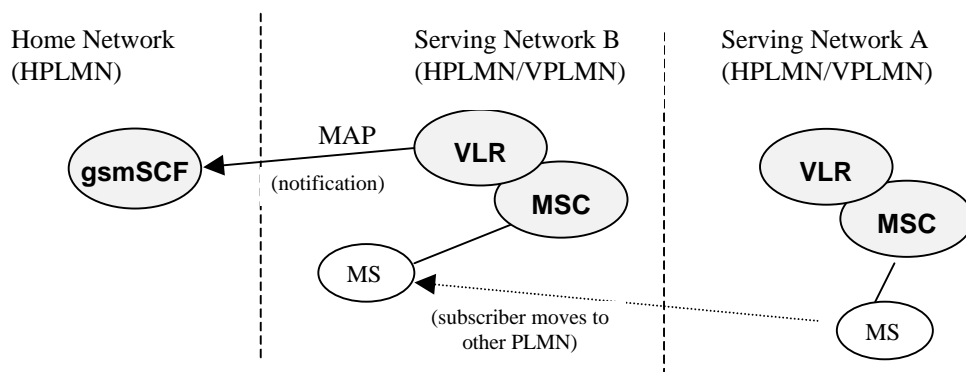
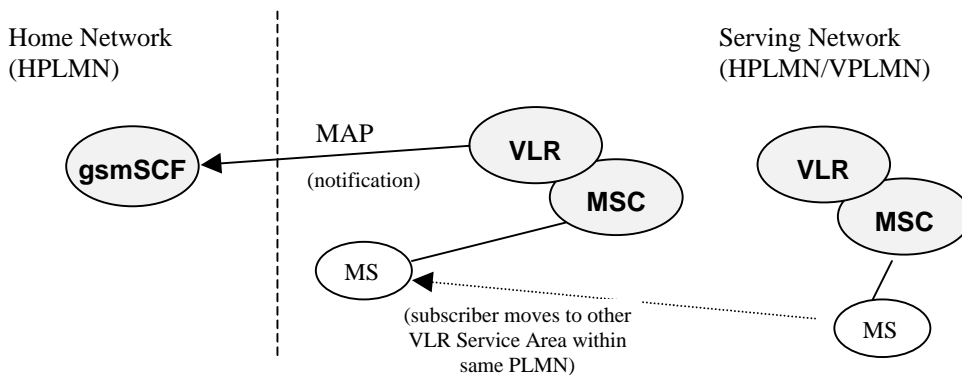


Figure 9.2: Location Update from one VLR Service Area to Another VLR Service Area; VLR Service Areas in different PLMNs.

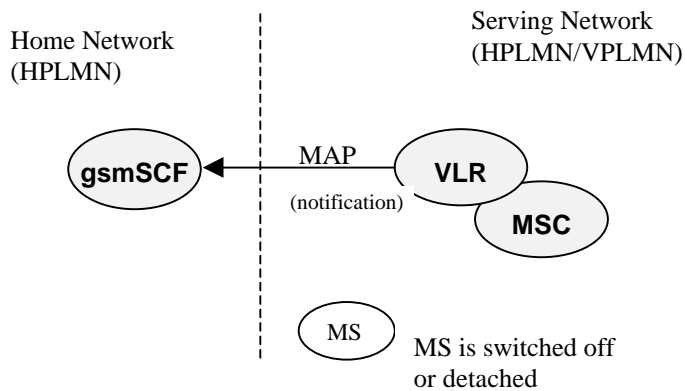
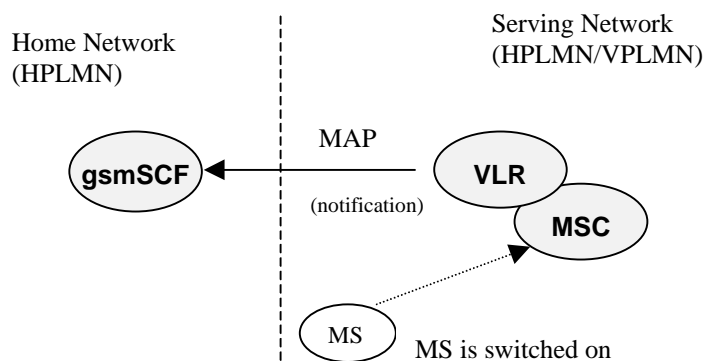


Figure 9.3: IMSI Detach (implicit/explicit)



**Figure 9.4: IMSI Attach**

When a Mobility Management Event has taken place and the processing thereof has been completed, then the VLR may have to send a notification to the gsmSCF. The processing of the Mobility Management event in VLR is not suspended by the sending of the notification nor is it in any way affected by the notification.

The sending of a Mobility Management notification to gsmSCF is independent of other CAMEL subscription data for a subscriber. Eg. a subscriber may have M-CSI without having O-CSI or VT-CSI.

The sending of a Mobility Management event notification is subscription based.

Refer to section 9.2.1.1 for a description of M-CSI and the different Mobility Management events that may lead to a notification to the gsmSCF.

## 9.3.1 Procedure descriptions

### 9.3.1.1 Procedure Set\_Notification\_Type

This procedure is called from process Update\_Location\_VLR in 3G TS 23.012 [32]. It checks the information element 'Location Update Type', which the VLR receives from the MSC via MAP\_UPDATE\_LOCATION\_AREA service. This element identifies the type of Location Update requested by the Mobile Station.

The possible values of this parameter are specified in 3G TS 24.008 [33].

The type of Location Update that was requested by the Mobile Station, determines which Mobility Management notification message shall be sent to the gsmSCF.

The values 'Periodic Updating' and 'Reserved' shall not lead to a Mobility Management notification to the gsmSCF.

