3GPP TSG_CN **Tdoc NP-000248**
Plenary Meeting #8, Dusseldorf, Germany
21st – 23rd June 2000.

Source: **TSG_N WG 2**

Title: **CRs to 3G Work Item CAMEL phase 3 - Stage 2, Category D**

Agenda item: **6.2.2**

Document for: **APPROVAL**

Introduction:

This document contains **8** CRs on **Work Item CAMEL phase 3,** that have been agreed by **TSG_N WG 2,** and are forwarded to **TSG_N Plenary** meeting #8 for approval.

Tdoc	Spec	CR	Rev	CAT	Rel.	Old Ver	New Ver	Subject
N2-000197	23.078	161	1	D	R99	3.4.0	3.5.0	Renaming "FSM" to "State Model" in GPRS
N2-000161	23.078	169		D	R99	3.4.0	3.5.0	Editorial corrections in the clause 5
N2-000239	23.078	170	1	D	R99	3.4.0	3.5.0	Editorial corrections in the clause 6
N2-000240	23.078	171	1	D	R99	3.4.0	3.5.0	Editorial corrections in the clause 7
N2-000164	23.078	172		D	R99	3.4.0	3.5.0	Editorial corrections in the clause 8
N2-000241	23.078	173	1	D	R99	3.4.0	3.5.0	Editorial corrections in the clause 9
N2-000242	23.078	174	1	D	R99	3.4.0	3.5.0	Editorial corrections in the clause 10
N2-000243	23.078	175	1	D	R99	3.4.0	3.5.0	Editorial corrections in the clause 11

3GPP N2 Meeting
Rotenburg, Germany, 22-26 May 2000

***Document* N2-000197**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

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23.078	CR	161r1	Current Version:	3.4.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	CN#8	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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

Source: N2 **Date:** 23 May 2000

Subject: Renaming "FSM" to "State Model" in GPRS

Work item: CAMEL Phase 3

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification	X		Release 99	X
				Release 00	

Reason for change:

When email discussions were held in April, the wording "FSM" and "State Model" were found confusing the reader of the chapter 6, GPRS interworking".
As the technical description explicitly shows the states and the detection points in the session and the PDP context, these models should have been the "state models".
Therefore, this CR proposes to replace all the "FSM" by "State Model" in the chapter 6.
The principle by this proposal are;

- All the "FSM" shall be replaced by "state model".
- The abbreviated wording, "SM", shall be avoided and replaced by "state model".
- Duplication after the above replacement shall be deleted.

"FSM" on other CRs, if any, should be interpreted and re-written as described above.

Clauses affected: 6 (6.4 and 6.6)

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

***** First Modified Part (6.4)*****

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~~models, one for the attach/detach procedures (GPRS Attach/Detach ~~FSM~~State Model) and the other for modelling individual PDP Contexts (GPRS PDP Context ~~FSM~~State Model).

6.4.1 General Handling

The GPRS state model ~~(GPRS SM)~~ is used to describe the actions in an SGSN during processing of a GPRS session or PDP Contexts.

The GPRS ~~SM~~ State Model 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 State Model~~SM~~.

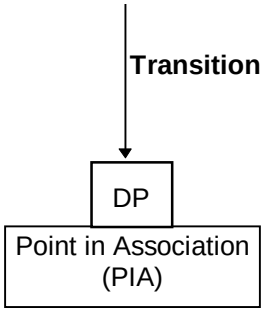

Figure Error! Reference source not found.**.1: GPRS State Model~~SM~~ Components**

6.4.2 GPRS Attach/Detach State Model~~FSM~~

The GPRS Attach/Detach State Model~~FSM~~ is used to model the behaviour of the GPRS attach/detach procedures.

When encountering a DP the Attach/Detach State Model~~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.

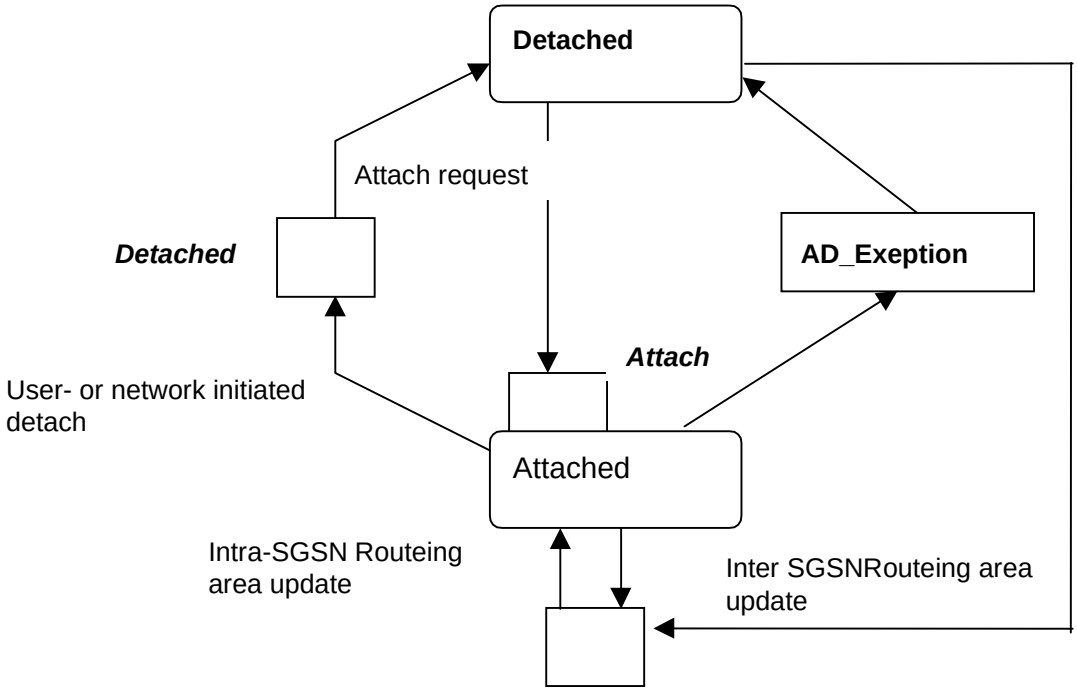

Figure Error! Reference source not found.**.2: GPRS Attach/Detach State Model~~FSM~~**

Table 1: 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 GPRS session	TDP-R[1)], 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 GPRS 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 GPRS 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 Attach/Detach model (PIAs)

This subclause describes the model for the attach and detach a GPRS session 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 Chage of position GPRS session).
- Information being analyzed, e.g. GPRS-CSI is analyzed.

Exit events:
- GPRS-CSI is analyzed (DP Attach or DP Change of position GPRS session).

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 Detached).
- Intra-SGSN Routeing Area Update is accepted (DP Change of position GPRS session).
- An exception is encountered, e.g. STANDBY timer expiry.

The GPRS Attach/Detach State Model~~FSM~~ shall only have one or more GPRS PDP Context State Model~~FSM~~s associated with it when in the Attached state. A GPRS PDP Context State Model~~FSM~~ cannot exist without its associated GPRS Attach/Detach State Model~~FSM~~ being in the Attached state. Closure of the GPRS Attach/Detach State Model~~FSM~~ via a detach will result in the idling of all associated GPRS PDP Context ~~FSM~~State Models and the release of the associated GPRS PDP Contexts.

It shall not be necessary to trigger a relationship from the GPRS Attach/Detach ~~FSM~~ State Model to the gsmSCF in order for triggering to occur in an associated GPRS PDP Context State Model~~FSM~~. However, in this latter case a GPRS Attach/Detach State Model~~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 State Model~~FSM~~ transiting to the Detached state. As noted above, in this state no PDP Contexts can exist and so all associated GSM PDP Context State Model ~~FSM~~s will transit to state Idle.

6.4.3 GPRS PDP Context State Model~~FSM~~

The GPRS PDP Context State Model~~FSM~~ is used to model the behaviour for the GPRS PDP Context procedures.

When encountering a DP the PDP Context State Model~~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.

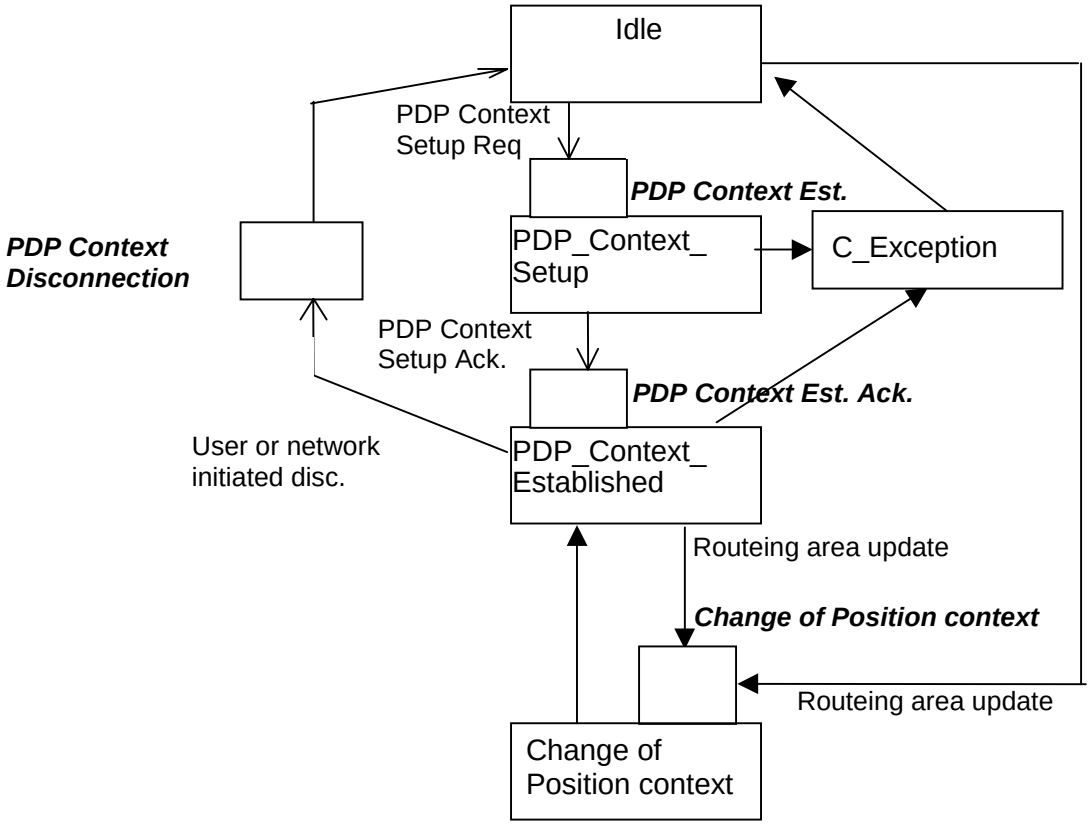

Figure Error! Reference source not found..**3: GPRS PDP Context State Model~~FSM~~**

Table 2: 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[1)], 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. Inter SGSN Routeing update occured in old SGSN.
DP Change of position context	TDP-R[2)], EDP-N, EDP-R	Routeing Area Update is accepted.

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.

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 or EDP-R in the case of Intra-SGSN Routeing Area Update (provided that this DP is dynamically armed by the Service Logic).

The PDP Context EDPs may be armed outside of the PDP context, requested by the gsmSCF.

6.4.3.1 Description of the PDP Context model (PIAs)

This subclause describes the model for PDP Context State Model~~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 context).
- Information being analyzed, e.g. GPRS-CSI is analyzed.

Exit events:
- GPRS-CSI is analyzed (DP PDP Context Establishment or DP Change of position context, new SGSN).

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 context).

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 is due to an inter SGSN routing area update (DP_PDP_Context_disconnection, old SGSN).
- Intra-SGSN Routeing Area Update Request is received from the MS (DP Change of position context).
- Inter-SGSN Routeing Area Update (DP_Change of position,new SGSN).
- An exception is encountered.

6.4.3.1.4 Change of position context

Entry events:
- Inter SGSN Routing Area update accepted (new SGSN).
- Intra SGSN Routeing Area update request received from the MS.

Actions:

- PDP Context (containing NSAPI, PDP Type, PDP Address, Access Point Name, QoS Requested, PDP Configuration Options) is reestablished in case of Inter-SGSN Routeing Area update accepted (new SGSN).

- Intra SGSN Routeing Area updated.

Exit events:

- reestablishement of the PDP context at the new SGSN and return to PDP context established in case of inter SGSN Routeing Area update accepted in new SGSN (PIA PDP context established).

- Routeing Area update completed in case of intra SGSN Routeing Area update (PIA PDP context established).

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 State Model~~FSM~~ and PDP context State Model~~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 State Model~~FSM~~ and PDP Cc~~c~~ontext State Model~~FSM~~

Encountered DP	Implicit disarmed DPs						
	DP Attach	DP Change of position GPRS 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 GPRS 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.

***** Next Modified Part (6.6) *****

6.6 Description of information flows

6.6.1 gprsSSF to gsmSCF Information Flows

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:

Information element name	Required	Description
Gprs Reference Number	M	This IE contains an identifier that is allocated by the gprsSSF and it is used to identify the gprsSSF instance taking care of GPRS session or PDP context.
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 routeing 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 State Model~~FSM~~ or to one single PDP context.

M Mandatory (The IE shall always be sent).

C Conditional (The IE shall be sent, if available).

***** Next Modified Part (6.6) *****

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 State Model~~FSM~~ or PDP Context State Model~~FSM~~) without substituting new data from the gsmSCF.

6.6.2.5.2 Information Elements

The following information element is used:

Information element name	Required	Description
PDP ID	C	This IE identifies the PDP context which processing shall continue for. If not present the dialogue corresponds to the GPRS 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 state model~~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.

3GPP N2 Meeting
Rotenburg, Germany, 22-26 May 2000

***Document* N2-000161**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

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23.078	CR	169	Current Version:	3.4.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	CN#8	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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 [X]
(at least one should be marked with an X)

Source: N2 **Date:** 23 May 2000

Subject: Editorial corrections in the clause 5

Work item: CAMEL Phase 3

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification	X		Release 99	X
				Release 00	

Reason for change: Various editorial corrections

Clauses affected: 5

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

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 subclause.

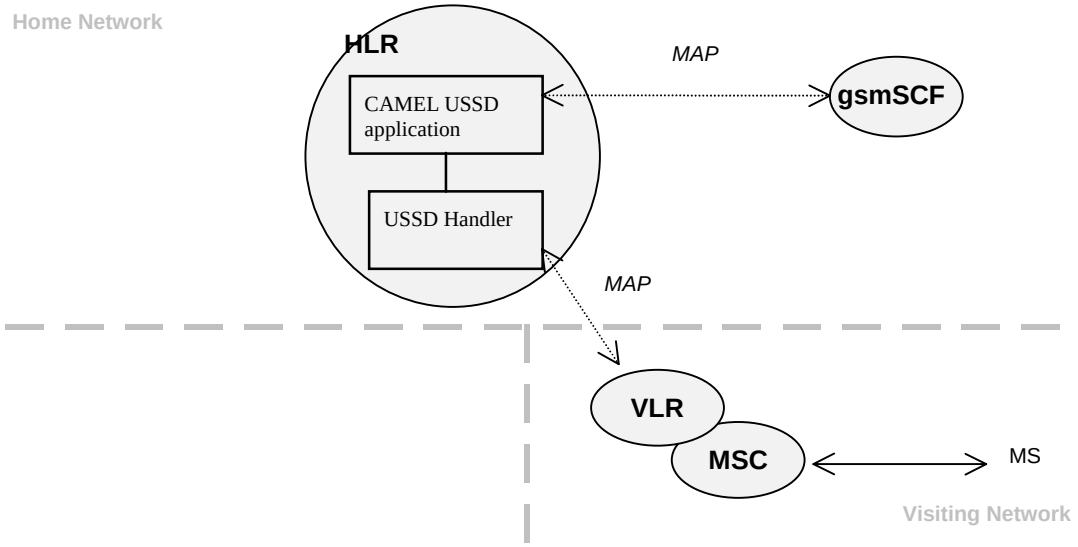


Figure 5.1: Handling of USSD to and from a CAMEL subscriber

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 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 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 routeing.

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 a particular service code. The address shall be an E.164 number to be used for routeing.

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 subclause 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 an IE which it receives.

Details of errors and exceptions to these rules are specified in are specified in 3G TS 29.002 [4].

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:

Information element name	Required	Description
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:

Information element name	Required	Description
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:

Information element name	Required	Description
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:

Information element name	Required	Description
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:

Information element name	Required	Description
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 element~~s~~ is~~are~~ required:

Information element name	Required	Description
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:

Information element name	Required	Description
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:

Information element name	Required	Description
IMSI	M	This IE identifies the subscriber.
Originating Entity Number	M	This IE identifies the functional entity initiating the subscriber activity. In this case, this shall be the address of the HLR.

M Mandatory (The IE shall always be sent).

3GPP N2 Meeting
Rotenburg, Germany, 22-26 May 2000

Document N2-000239
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.078	CR	170r1	Current Version:	3.4.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	CN#8	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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

Source: N2 **Date:** 26 May 2000

Subject: Editorial corrections in the clause 6

Work item: CAMEL Phase 3

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification	X		Release 99	X
				Release 00	

Reason for change: Various editorial corrections. See “other comments” for detail.

Clauses affected: 6

Other specs affected:

Other 3G core specifications		→ List of CRs:	
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

Following Changes are highlighted.

Document structure in clause 6.5 is made to as similar as that of clause 4 for better readability. As the result, this becomes as follows.

6.5Procedures for CAMEL GPRS
6.5.1 Overall SDL Architecture
6.5.2 Handling GPRS in the SGSN
6.5.2.1 Actions of the SGSN on receipt of Int_Error
6.5.2.2 Actions of the SGSN on receipt of Int_Continue
6.5.2.3 Handling of GPRS Attach/Detach
6.5.2.4 Handling of GPRS Routeing Area Update
6.5.2.5 Handling of PDP Context establishment and deactivation
6.5.3 Handling GPRS in the gprsSSF
6.5.3.1 Procedure Handle_SCI_GPRS
6.5.3.2 Process GPRS_SSF and procedures

Wording change
“GSM” PDP Context ... -> “GPRS” PDP Context ..(in subclause 6.4.2.1.2)
Chapter, section -> clause or subclause.
information elements are “used” -> “required” as described in other clause.

Note under the table 3 is moved into the table as Note 3.

Short introductory text is inserted on the top of information flows. (in clause 6.6)

Reference of the information elements are corrected. (in subclause 6.6.3.1)

Previous subclause 6.6.5 “SGSN to HLR Information Flows” is an overlapped subclause.
Deleted and Insert Subscriber Data ack is moved into 6.6.4 as the subclause 6.6.4.1.

Referenced documents are corrected. (in subclause 6.5.2 and 6.6.)

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 a GPRS session requiring CAMEL support. The architecture is applicable to the third phase of CAMEL.

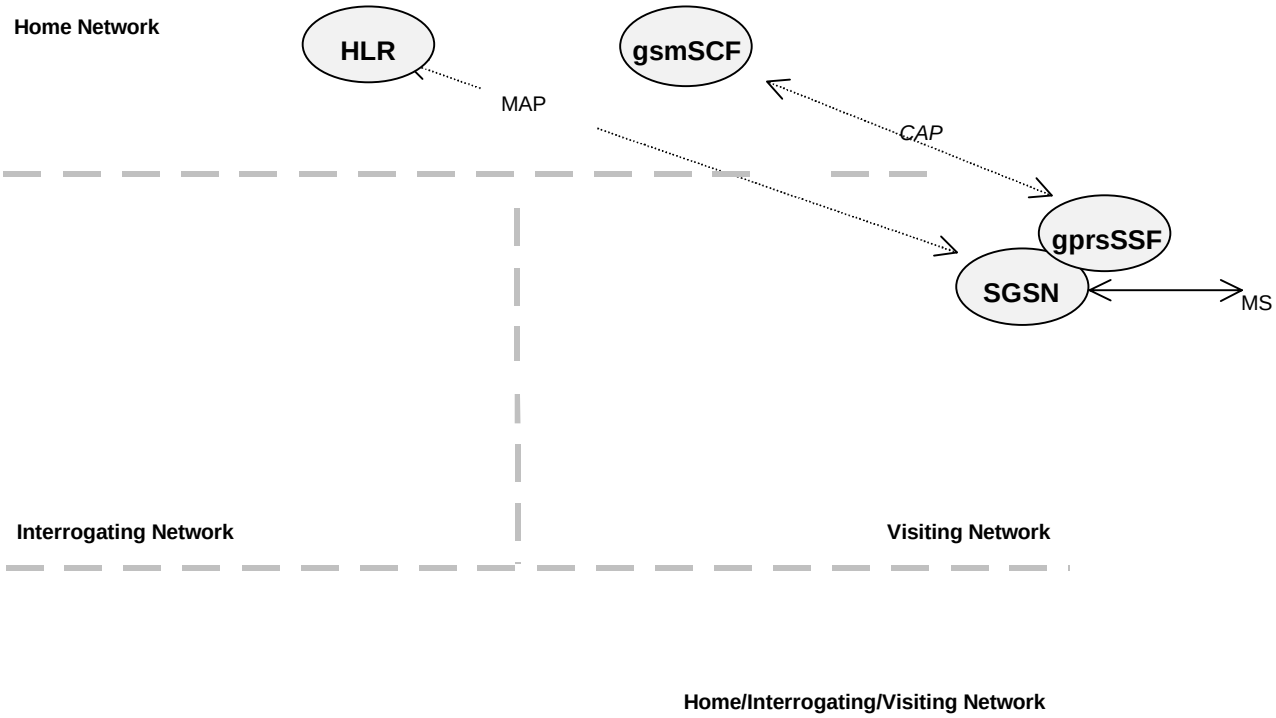


Figure 6.1 Functional architecture for support of CAMEL

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 or Inter-SGSN Routeing 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 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 routeing.

6.3.1.2 Service Key

The Service Key identifies to the gsmSCF the service logic that shall apply.

6.3.1.3 Default GPRS Handling

The Default GPRS Handling indicates whether the GPRS session or PDP context 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.

6.3.1.8 gsmSCF address list for CSI

The gsmSCF address list indicates a list of gsmSCF addresses to which Notification on Change of Subscriber Data is to be sent. This list is common to all CSI.

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 state model (GPRS SM) is used to describe the actions in an SGSN during processing of a GPRS session 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.

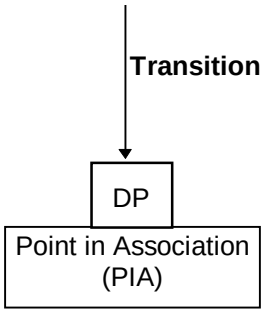


Figure 6.2: GPRS SM Components

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.

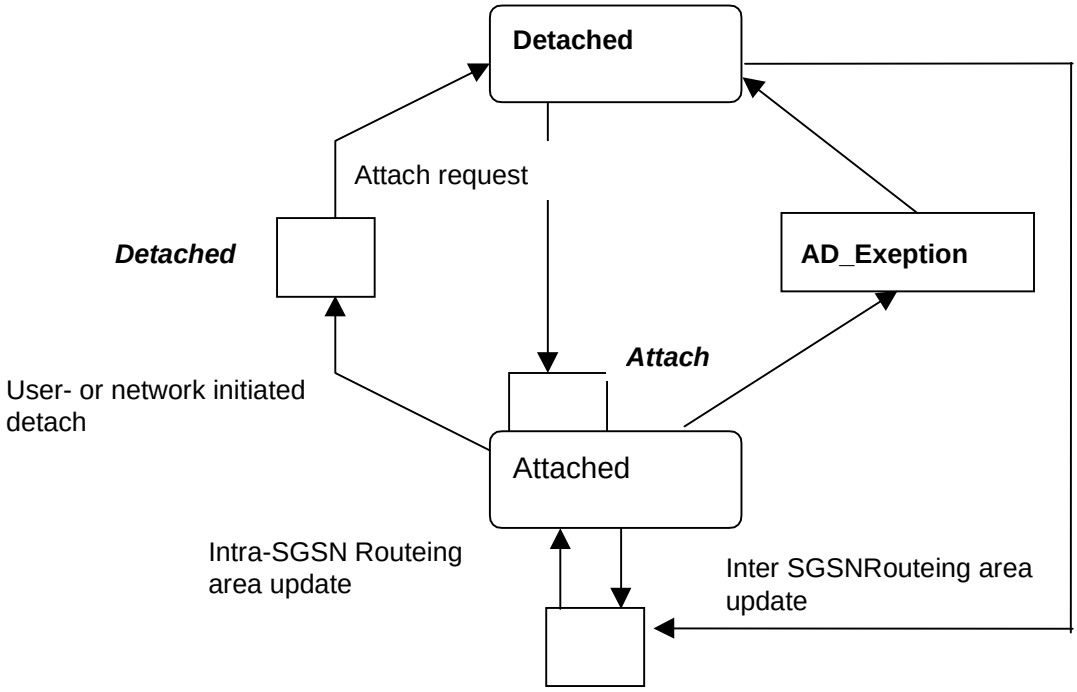


Figure 6.3: GPRS Attach/Detach FSM

Table 1: 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 GPRS session	TDP-R[1)], 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 GPRS 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 GPRS 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 Attach/Detach model (PIAs)

This subclause describes the model for the attach and detach a GPRS session 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 Chage of position GPRS session).
- Information being analyzed, e.g. GPRS-CSI is analyzed.

Exit events:
- GPRS-CSI is analyzed (DP Attach or DP Change of position GPRS session).

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 Detached).
- Intra-SGSN Routeing Area Update is accepted (DP Change of position GPRS session).
- 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 GPRS~~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 GPRS~~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.

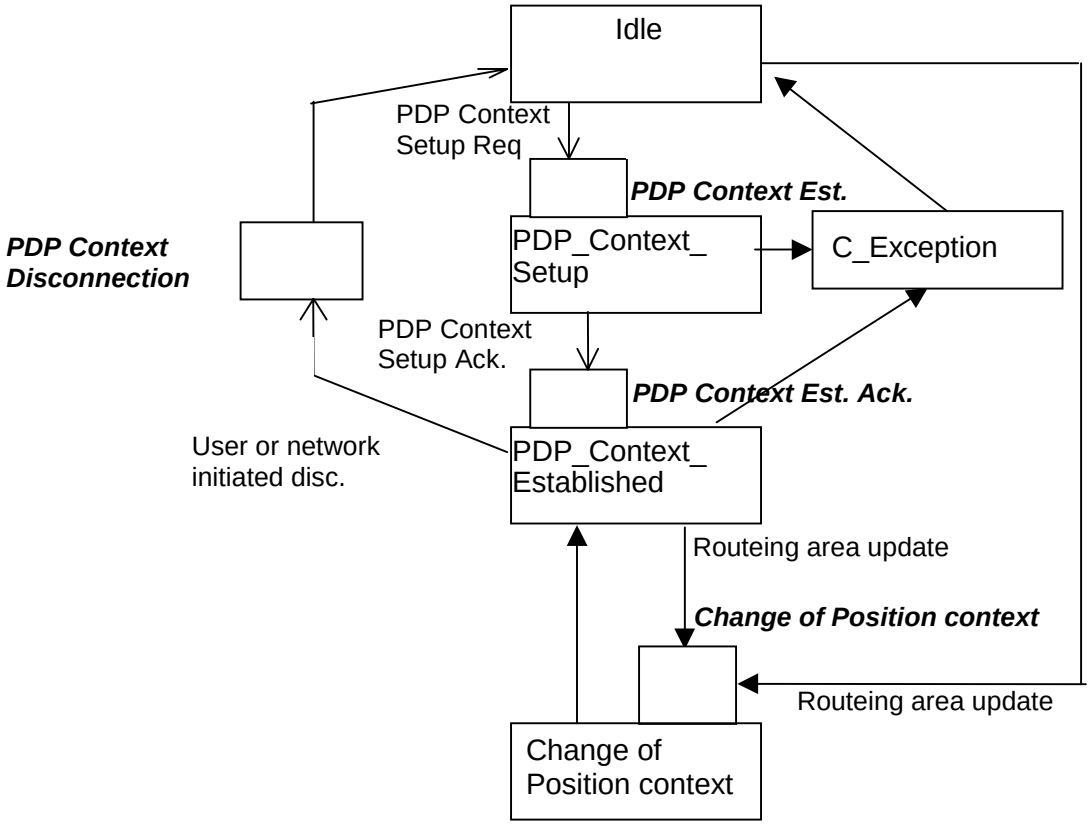


Figure 6.4: GPRS PDP Context FSM

Table 2: 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[1)], 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. Inter SGSN Routeing update occured in old SGSN.
DP Change of position context	TDP-R[2)], EDP-N, EDP-R	Routeing Area Update is accepted.

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.

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 or EDP-R in the case of Intra-SGSN Routeing Area Update (provided that this DP is dynamically armed by the Service Logic).

The PDP Context EDPs may be armed outside of the PDP context, requested by the gsmSCF.

6.4.3.1 Description of the PDP Context model (PIAs)

This subclause describes the 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 context).
- Information being analyzed, e.g. GPRS-CSI is analyzed.

Exit events:
- GPRS-CSI is analyzed (DP PDP Context Establishment or DP Change of position context, new SGSN).

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 context).

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 is due to an inter SGSN routing area update (DP – PDP – Context – disconnection, old SGSN).
- Intra-SGSN Routeing Area Update Request is received from the MS (DP Change of position context).
- Inter-SGSN Routeing Area Update (DP – Change of position, new SGSN).
- An exception is encountered.

6.4.3.1.4 Change of position context

Entry events:
- Inter SGSN Routing Area update accepted (new SGSN).
- Intra SGSN Routeing Area update request received from the MS.

Actions:

- PDP Context (containing NSAPI, PDP Type, PDP Address, Access Point Name, QoS Requested, PDP Configuration Options) is reestablished in case of Inter-SGSN Routeing Area update accepted (new SGSN).

- Intra SGSN Routeing Area updated.

Exit events:

- reestablishement of the PDP context at the new SGSN and return to PDP context established in case of inter SGSN Routeing Area update accepted in new SGSN (PIA PDP context established).

- Routeing Area update completed in case of intra SGSN Routeing Area update (PIA PDP context established).

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 FSM 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 GPRS 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 GPRS 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 the case of inter SGSN Routing Area update.

6.5 Procedures for CAMEL GPRS

6.5.1 Overall SDL Architecture

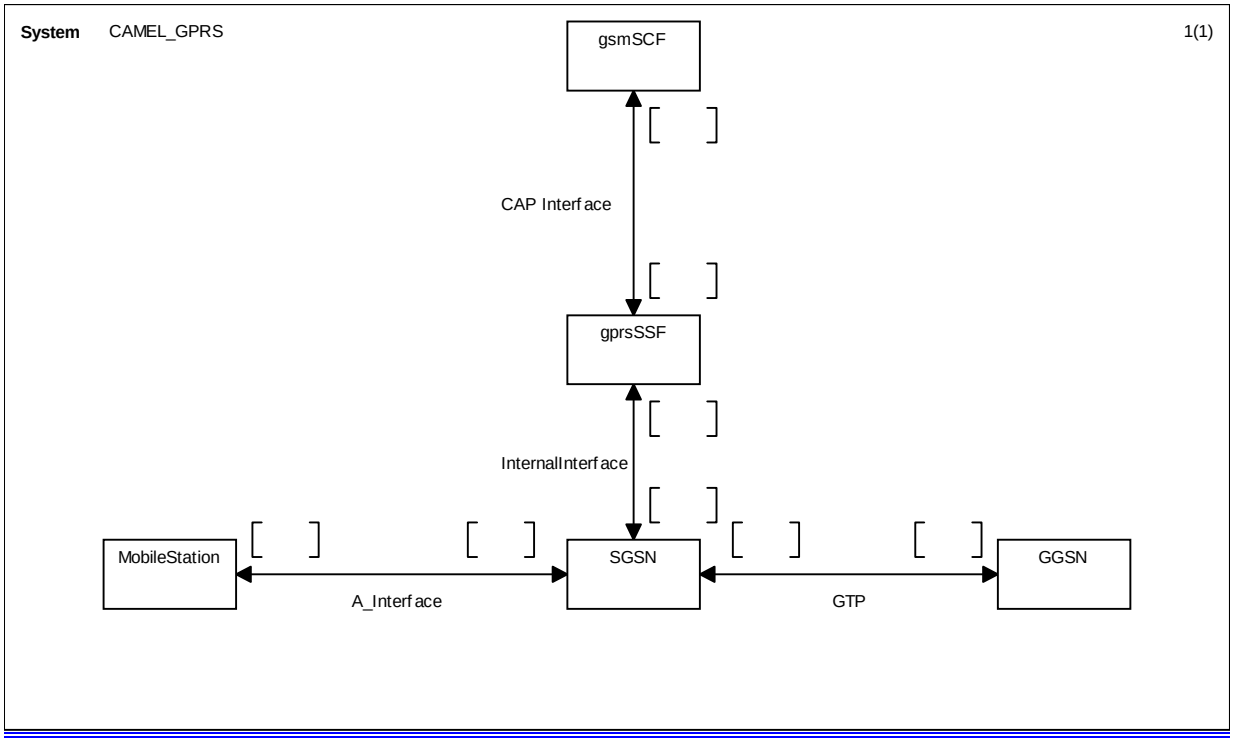


Figure 6.5: Architecture for CAMEL/GPRS interworking

6.5.2 Handling GPRS in the SGSN

The functional behaviour of the SGSN is specified in 3G TS 23.060 [11]~~29.002 [4]~~. The procedures specific to CAMEL are specified in this subclause :

- Procedure CAMEL_GPRS_Attach_Request;
- Procedure CAMEL_GPRS_Detach_Indication;
- Procedure CAMEL_GPRS_Routeing_Area_Update;
- Procedure CAMEL_GPRS_Context_Acknowledge;
- Procedure CAMEL_GPRS_Activate_PDP_Context;
- Procedure CAMEL_GPRS_Create_PDP_Context;
- Procedure CAMEL_GPRS_Modify_PDP_Context;
- Procedure CAMEL_GPRS_Deactivate_PDP_Context.