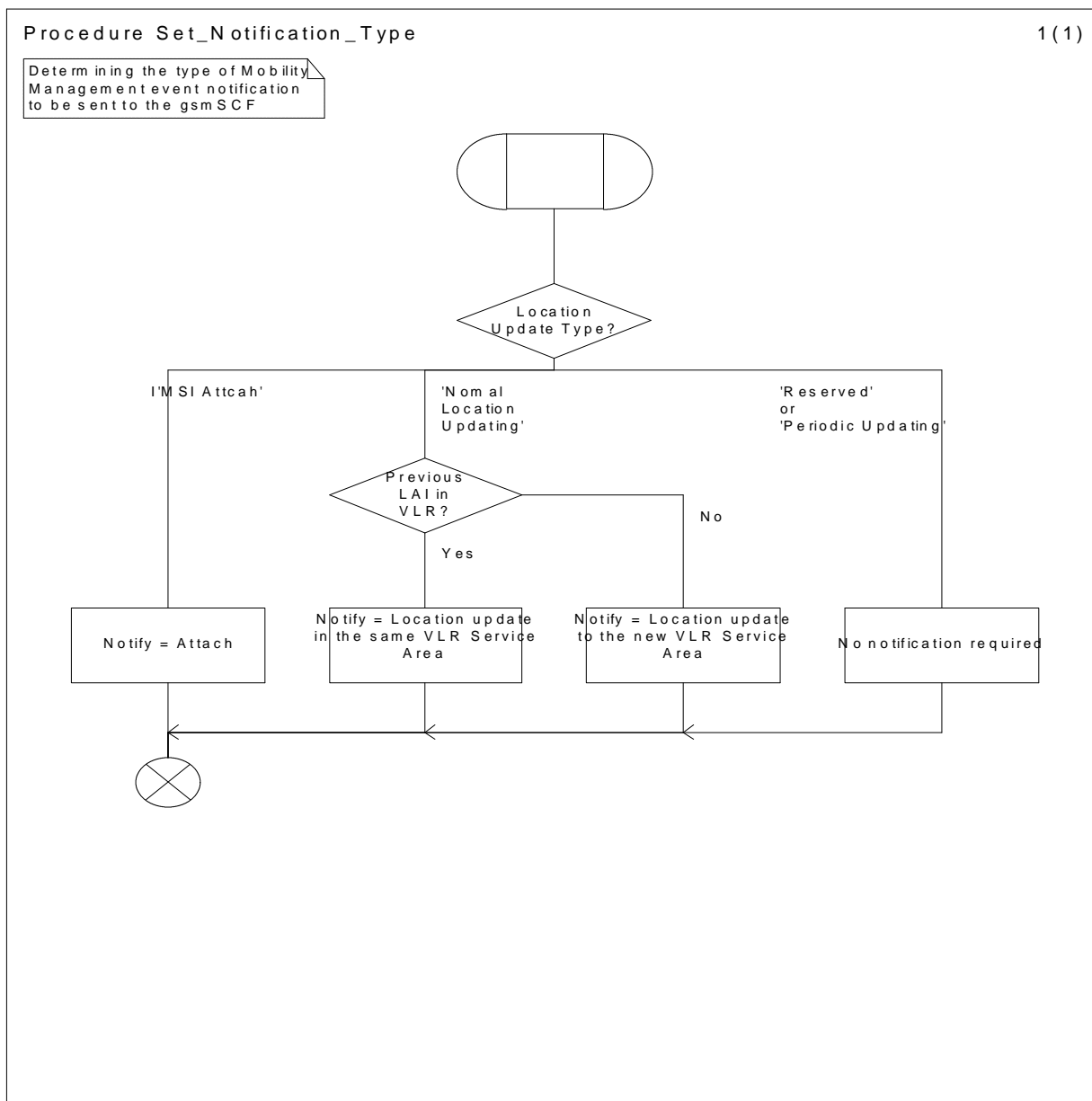


Figure 9.5: Procedure Set\_Notification\_Type

### 9.3.1.2 Procedure Notify\_gsmSCF

This procedure is called from the process 'Update\_Location\_Area\_VLR' and process 'Detach\_IMSI\_VLR' in 3G TS 23.012 [32].

It is also called from the process 'Update\_Location\_VLR' in 3G TS 29.002 [4].

The calling process passes on the variable 'Notify' to the procedure 'Notify\_gsmSCF'. This variable indicates which Mobility Management notification may have to be sent to the gsmSCF.

If this variable has a value NULL, then no notification shall be sent to the gsmSCF.

If a notification may have to be sent to the gsmSCF, then the procedure checks the presence of M-CSI.

- If M-CSI is present and the Mobility Management event indicated in the variable 'Notify' is marked in M-CSI, then a notification shall be sent to the gsmSCF.
- If M-CSI is not present or the Mobility Management event indicated in the variable 'Notify' is not marked in M-CSI, then no notification shall be sent to the gsmSCF.

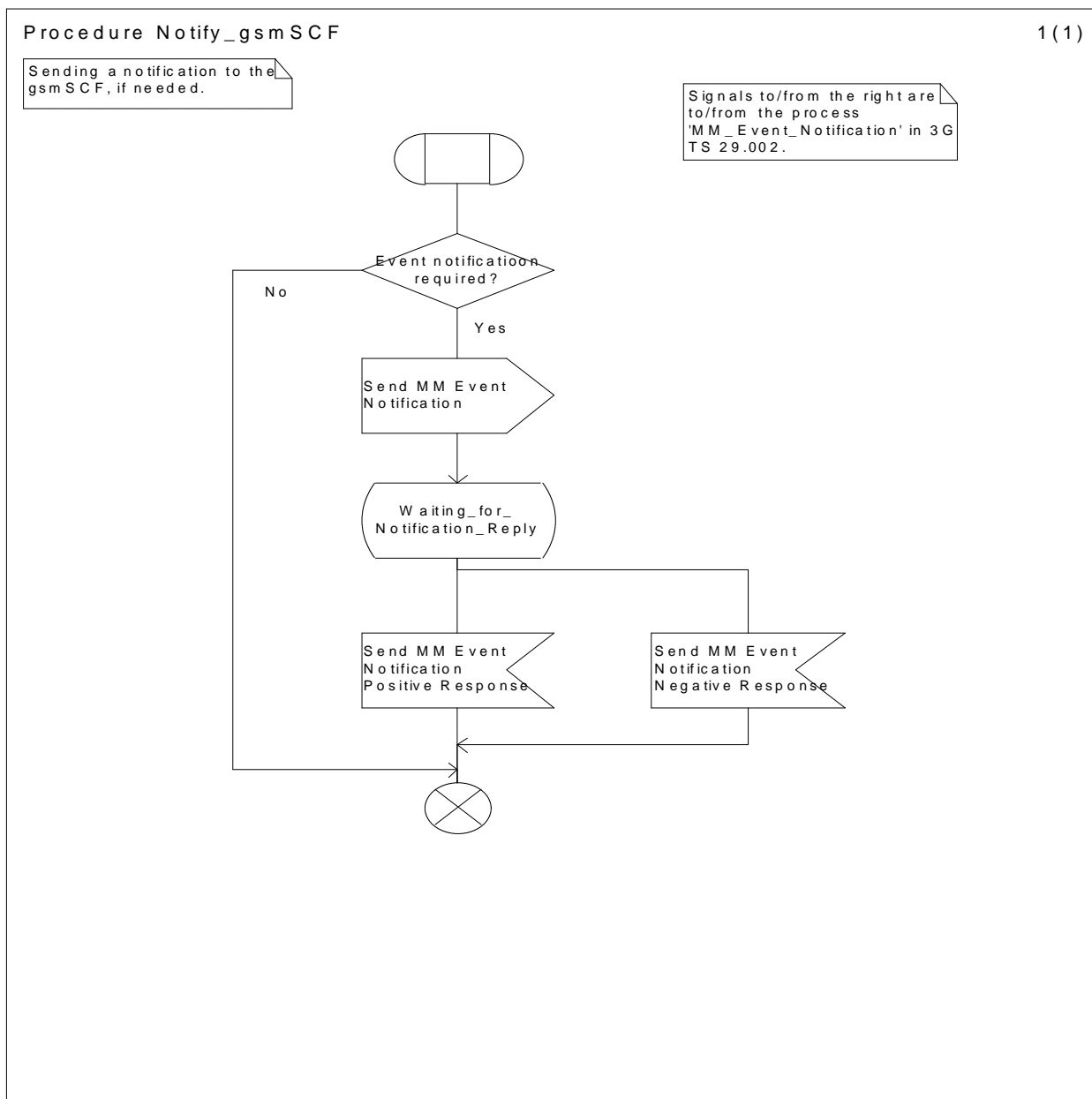


Figure 9.6: Procedure Notify\_gsmSCF

## 9.4 Description of information flows

This clause contains the detailed description of the information flows used by CAMEL for Mobility Management control.

Each Information Element, (IE), is marked as Mandatory (M), Conditional (C), Optional (O) or Not applicable (-). This categorisation is a functional classification, i.e., stage 2 information and not a stage 3 classification to be used for the ASN.1 syntax of the protocol.

The following principles apply for the handling of the IEs by the receiving entity :

- The gsmSCF may silently discard any IE which it does not functionally support
- The VLR shall functionally support all IE's which can be sent to it.

## 9.4.1 VLR to gsmSCF information flows

### 9.4.1.1 Mobility Management event Notification

#### 9.4.1.1.1 Description

This IF is generated by the VLR when it shall notify the gsmSCF of a Mobility Management event.

#### 9.4.1.1.2 Information Elements

The following information elements are required:

Information element name	Required	Description
Event Met	M	This IE indicates the type of Mobility Management that lead to the notification. The value of this IE shall be one of the following. - - Location update in the same VLR service area - Location update to ananother VLR service area - IMSI attach - MS initiated IMSI detach (explicit detach) - Network initiated IMSI detach (implicit detach)
Service Key	M	This IE indicates the Service Logic that the gsmSCF shall apply.
IMSI	M	This IE identifies the mobile subscriber to whom the Mobility Event applies.
Basic MSISDN	M	This IE identifies the mobile subscriber to whom the Mobility Event applies.
Location Information	C	This IE indicates the current location of the MS. This IE is explained in section 4.6.1.7.
Supported CAMEL Phases	M	This IE indicates the CAMEL Phases that are supported by the MSC/VLR in which the MS is registered after the mobility management event.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

## 9.4.2 HLR to VLR information flows

### 9.4.2.1 Delete Subscriber Data

#### 9.4.2.1.1 Description

This IF is used by an HLR to remove certain subscriber data from a VLR if the subscription of one or more supplementary services or basic services is withdrawn. Note that this IF is not used in the case of erasure or de-activation of supplementary services. This IF is specified in 3G TS 29.002 [4].

### 9.4.2.1.2 Information Elements

The Delete Subscriber Data contains the following CAMEL specific IE:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
CAMEL Subscription Info Withdraw	C	This IE identifies that all CSIs shall be deleted from the subscriber data in VLR.

C Conditional (The IE shall be sent when deletion is requested)

### 9.4.2.2 Insert Subscriber Data

#### 9.4.2.2.1 Description

This IF is used by an HLR to update a VLR with certain subscriber data. This IF is specified in 3G TS 29.002 [4].

#### 9.4.2.2.2 Information Elements

Insert Subscriber Data contains the following CAMEL specific IE for Mobility Management:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
M-CSI	C	This IE identifies the subscriber as having mobility management notification services. It contains the events that shall be reported, the gsmSCF Address and the Service Key.

C Conditional (The IE shall be sent, if required)

M-CSI contains the following information:

<b>Information element name</b>	<b>Required</b>	<b>Description</b>
GsmSCF Address	M	This IE is described in section 9.2.1.
Service Key	M	This IE is described in section 9.2.1.
Mobility Management Triggers	M	<p>This IE indicates which Mobility Management events shall be reported to the gsmSCF. It shall contain one or more of the following elements:</p> <ul style="list-style-type: none"> <li>- Location update in the same VLR service area</li> <li>- Location update to another VLR service area</li> <li>- IMSI attach</li> <li>- MS initiated IMSI detach (explicit detach)</li> <li>- Network initiated IMSI detach (implicit detach)</li> </ul>

M Mandatory (The IE shall always be sent)

## 10 Control and interrogation of subscription data

### 10.1 Architecture

#### 10.1.1 Functional Entities used for CAMEL

This subclause describes the functional architecture required to support control and interrogation of subscription data. Figure 10.1 shows the functional entities involved in CAMEL support of control and interrogation of subscription data.



**Figure 10.1: Functional architecture for support of control and interrogation of subscription data**

**gsmSCF:** see subclause 4.1.

**HLR:** The HLR may provide an interface towards the gsmSCF for the Any Time Subscription Interrogation and Any Time Modification procedure. The gsmSCF may provide an interface towards the HLR for the Notify Subscriber Data Change procedure.

#### 10.1.2 Interfaces defined for CAMEL

This subclause describes the different interface applicable to CAMEL control of subscription data. It specifies on a high level the functions specific to CAMEL.

##### 10.1.2.1 gsmSCF - HLR

This interface is used by the gsmSCF to interrogate or modify information in the HLR. As a network operator option, the HLR may refuse to provide or modify the information requested by the gsmSCF. This interface is also used to notify to the gsmSCF of change of subscriber data by the HLR.

## 10.2 Procedures for CAMEL

### 10.2.1 Any Time Interrogation for Subscription Information Retrieval

Handling of Any Time Interrogation for Subscription Information Retrieval involves the following process:

- CAMEL\_ATSI\_HLR.

If an OSS needs the Subscription Information, the gsmSCF initiates a transaction to the HLR by sending a *Any\_Time\_Subscription\_Interrogation* Request. Support for this procedure is a network operator option.

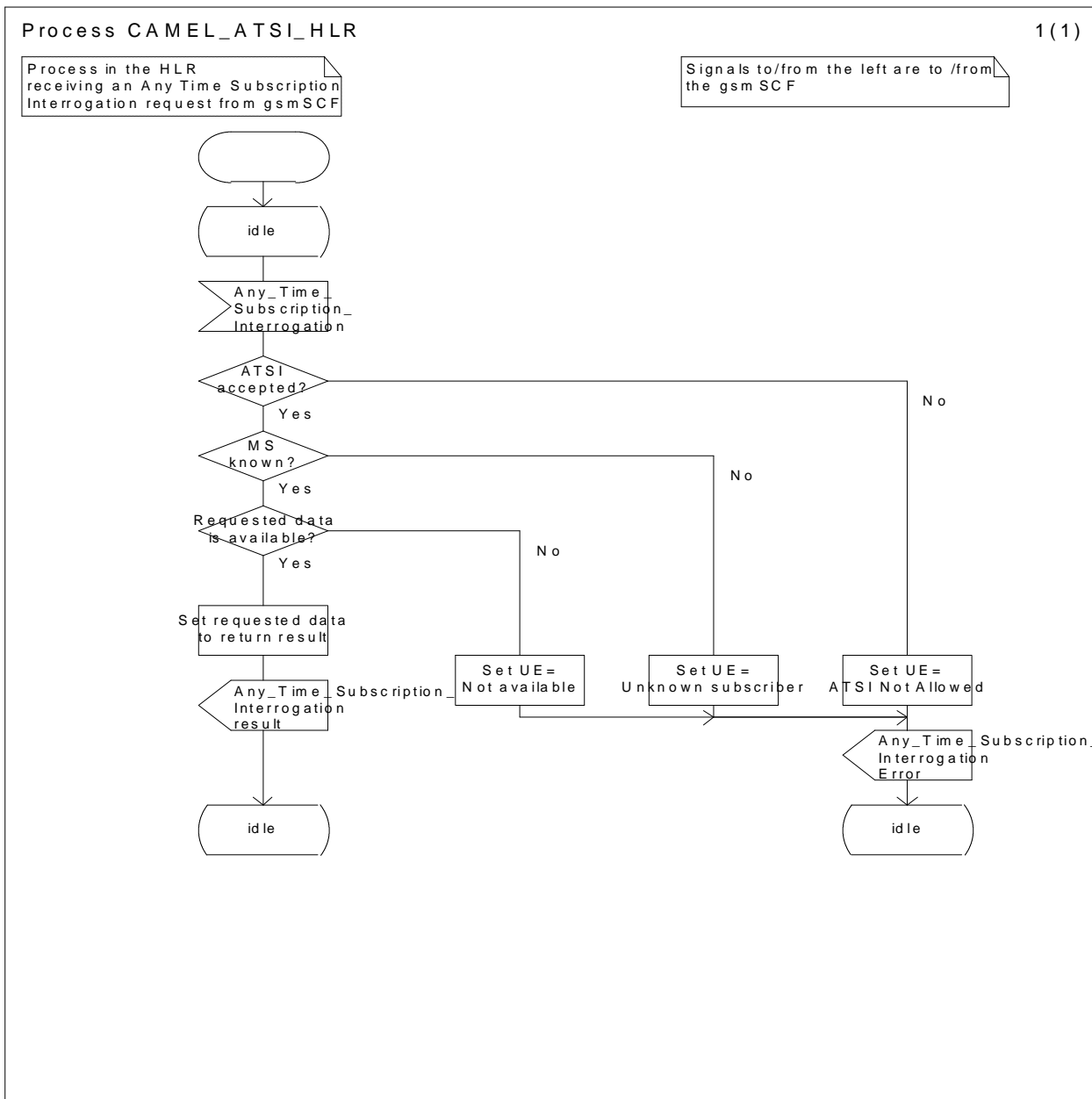


Figure 10.2: Process CAMEL\_ATSI\_HLR (sheet 1)

### 10.2.2 Any Time Modification

Handling of Any Time Modification involves the following process:

- CAMEL\_ATM\_HLR.

If an OSS needs to modify the Subscriber Information, the gsmSCF initiates a transaction to the HLR by sending a Any\_Time\_Modification Request.

When HLR receives a Any\_Time\_Modification Request, HLR does the procedure as follows.