6.5.2.1~~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.

6.5.2.2~~2~~ Actions of the SGSN on receipt of Int_Continue

The SGSN continues processing without any modification of GPRS parameters.

~~6.5.3Procedure Handle_SCI_GPRS~~

~~1) Precondition: before an answer event is detected and no Tsw running:~~

~~if 1 set of e-parameters received -> send to the SGSN;~~

~~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 SGSN;~~

~~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 SGSN shall store the received e-parameters to be sent subsequently to the MS. The SGSN shall send these e-parameters to the MS in a Connect message or in a Facility message.~~

6.5.4 Overall SDL Architecture

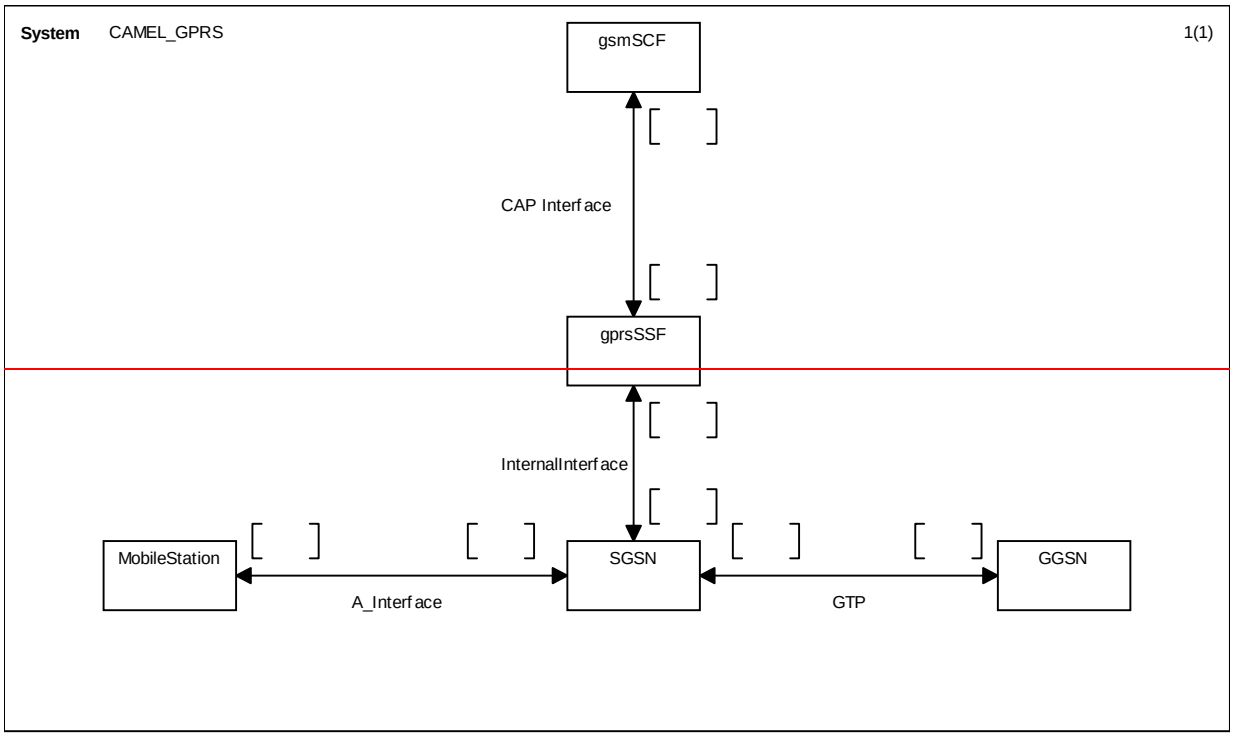


Figure 6.5: Architecture for CAMEL/GPRS interworking

6.5.2.35 Handling of GPRS Attach/Detach

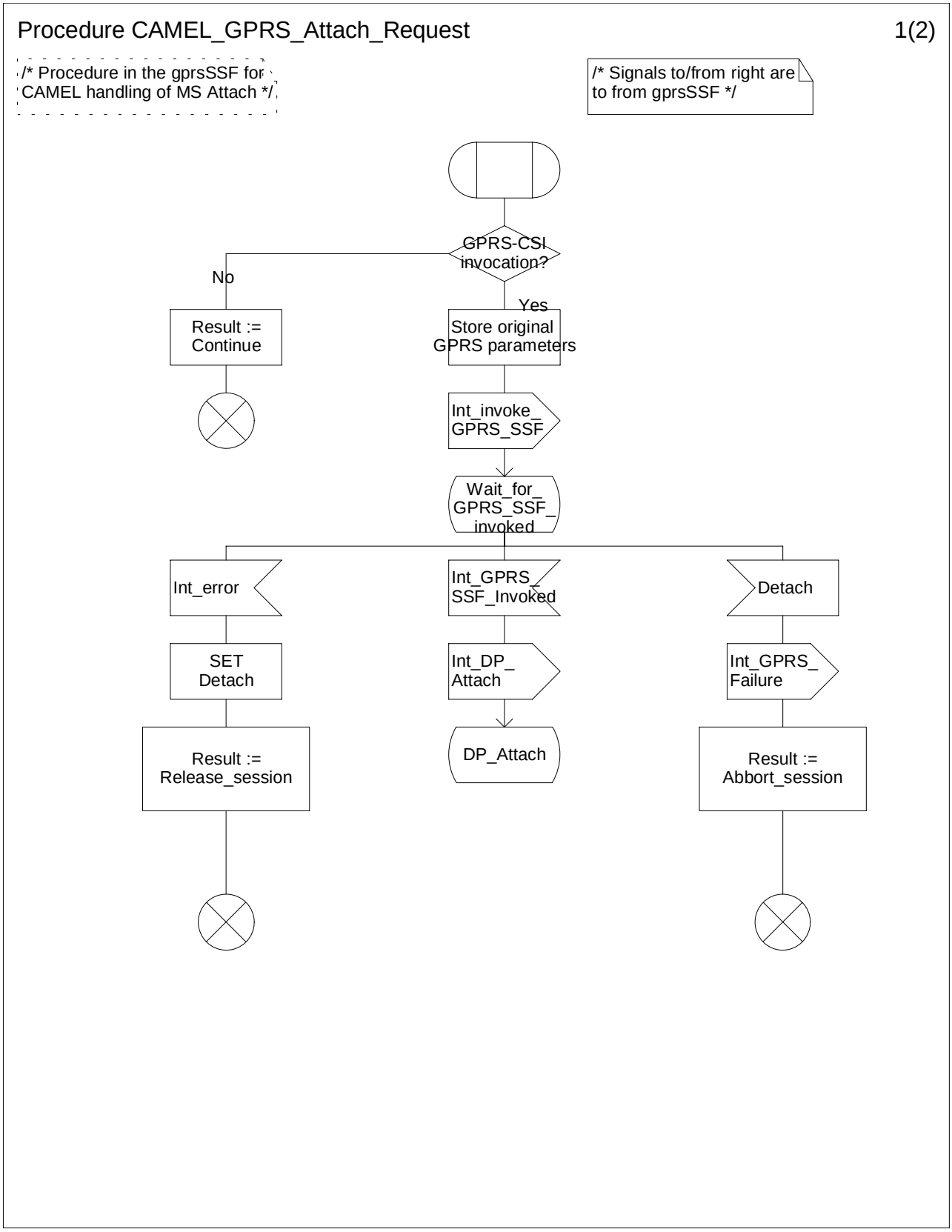


Figure 6.7 a: Procedure CAMEL_GPRS_Attach_Request (sheet 1)

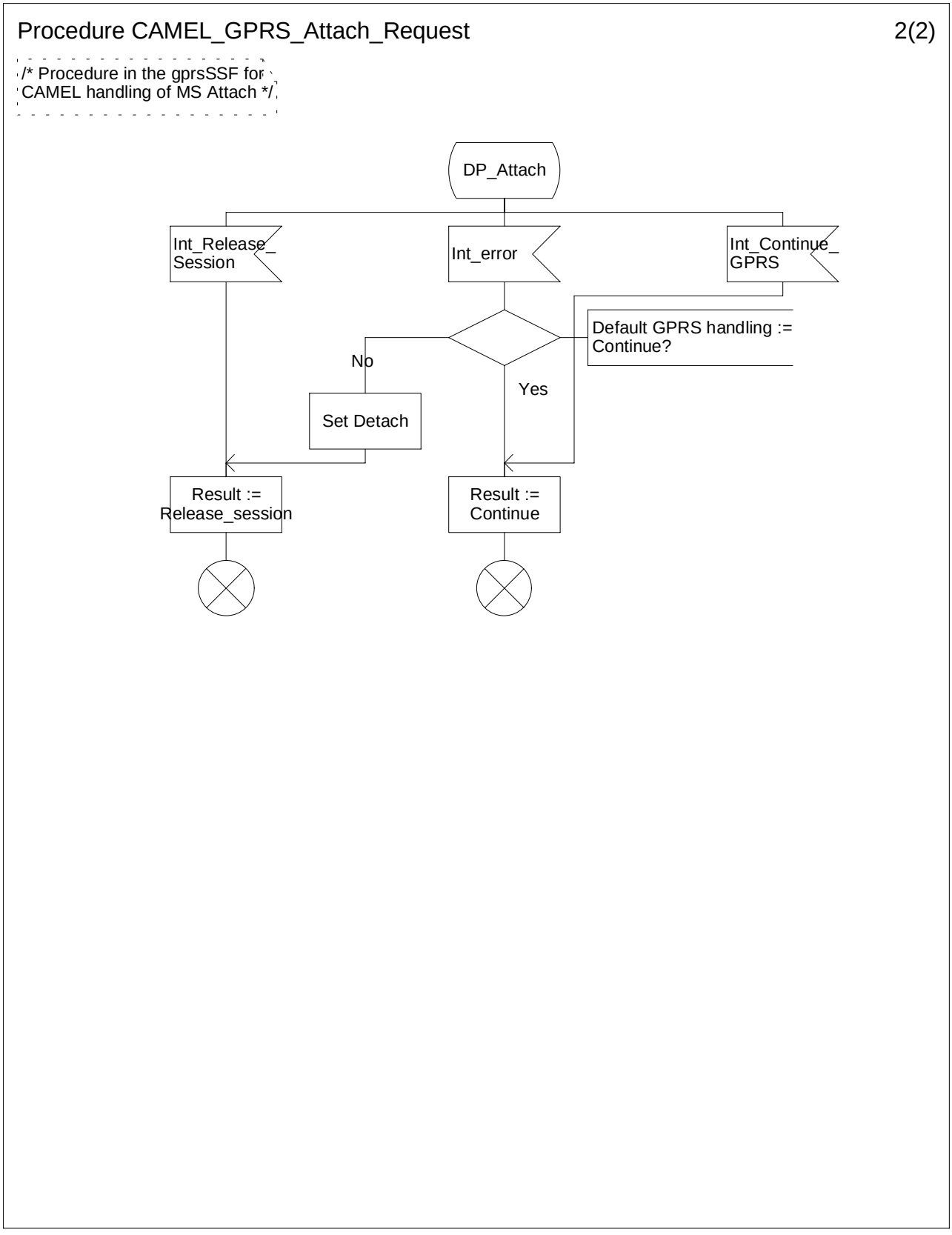


Figure 6.7 b: Procedure CAMEL_GPRS_Attach_Request (sheet 2)

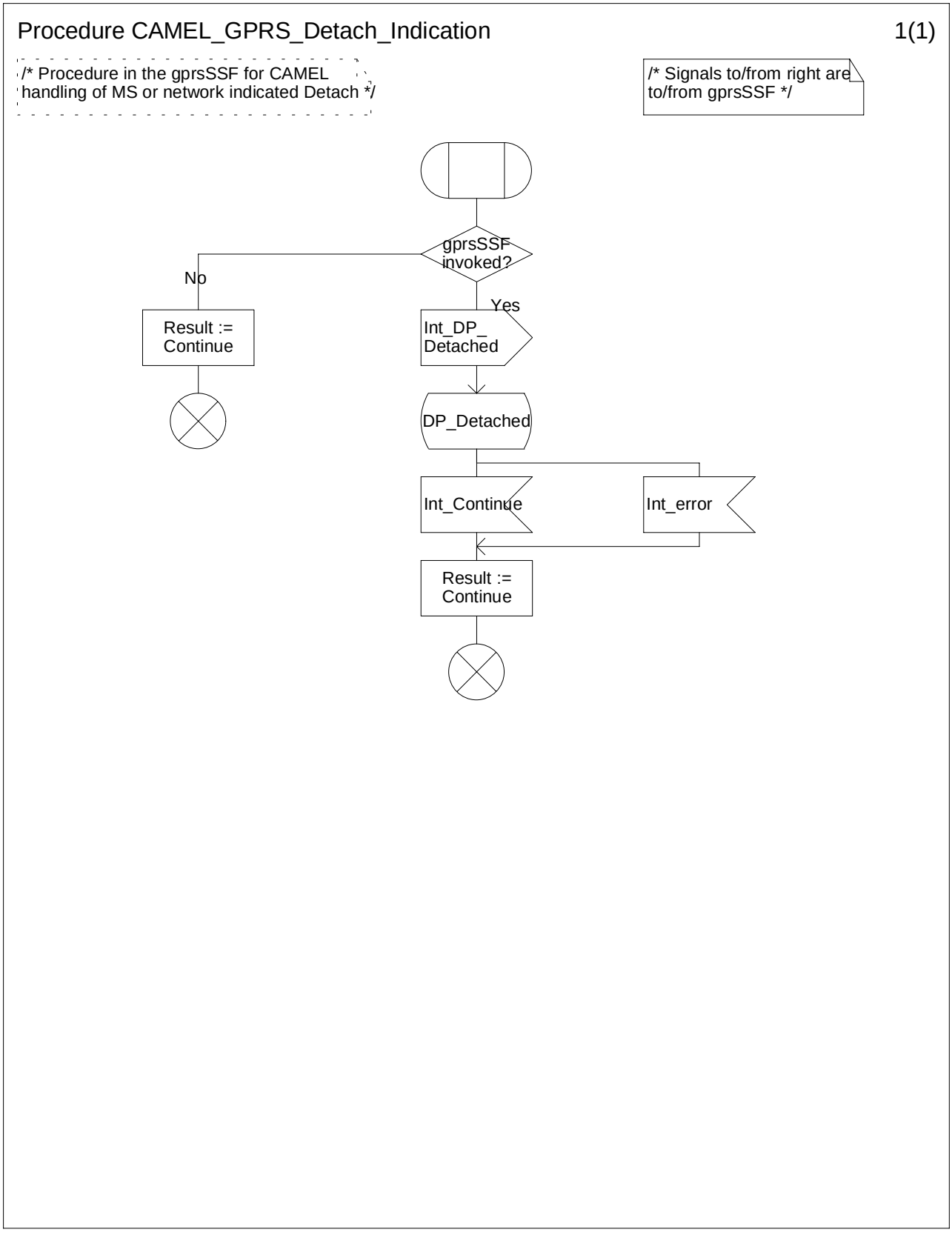


Figure 6.8: Procedure CAMEL_GPRS_Detach_Indicaton

6.5.2.46 Handling of GPRS Routeing Area Update

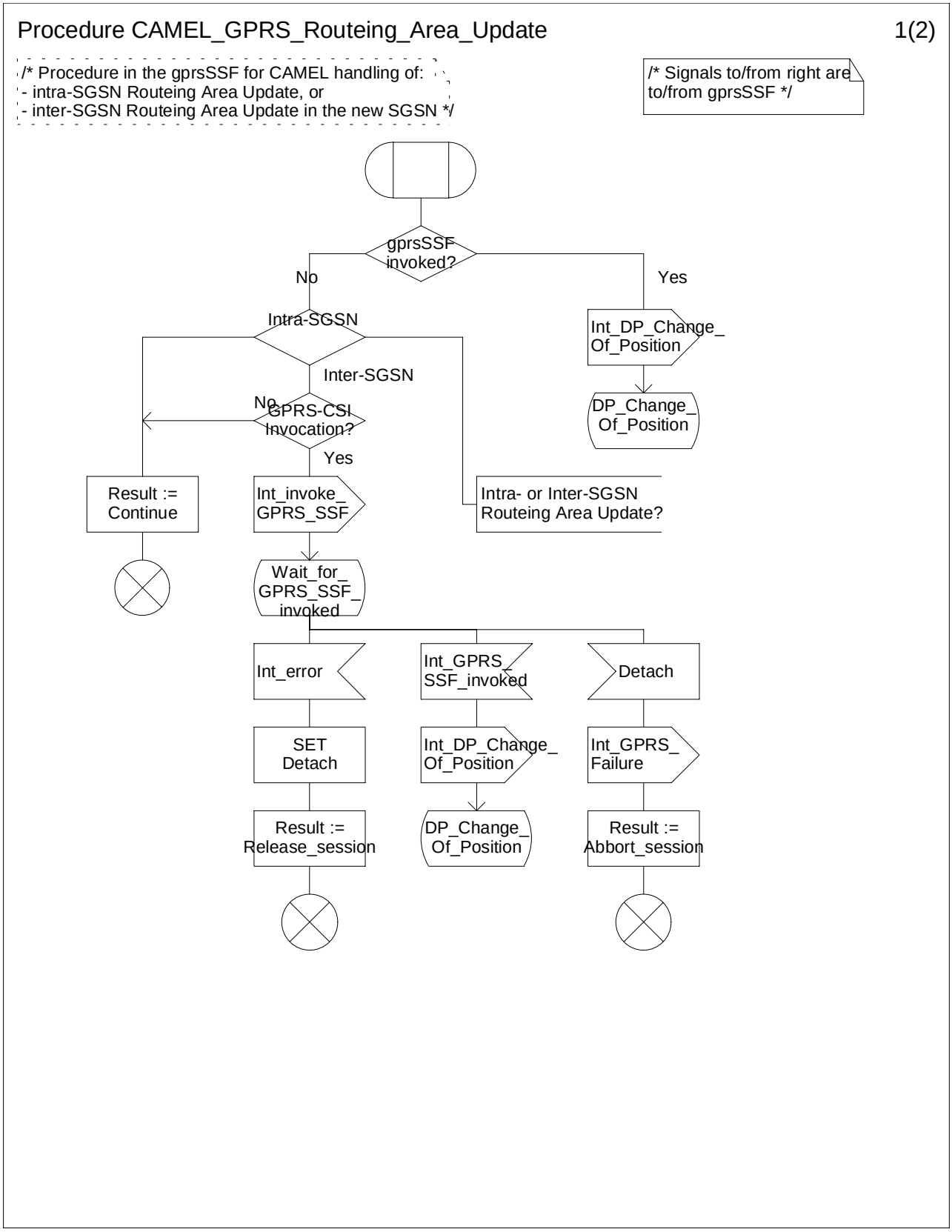


Figure 6.9 a: Procedure CAMEL_GPRS_Routeing_Area_Update (sheet 1)

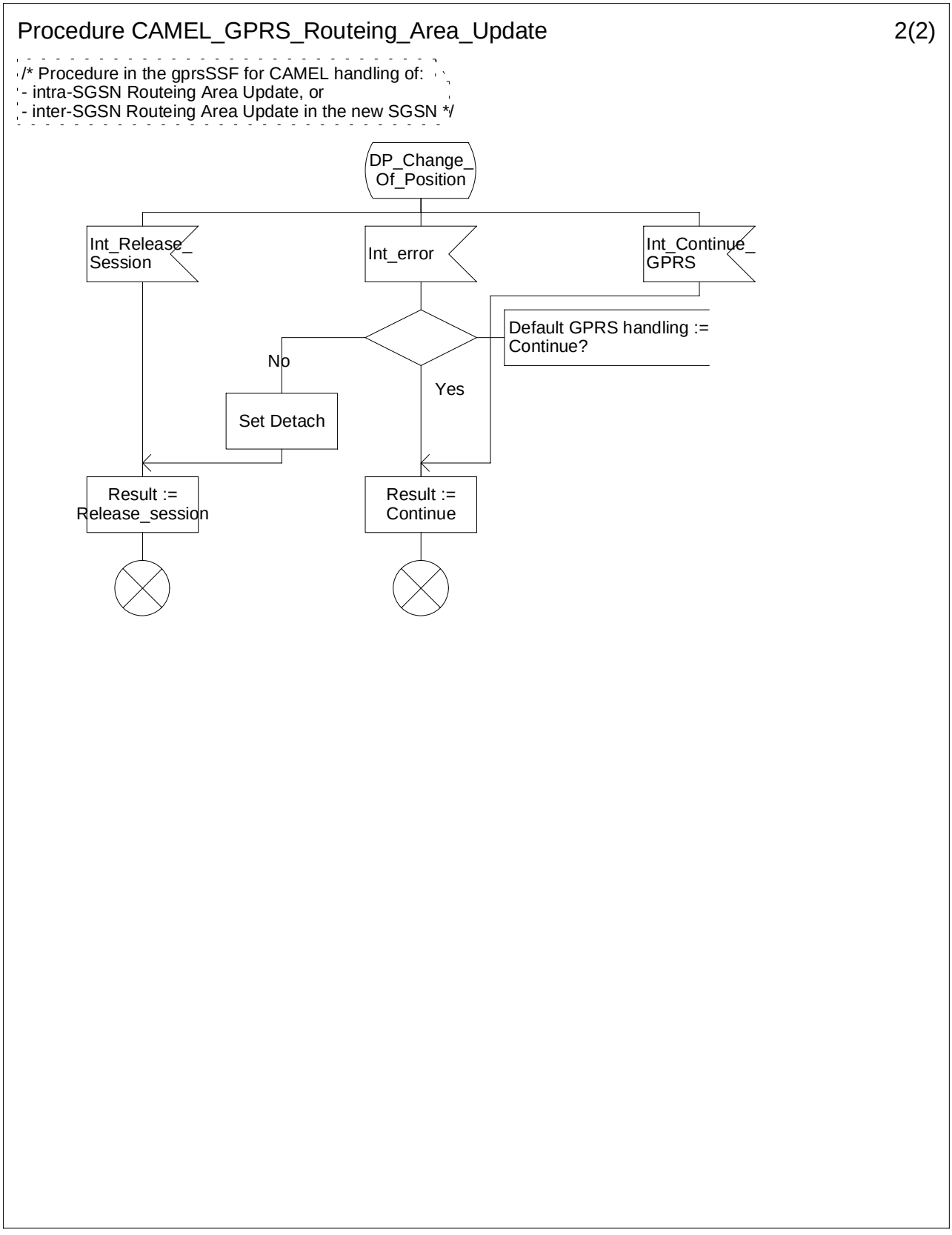


Figure 6.9 b: Procedure CAMEL_GPRS_Routeing_Area_Update (sheet 2)

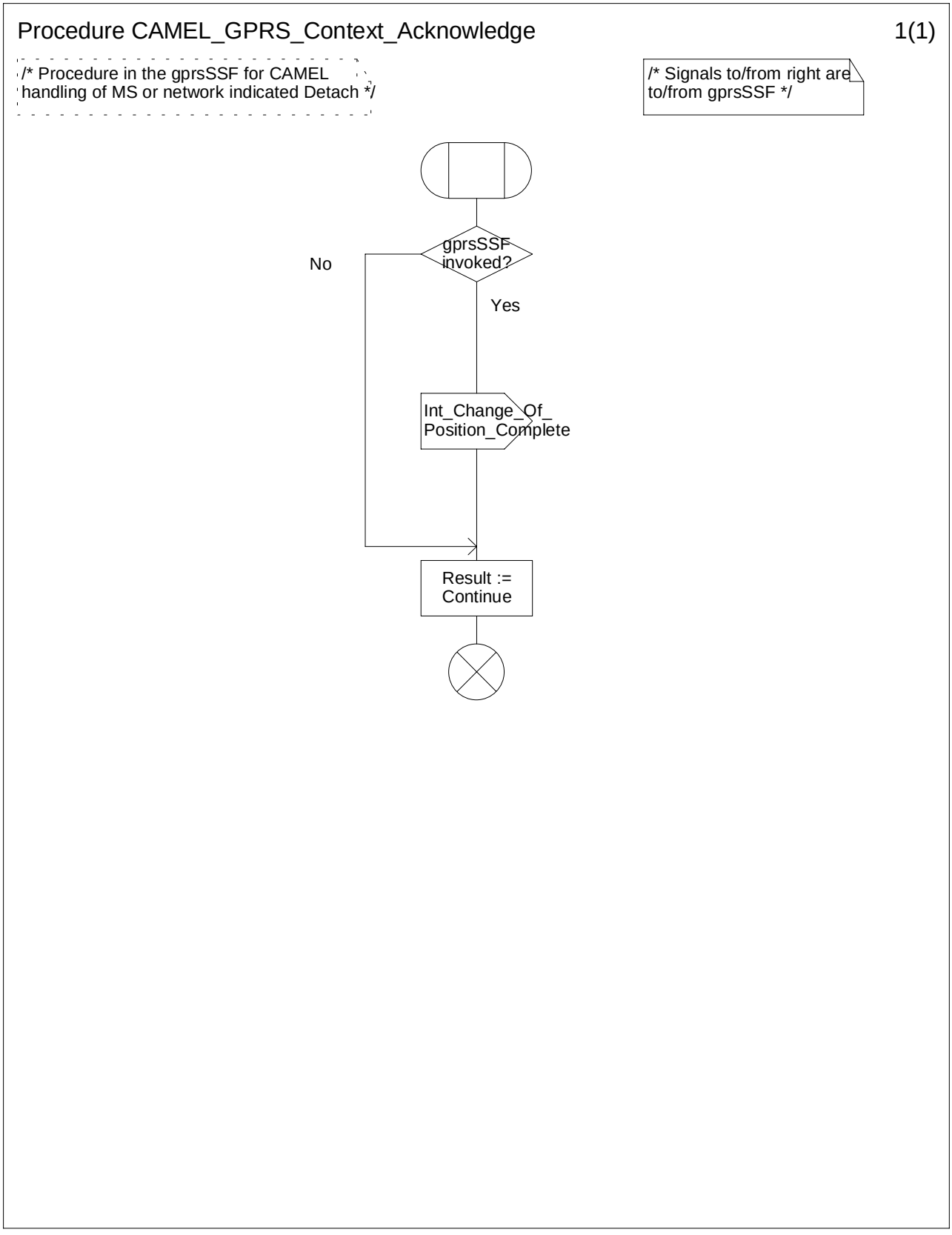


Figure 6.10: Procedure CAMEL_GPRS_Context_Acknowledge

6.5.2.57 Handling of PDP Context establishment and deactivation

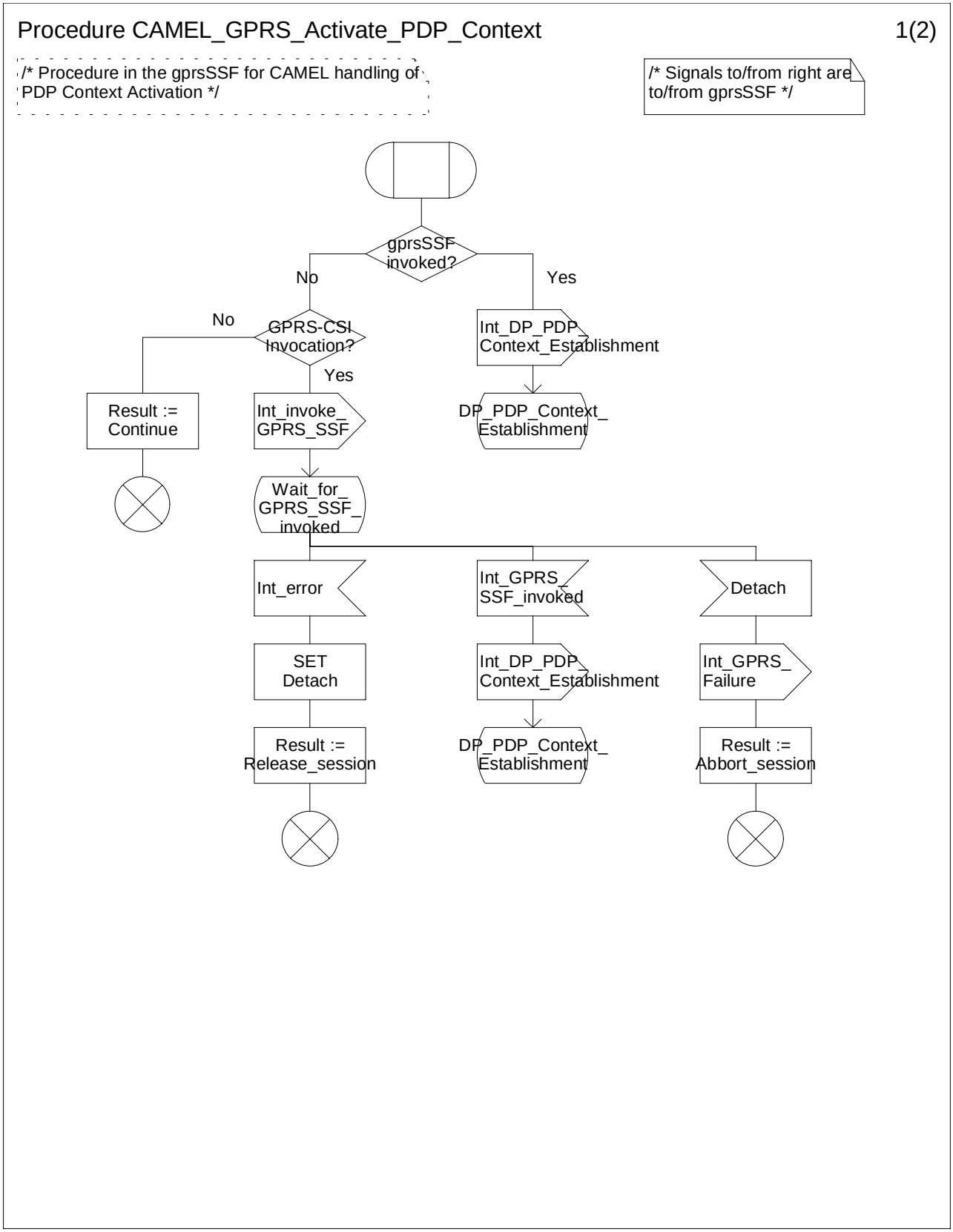


Figure 6.11 a: Procedure CAMEL_GPRS_Activate_PDP_Context (sheet 1)

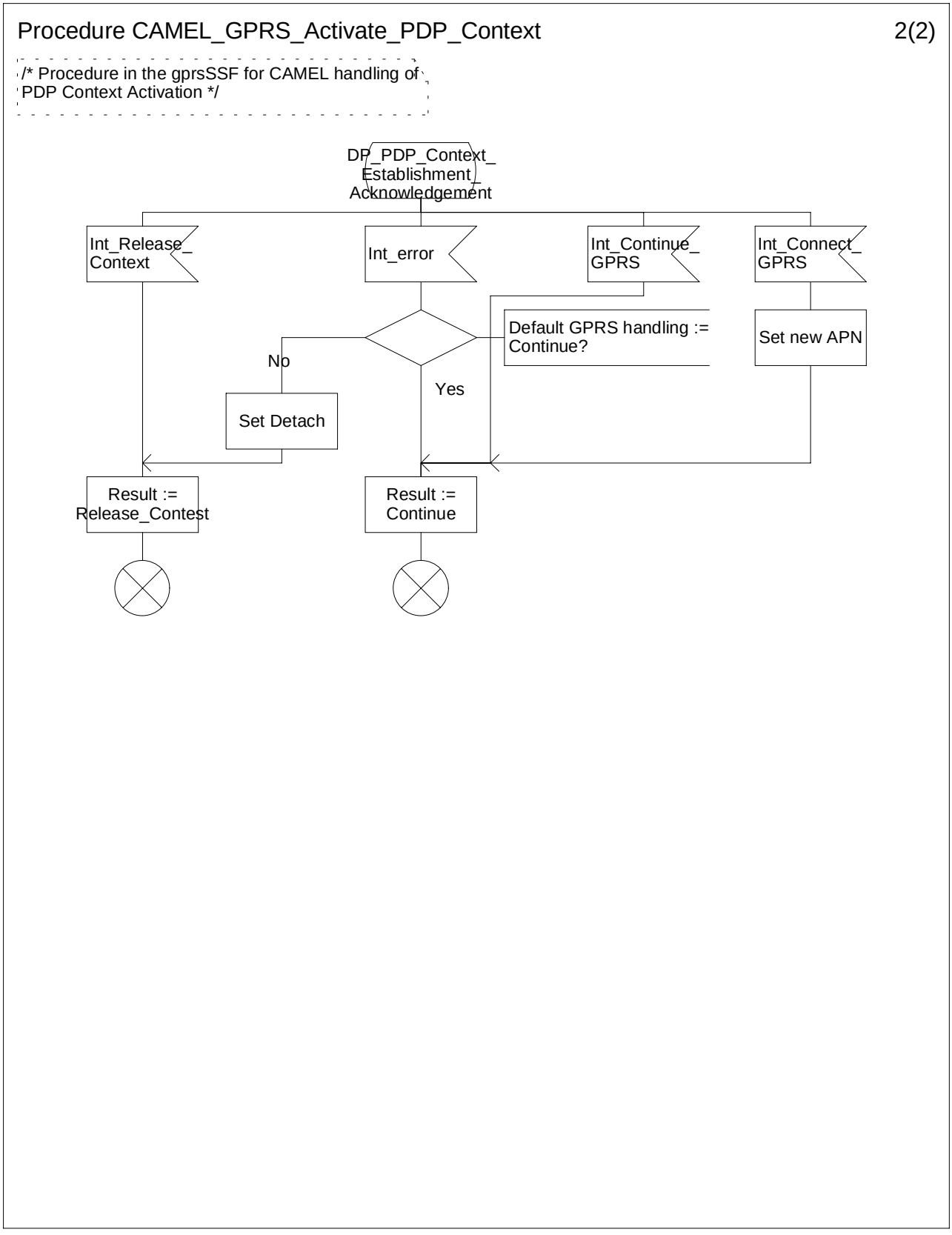


Figure 6.11 b: Procedure CAMEL_GPRS_Activate_PDP_Context (sheet 2)

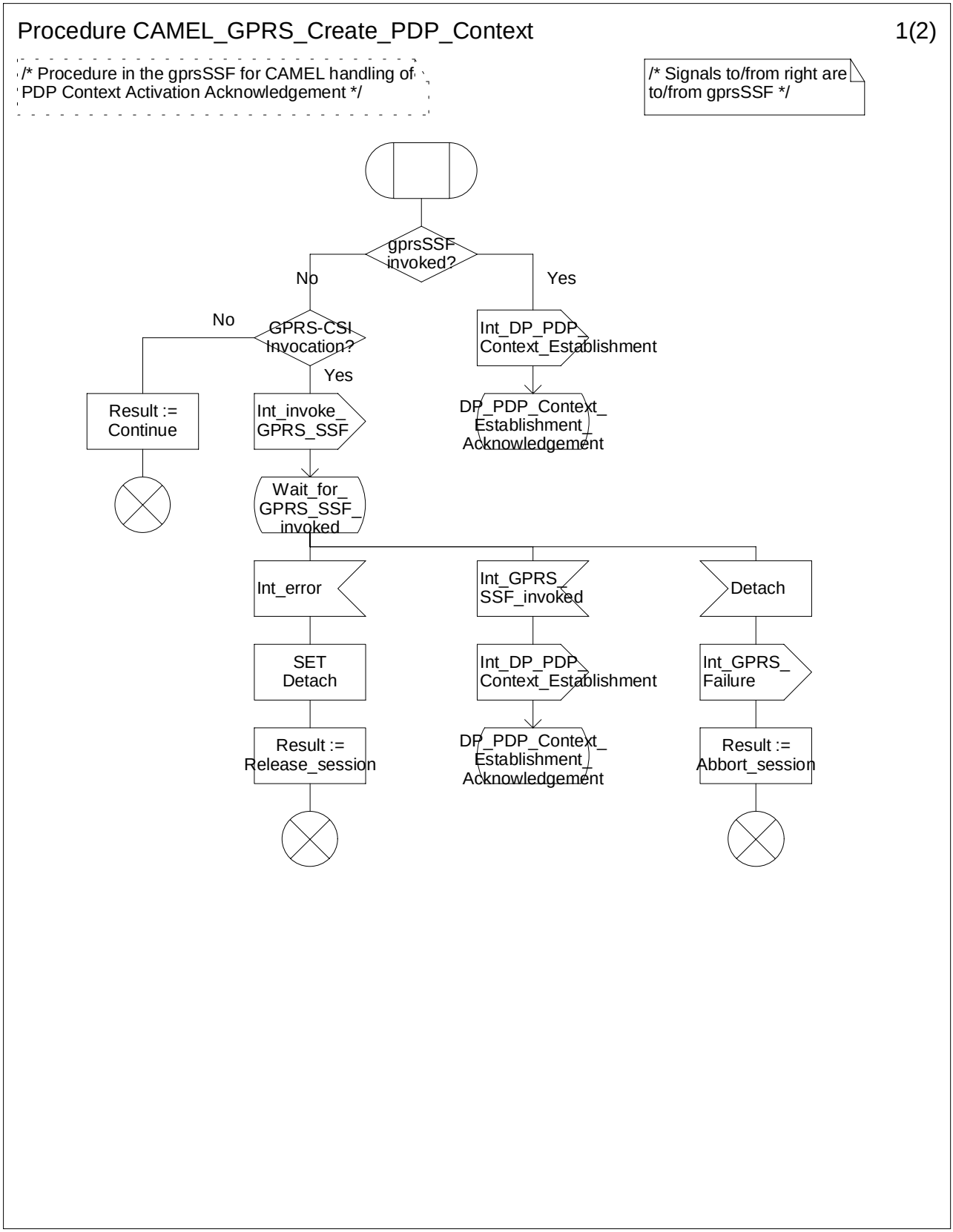


Figure 6.12 a: Procedure CAMEL_GPRS_Create_PDP_Context (sheet 1)

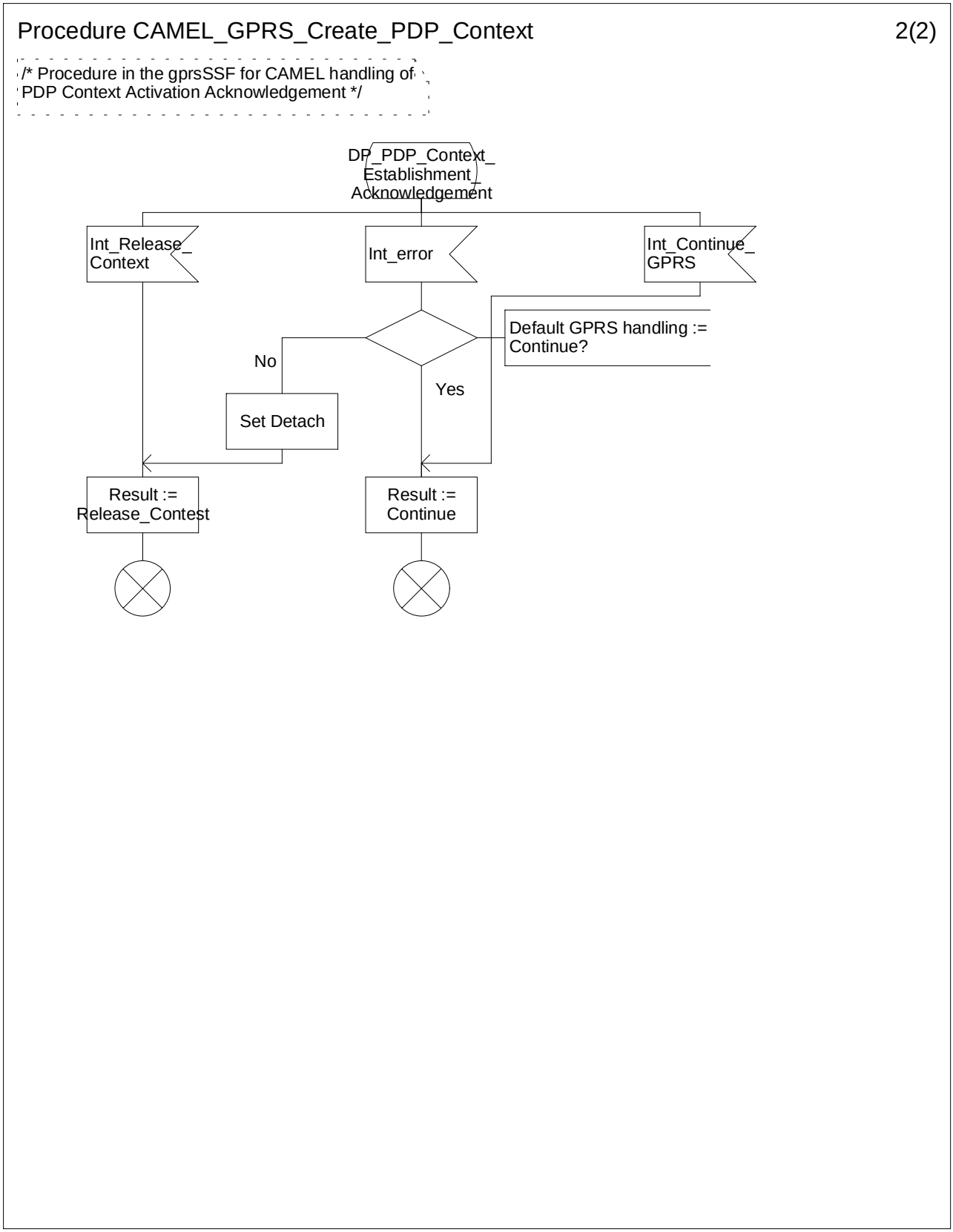


Figure 6.12 b: Procedure CAMEL_GPRS_Create_PDP_Context (sheet 2)

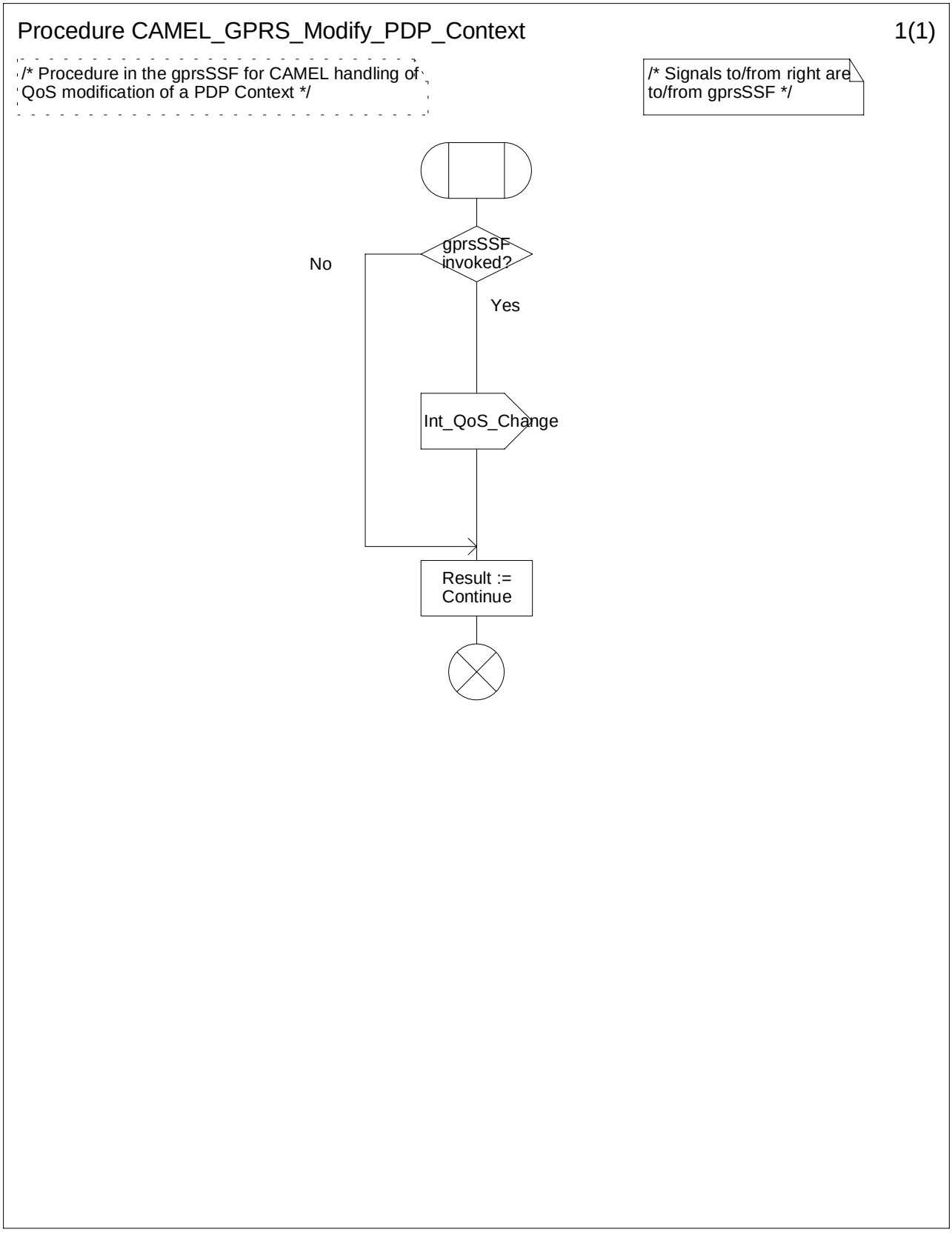


Figure 6.13: Procedure CAMEL_GPRS_Modify_PDP_Context

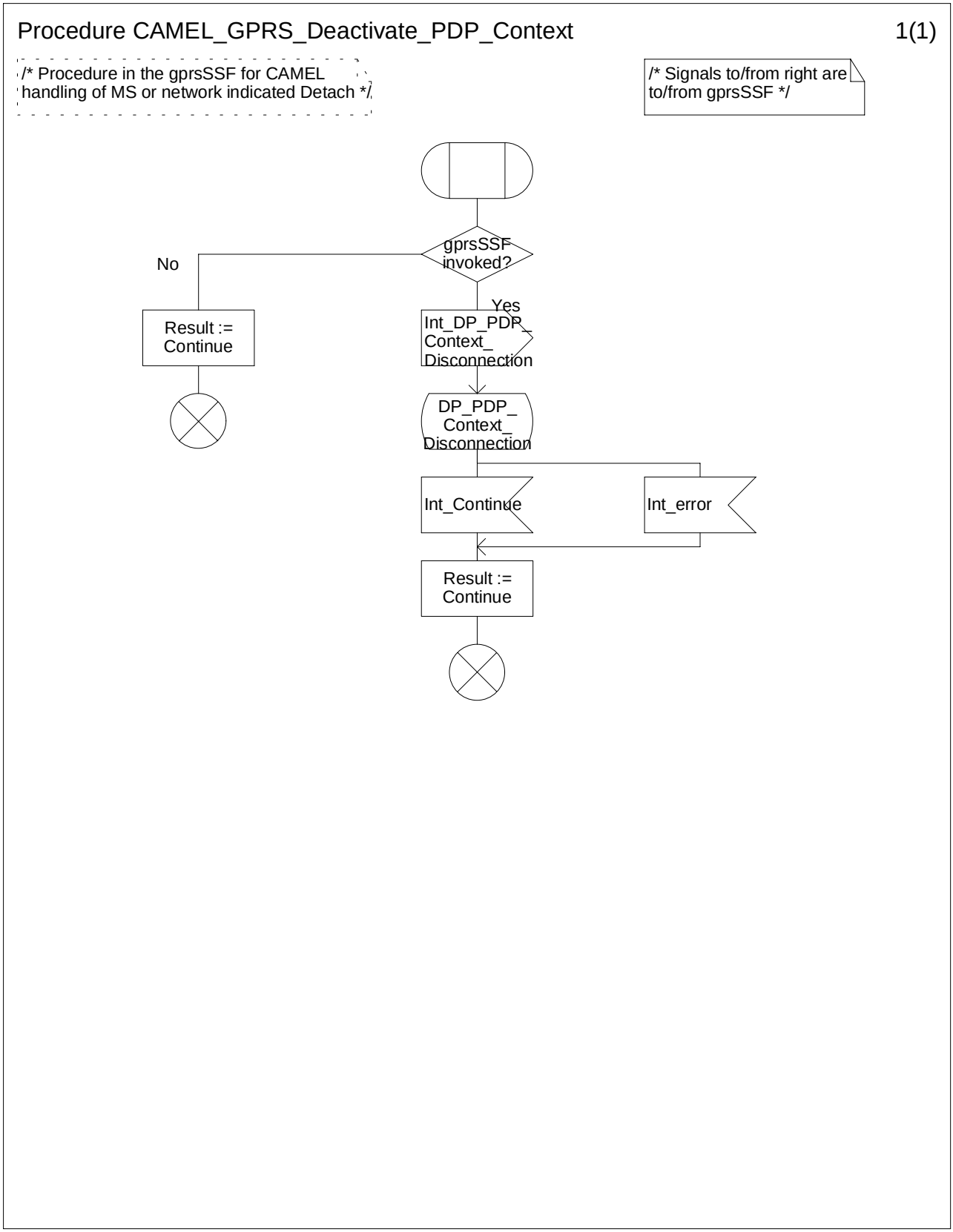


Figure 6.14: Procedure CAMEL_GPRS_Deactivate_PDP_Context

6.5.38 Handling GPRS in the gprsSSF

6.5.3.1 Procedure Handle_SCI_GPRS

1) Precondition: before an answer event is detected and no Tsw running:

   if 1 set of e-parameters received --> send to the SGSN;

   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 SGSN;

   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 SGSN shall store the received e-parameters to be sent subsequently to the MS. The SGSN shall send these e parameters to the MS in a Connect message or in a Facility message.

6.5.3.2 Process GPRS_SSF and procedures

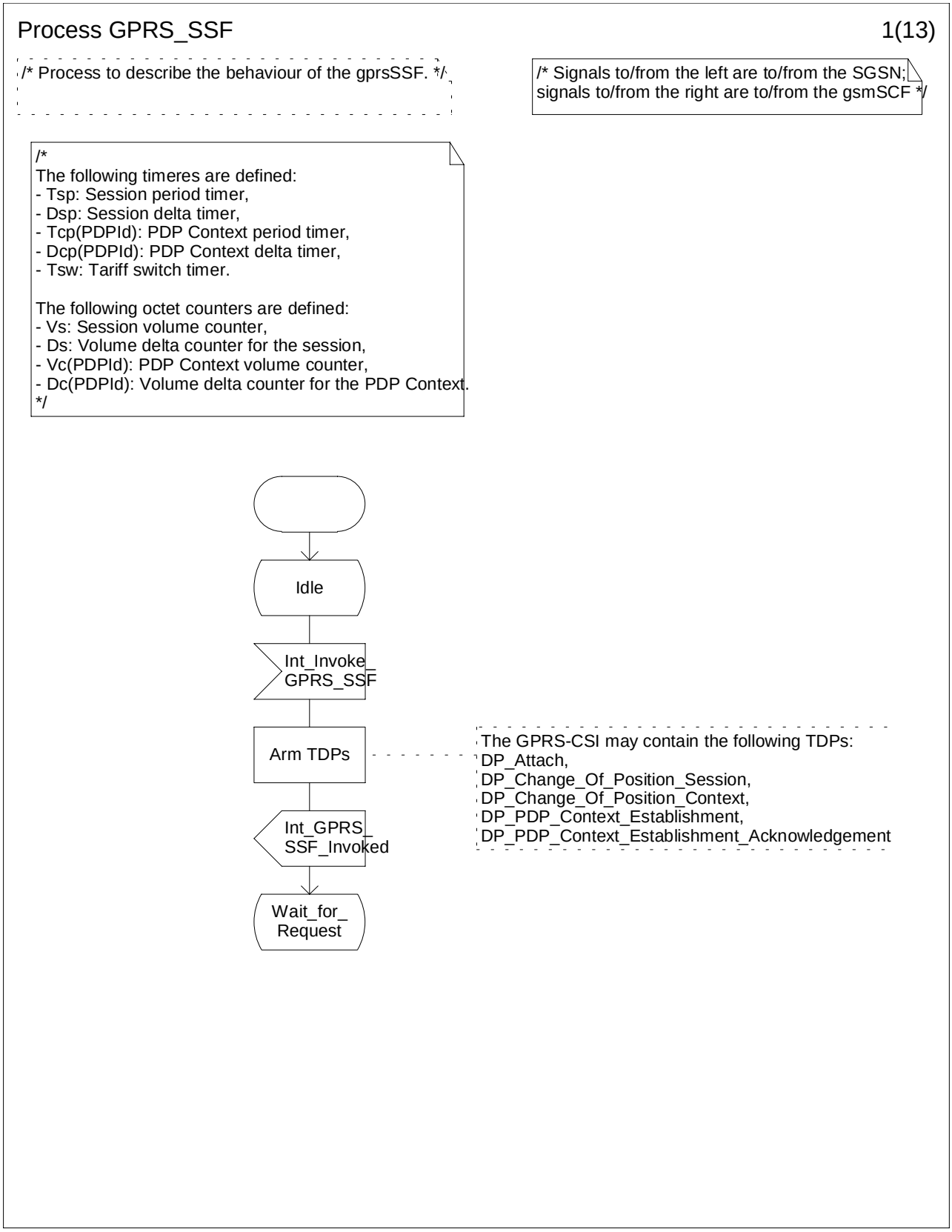


Figure 6.15 a: Process GPRS_SSF (sheet 1)

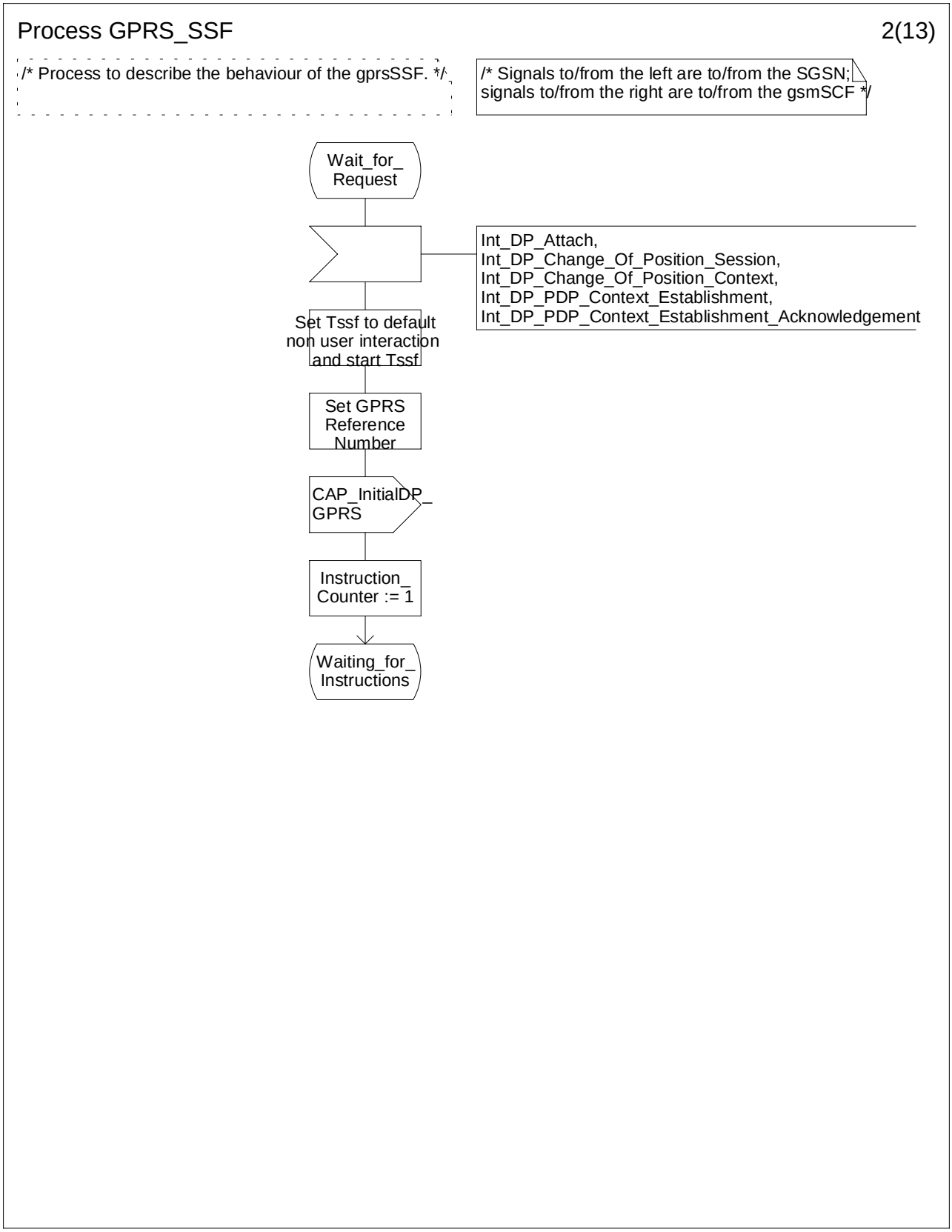


Figure 6.15 b: Process GPRS_SSF (sheet 2)

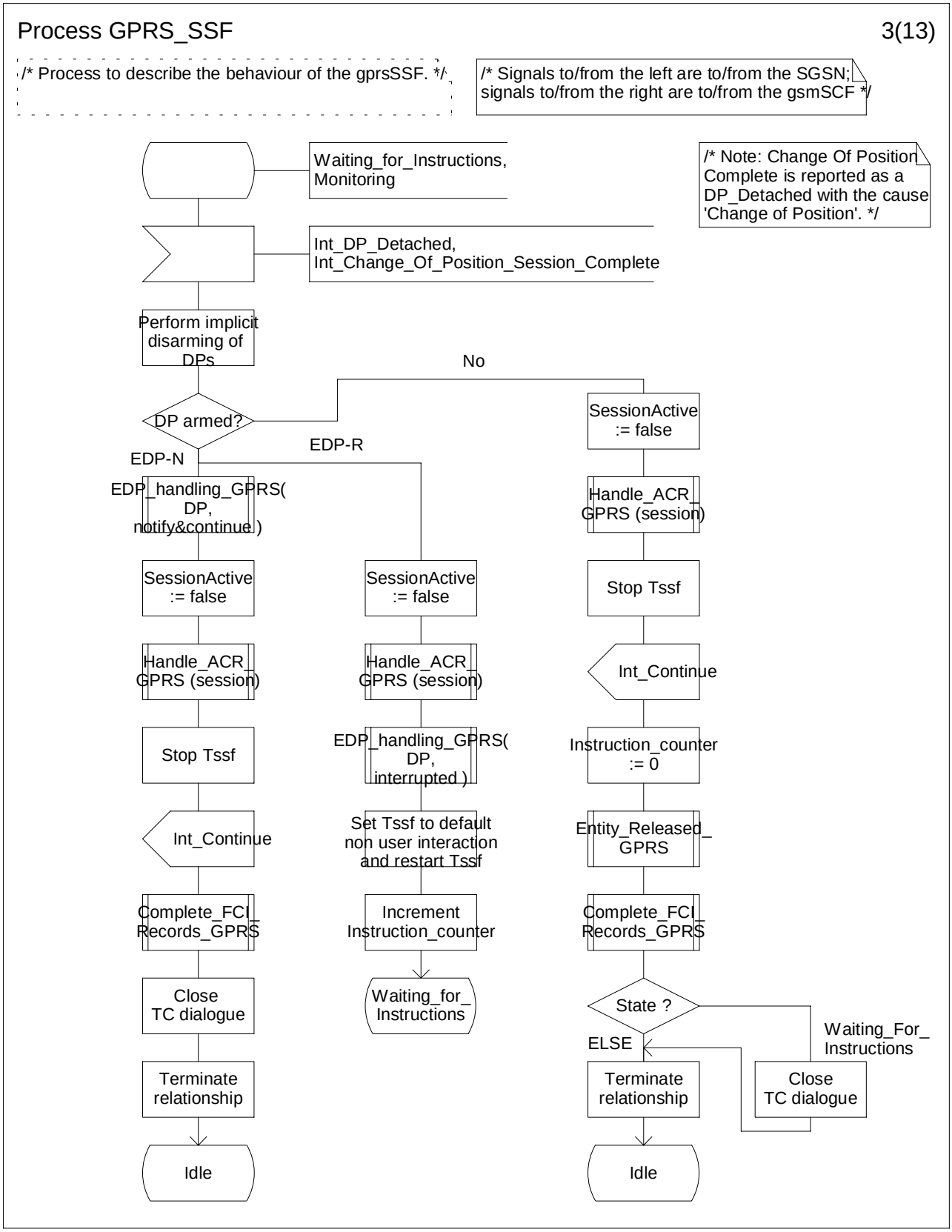


Figure 6.15 c: Process GPRS_SSF (sheet 3)

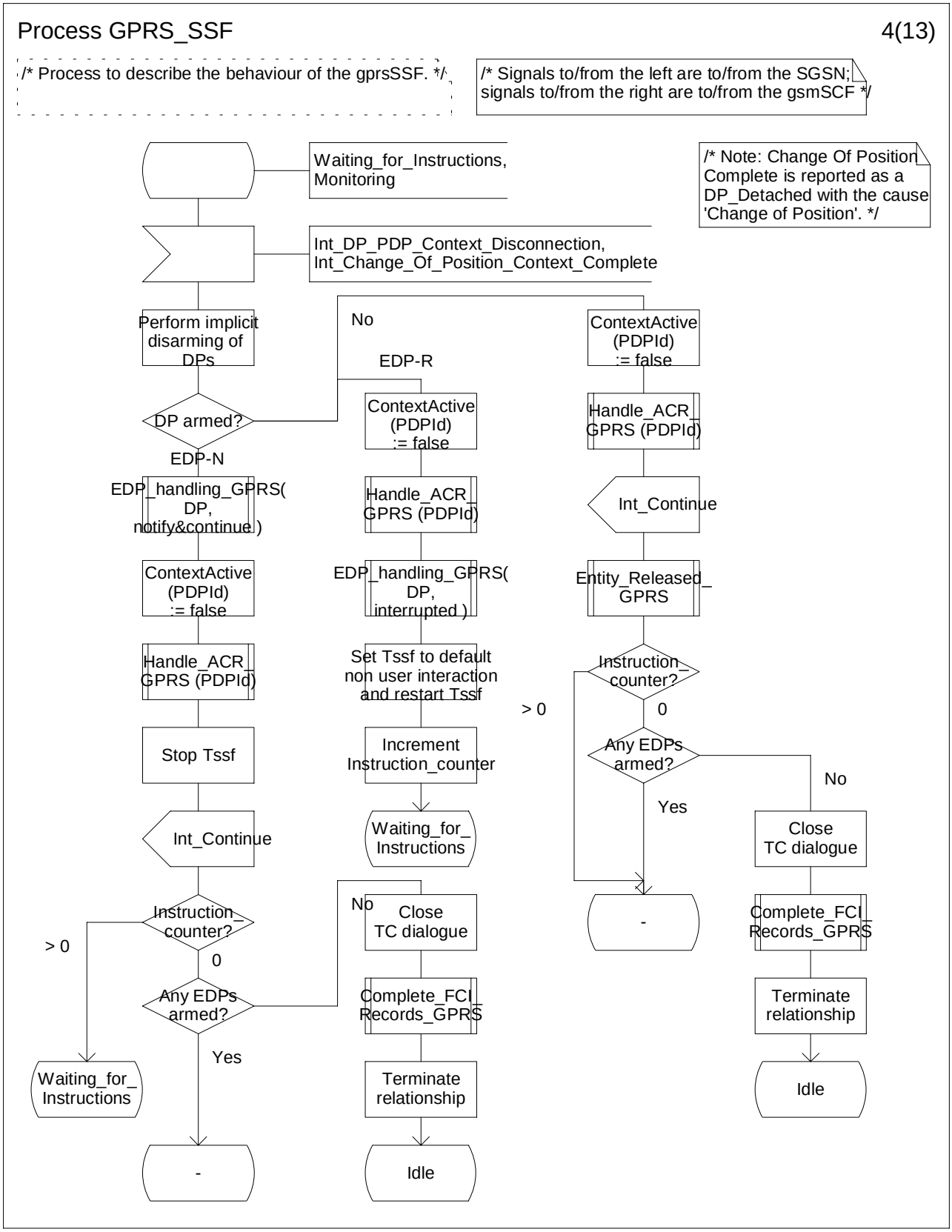


Figure 6.15 d: Process GPRS_SSF (sheet 4)