- Call forwarding or call barring supplementary service data is requested
  - if only ss-code (and basic-service) is set in the Any\_Time\_Modification request, HLR erases the data related to the requested supplementary service.
  - if ss-code (and basic-service) and ss-status are set in the Any\_Time\_Modification request, HLR does the activation or deactivation of the requested supplementary service.



if ss-code (and basic-service) and “forwarded-to number”/”forwarded to subaddress”/”no reply condition time” are set in the Any\_Time\_Modification request, HLR modifies the requested data of the requested supplementary service.

- CSI data is requested

HLR modifies the CSI state and/or the notification flag of the requested CSI.

If a notification flag is set for the modified data, Notify\_Subscriber\_Data\_Change is sent for the gsmSCF except for the gsmSCF which sent Any\_Time\_Modification Request. Support for this procedure is a network operator option.

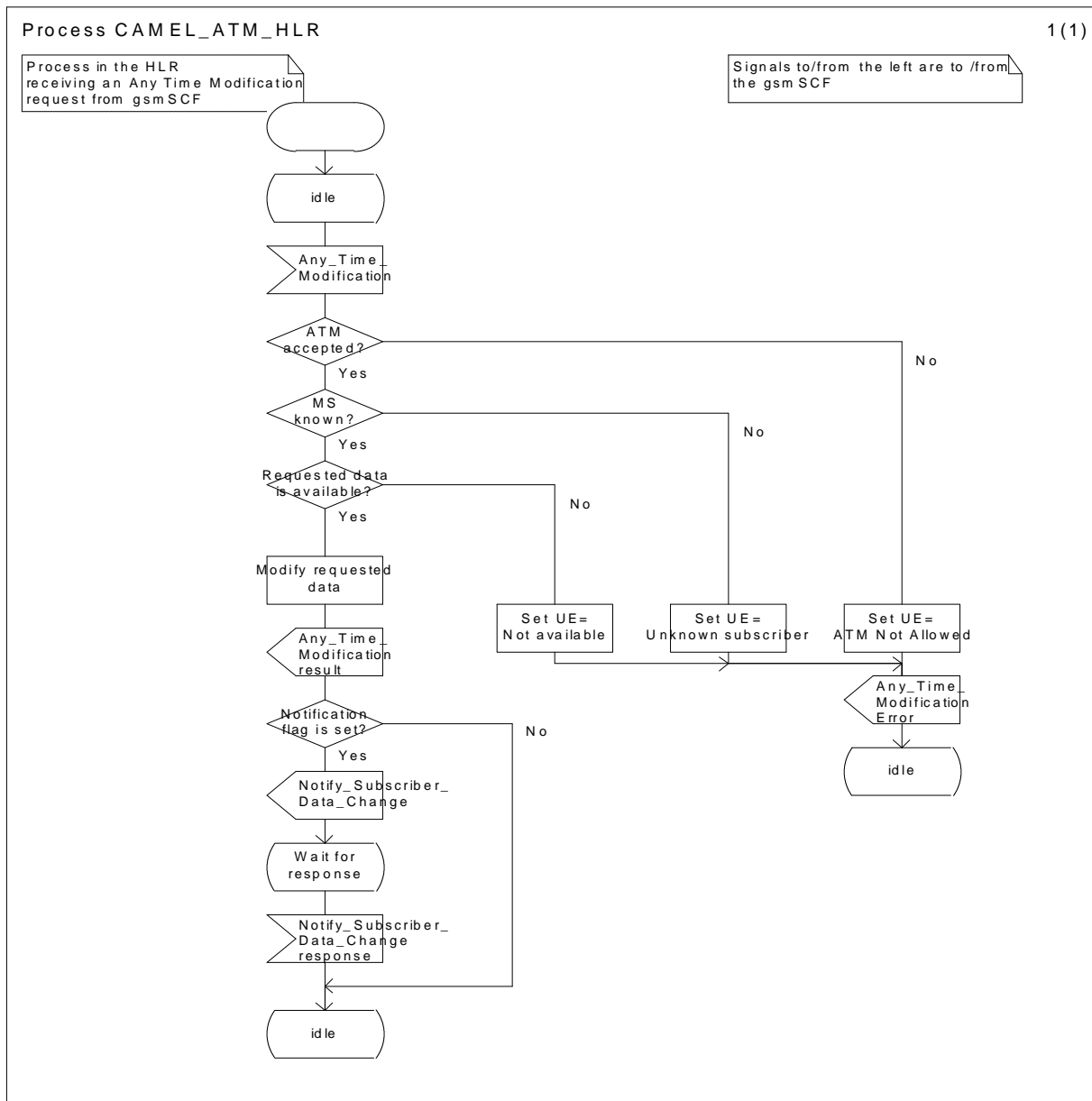


Figure 10.3: Process CAMEL\_ATM\_HLR (sheet 1)

### 10.2.3 Notify Subscriber Data Change

Changes of CSI shall be notified only if the CSI is marked with the Notification flag.

When the change of subscriber data was caused by Any Time Modification the notification of change of subscriber data shall not be sent to the gsmSCF from which this Any Time Modification was received.

Each gsmSCF shall be notified only once. Multiple occurrence of gsmSCF Address in CSIs of the subscriber shall not lead to multiple notification.

Handling of Notify subscriber data change involves the following process:

- CAMEL\_NSDC\_HLR.

If an OSS needs to notify to the CSE the change of subscriber data, the HLR initiates a transaction to the gsmSCF by sending Notify\_Subscriber\_Data\_Change Request. Support for this procedure is a network operator option.