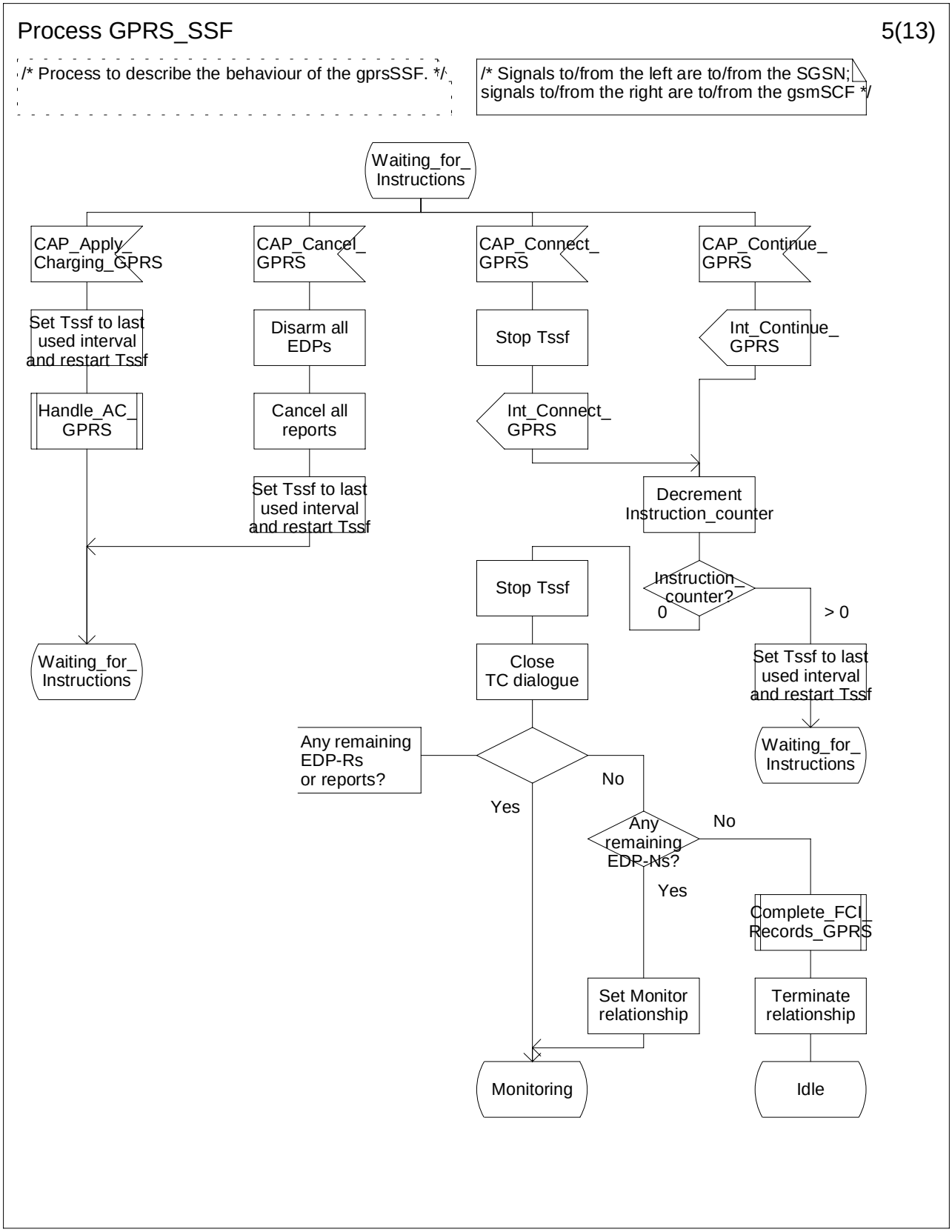


Figure 6.15 e: Process GPRS_SSF (sheet 5)

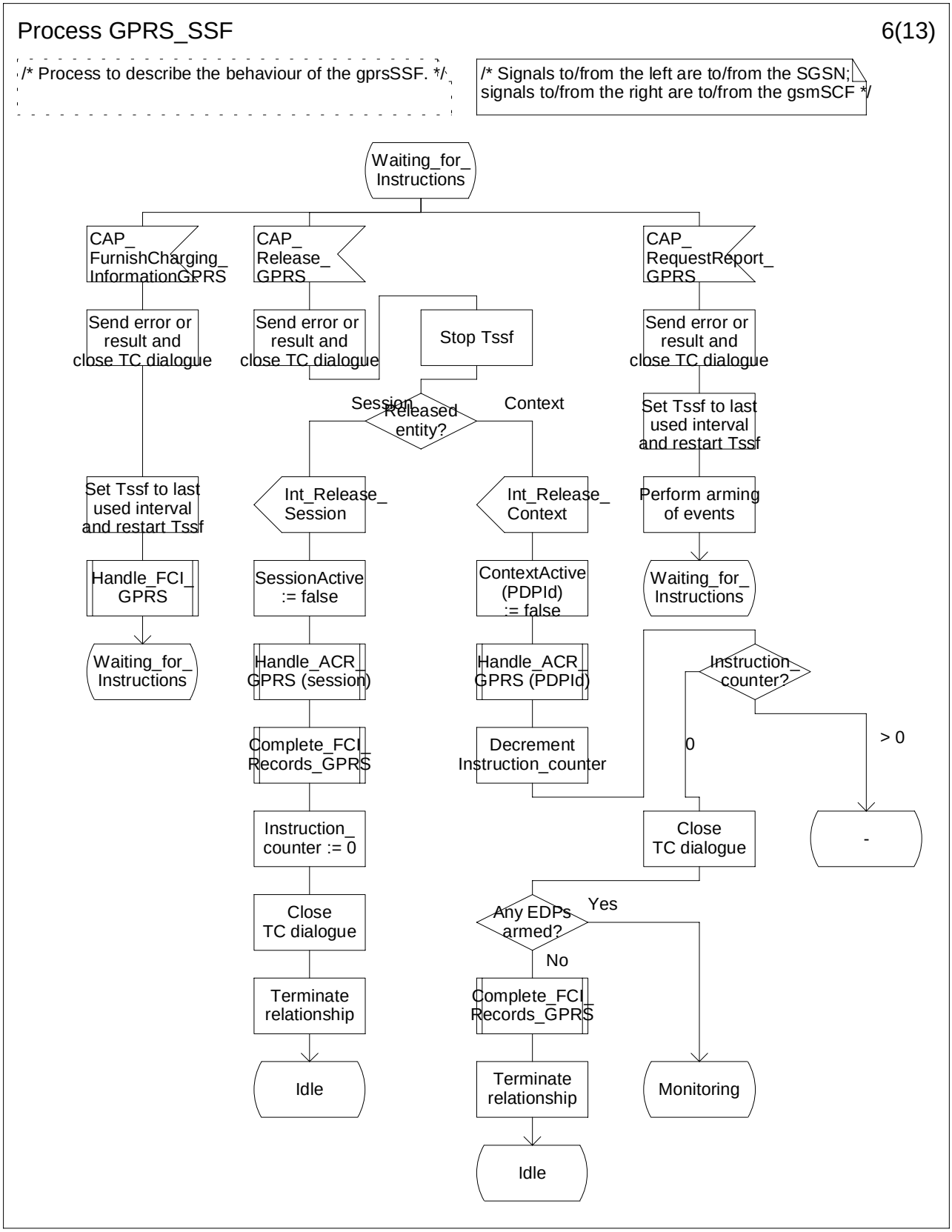


Figure 6.15 f: Process GPRS_SSF (sheet 6)

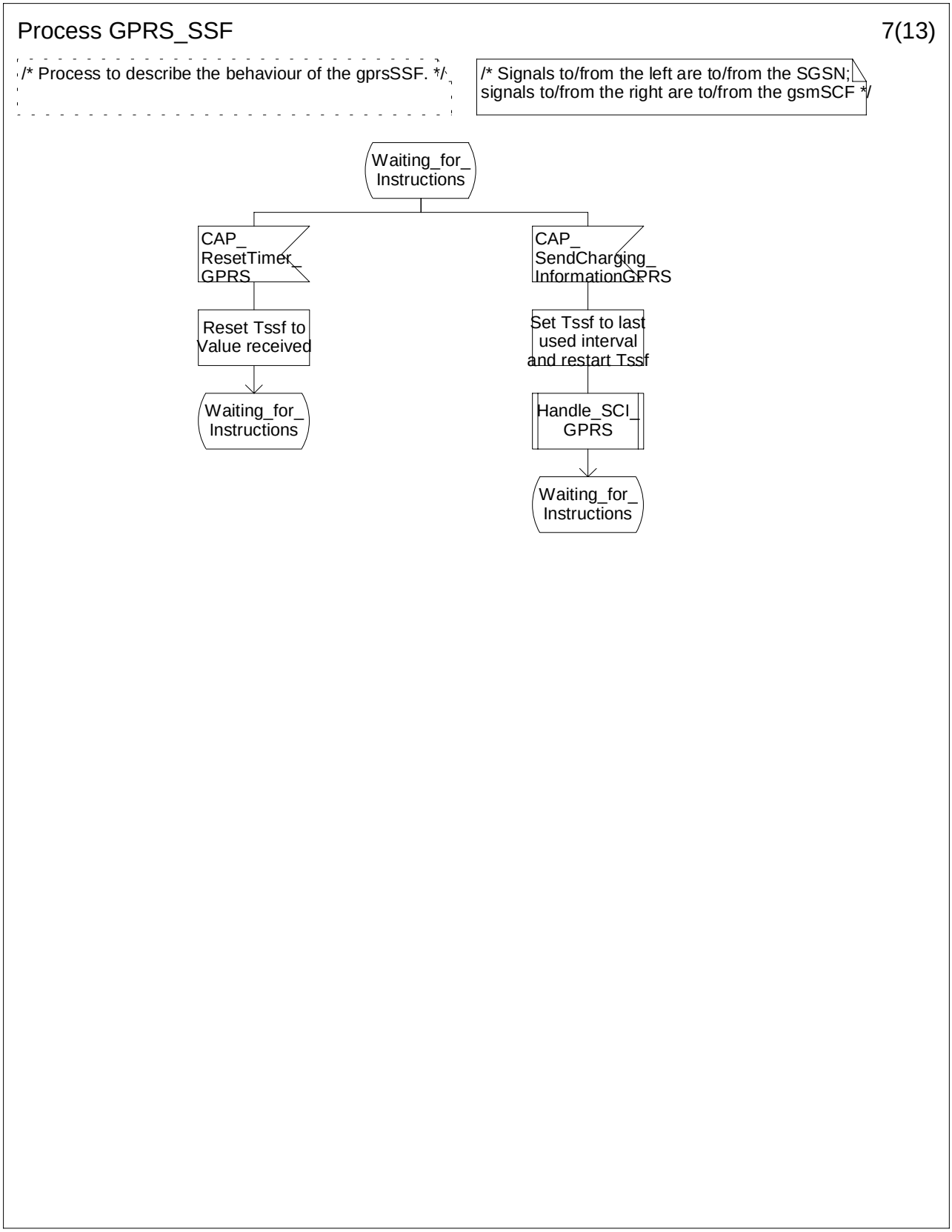


Figure 6.15 g: Process GPRS_SSF (sheet 7)

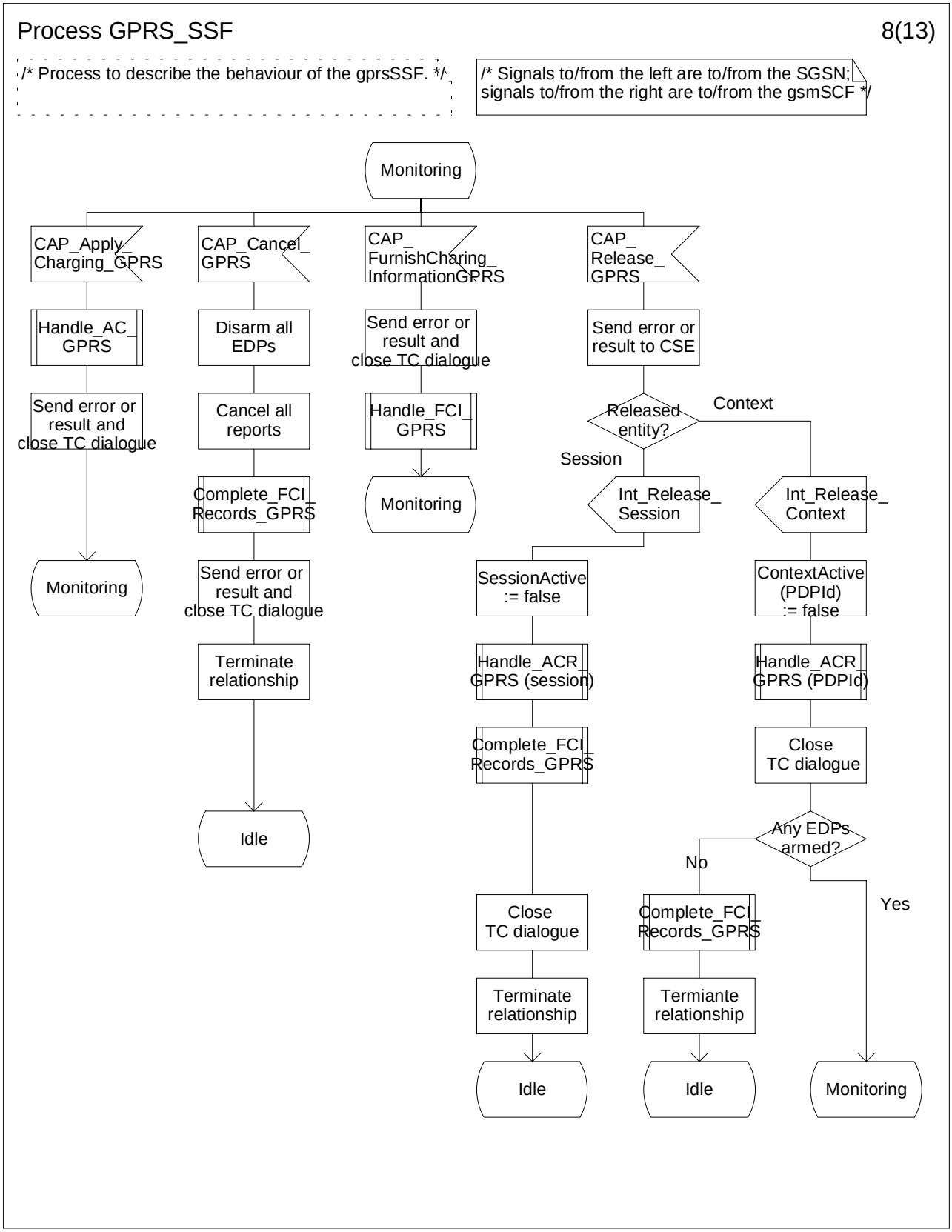


Figure 6.15 h: Process GPRS_SSF (sheet 8)

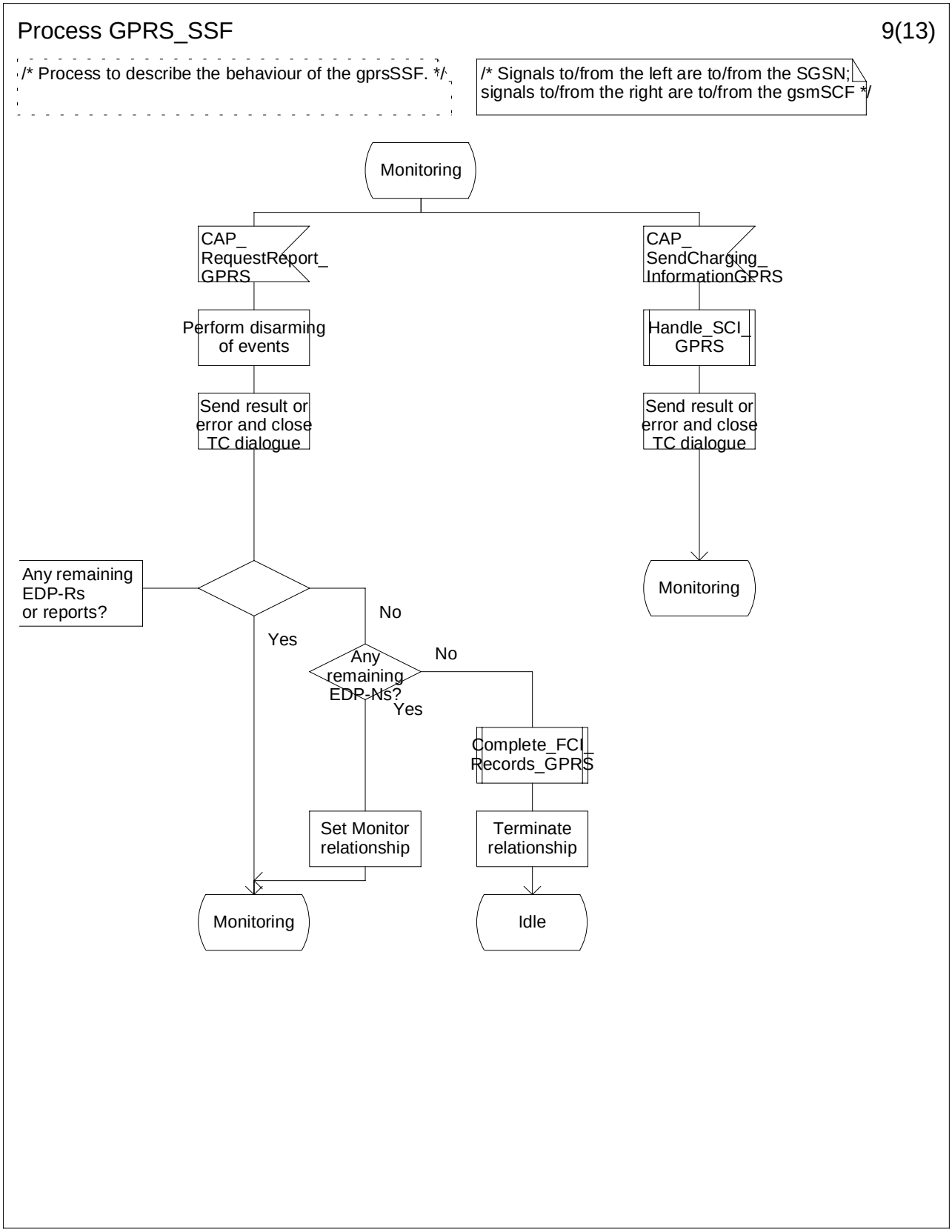


Figure 6.15 i: Process GPRS_SSF (sheet 9)

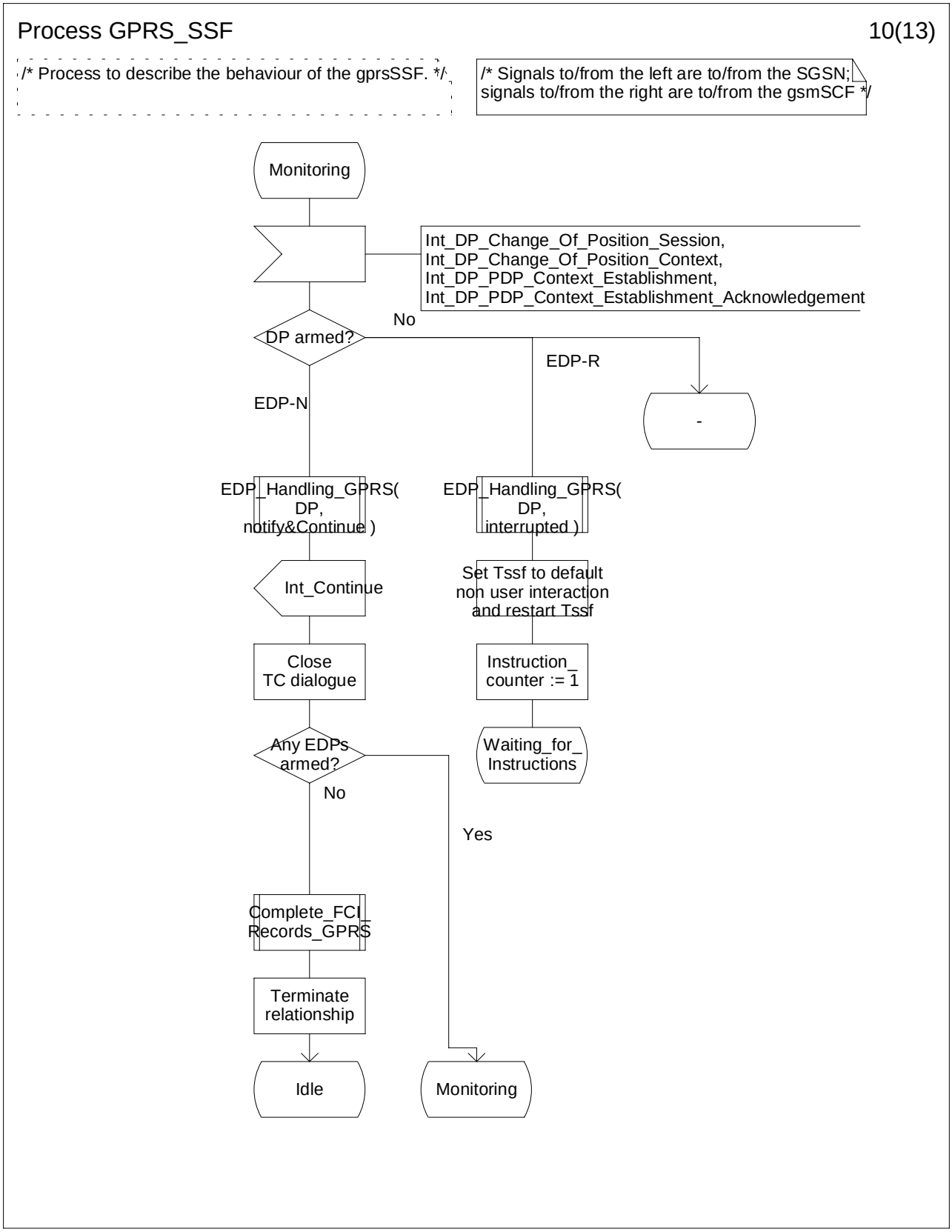


Figure 6.15 j: Process GPRS_SSF (sheet 10)

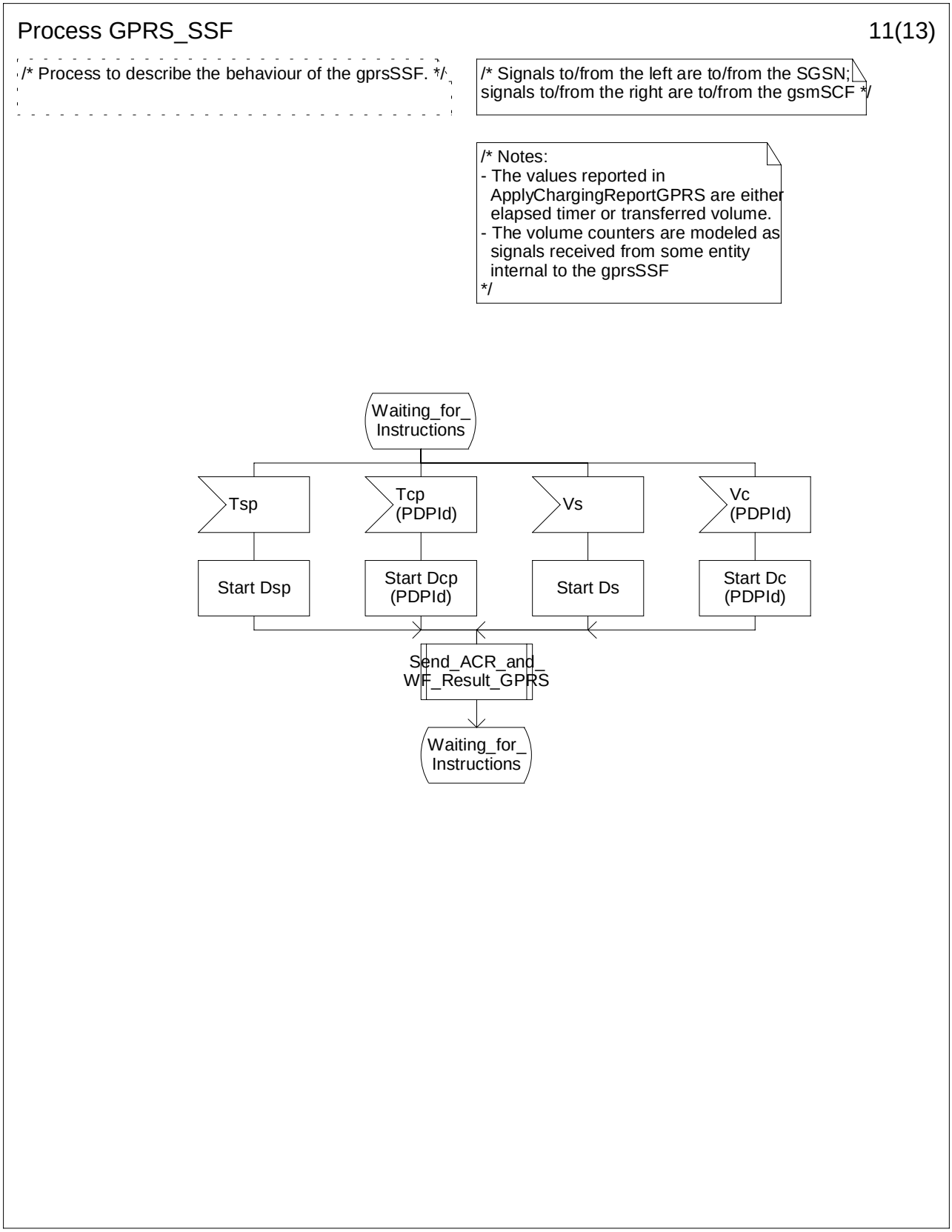


Figure 6.15 k: Process GPRS_SSF (sheet 11)

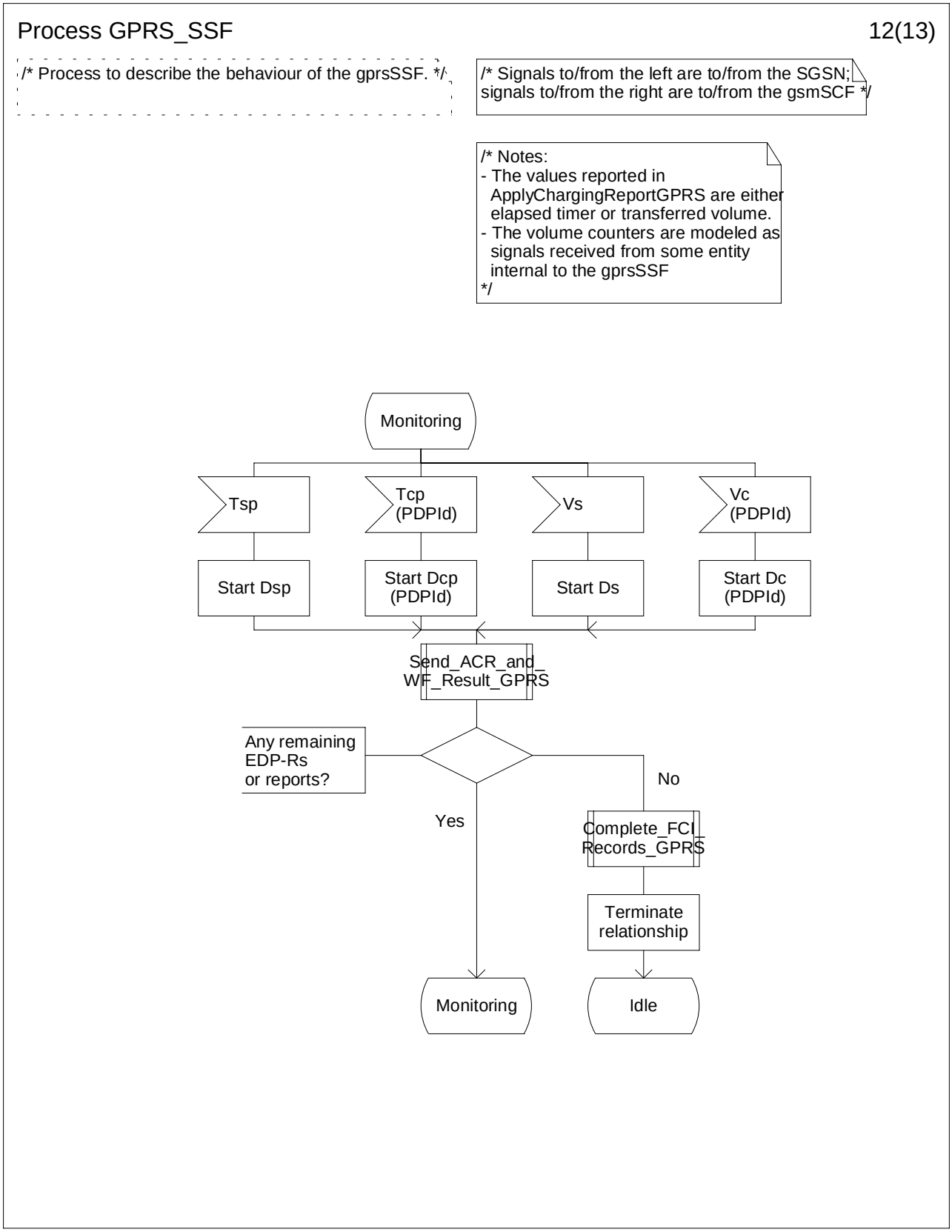


Figure 6.15 l: Process GPRS_SSF (sheet 12)

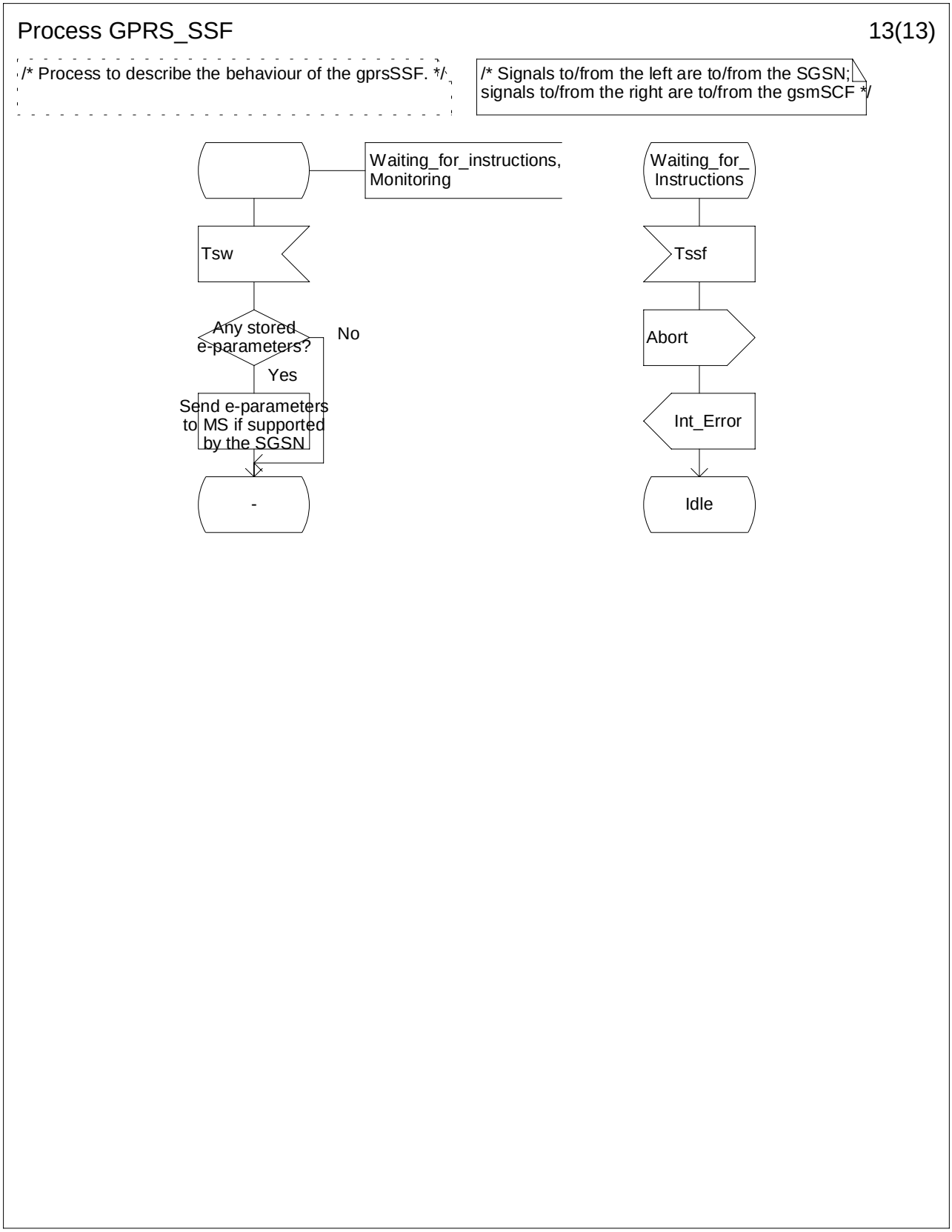


Figure 6.15 m: Process GPRS_SSF (sheet 13)

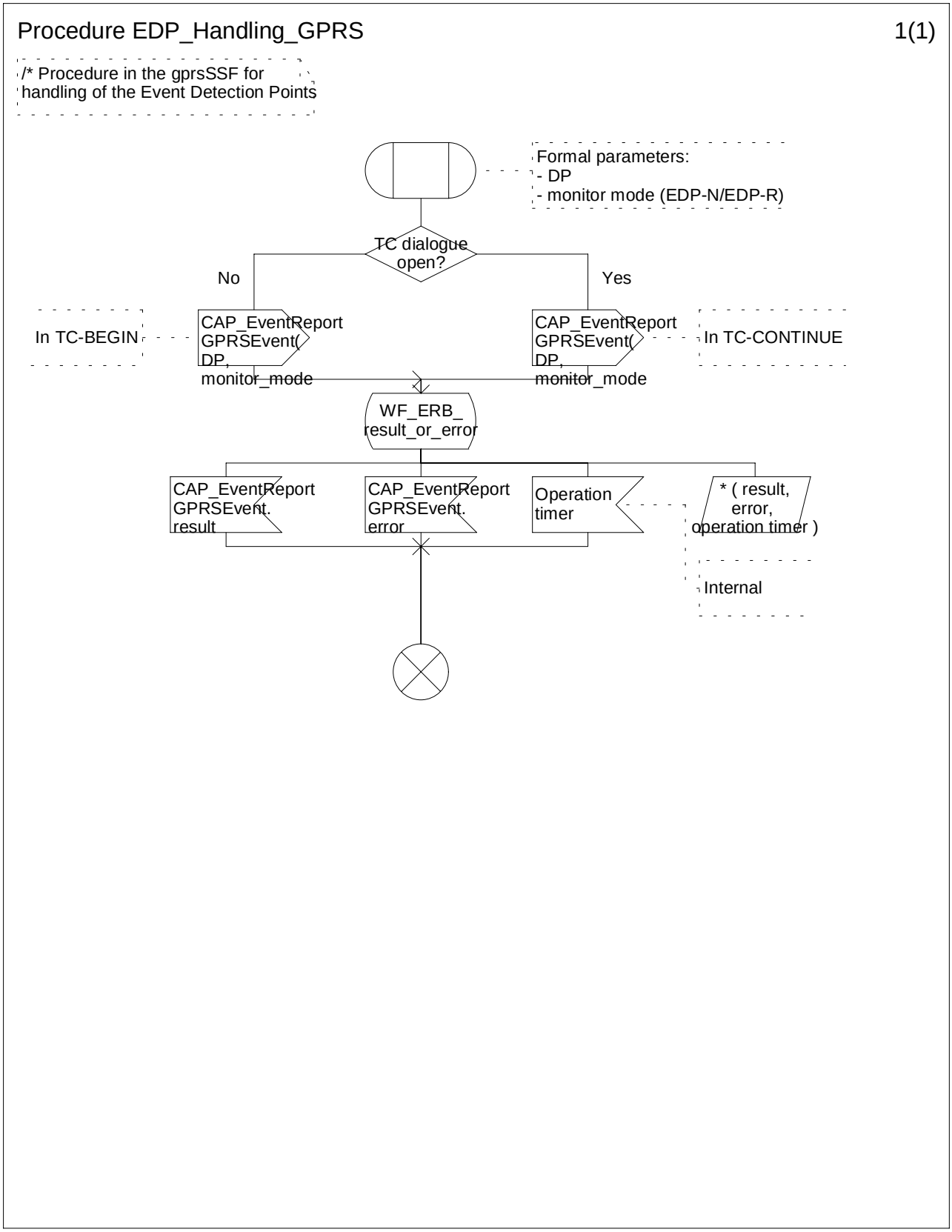


Figure 6.16 a: Procedure EDP_Handling_GPRS (sheet 1)

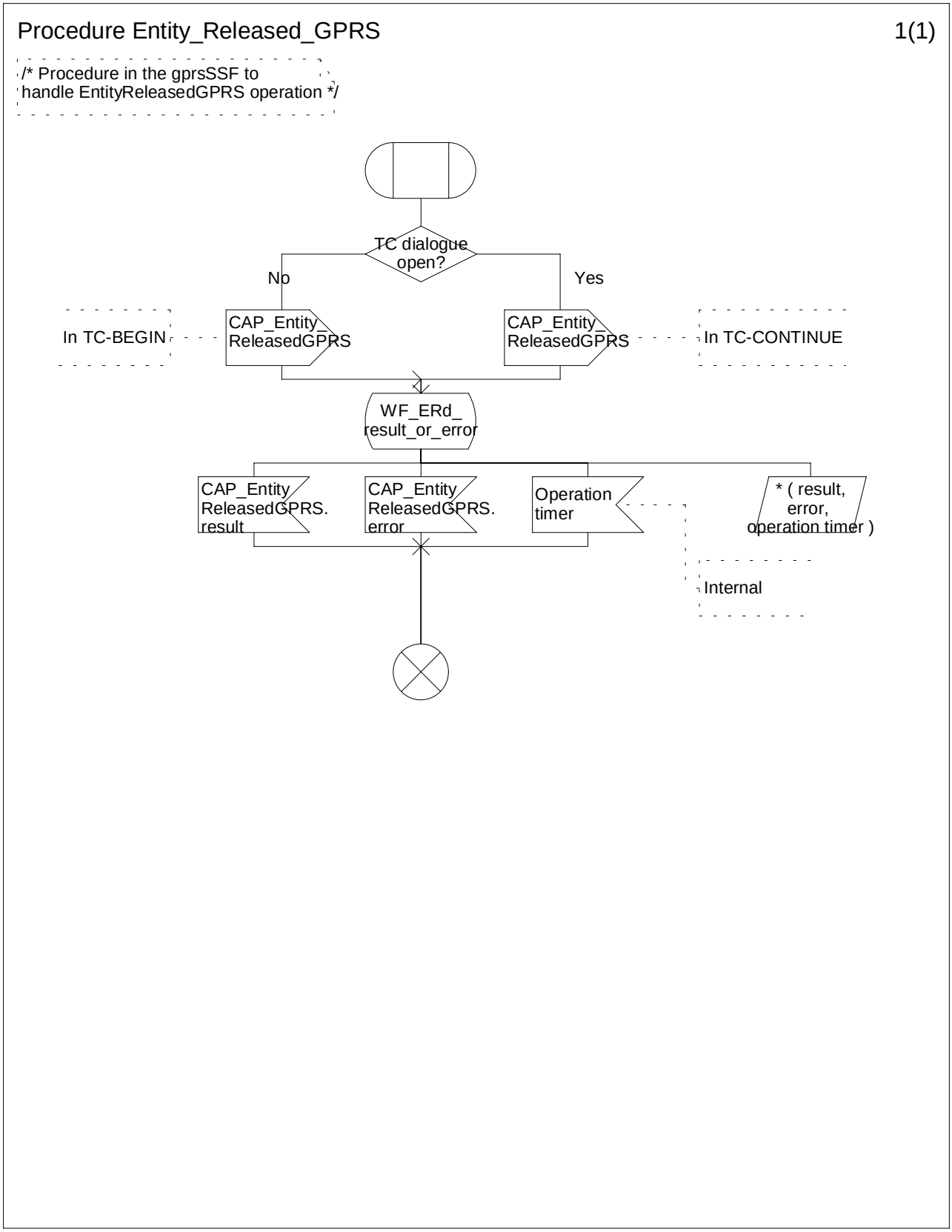


Figure 6.17 a: Procedure Entity_Released_GPRS (sheet 1)

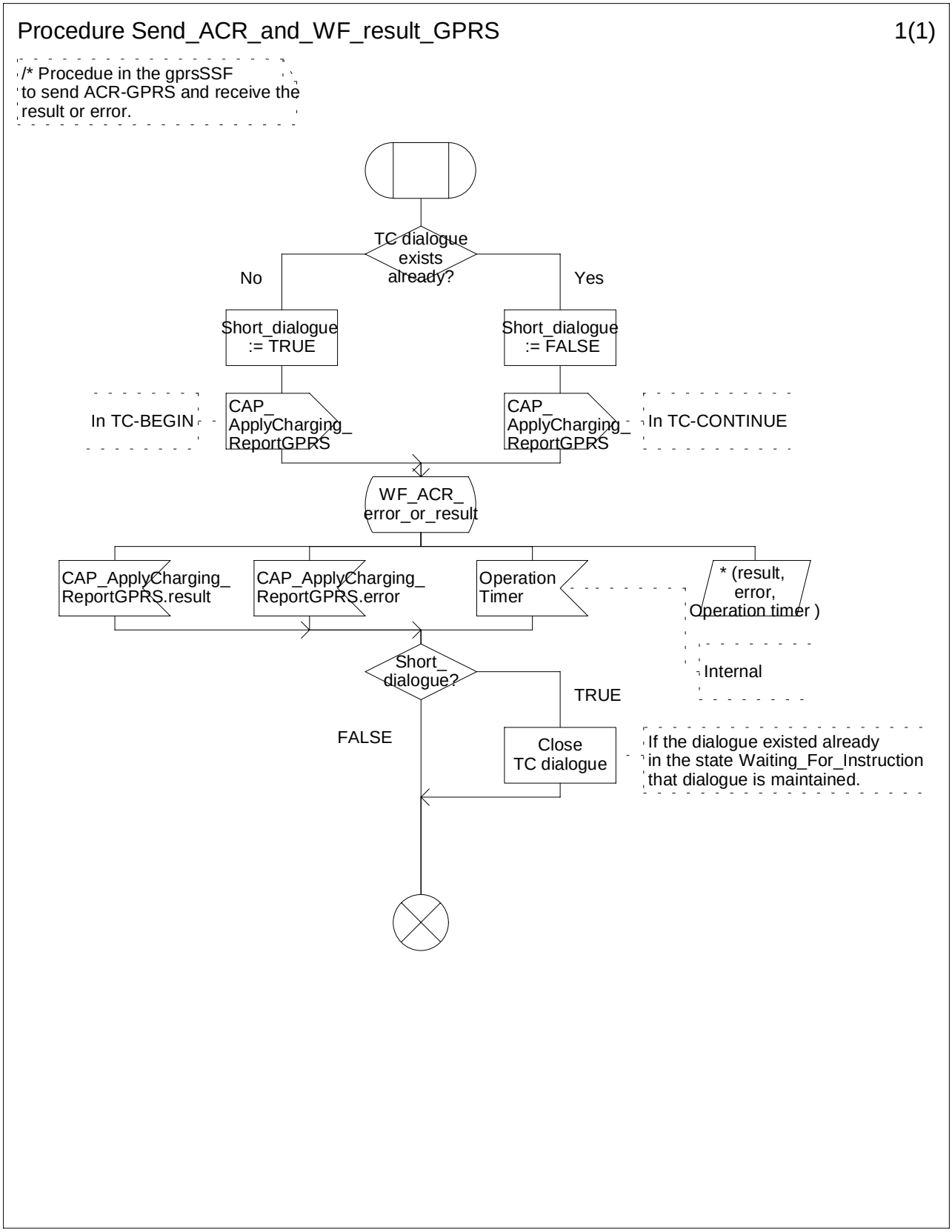


Figure 6.18 a: Procedure Send_ACR_and_WF_result_GPRS (sheet 1)

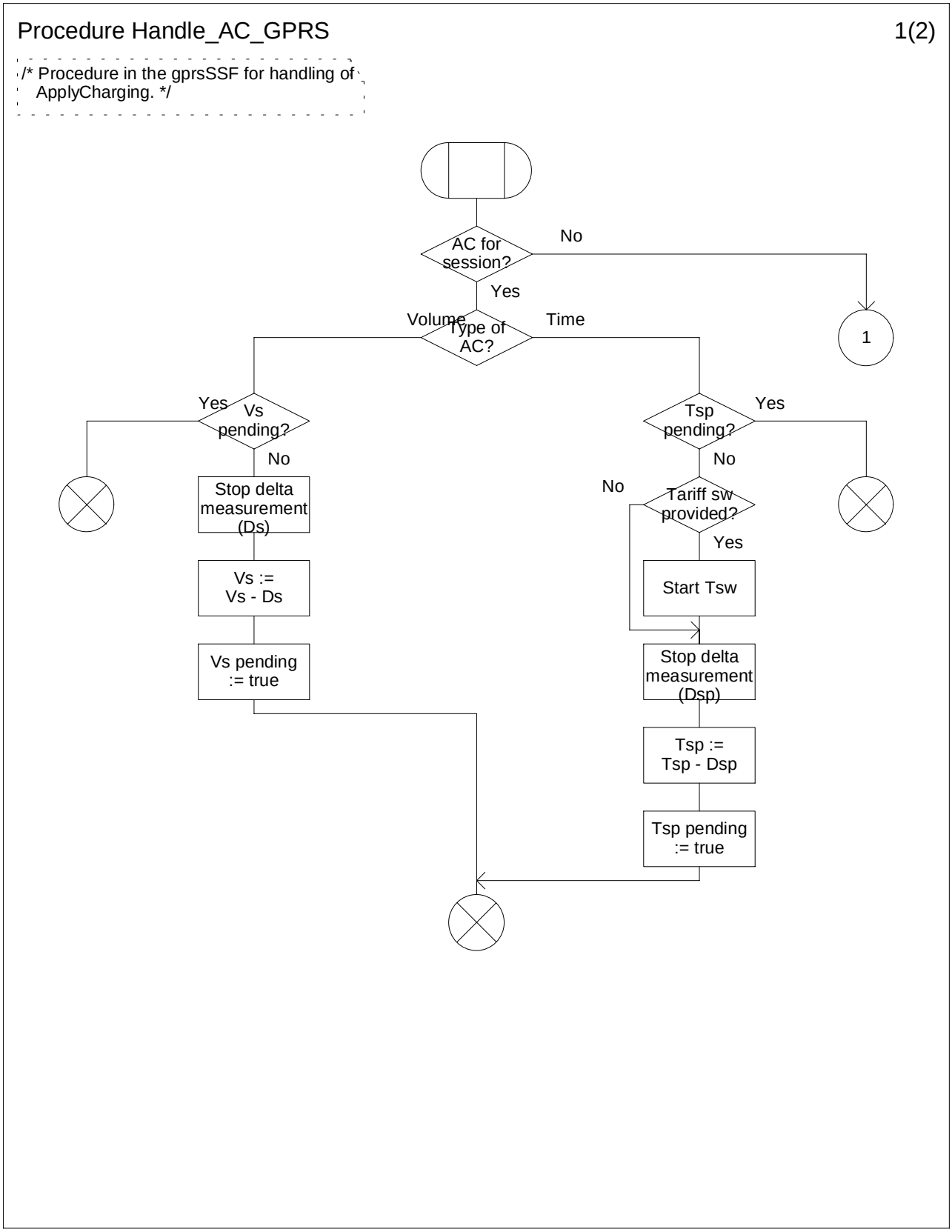


Figure 6.19 a: Procedure Handle_AC_GPRS (sheet 1)

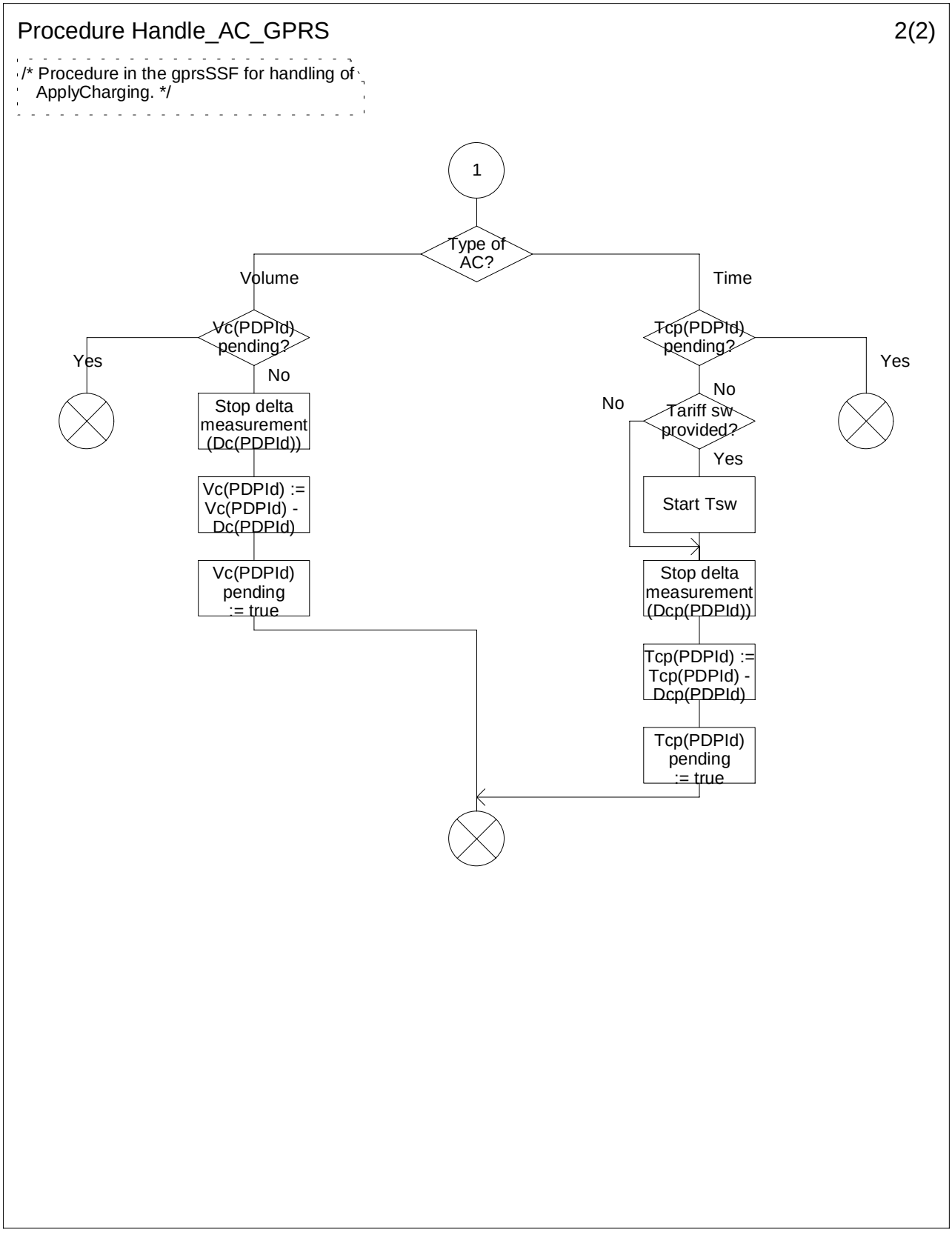


Figure 6.19 b: Procedure Handle_AC_GPRS (sheet 2)

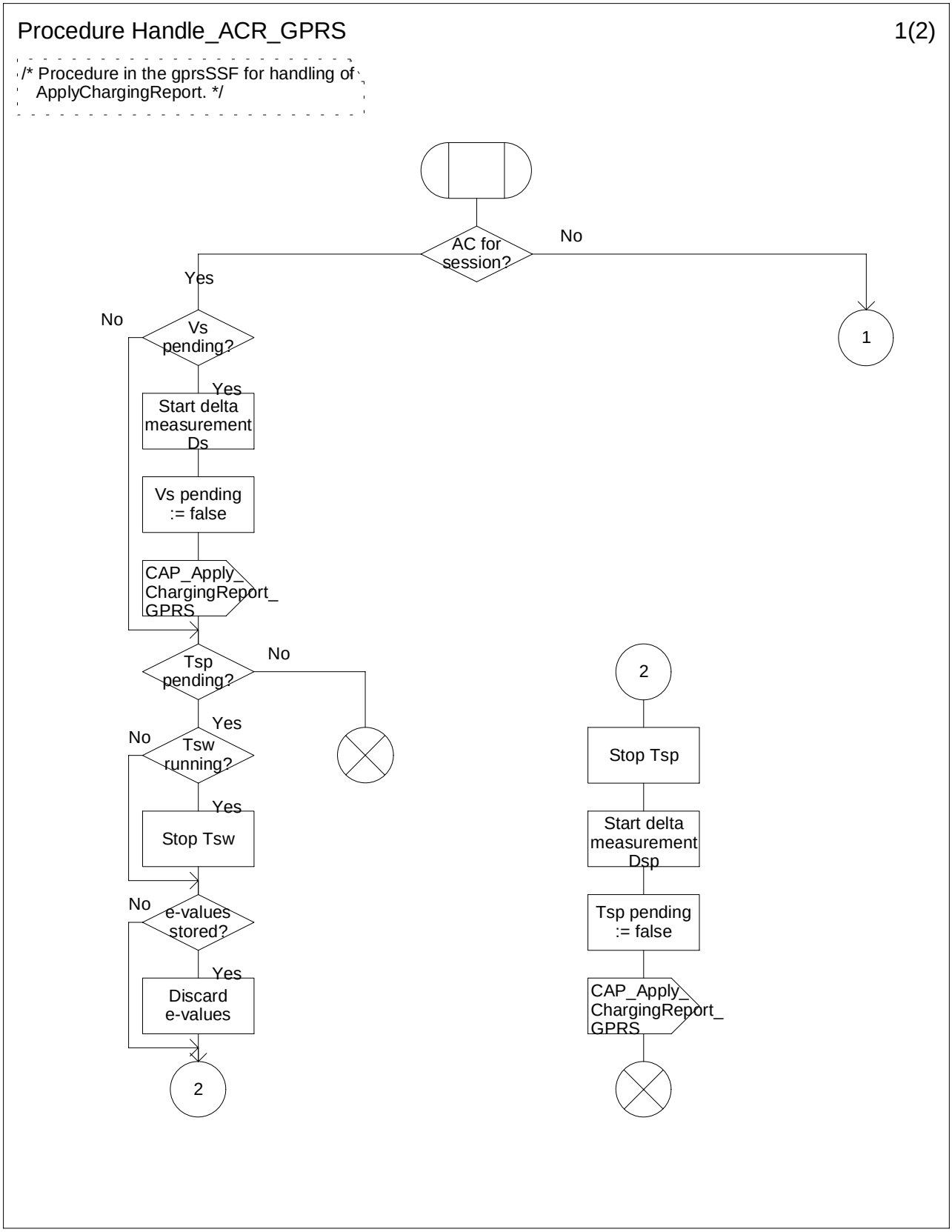
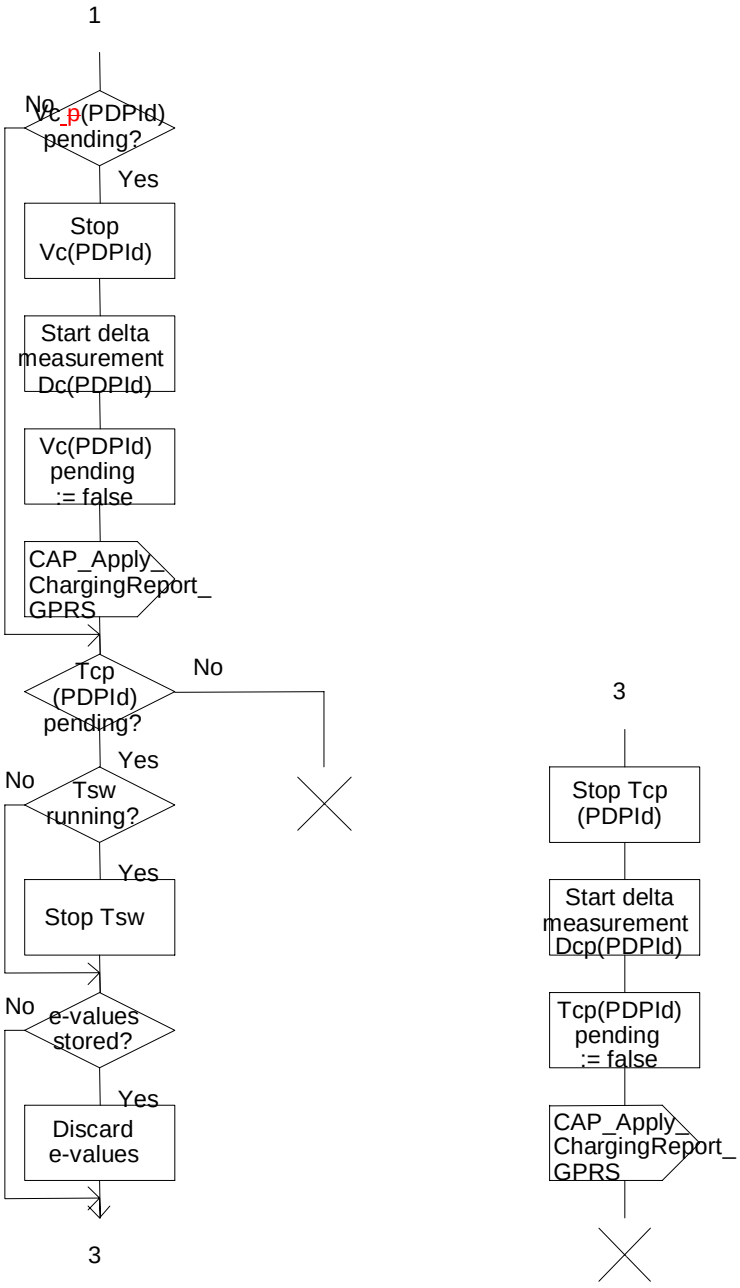


Figure 6.20 a: Procedure Handle_ACR_GPRS (sheet 1)

Procedure Handle_ACR_GPRS 2(2)

/* Procedure in the gprsSSF for handling of ApplyChargingReport. */



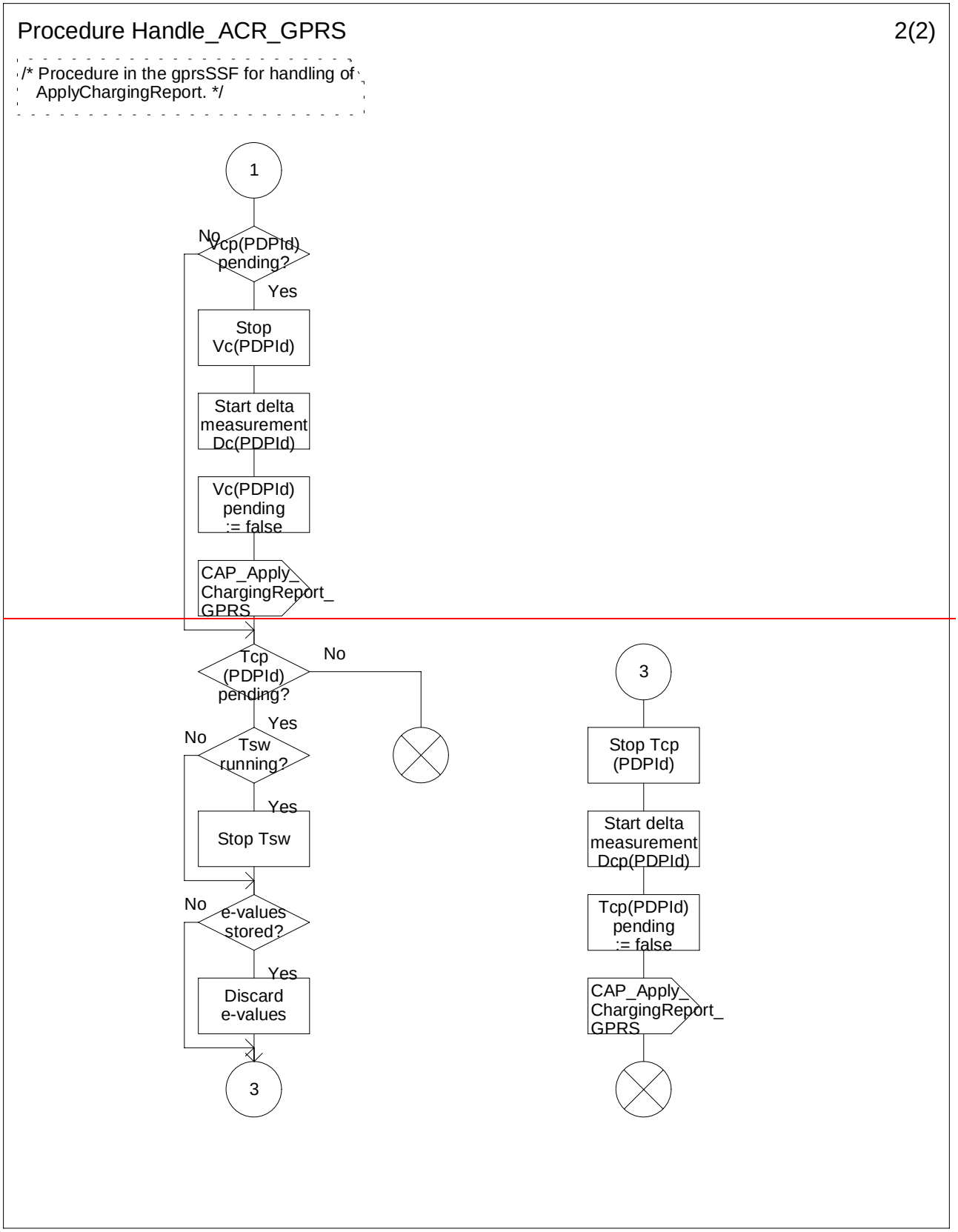


Figure 6.20 b: Procedure Handle_ACR_GPRS (sheet 2)

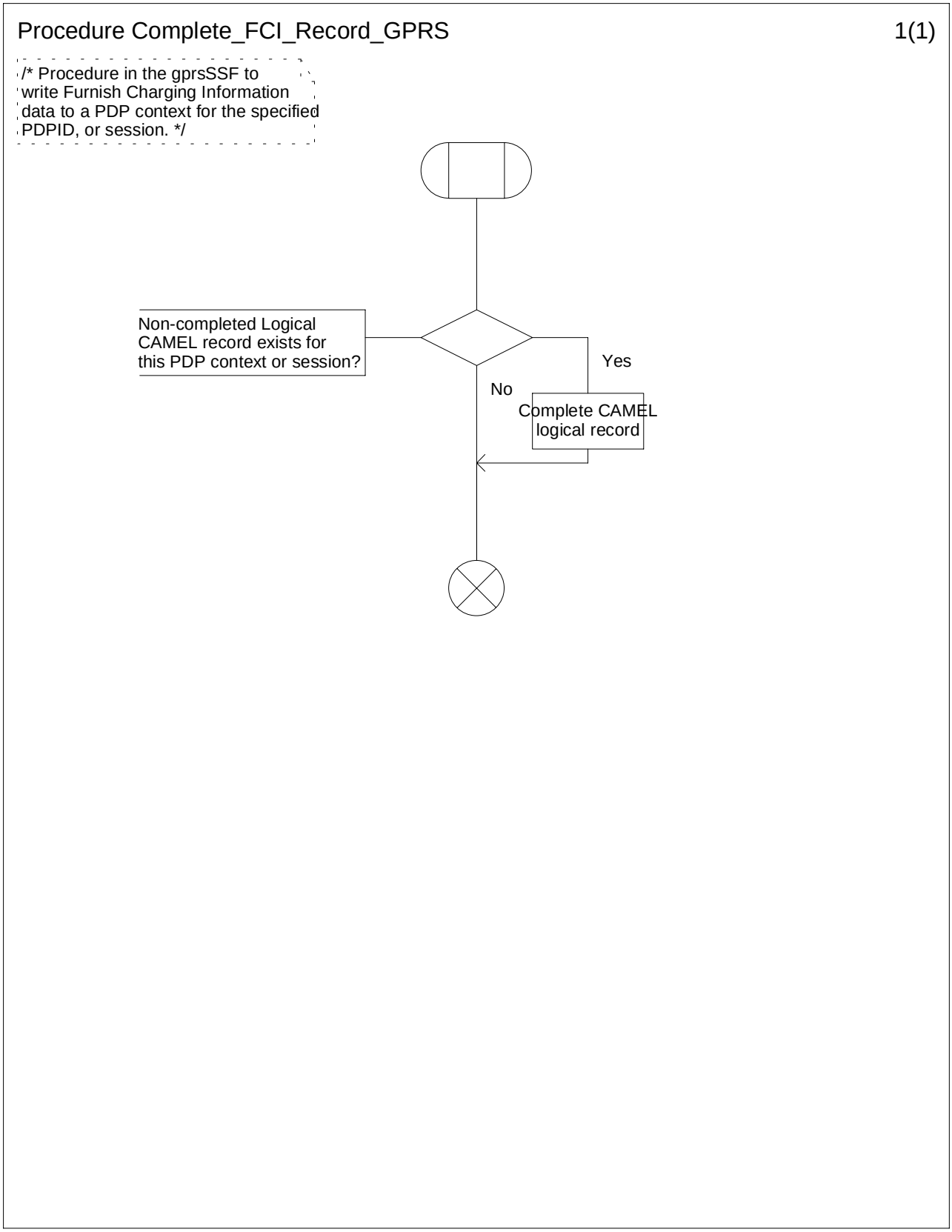


Figure 6.21 a: Procedure Complete_FCI_Record_GPRS (sheet 1)

6.6 Description of information flows

This subclause 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.

Details of errors and exceptions to these rules are specified in 3G TS 29.002 [4] and 29.078 [5].

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

The following information elements are required~~used~~:

Information element name	Required	Description
Gprs Reference Number	M	This IE contains an identifier that is allocated by the gprsSSF and it is used to identify the gprsSSF instance taking care of GPRS session or PDP context.
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. This IE shall only be present if sending of the Apply Charging Report was triggered by a change in Quality of Service.
Active	M	This IE indicates if the GPRS session or PDP context is still established, 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 GPRS 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 gsmSCF at any phase that a GPRS session or PDP context has been terminated by the SGSN without reporting any EDP.