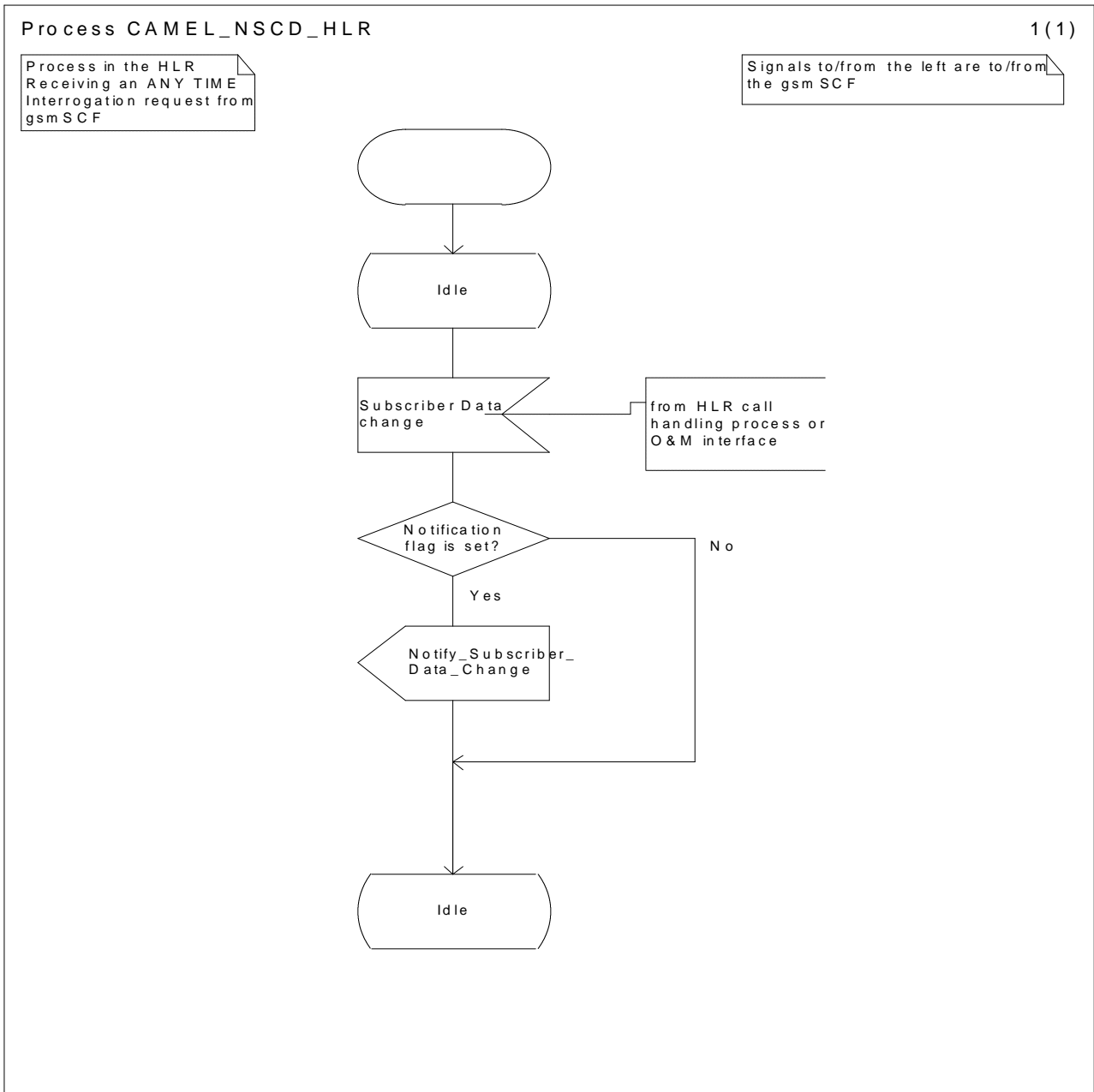


Figure 10.4: Process CAMEL\_NSDC\_HLR (sheet1)

## 10.3 Description of information flows

This clause contains the detailed description of the information flows used by CAMEL.

Each Information Element, IE is marked as Mandatory (M), Conditional (C), Optional (O) or Not applicable (-). This categorisation is a functional classification, i.e., stage 2 information and not a stage 3 classification to be used for the ASN.1 syntax of the protocol.

The following principles apply for the handling of the Ies by the receiving entity :

- The gsmSCF may silently discard any IE which it does not functionally support
- The HLR shall return an error if it does not functionally support a IE which it receives.

Details of errors and exceptions to these rules are specified in are specified in 3G TS 29.002.

### 10.3.1 gsmSCF to HLR information flows

#### 10.3.1.1 Any Time Subscription Interrogation Request

##### 10.3.1.1.1 Description

This IF is used to request subscription information from the HLR at any time.

##### 10.3.1.1.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
GsmSCF Address	M	This IE indicates the address of the interrogating gsmSCF.
Requested Info	M	This IE indicates the type of subscriber information being requested: <ul style="list-style-type: none"> <li>- supplementary service</li> <li>- operator determined barring</li> <li>- CAMEL subscription information</li> <li>- supported CAMEL phases</li> </ul>
Subscriber Identity	M	This IE identifies the subscriber for which the information is requested. The identity can be one of: <ul style="list-style-type: none"> <li>- IMSI</li> <li>- MSISDN</li> </ul>

M Mandatory (The IE shall always be sent)

Supplementary service contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>SS code</u>	<u>C</u>	This IE indicates a supplementary service or a set of supplementary services as defined in 3G TS 22.004 [25].
<u>Basic Service</u>	<u>C</u>	See 3G TS 22.002 [24].

C Conditional (The IE shall be sent, if requested and available)

CAMEL subscription information contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
CAMEL subscription information	C	This IE indicates what information about CSI is requested. It may be one or more elements of the following. - O-CSI/T-CSI/VT-CSI/TIF-CSI/GPRS-CSI/SMS-CSI/SS-CSI/M-CSI

C Conditional (The IE shall be sent, if requested and available)

### 10.3.1.2 Any Time Modification Request

#### 10.3.1.2.1 Description

This IF is used to modify information in the HLR at any time.

#### 10.3.1.2.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
GsmSCF Address	M	This IE indicates the address of the interrogating gsmSCF.
Subscriber Identity	M	This IE identifies the subscriber for which the information is requested. The identity can be one of: - IMSI - MSISDN
Call forwarding SS data	C	This IE indicates the data of call forwarding.
Call barring SS data	C	This IE indicates the data of call barring.
CAMEL subscription information	C	This IE indicates the CAMEL subscription information.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

Call forwarding SS data contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
SS Code	C	This IE indicates a supplementary service or a set of supplementary services as defined in 3G TS 22.004 [25].
Basic Service	C	See 3G TS 22.002 [24].
SS Status	C	See 3G TS 23.011 [26].
Forwarded-to Number	C	See 3G TS 23.082 [27].
Forwarded-to Subaddress	C	See 3G TS 23.082 [27].
No Reply Condition Time	C	See 3G TS 23.082 [27].
Notification Flag	C	This IE indicates whether the change of data of call forwarding SS is notified to the gsmSCF or not.

C Conditional (The IE shall be sent, if available)

Call barring SS data contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
SS Code	C	This IE indicates a supplementary service or a set of supplementary services as defined in 3G TS 22.004 [25].
Basic Service	C	See 3G TS 22.002 [24].
SS Status	C	See 3G TS 23.011 [26].
Password	C	See 3G TS 23.011 [26].
Wrong password attempts counter	C	See 3G TS 23.011 [26].
Notification flag	C	This IE indicates whether the change of data of call barring SS is notified to the gsmSCF or not.

C Conditional (The IE shall be sent, if available)

CAMEL subscription information contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
O-CSI	C	This IE indicates the activation and notification status of the O-CSI.
T-CSI	C	This IE indicates the activation and notification status of the T-CSI.
VT-CSI	C	This IE indicates the activation and notification status of the TVMSC-CSI.
TIF-CSI	C	This IE indicates the activation and notification status of the TIF-CSI.
GPRS-CSI	C	This IE indicates the activation and notification status of the GPRS-CSI.
SMS-CSI	C	This IE indicates the activation and notification status of the SMS-CSI.
SS-CSI	C	This IE indicates the activation and notification status of the SS-CSI.
M-CSI	C	This IE indicates the activation and notification status of the M-CSI.

C Conditional (The IE shall be sent, if available)

O-CSI/T-CSI/VT-CSI/GPRS-CSI/SMS-CSI/SS-CSI/M-CSI contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
CSI state	C	This IE indicates whether the CSI is active or not.
Notification flag	C	This IE indicates whether the change of CSI is notified to the gsmSCF or not.

C Conditional (The IE shall be sent, if available)

TIF-CSI contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Translation Information Flag	C	See 4.3.2.2.
Notification flag	C	This IE indicates whether the change of TIF-CSI is notified to the gsmSCF or not.

C Conditional (The IE shall be sent, if available)

## 10.3.2 HLR to gsmSCF information flows

### 10.3.2.1 Any Time Subscription Interrogation ack

#### 10.3.2.1.1 Description

This IF is used by the HLR to provide the requested subscription information to the gsmSCF.

#### 10.3.2.1.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Call forwarding SS	C	This IE indicates the data related to the call forwarding.
Call barring SS data	C	This IE indicates the data related to the call barring.
Operator determined barring	C	This IE indicates the data related to the operator determined barring.
CAMEL subscription information	C	This IE indicates the data related to the CAMEL subscription information.
Supported CAMEL phases	C	This IE indicates the CAMEL phase supported at the VPLMN

C Conditional (The IE shall be sent, if requested and available)

Call forwarding SS data contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Basic Service	C	See 3G TS 22.002 [24].
SS Status	C	See 3G TS 23.011 [26].
Forwarded-to Number	C	See 3G TS 23.082 [27].
Forwarded-to Subaddress	C	See 3G TS 23.082 [27].
Subscription Options	C	See 3G TS 23.082 [27].
No Reply Condition Time	C	See 3G TS 23.082 [27].
Notification Flag	C	This IE indicates whether the change of data of call forwarding SS is notified to the gsmSCF or not.

C Conditional (The IE shall be sent, if available)

Call barring SS data contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Basic Service	C	See 3G TS 22.002 [24].