6.6.1.3.2 Information Elements

The following information elements are required~~used~~:

Information element name	Required	Description
Gprs Reference Number	M	This IE contains an identifier that is allocated by the gprsSSF and it is used to identify the gprsSSF instance taking care of GPRS session or PDP context.
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:

Information element name	Required	Description
Gprs Reference Number	M	This IE contains an identifier that is allocated by the gprsSSF and it is used to identify the gprsSSF instance taking care of GPRS session or PDP context.
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 routeing 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:

Information element name	Required	Description
Gprs Reference Number	M	This IE contains an identifier that is allocated by the gprsSSF and it is used to identify the gprsSSF instance taking care of GPRS session or PDP context.
ServiceKey	M	This IE indicates to the gsmSCF the requested CAMEL Service. It is used to address the required 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

The following information elements are required~~used~~:

Information element name	Required	Description
Gprs Reference Number	M	This IE contains an identifier that is allocated by the gprsSSF and it is used to identify the gprsSSF instance taking care of GPRS session or PDP context.

M Mandatory (The IE shall always be sent).

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 a PDP Context.

6.6.2.2.2 Information Elements

The following information elements are required:

Information element name	Required	Description
Gprs Reference Number	M	This IE contains an identifier that is allocated by the gprsSSF and it is used to identify the gprsSSF instance taking care of GPRS session or PDP context.
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 GPRS 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 required~~used~~:

Information element name	Required	Description
Gprs Reference Number	M	This IE contains an identifier that is allocated by the gprsSSF and it is used to identify the gprsSSF instance taking care of GPRS session or PDP context.
PDP ID	C	This IE identifies the PDP context which is to be cancelled. If not present the dialogue corresponds to the GPRS 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

The following information elements are required~~used~~:

Information element name	Required	Description
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 element is required~~used~~:

Information element name	Required	Description
PDP ID	C	This IE identifies the PDP context which processing shall continue for. If not present the dialogue corresponds to the GPRS 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

The following information elements are required~~used~~:

Information element name	Required	Description
Gprs Reference Number	M	This IE contains an identifier that is allocated by the gprsSSF and it is used to identify the gprsSSF instance taking care of GPRS session or PDP context.
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	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.

		- 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 GPRS session or PDP Context. - 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 GPRS session or PDP Context, by the free format data received in this IF. If no Logical call record exists yet for that GPRS session or PDP Context, then the gprsSSF shall ignore this IE.
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 GPRS 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 required~~used~~:

Information element name	Required	Description
Gprs Reference Number	M	This IE contains an identifier that is allocated by the gprsSSF and it is used to identify the gprsSSF instance taking care of GPRS session or PDP context.
GPRS Cause	M	This IE contains the Cause value indicating the reason for releasing the GPRS session or PDP context.
PDP ID	C	This IE identifies the PDP context which shall be released. If not present the dialogue corresponds to the GPRS 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 GPRS~~Data~~ IF).

6.6.2.8.2 Information Elements

The following information elements are required~~used~~:

Information element name	Required	Description
Gprs Reference Number	M	This IE contains an identifier that is allocated by the gprsSSF and it is used to identify the gprsSSF instance taking care of GPRS session or PDP context.
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 GPRS 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:

Information element name	Required	Description
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:

Information element name	Required	Description
Timer ID	M	This IE specifies the default value for the Tssf timer.
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 GPRS 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 to the MS.

6.6.2.10.2 Information Elements

The following information elements are required:

Information element name	Required	Description
Gprs Reference Number	M	This IE contains an identifier that is allocated by the gprsSSF and it is used to identify the gprsSSF instance taking care of GPRS session or PDP context.
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 contains the following information~~is defined as~~:

Information element name	Required	Description
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 GPRS session or for a single PDP context for the dialogue.

M Mandatory (The IE shall always be sent).

C Conditional (The IE shall be sent, if available).

AOC GPRS contains the following information~~is defined as~~:

Information element name	Required	Description
AOC Initial	M	This IE contains CAI elements as defined in 3G TS 22.024 [31~~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 contains the following information~~is defined as~~:

Information element name	Required	Description
CAI Elements	M	This IE contains CAI elements as defined in 3G TS 22.024 [31~~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:

Information element name	Required	Description
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:

Information element name	Required	Description
GsmSCF Address	M	See subclause 6.3.1.1.~~This IE is described in section 0~~
Service Key	M	See subclause 6.3.1.2.~~This IE is described in section 0.~~
Default Session Handling	M	See subclause 6.3.1.3.~~This IE is described in section 0.~~
TDP List	M	See subclause 6.3.1.4.~~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 Insert Subscriber Data ack

See subclause 4.6.8.1.

6.6.4.~~1~~2 Update GPRS Location

6.6.4.~~1~~2.1 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~~2.2 Information Elements

Update GPRS location contains the following CAMEL specific IE:

Information element name	Required	Description
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 subclause 4.6.8.~~

3GPP N2 Meeting
Rotenburg, Germany, 22-26 May 2000

Document N2-000240
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.078	CR	171r1	Current Version:	3.4.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	CN#8	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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

Source: N2 **Date:** 25 May 2000

Subject: Editorial corrections in the clause 7

Work item: CAMEL Phase 3

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification	X		Release 99	X
				Release 00	

Reason for change: Various editorial corrections. See "Other comments" for detail.

Clauses affected: 7

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

Following changes are highlighted:
- Supported service "Mobile Originating Short Message Service" is clearly stated.
- Wording change to be aligned with other documents (especially stage 1)
- Header of the tables in the subclause 7.6 are adjusted as other clauses.
- Referenced documents are corrected. (in subclause 7.5.2.1 and 7.6)

7 Short Message Service

7.1 Architecture

7.1.1 Functional Entities used for CAMEL

This subclause describes the functional architecture needed to support Mobile Originating Short Message Service (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.

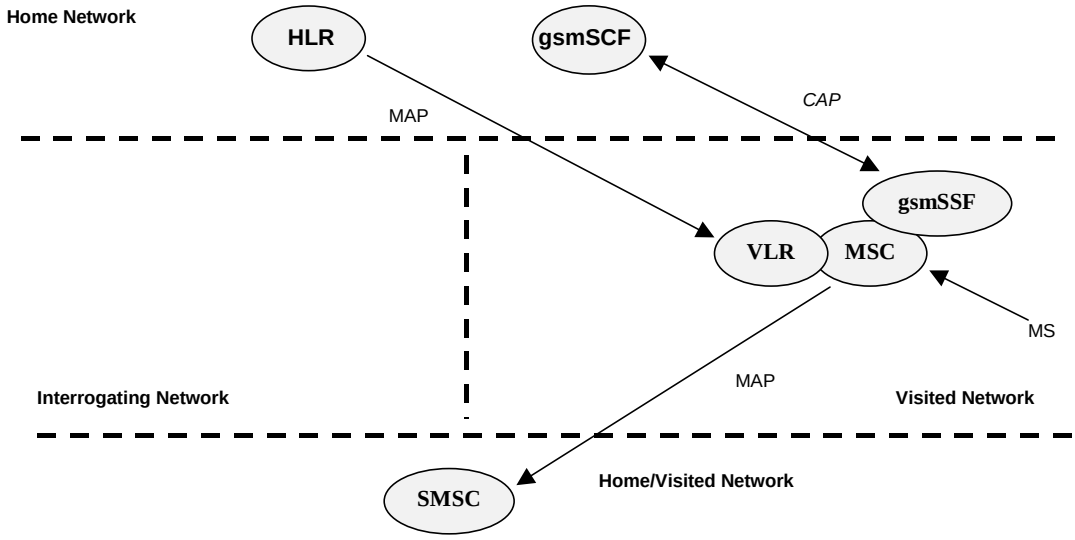


Figure 7.1: Functional architecture for support of CAMEL control of MSC switched MO SMS

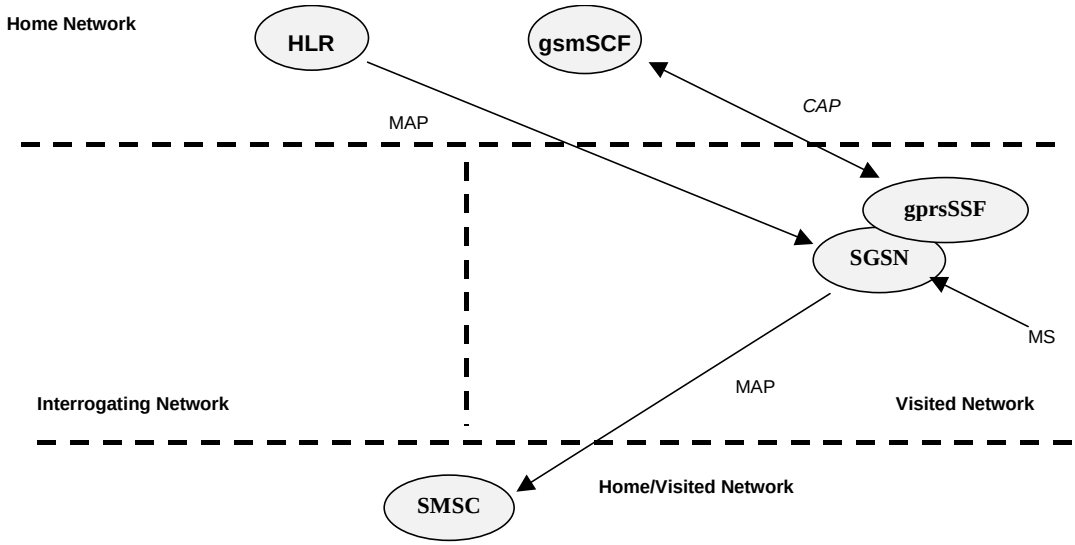


Figure 7.2: Functional architecture for support of CAMEL control of SGSN switched MO SMS

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 3.14.1.

gsmSSF: see subclause 3.14.1.

gsmSCF: see subclause 3.14.1.

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 Short Message Service 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 routeing.

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.

7.3.1.8 gsmSCF address list for CSI

The gsmSCF address list indicates a list of gsmSCF addresses to which Notification on Change of Subscriber Data is to be sent. This list is common to all CSI.

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 Mobile Originating SMS State Model ~~for SMS~~

7.4.2.1 Description of MO 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.

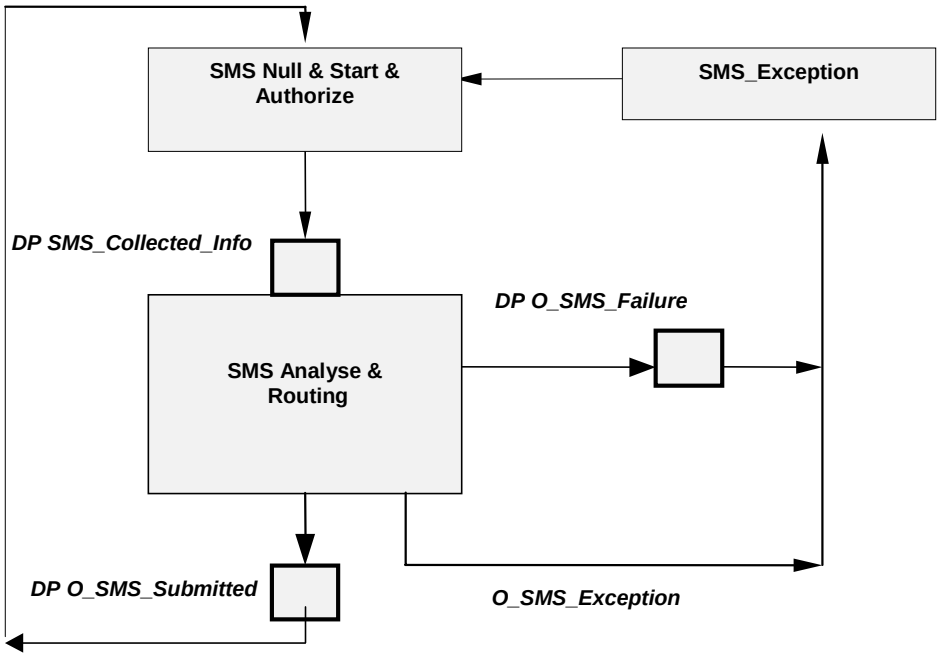


Figure 7.3: MO SMS State Model

Table 1: Description of MO SMS DPs in the MSC and SGSN

CAMEL Detection Point:	DP Type	Description:
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 MO SMS 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, actions~~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. (DP SMS_Collected_Info).

Actions:
- Information being analysed and/or translated to determine routeing 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. (DP 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 (DP O_SMS_Failure).

  A negative acknowledgement is sent to the MS.
- Negative acknowledgement from the SMSC is received (DP 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

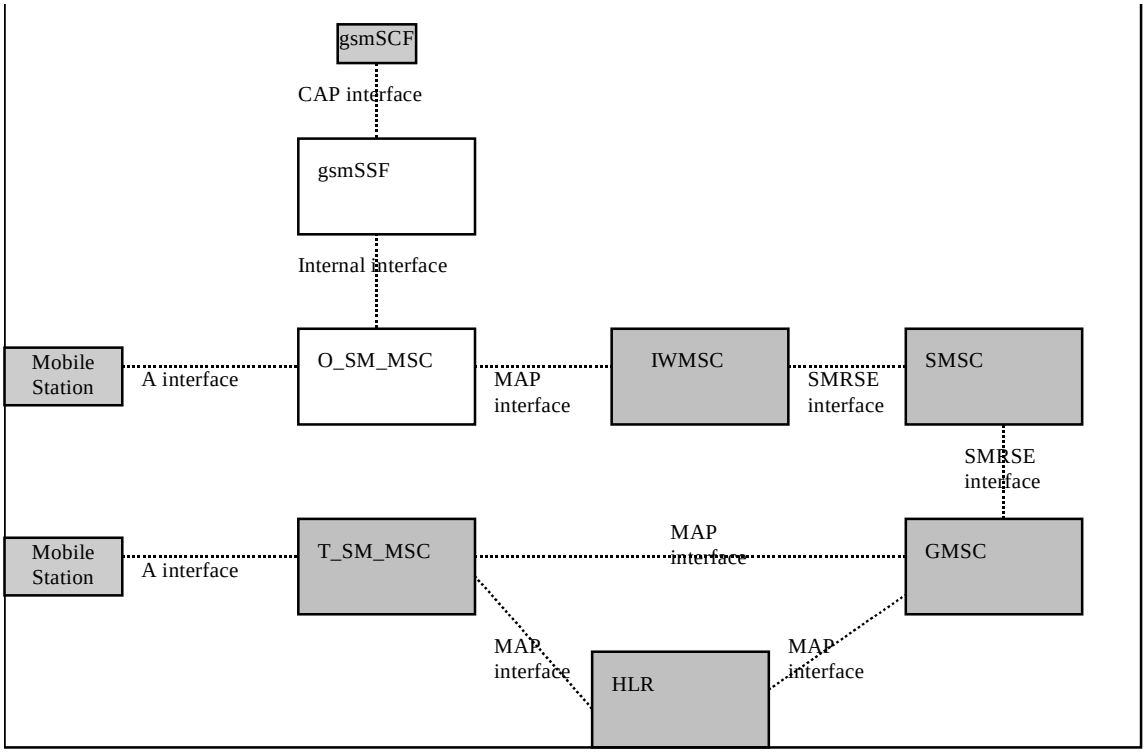


Figure 7.4: Case of MO SMS via MSC (separated IWMSC)

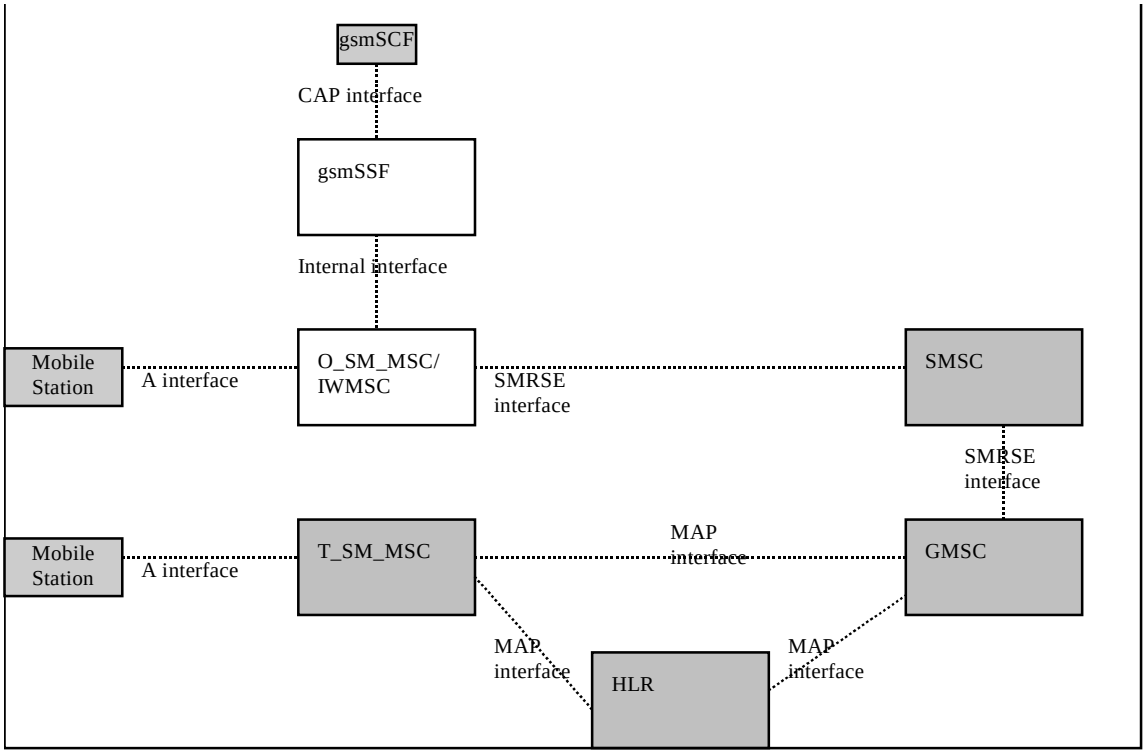


Figure 7.5: Case of MO SMS via MSC (integrated IWMSC)

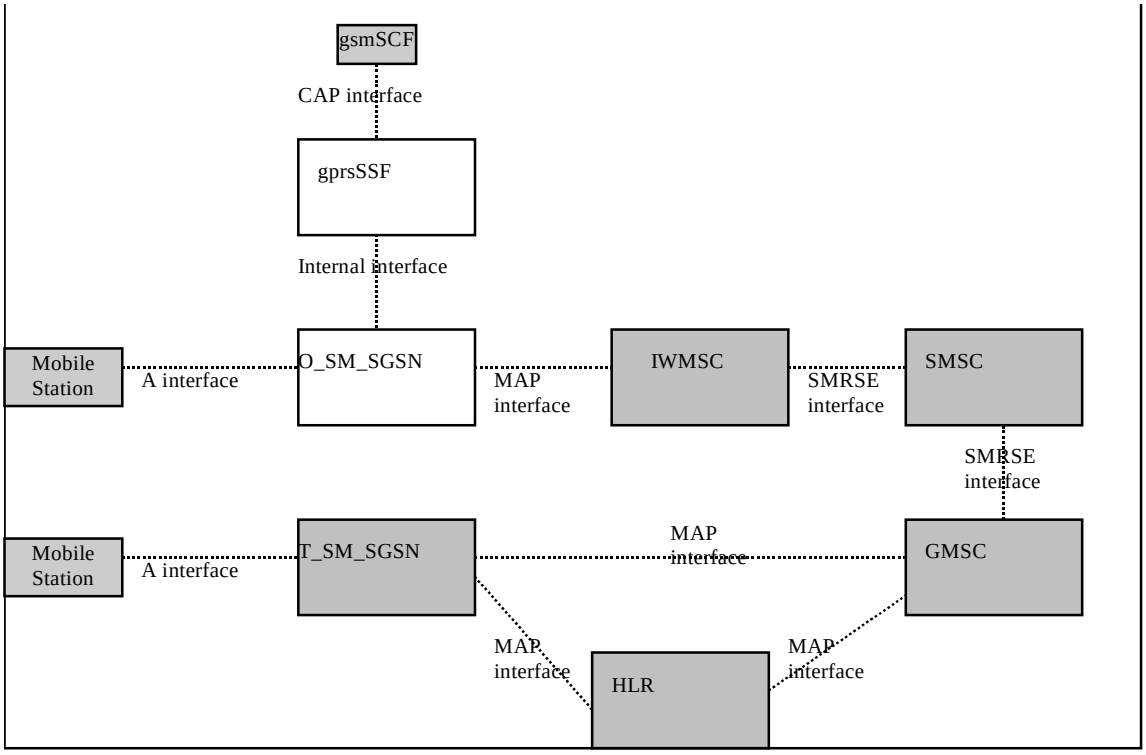


Figure 7.6: Case of MO SMS via GPRS SGSN

7.5.2 Handling of mobile originating~~ed~~ SMS

7.5.2.1 Handling of mobile originating~~ed~~ SMS in the originating MSC/SGSN

The functional behaviour of the originating VMSC/SGSN is specified in 3G TS 23.018 [3], 23.060 [11]~~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.

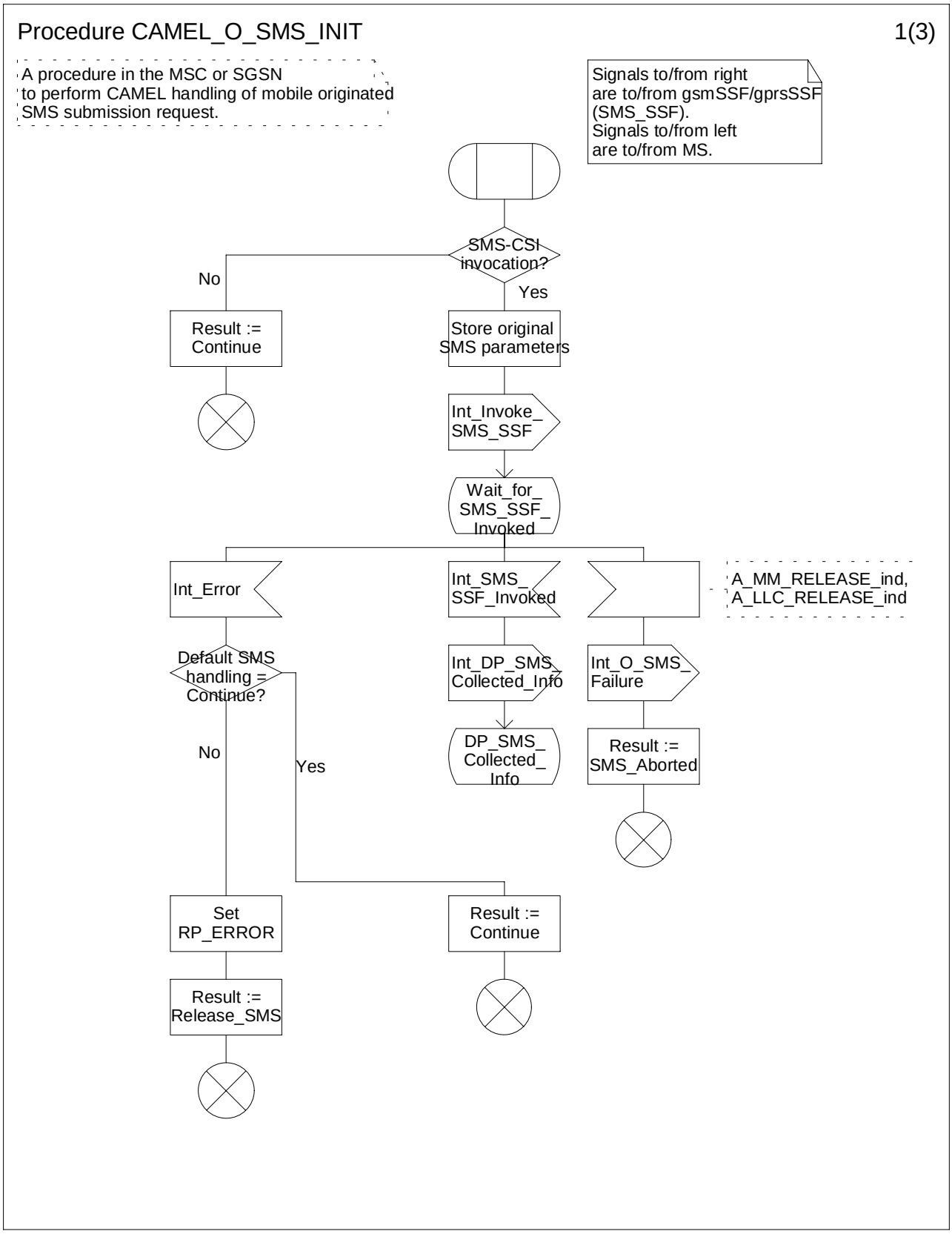


Figure 7.7 a: Procedure CAMEL_O_SMS_INIT (sheet1)

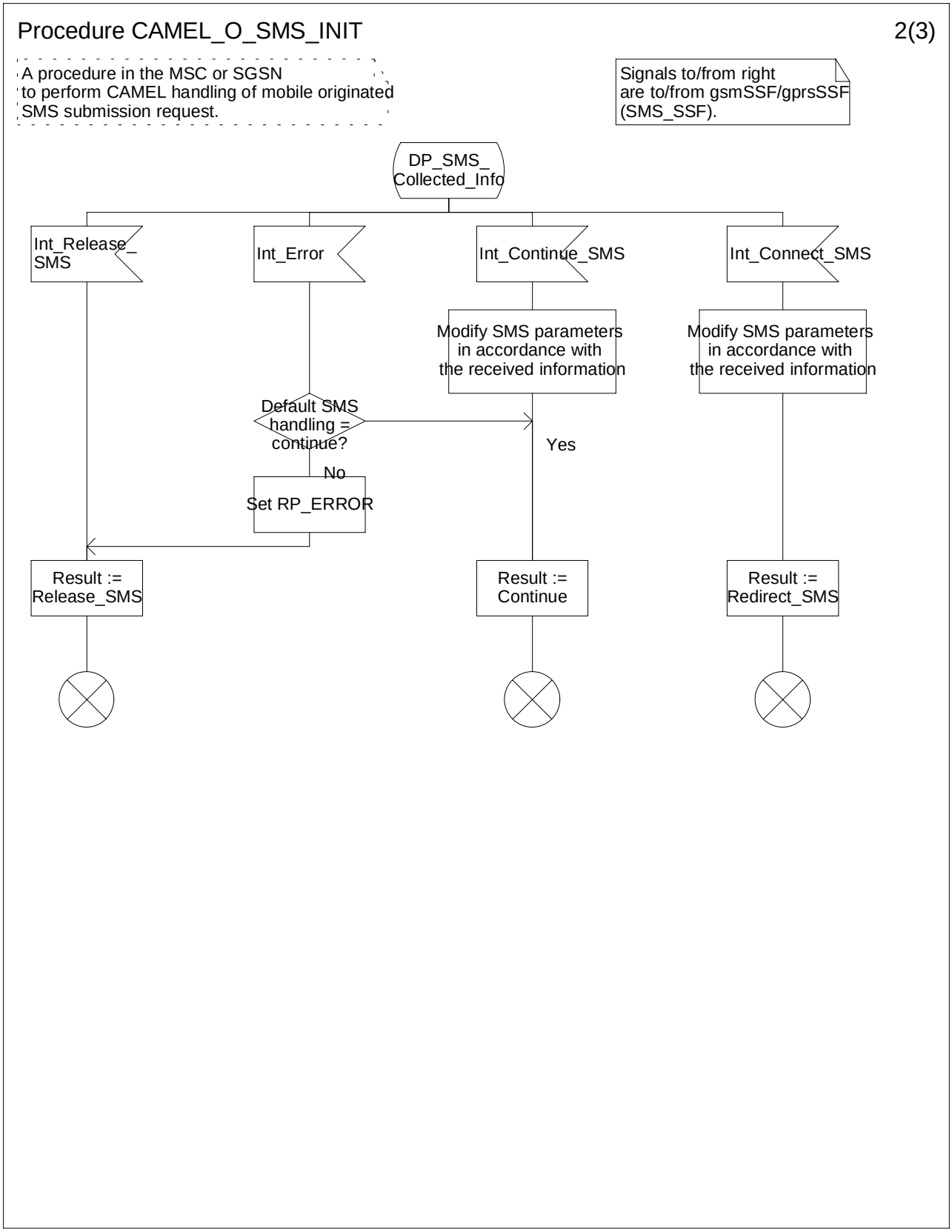


Figure 7.7 b: Procedure CAMEL_O_SMS_INIT (sheet2)

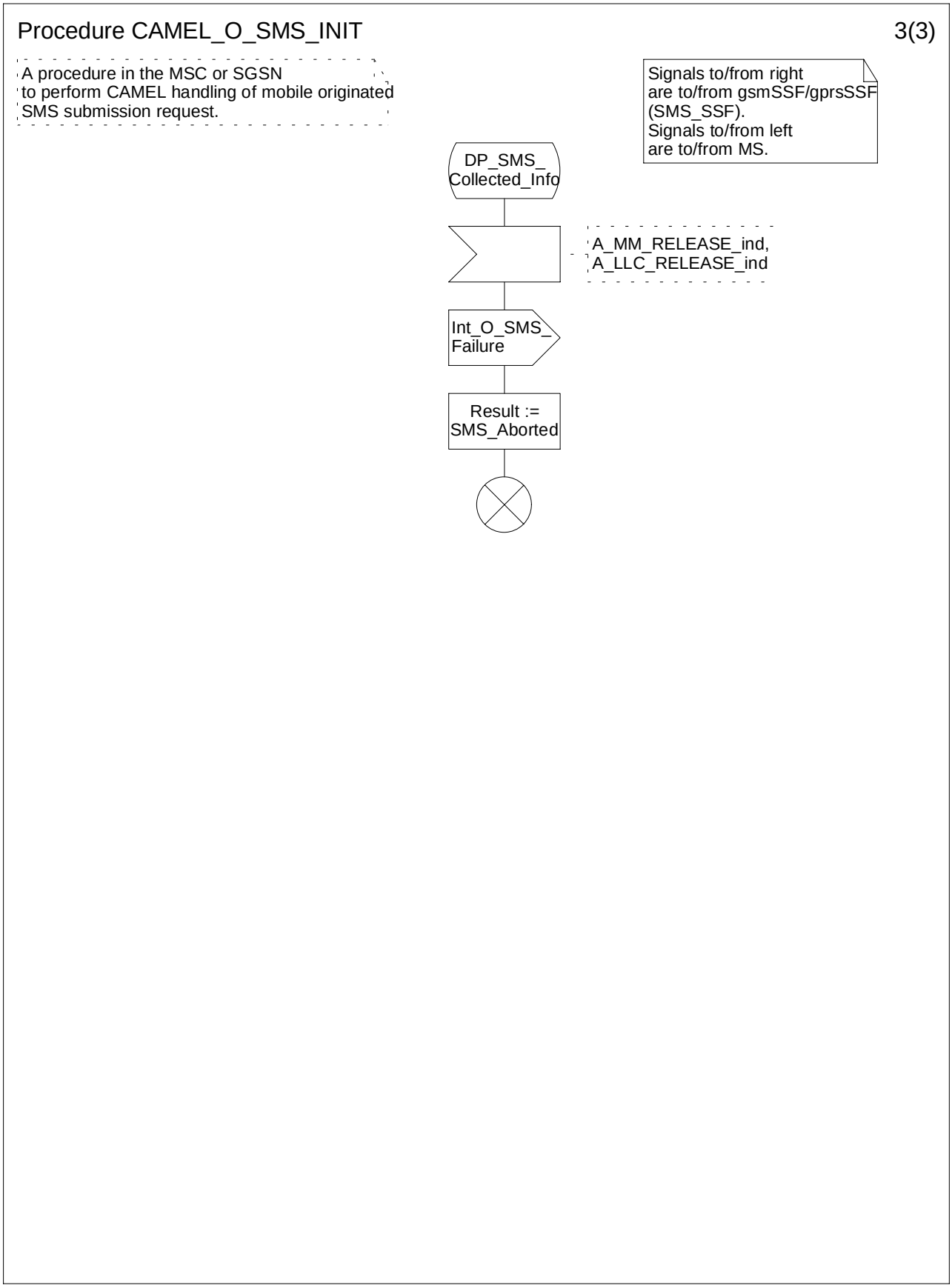


Figure 7.7 c: Procedure CAMEL_O_SMS_INIT (sheet3)

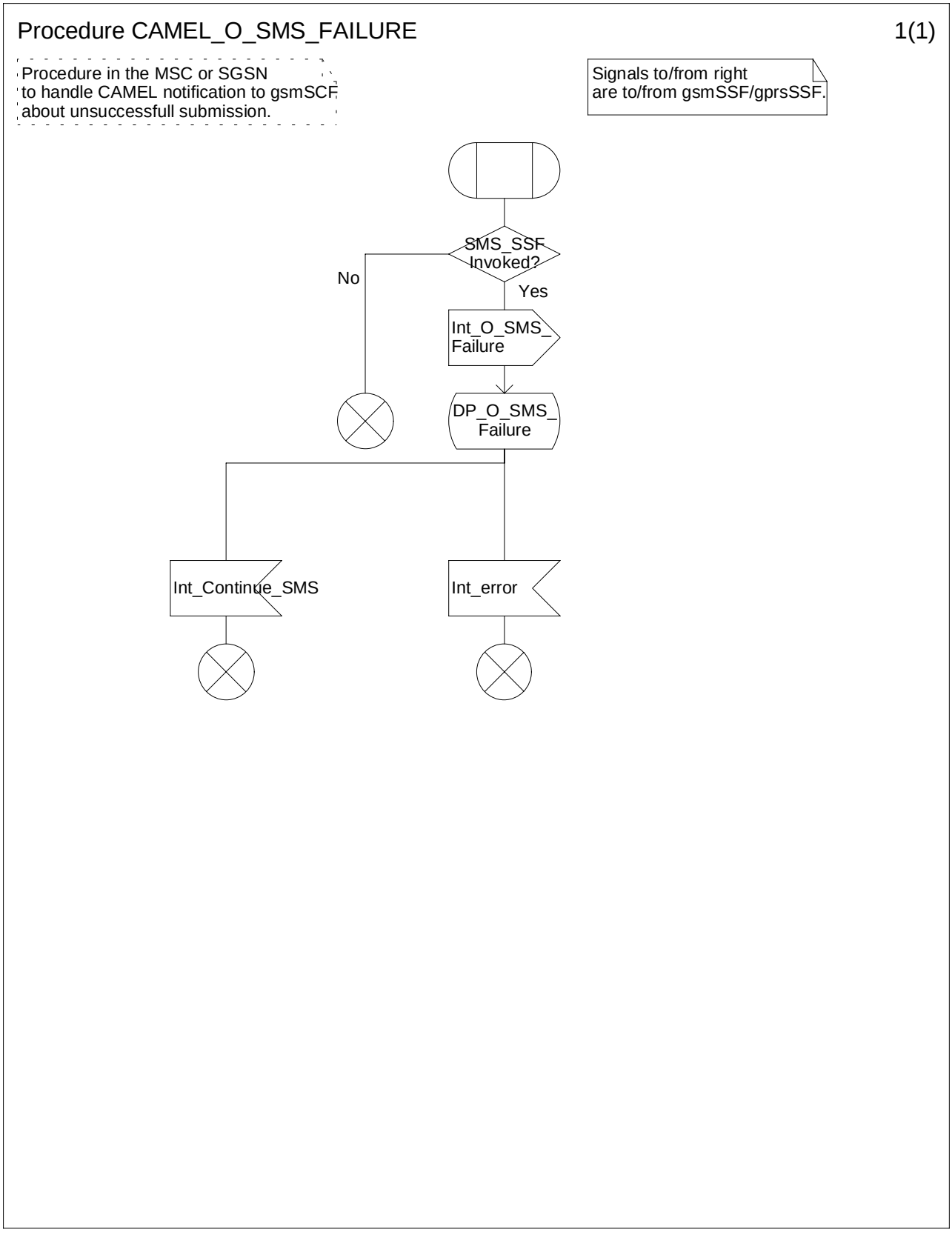


Figure 7.8: Procedure CAMEL_O_SMS_FAILURE (sheet1)

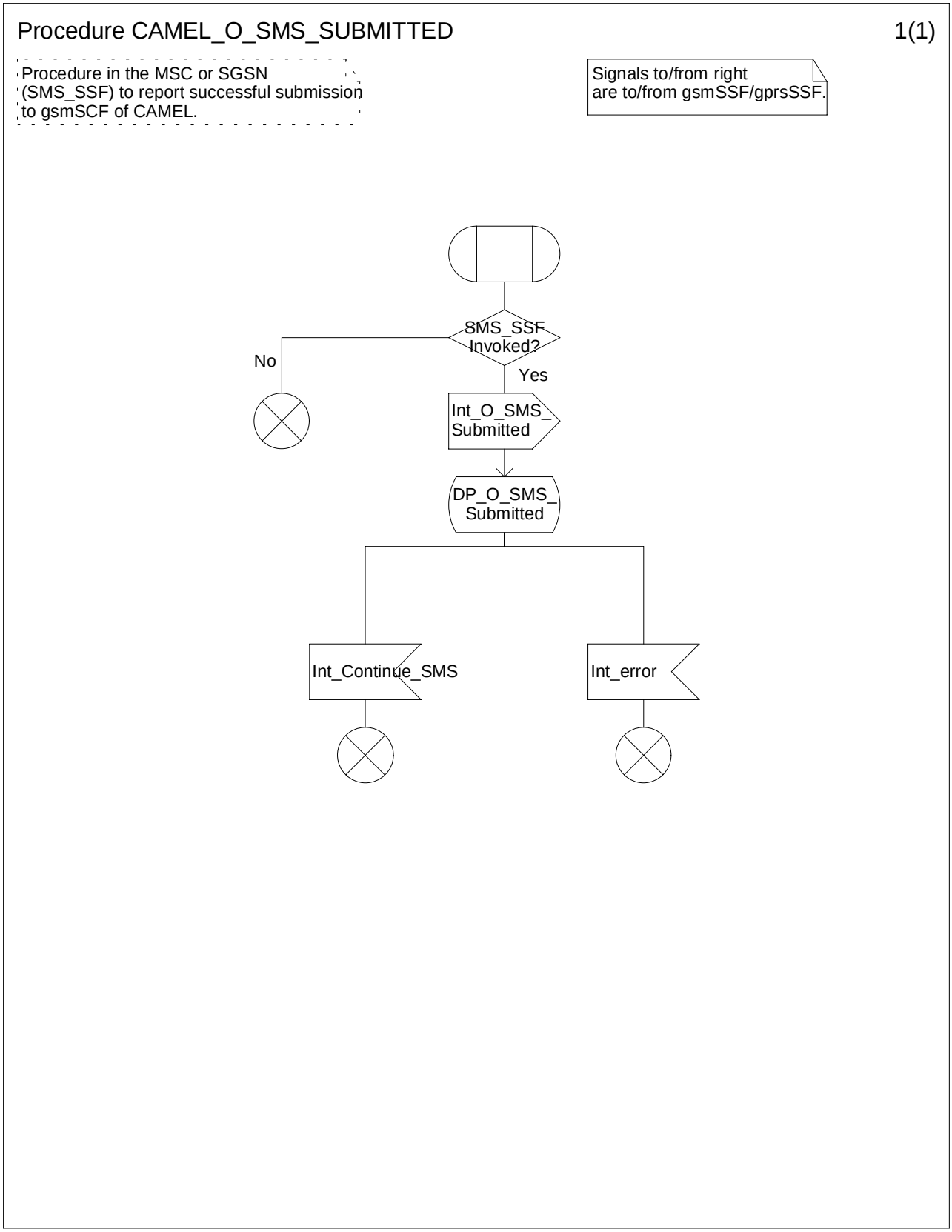


Figure 7.9: Procedure CAMEL_O_SMS_SUBMITTED (sheet1)

7.5.3 Handling of mobile originating~~ed~~ SMS in the gsmSSF/gprsSSF

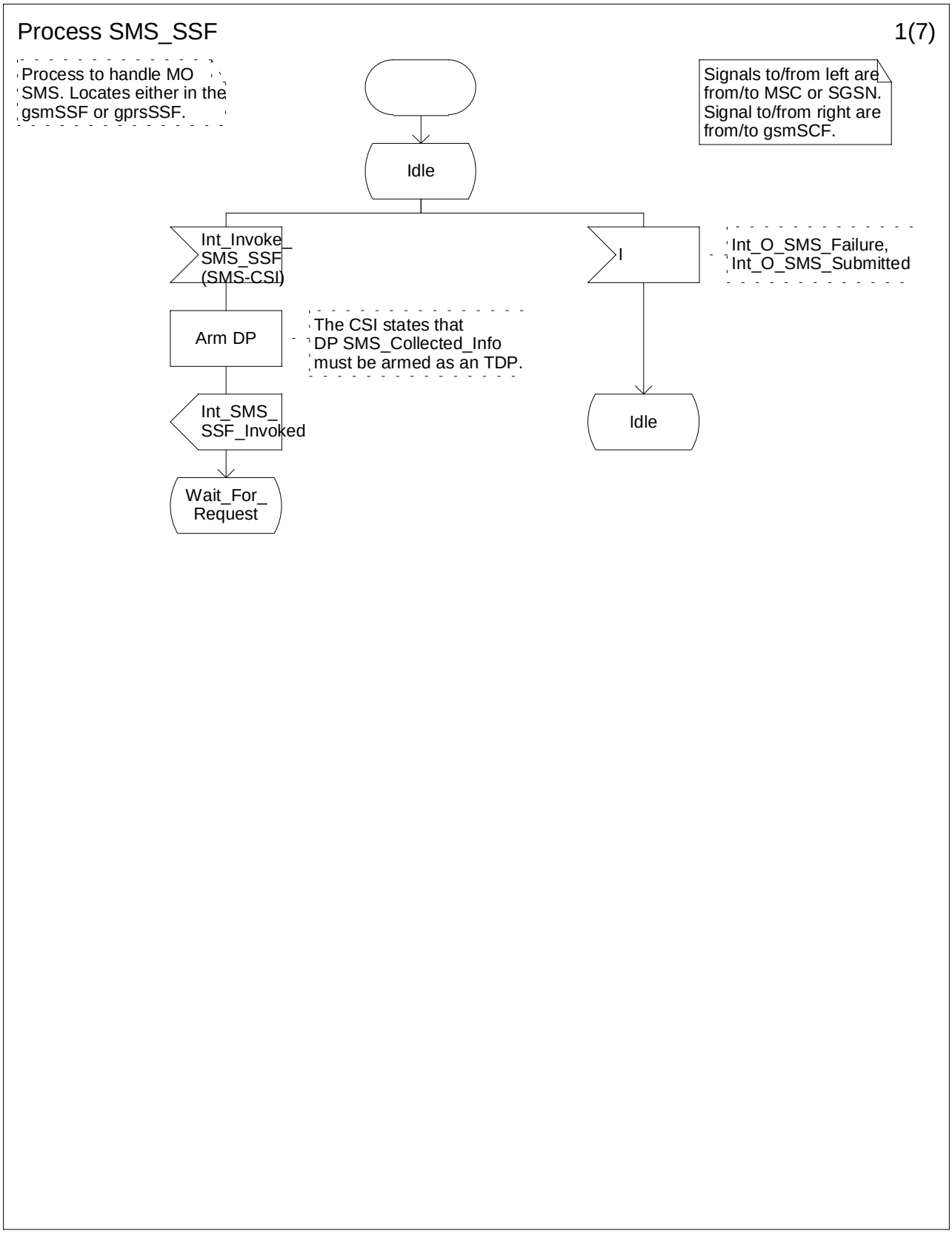


Figure 7.10 a: Process SMS_SSF (sheet 1)

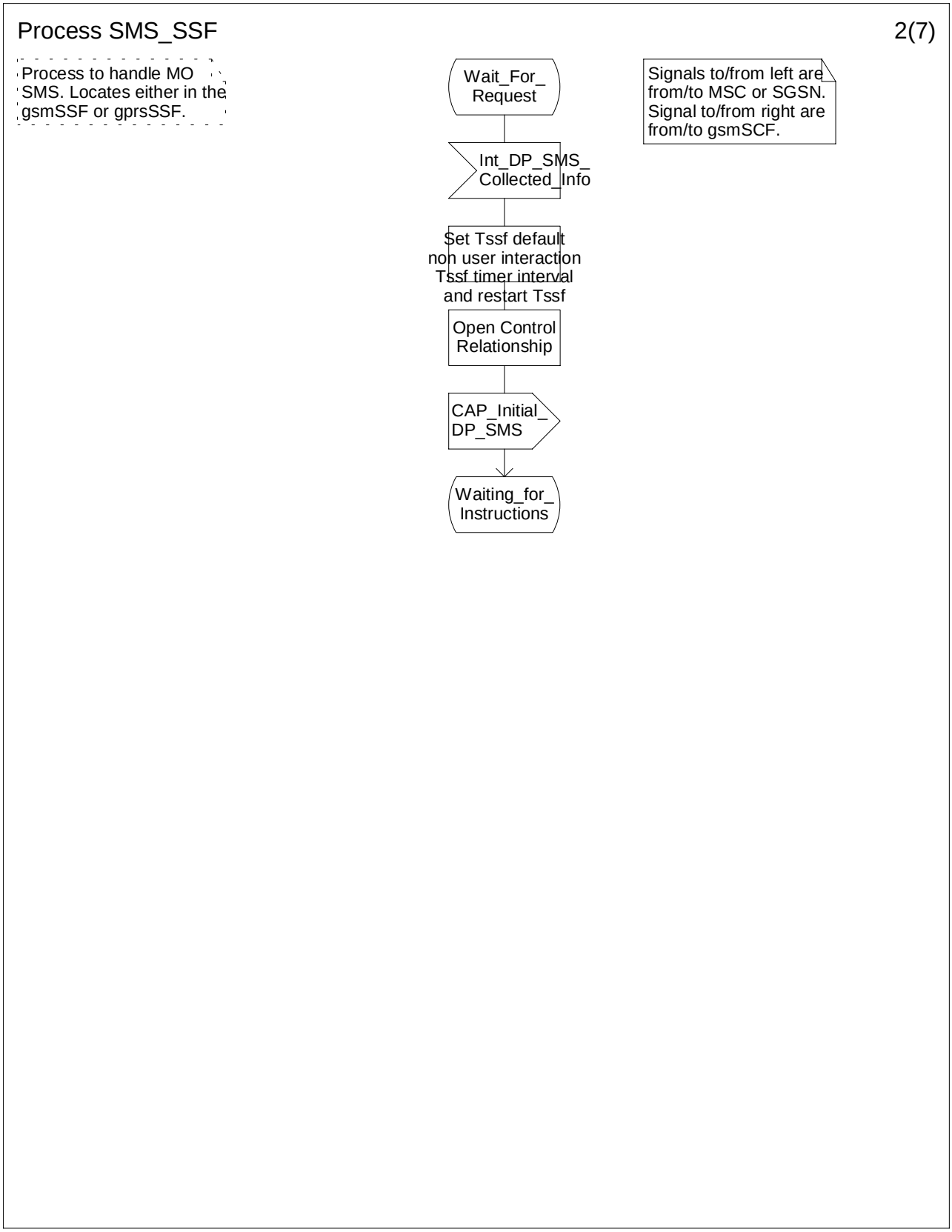


Figure 7.10 b: Process SMS_SSF (sheet 2)

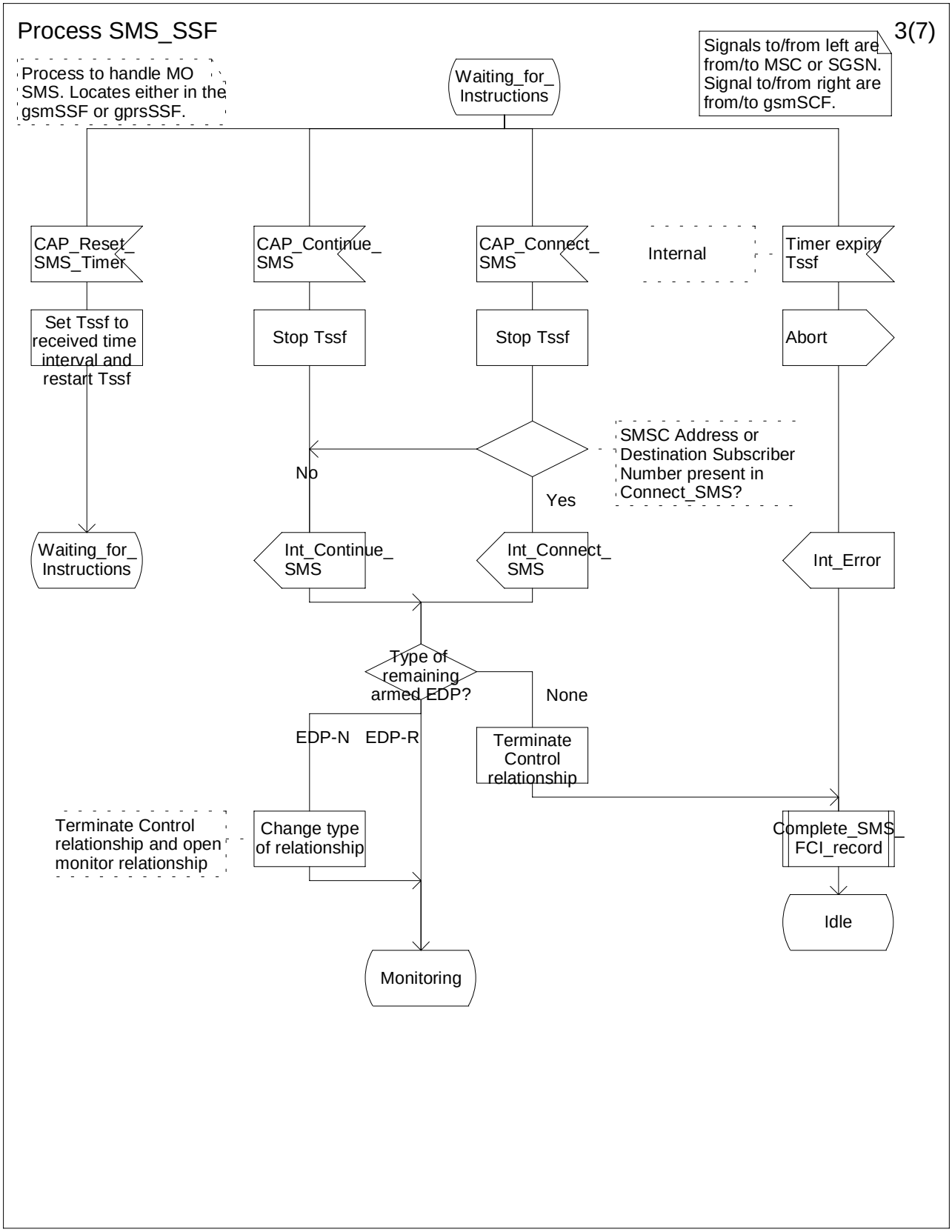


Figure 7.10 c: Process SMS_SSF (sheet 3)

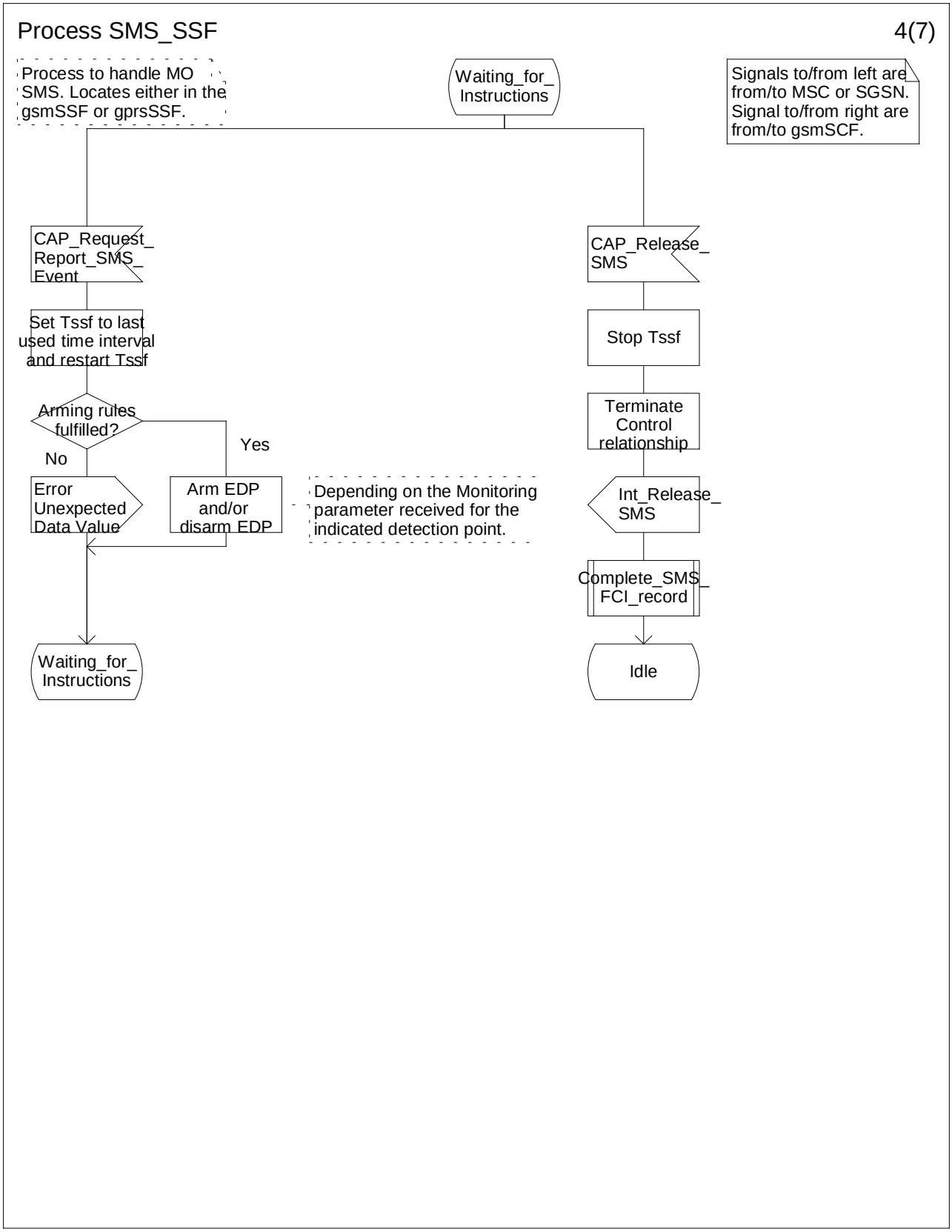


Figure 7.10 d: Process SMS_SSF (sheet 4)

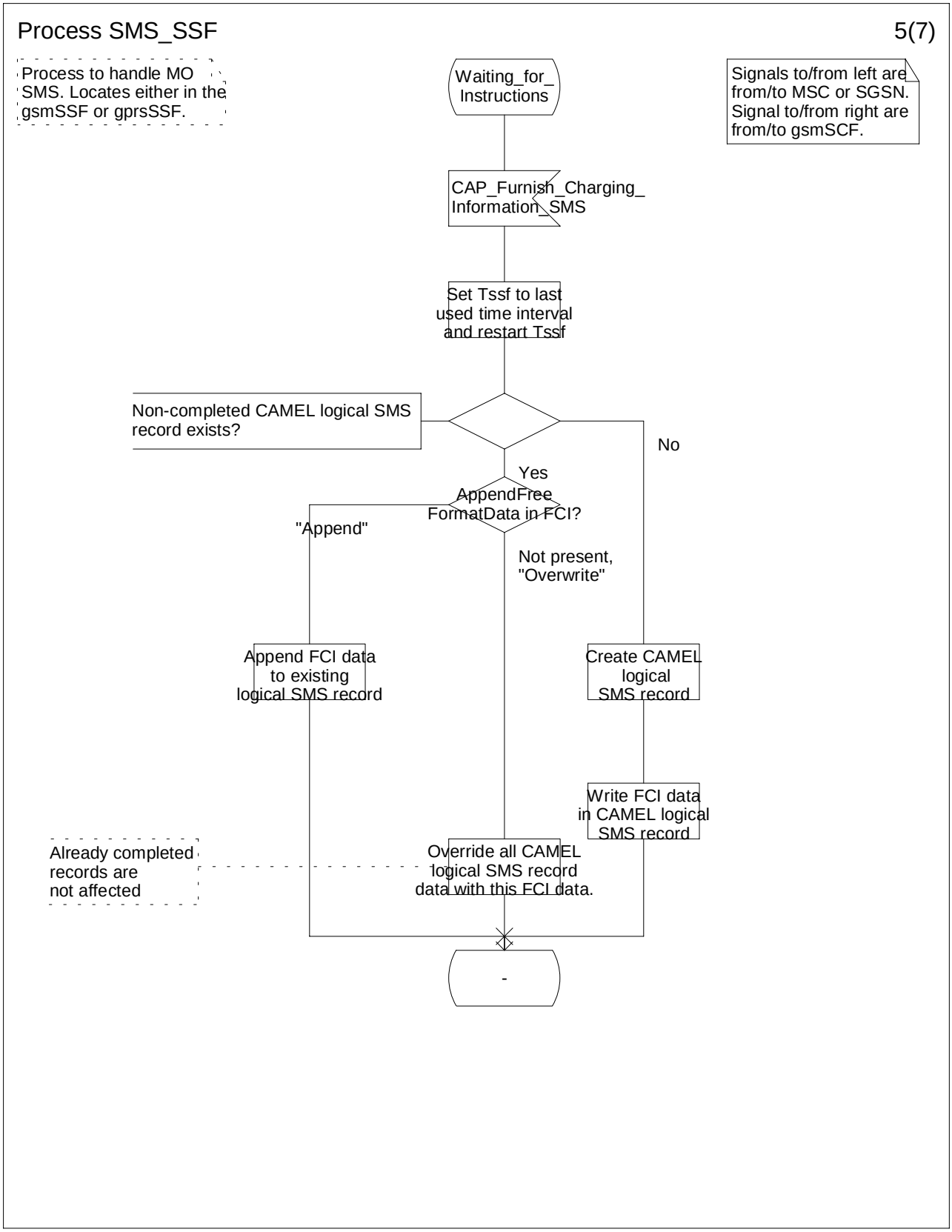


Figure 7.10 e: Process SMS_SSF (sheet 5)

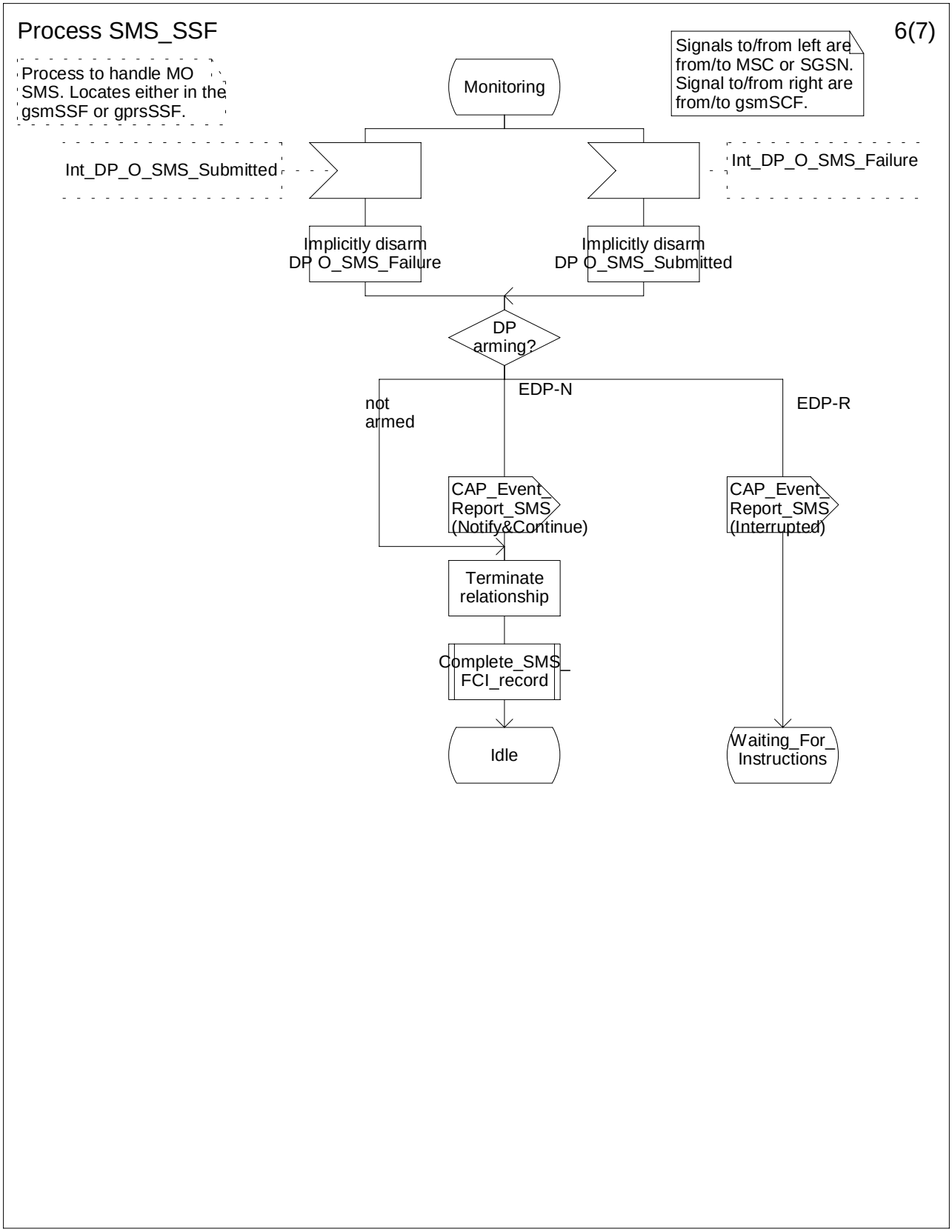


Figure 7.10 f: Process SMS_SSF (sheet 6)

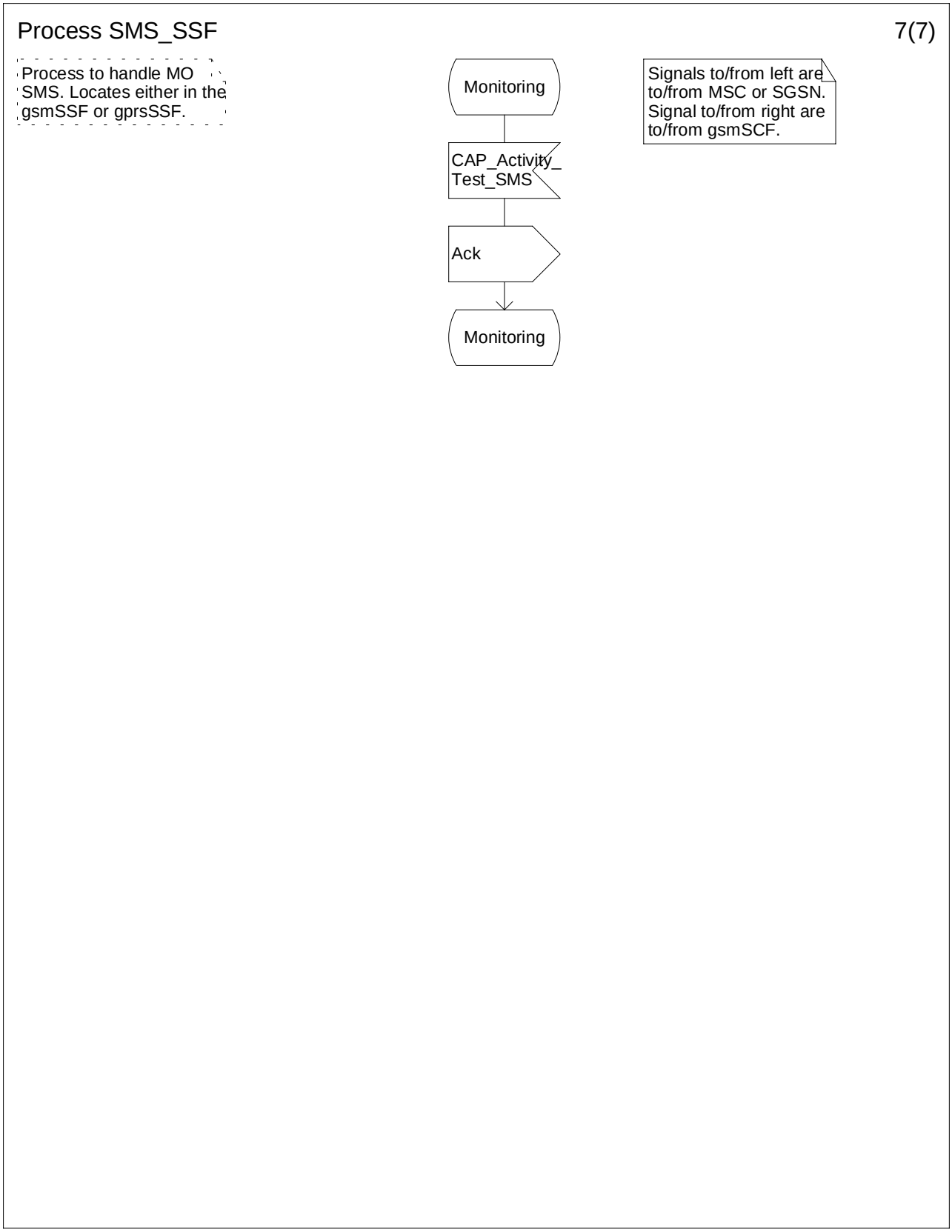


Figure 7.10 g: Process SMS_SSF (sheet 7)

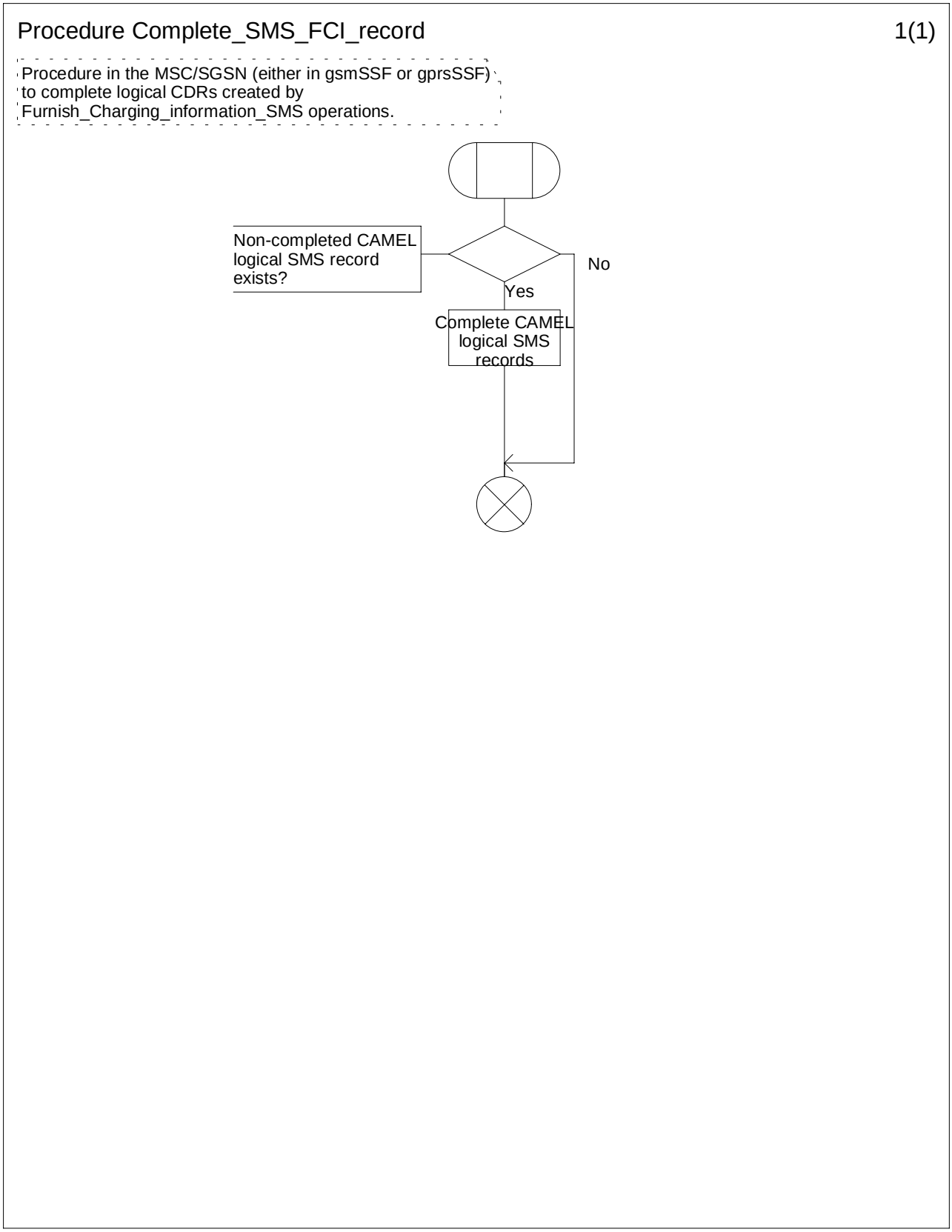


Figure 7.11: Procedure Complete_SMS_FCI_record (sheet 1)

7.6 Description of information flows

This subclause 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.