SS Status	C	See 3G TS 23.011 [26].
Password	C	See 3G TS 23.011 [26].
Wrong password attempts counter	C	See 3G TS 23.011 [26].
Notification flag	C	This IE indicates whether the change of data of call barring SS this IE is notified to the gsmSCF or not.

C Conditional (The IE shall be sent, if available)

Operator determined barring data contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
ODB General Data	C	This IE indicates the set of subscribers features that the network operator or the service provider can regulate
ODB HPLMN Specific Data	C	This IE indicates the set of subscribers features that the network operator or the service provider can regulate only when the subscriber is registered in the HPLMN.
Notification flag	C	This IE indicates whether the change of data of ODB is notified to the gsmSCF or not.

C Conditional (The IE shall be sent, if available)

CAMEL subscription information contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
O-CSI	C	See section 4.3.1.
T-CSI	C	See section 4.3.4.
VT-CSI	C	See section 4.3.5.
TIF-CSI	C	See section 4.3.6.2.
GPRS-CSI	C	See section 6.3.1.
SMS-CSI	C	See section 7.3.1.
SS-CSI	C	See section 8.2.1.1.
M-CSI	C	See section 9.2.1.1

C Conditional (The IE shall be sent, if available)

### 10.3.2.2 Any Time Modification ack

#### 10.3.2.2.1 Description

This IF is used by the HLR to provide the modified information to the gsmSCF.

#### 10.3.2.2.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Call forwarding SS data	C	This IE indicates the data related to call forwarding.
Call barring SS data	C	This IE indicates the data related to call barring.
CAMEL subscription information	C	This IE indicates the data related CAMEL subscription information.

C Conditional (The IE shall be sent, if requested and available)

Call forwarding SS data contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
SS Code	C	This IE indicates a supplementary service or a set of supplementary services as defined in 3G TS 22.004 [25].
Basic Service	C	See 3G TS 22.002 [24].
SS Status	C	See 3G TS 23.011 [26].
Forwarded-to Number	C	See 3G TS 23.082 [27].
Forwarded-to Subaddress	C	See 3G TS 23.082 [27].
Subscription Options	C	See 3G TS 23.082 [27].
No Reply Condition Time	C	See 3G TS 23.082 [27].
Notification Flag	C	This IE indicates whether the change of data of call forwarding SS is notified to the gsmSCF or not.

C Conditional (The IE shall be sent, if available)

Call barring SS data contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
SS Code	C	This IE indicates a supplementary service or a set of supplementary services as defined in 3G TS 22.004 [25].
Basic Service	C	See 3G TS 22.002 [24].
SS Status	C	See 3G TS 23.011 [26].
Password	C	See 3G TS 23.011 [26].
Wrong password attempts counter	C	See 3G TS 23.011 [26].
Notification flag	C	This IE indicates whether the change of data of call barring SS is notified to the gsmSCF or not.

C Conditional (The IE shall be sent, if available)

CAMEL subscription information contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
O-CSI	C	See section 4.3.1.
T-CSI	C	See section 4.3.4.
VT-CSI	C	See section 4.3.5.
TIF-CSI	C	See section 4.3.6.2.



GPRS-CSI	C	See section 6.3.1.
SMS-CSI	C	See section 7.3.1.
SS-CSI	C	See section 8.2.1.1.
M-CSI	C	See section 9.2.1.1

C Conditional (The IE shall be sent, if available)

### 10.3.2.3 Notify Subscriber Data Change

#### 10.3.2.3.1 Description

This IF is used by the HLR to notify to the gsmSCF of the change of subscriber data.

#### 10.3.2.3.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Subscriber Identity	M	This IE identifies the subscriber for which the information is requested. The identity can be one of: - IMSI - MSISDN
Changed Data	M	This IE identifies the data that has changed. The data can be one of: - Call Forwarding SS Data - Call Barring SS Data - CAMEL Subscription Information

# 11 Location Services

Support of Location Services in CAMEL Phase 3 is a network operator option.

## 11.1 Architecture

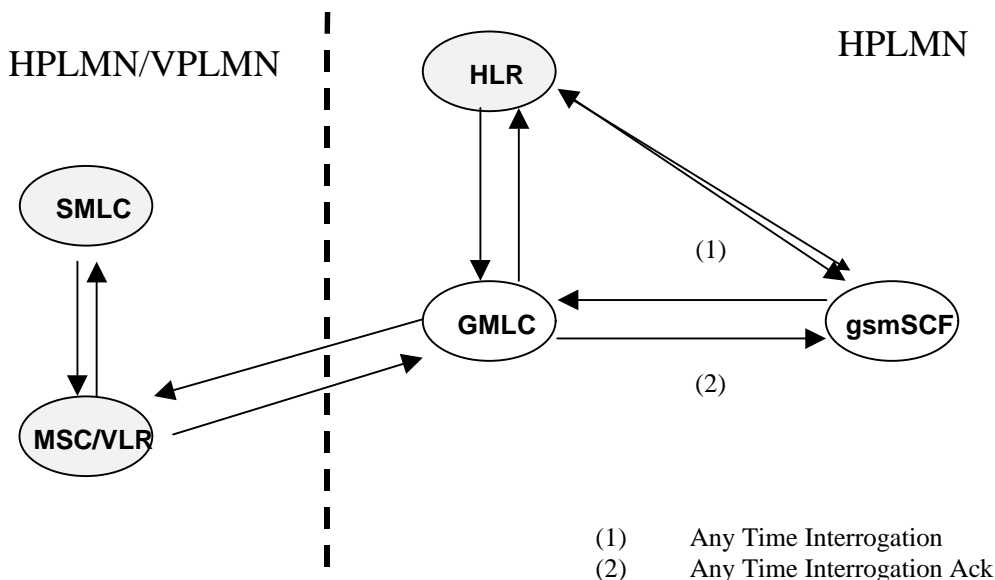
### 11.1.1 Functional Entities used for CAMEL

This subclause describes CAMEL support of Location Services. Location Services is only supported in CAMEL Phase 3.

Figure 11.1 indicates the functional entities involved in Location Services. The interfaces between gsmSCF and GMLC and HLR are defined in this chapter.

The principle operation of Location Services is described in 3G TS 22.071 [17].

The interfaces between GMLC, HLR, MSC/VLR and SGSN are described in 3G TS 23.071 [18].



**Figure 11.1: Functional architecture for support of CAMEL**

**gsmSCF:** see subclause 4.1.

**GMLC:** A functional entity that allows external LCS Clients to request real-time information about a Mobile Station. The information that can be requested from the GMLC is the location of the mobile station.

**SMLC:** A functional entity that performs positioning activities for Mobile Stations. The SMLC interfaces with the MSC/VLR where the subscriber is currently registered.

**HLR:** see subclause 4.1.

**MSC/VLR:** see subclause 4.1.

The information flows between the GMLC and other functional entities than the gsmSCF, have not been indicated in the functional architecture as shown in figure 1. These information flows fall outside the scope of the present document.

Refer to [17] and [18] for a description of the functioning of Location Services.

## 11.1.2 Interfaces defined for CAMEL

This subclause describes the different interfaces applicable to CAMEL. It specifies on a high level the functions specific to CAMEL.

### 11.1.2.1 gsmSCF - GMLC interface

This interface is used by the gsmSCF to request information (Mobile Station location) from the GMLC at any time.

### 11.1.2.2 GMLC - gsmSCF interface

This interface is used by the GMLC to return the requested information (Mobile Station location) to the gsmSCF. The gsmSCF had requested this information via the Any Time Interrogation procedure before.

### 11.1.2.3 gsmSCF - HLR

This interface is used by the gsmSCF to interrogate the HLR. As a network operator option, the HLR may refuse to provide the information requested by the gsmSCF.

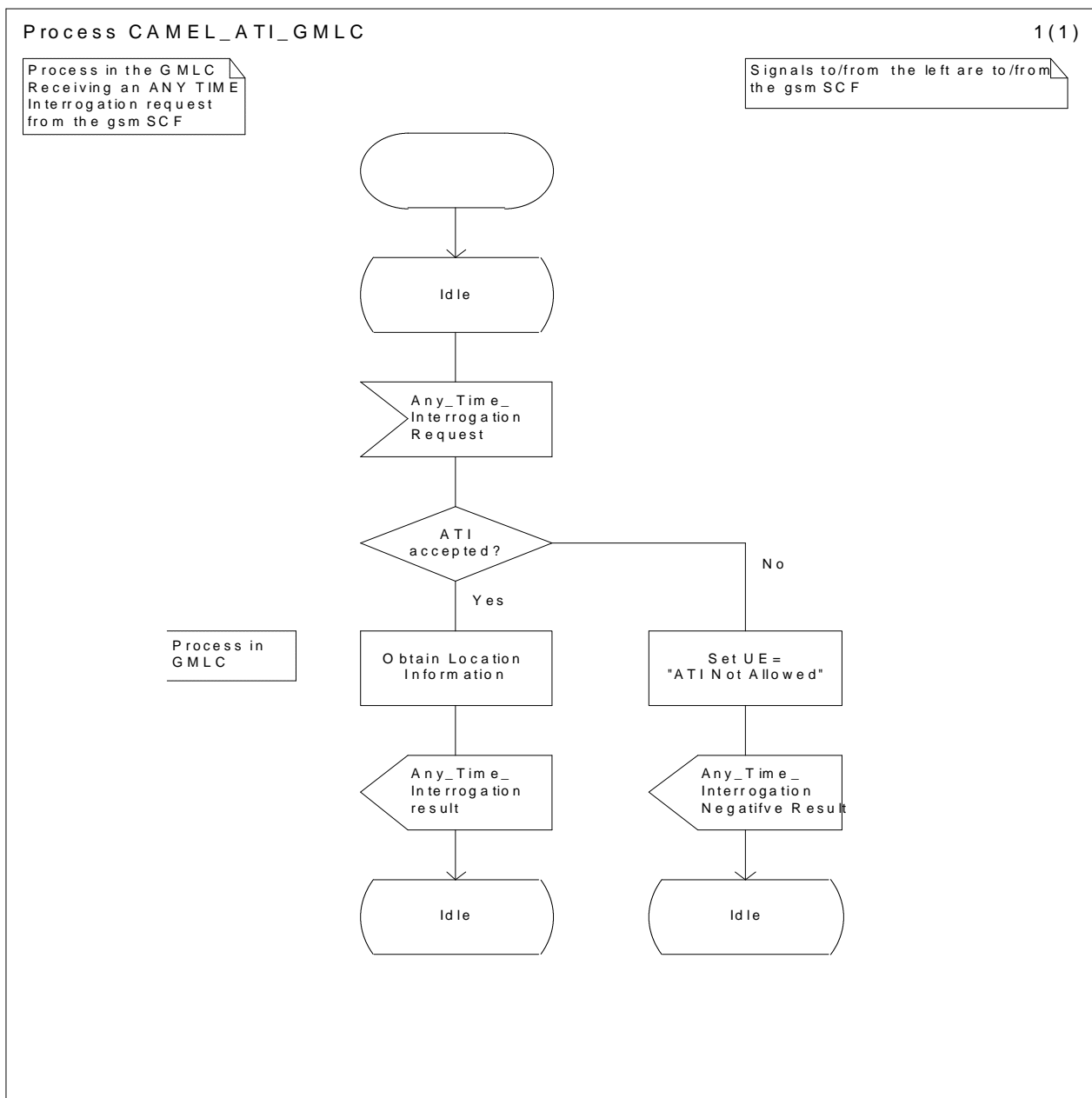
## 11.2 Procedures for CAMEL

### 11.2.1 Any Time Interrogation

Handling of Any Time Interrogation involves the following process:

- CAMEL\_ATI\_GMLC

If an OSS needs to retrieve the active location of a Mobile Station, the gsmSCF initiates a transaction to the GMLC by sending a Any\_Time\_Interrogation Request.



**Figure 11.2: Process CAMEL\_ATI\_GMLC**

### 11.2.2 Any Time Interrogation for Subscriber State and Location Information

Handling of Any Time Interrogation for Subscriber State and Location Information involves the following process:

- CAMEL\_ATI\_HLR.

If an OSS needs the Subscriber State and/or the Location Information, the gsmSCF initiates a transaction to the HLR by sending a Any\_Time\_Interrogation Request. Support for this procedure is a network operator option.

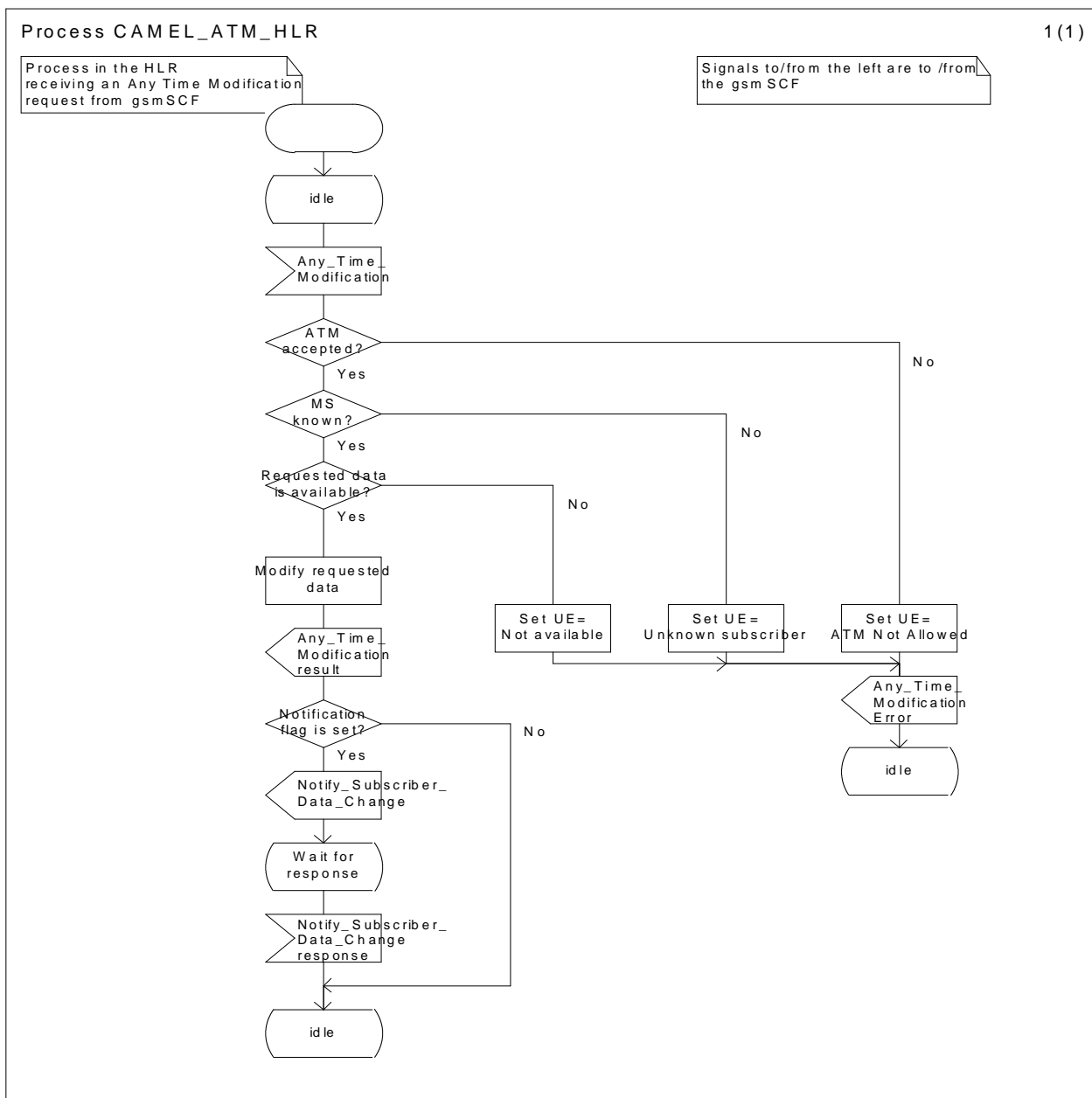


Figure 11.3: Process CAMEL\_ATI\_HLR

### 11.3 Description of information flows

This clause contains the detailed description of the information flows used by CAMEL.

Each Information Element, IE, is marked as Mandatory (M), Conditional (C), Optional (O) or Not applicable (-). This categorisation is a functional classification, i.e., stage 2 information and not a stage 3 classification to be used for the ASN.1 syntax of the protocol.

The following principles apply for the handling of the IEs by the receiving entity :

- The gsmSCF may silently discard any IE which it does not functionally support
- The GMLC shall return an error if it does not functionally support a IE which it receives.

Details of errors and exceptions to these rules are specified in are specified in 3G TS 29.002 [4].

## 11.3.1 gsmSCF to GMLC information flows

### 11.3.1.1 Any Time Interrogation Request

#### 11.3.1.1.1 Description

This IF is used to request information (Mobile Station location) from the GMLC.

#### 11.3.1.1.2 Information Elements

The following information elements are required:

Information element name	Required	Description
gsmSCF Address	M	This IE indicates the address of the interrogating gsmSCF.
Requested Info	M	This IE indicates the type of information that is requested. It shall have the following value: - Mobile Station location
Mobile Station Identity	M	This IE identifies the Mobile Station of which the information is requested. The identity can be one of the following list: - IMSI - MSISDN

M Mandatory (The IE shall always be sent)

## 11.3.2 GMLC to gsmSCF information flows

### 11.3.2.1 Any Time Interrogation ack

#### 11.3.2.1.1 Description

This IF is used by the GMLC to provide the requested information to the gsmSCF. The gsmSCF requested the information previously with the Any Time Interrogation IF.

#### 11.3.2.1.2 Information Elements

The following information elements are required:

Information element name	Required	Description
Location Information	C	This IE indicates the location of the Mobile Station.

C Conditional (The IE shall be sent if requested and available)

Location Information contains the following information:

Information element name	Required	Description
Location Number	-	See 3G TS 23.018 [3].
CellIdOrLAI	-	See 3G TS 23.018 [3].
Geographical Information	C	See 3G TS 23.032 [x]. The GMLC receives Extended Geographical

		Information from the MSC. The Extended Geographical Information shall be converted to the Geographical Information by the GMLC.
Geodetic Information	C	See 3G TS 23.018 [3].
Age Of Location Information	C	See 3G TS 23.018 [3].
VLR number	-	See 3G TS 23.018 [3].
Selected LSA Identity	-	See 3G TS 23.018 [3].
MSC number	C	See 3G TS 23.032. [x] The GMLC receives the MSC number from the HLR in the SendRoutingInfoForLCS MAP operation.

C Conditional (The IE shall be sent, if available)

### 11.3.3 gsmSCF to HLR information flows

#### 11.3.3.1 Any Time Interrogation Request

##### 11.3.3.1.1 Description

This IF is used to request information (subscriber state and/or location) from the HLR at any time.

##### 11.3.3.1.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
gsmSCF Address	M	This IE indicates the address of the interrogating gsmSCF.
Requested Info	M	This IE indicates the type of subscriber information being requested: <ul style="list-style-type: none"> <li>- subscriber location</li> <li>- subscriber state</li> <li>- currentLocation (currentLocation shall not be present if locationInformation is not present in the RequestedInfo parameter)</li> </ul>
Subscriber Identity	M	This IE identifies the subscriber for which the information is requested. The identity can be one of: <ul style="list-style-type: none"> <li>- IMSI</li> <li>- MSISDN</li> </ul>

M Mandatory (The IE shall always be sent)

### 11.3.4 HLR to gsmSCF information flows

#### 11.3.4.1 Any Time Interrogation ack

##### 11.3.4.1.1 Description

This IF is used by the HLR to provide the requested subscriber location and/or subscriber state information to the gsmSCF.

## 11.3.4.1.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Location Information	C	This IE indicates the location of the served subscriber.
Subscriber State	C	This IE indicates the status of the MS. The possible values of the IE are: <ul style="list-style-type: none"> <li>- CAMELBusy: The VLR has indicated that the MS is engaged on a transaction for a mobile originating or terminated circuit-switched call.</li> <li>- NetworkDeterminedNotReachable: The VLR has indicated that the network can determine from its internal data that the MS is not reachable.</li> <li>- AssumedIdle: The VLR has indicated that the state of the MS is neither "CAMELBusy" nor "NetworkDeterminedNotReachable".</li> <li>- NotProvidedFromVLR: The VLR did not provide any information on subscriber state even though it was requested.</li> </ul>

C Conditional (The IE shall be sent, if requested and available)

Location Information contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Location Number	C	See 3G TS 23.018 [3].
CellIdOrLAI	C	See 3G TS 23.018 [3].
Geographical Information	C	See 3G TS 23.018 [3].
Geodetic Information	C	See 3G TS 23.018 [3].
Age Of Location Information	C	See 3G TS 23.018 [3].
VLR number	C	See 3G TS 23.018 [3].
Selected LSA Identity	C	See 3G TS 23.018[3]

C Conditional (The IE shall be sent, if available)



## Annex A: Change history

Change history						
TSG CN#	Spec	Version	CR	<Phase>	New Version	Subject/Comment
Apr 1999	GSM 03.78	7.0.0				Transferred to 3GPP CN1
CN#03	23.078	3.0.0			3.0.0	Approved at CN#03
CN#4	23.078	3.1.0	003	R99	3.1.0	Inclusion of Subscriber Activity Information Flow
CN#4	23.078	3.1.0	004	R99	3.1.0	Inclusion of Alerting Pattern in Provide Roaming Number
CN#4	23.078	3.1.0	005	R99	3.1.0	Dialled Number String Format
CN#4	23.078	3.1.0	006	R99	3.1.0	Handling of AC/ACR in DP Busy, DP No Answer and DP
CN#4	23.078	3.1.0	007	R99	3.1.0	Inclusion of Activity Test IF between gsmSCF & gsmSRF and gsmSCF and assistSSF
CN#4	23.078	3.1.0	008	R99	3.1.0	Correction of USSD Information flows
CN#4	23.078	3.1.0	009	R99	3.1.0	Various corrections
CN#4	23.078	3.1.0	010	R99	3.1.0	Correction of CAMEL Phase interworking with Call Forwarding
CN#4	23.078	3.1.0	011	R99	3.1.0	Renaming of Call Active Variable
CN#4	23.078	3.1.0	012	R99	3.1.0	Reporting of O/T_Abandon DP when caller clears during O/T_Busy, O/T_No_Answer or Route_Select_Failure EDP-R.
CN#4	23.078	3.1.0	013	R99	3.1.0	Clarification on the scope of CAMEL Capability Handling parameter
CN#4	23.078	3.1.0	014	R99	3.1.0	Refining trigger criteria at DP2, due to the introduction of North American Equal Access
CN#4	23.078	3.1.0	015	R99	3.1.0	Introduction of MSISDN in USSD operation
CN#4	23.078	3.1.0	016	R99	3.1.0	MSC address in Initial DP
CN#4	23.078	3.1.0	017	R99	3.1.0	Correction of gsmSDL; return to idle after ACR
CN#4	23.078	3.1.0	018	R99	3.1.0	Notification of call forwarding to the gsmSCF

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# History

<b>Document history</b>		
V3.0.0	May 1999	Approved at TSGN #3. Under TSG TSG CN Change Control.
V3.1.0	August 1999	Approved at TSGN #4
<a href="#">V3.2.0</a>	<a href="#">November 1999</a>	<a href="#">CRs approved at TSGN #5 are considered.</a>