Details of errors and exceptions to these rules are specified in 3G TS 29.002 [4], 29.078 [5].

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

The following information elements are required:

Information element name	Required ~~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

The following information elements are required:

Information element name	~~MO~~ ~~SMS~~Required	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., *SMS_Collected_Info*) 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	This IE indicates to the gsmSCF the requested CAMEL Service. It is used to address the required application/SLP within the gsmSCF.
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 1st octect of the SMS-SUBMIT TPDU which is specified in 3G TS 23.040 [21]. The 1st octet includes the following information: - Message Type Indicator - Reject Duplicates - Validity Period Format - Status Report Request - User Data Header Indicator - Reply Path
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~~ Required	Description
CellGlobalIDOrServiceAreaIdOrLAI	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~~ Required	Description
CellGlobalIDOrServiceAreaIdOrRAI	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

The following information elements are required:

Information element name	~~MO~~ ~~SMS~~ Required	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

The following information element~~s~~ is~~are~~ required:

Information element name	~~MO~~ ~~SMS~~ Required	Description
FCI Billing Charging Characteristics	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:

Information element name	Required ~~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	Required ~~MO~~ ~~SMS~~	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	This IE indicates that the gsmSSF/gprsSSF shall append the free format data to the Logical MO SMS record. - 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. - 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. If no Logical MO SMS record exists yet, then the gsmSSF/gprsSSF shall ignore this IE.

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

The following information element~~s~~ is~~are~~ required:

Information element name	~~MO~~ ~~SMS~~ Required	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 IF).

7.6.2.6.2 Information Elements

The following information elements are required:

Information element name	~~MO~~ ~~SMS~~ Required	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~~ Required	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:

Information element name	Required	Description
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:

Information element name	Required	Description
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

The Insert Subscriber Data contains the following CAMEL ~~MO SMS~~ specific IE for MO SMS:

Information element name	Required	Description
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	See subclause 7.3.1.1.~~This IE is described in section x.~~
Service Key	M	See subclause 7.3.1.2.~~This IE is described in section x.~~
Default SMS Handling	M	See subclause 7.3.1.3.~~This IE is described in section x~~
CAMEL Capability Handling	M	See subclause 7.3.1.5.~~This IE is described in subclause 4.3.1.~~
SMS Triggers	M	This IE is described in section x. It includes the following trigger: - *SMS_Collected_Info*

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 subclause 4.6.8.1.

7.6.4.2 Update Location

See subclause 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 for MO SMS:

Information element name	Required	Description
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:

Information element name	Required	Description
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	See subclause 7.3.1.1.~~This IE is described in section x.~~
Service Key	M	See subclause 7.3.1.2.~~This IE is described in section x.~~
Default SMS Handling	M	See subclause 7.3.1.3.~~This IE is described in section x~~
CAMEL Capability Handling	M	See subclause 7.3.1.5.~~This IE is described in subclause 4.3.1.~~
SMS Triggers	M	This IE is described in section x. It includes the following trigger: *SMS_Collected_Info*

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 subclause 4.6.8.1.

7.6.6.2 Update GPRS Location

See subclause 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.

The 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).

3GPP N2 Meeting
Rotenburg, Germany, 22-26 May 2000

Document N2-000164
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.078	CR	172	Current Version:	3.4.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	CN#8	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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

Source: N2 **Date:** 23 May 2000

Subject: Editorial corrections in the clause 8

Work item: CAMEL Phase 3

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification	X		Release 99	X
				Release 00	

Reason for change: Various editorial corrections. See “Other comments” for detail.

Clauses affected: 8

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

Following changes are highlighted:
- Change structure to one-level up in the subclause 8.2.1.
- Reference documents and the numbers are inserted.
- Wording style is adjusted, as other clauses for information flows.

8 SS Notifications

8.1 Architecture

8.1.1 Functional Entities used for CAMEL

This subclause describes the functional architecture needed to support Supplementary Service (SS) Notifications. Figure 8.1 shows the functional entities involved in sending SS Notifications. The architecture is applicable to the third phase of CAMEL.

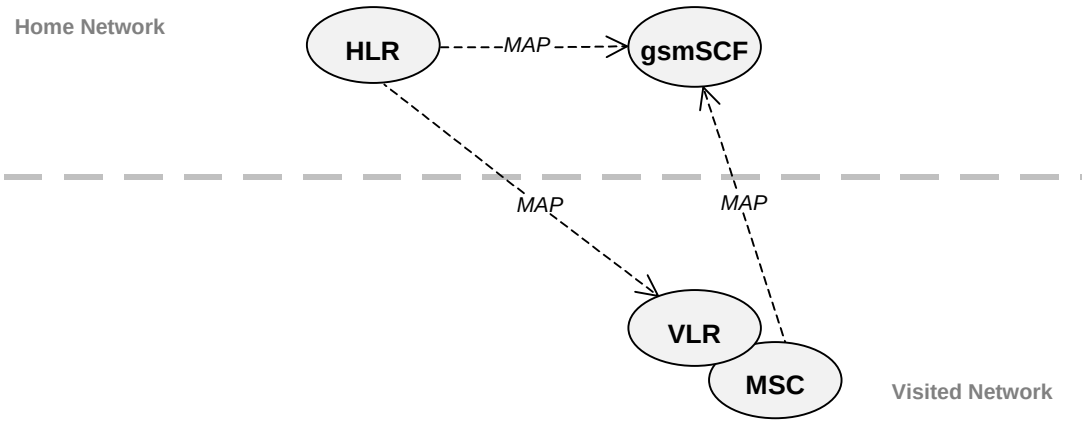


Figure 8.1: Functional architecture for support of SS Notifications

HLR: For subscribers requiring CAMEL support, the HLR stores the information relevant to the current subscription regarding SS-CSI. The SS-CSI is sent to the VLR at Location Update, on Data Restoration or if the SS-CSI is updated by administrative action. 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.

MSC: When processing an invocation of any of the supplementary services ECT, CD and MPTY, the MSC may receive an 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 SS-CSI as a part of the subscriber data for subscribers roaming in the VLR area.

gsmSCF: The gsmSCF receives the SS Invocation Notification from the MSC or HLR.

8.1.2 Interfaces defined for SS Notifications

This subclause describes the different interfaces applicable to SS Notifications. It specifies on a high level the functions specific to SS Notifications.

8.1.2.1 MSC - gsmSCF interface

This interface is used by the MSC to send supplementary service invocation notifications to the gsmSCF. The SS invocations that can be notified to the gsmSCF via this interface are Call Deflection (CD), Explicit Call Transfer (ECT) and Multi Party (MPTY).

8.1.2.2 HLR - gsmSCF interface

This interface is used by the HLR to send supplementary service invocation notifications to the gsmSCF. The SS invocation that can be notified to the gsmSCF via this interface is Call Completion to Busy Subscriber (CCBS).

8.1.2.3 VLR - MSC interface

This interface is used by the VLR to transfer SS-CSI to the MSC.

8.1.2.4 HLR-VLR interface

This interface is used by the HLR to send the SS-CSI to the VLR or to remove SS-CSI from the VLR.

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 subclause 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.

8.2.1.~~1.~~5 gsmSCF address list for CSI

The gsmSCF address list indicates a list of gsmSCF addresses to which Notification on Change of Subscriber Data is to be sent. This list is common to all CSI.

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 is sent.

The sending of the notification is independent of call related CAMEL processing, i.e. processing indicated by O/D/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 (see 3G TS 23.072 [35]).

When a subscriber activates a CCBS request, the HLR checks whether the criteria for sending a notification are fulfilled, i.e. whether

- The subscriber is provisioned with an active SS-CSI, and
- CCBS is marked in the SS-CSI.

If the criteria are fulfilled, a notification is immediately sent to the gsmSCF given by the gsmSCF address contained in the SS-CSI and the processing of the CCBS request continues. Whenever the state of the CCBS request changes (see 3G TS 23.093 [38]), an additional notification is immediately sent to the gsmSCF and the processing of the CCBS request continues.

If the criteria are not fulfilled, the processing of the CCBS request continues unchanged and no notifications are sent.

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 are specified in 3G TS 29.002 [4].

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:

Information element name	Required	Description
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

8.4.2.1 Delete Subscriber Data

8.4.2.1.1 Description

This IF is used by the HLR to remove CAMEL subscription data from the VLR. This IF is specified in 3G TS 29.002 [4].

8.4.2.1.2 Information Elements

The Delete Subscriber Data contains the following CAMEL specific IE for SS Notifications:

Information element name	Required	Description
CAMEL Subscription Info Withdraw	C	This IE identifies that all CSIs shall be deleted from the subscriber data in the VLR.

C Conditional (The IE shall be sent when deletion is requested).

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

The Insert Subscriber Data contains the following CAMEL specific IE for SS Notifications:

Information element name	Required	Description
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 subclause 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:

Information element name	Required	Description
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.
B- Number	M	This IE indicates the destination address of the CCBS request.
CCBS Request State	M	This IE identifies the current state of the CCBS request. It can be one of: - Request - Recall - Active - Completed - Suspended - Frozen - Deleted

M Mandatory (The IE shall always be sent).

8.4.4 VLR to MSC information flows

8.4.4.1 Invoke SS result

8.4.4.1.1 Description

This IF is used by the VLR to send SS-CSI to the MSC. This IF is specified in 3G TS 29.002 [4].

8.4.4.1.2 Information Elements

The Invoke SS result ~~The IF~~ contains the following CAMEL specific IE for SS Notifications:

Information element name	Required	Description
SS-CSI	C	This IE is included when it is available in the VLR and either ECT or MPTY has been successfully invoked and that supplementary service has been marked for notification.

C Conditional (The IE shall be sent when ECT or MPTY invocation shall be notified).

8.4.4.2 Send Info For Incoming Call ack

8.4.4.2.1 Description

This IF is used by the VLR to send SS-CSI to the MSC. This IF is specified in 3G TS 23.018 [3].

8.4.4.2.2 Information Elements

The Send Info For Incoming Call ack~~IE~~ contains the following CAMEL specific IE for SS Notifications:

Information element name	Required	Description
SS-CSI	C	This IE is included when it is available in the VLR and CD has been successfully invoked and that supplementary service has been marked for notification.

C Conditional (The IE shall be sent when CD invocation shall be notified).

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Rotenburg, Germany, 22-26 May 2000

***Document* N2-000241**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.078	CR	173r1	Current Version:	3.4.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	CN#8	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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

Source: N2 **Date:** 26 May 2000

Subject: Editorial corrections in the clause 9

Work item: CAMEL Phase 3

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification	X		Release 99	X
				Release 00	

Reason for change: Various editorial corrections. See “Other comments” for detail.

Clauses affected: 9

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

Following changes are highlighted:
- Inclusion of the MS in the figure 9.1.
- Change structure to one-level up in the subclause 9.2.1
- Description of the location information IE in the subclause 9.4.1.1.2 has been referenced to meaningless subclause. Added.

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.

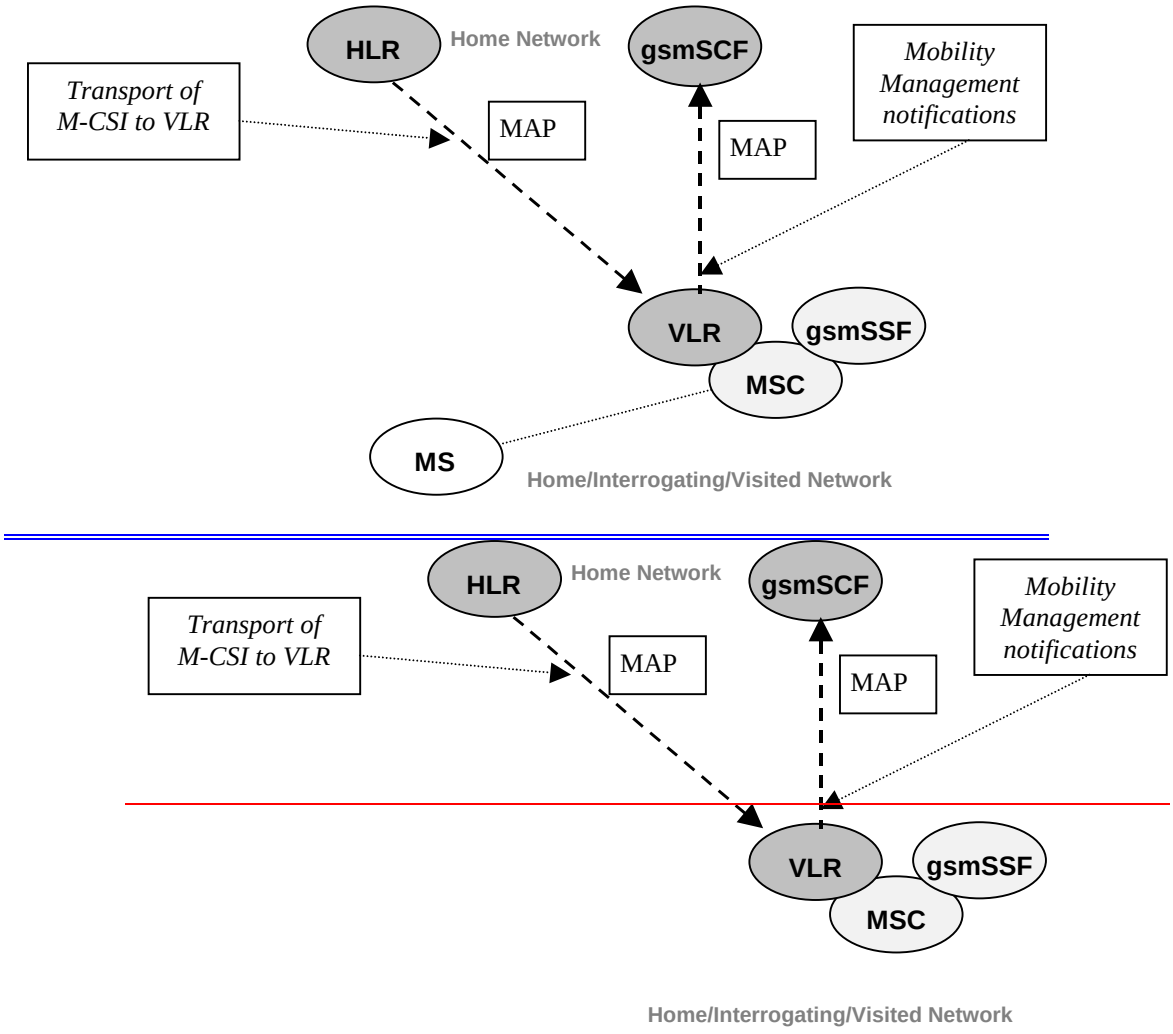

Figure 9.1: Functional architecture for support of CAMEL

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: s~~S~~ee 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 ananother 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.

9.2.1.~~1.~~6 gsmSCF address list for CSI

The gsmSCF address list indicates a list of gsmSCF addresses to which Notification on Change of Subscriber Data is to be sent. This list is common to all CSI.

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).

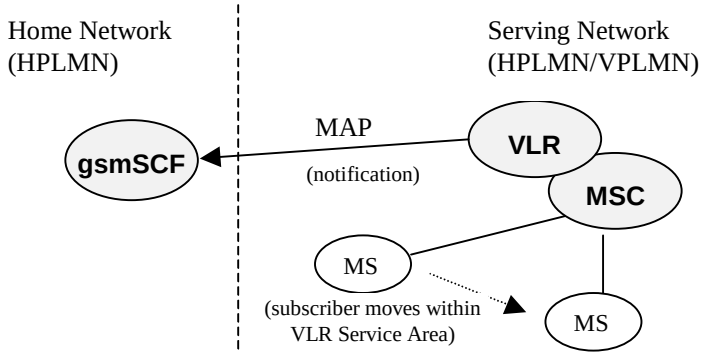

Figure 9.2: Location Update within a single VLR Service Area

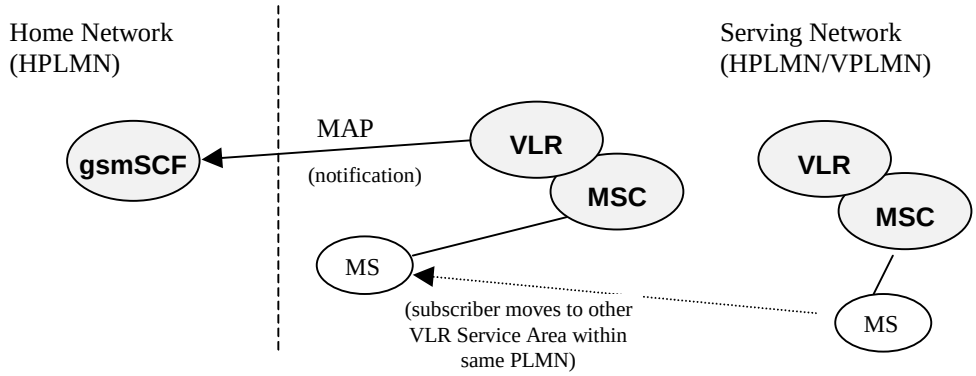

Figure 9.3: Location Update from one VLR Service Area to another VLR Service Area

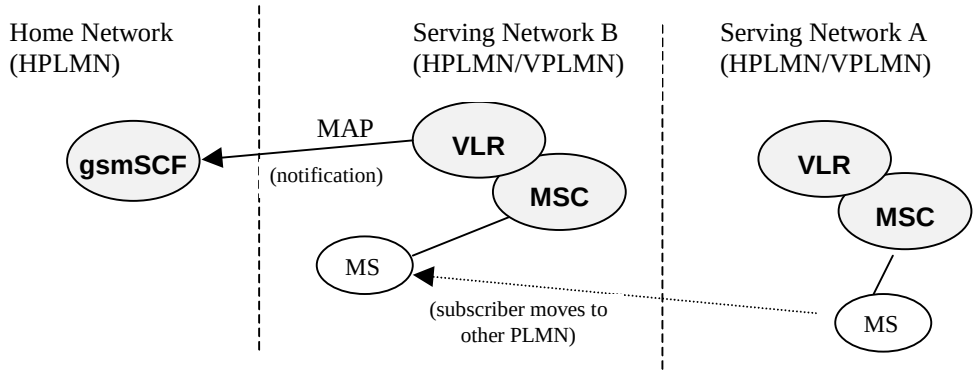

Figure 9.4: Location Update from one VLR Service Area to Another VLR Service Area

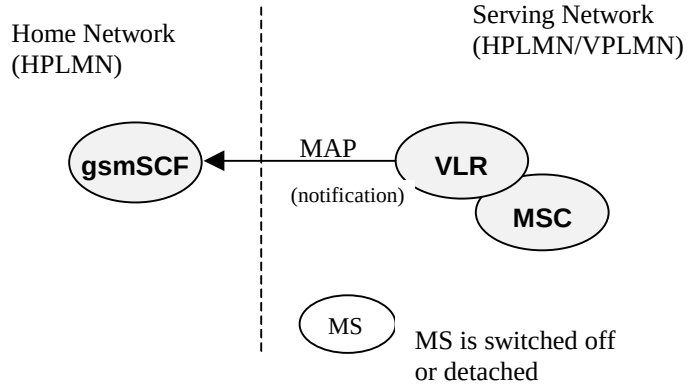

Figure 9.5: IMSI Detach (implicit/explicit)

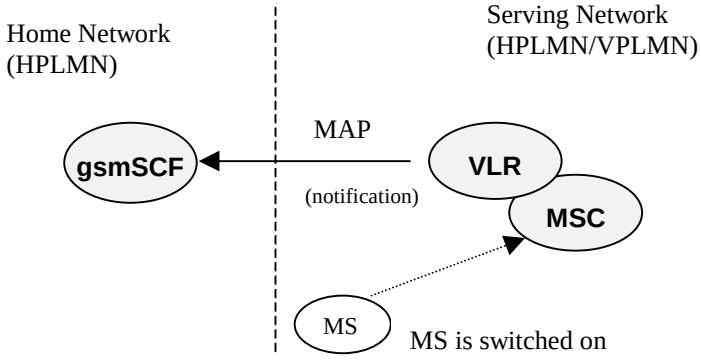

Figure 9.6: IMSI Attach

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 subclause 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.

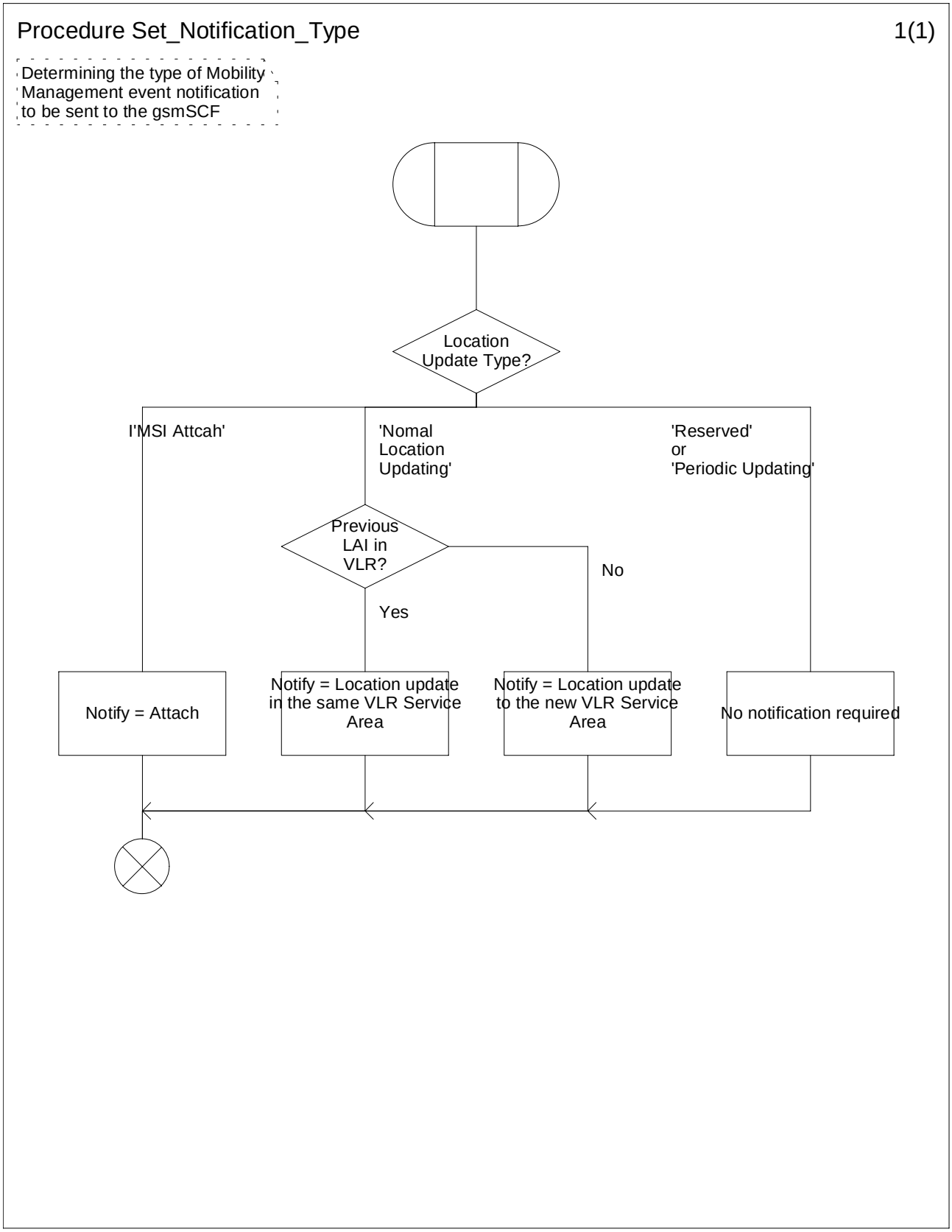

Figure 9.7: Procedure Set_Notification_Type

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.

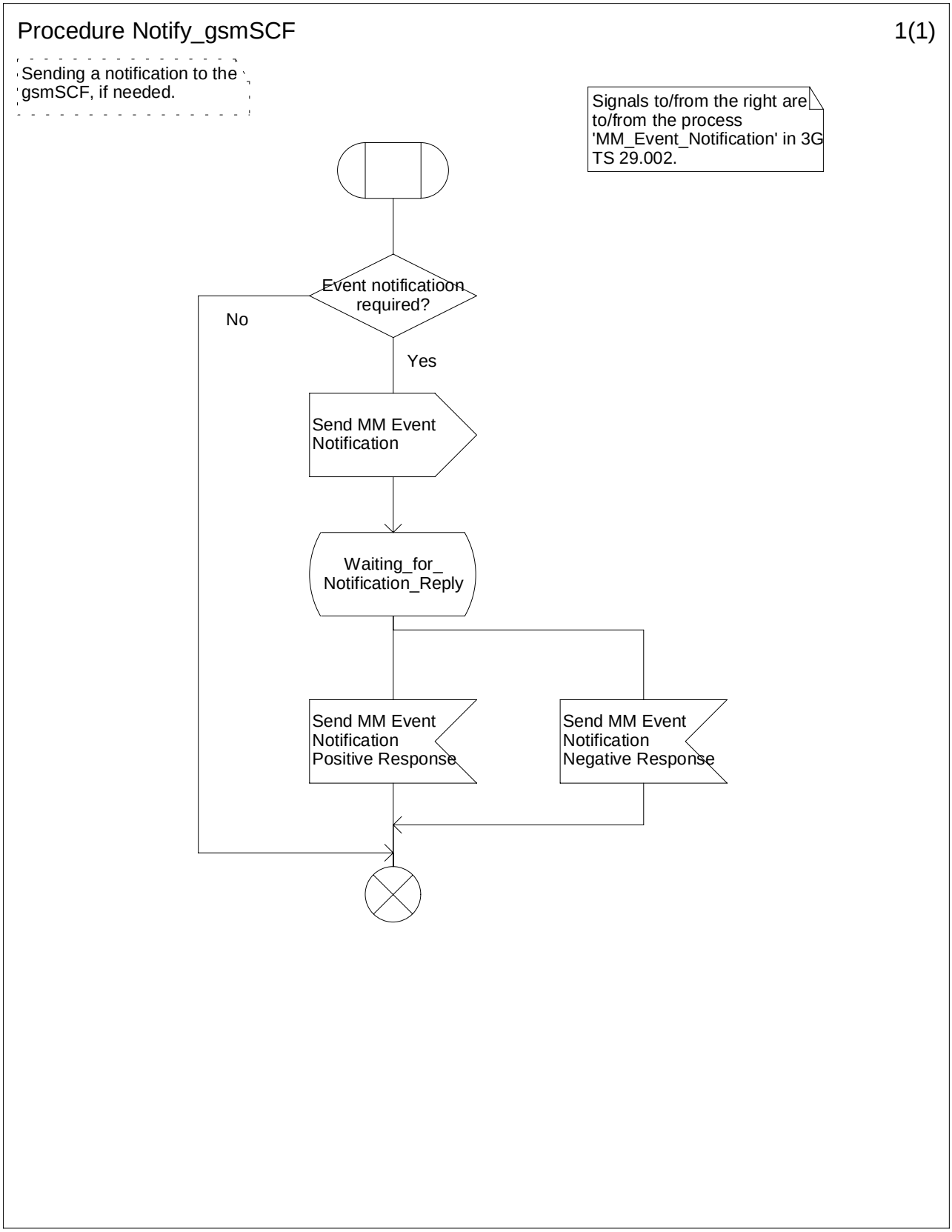

Figure 9.8: Procedure Notify_gsmSCF

9.4 Description of information flows

This subclause 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 described in the next table~~explained in subclause 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).

Location Information contains the following information:

Information element name	Required	Description
Location Number	C	See 3G TS 23.018 [3].
CellGlobalIdOrServiceAreaIdOrLAI	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	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.

C Conditional (The IE shall be sent, if available. Further conditions are in the description column).

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 for Mobility Management:

Information element name	Required	Description
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:

Information element name	Required	Description
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:

Information element name	Required	Description
GsmSCF Address	M	This IE is described in subclause 9.2.1.
Service Key	M	This IE is described in subclause 9.2.1.
Mobility Management Triggers	M	This IE indicates which Mobility Management events shall be reported to the gsmSCF. It shall contain one or more of the following elements: - 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)

M Mandatory (The IE shall always be sent).

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Rotenburg, Germany, 22-26 May 2000

***Document* N2-000242**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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23.078	CR	174r1	Current Version:	3.4.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	CN#8	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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 [X]
(at least one should be marked with an X)

Source: N2 **Date:** 26 May 2000

Subject: Editorial corrections in the clause 10

Work item: CAMEL Phase 3

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification	X		Release 99	X
				Release 00	

Reason for change:
- Various editorial corrections.
- All the procedures in this clause are stated as “network operator option”. Therefore, this is stated at the very beginning.

Clauses affected: 10

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

10 Control and interrogation of subscription data

Support of the procedures described in this clause in CAMEL Phase 3 is a network operator option.

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 3.1 ~~4.1~~.

HLR: The HLR may provide an interface to the gsmSCF for the Any Time Subscription Interrogation and Any Time Modification procedures. The gsmSCF may provide an interface to the HLR for the Notify Subscriber Data Change procedure.

10.1.2 Interfaces defined for CAMEL

This subclause describes the 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 by the HLR to notify the gsmSCF of a change of subscriber data.

10.2 Procedures for CAMEL

10.2.1 Any Time Subscription Interrogation

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 an Any Time Subscription Interrogation Request. ~~Support for this procedure is a network operator option.~~

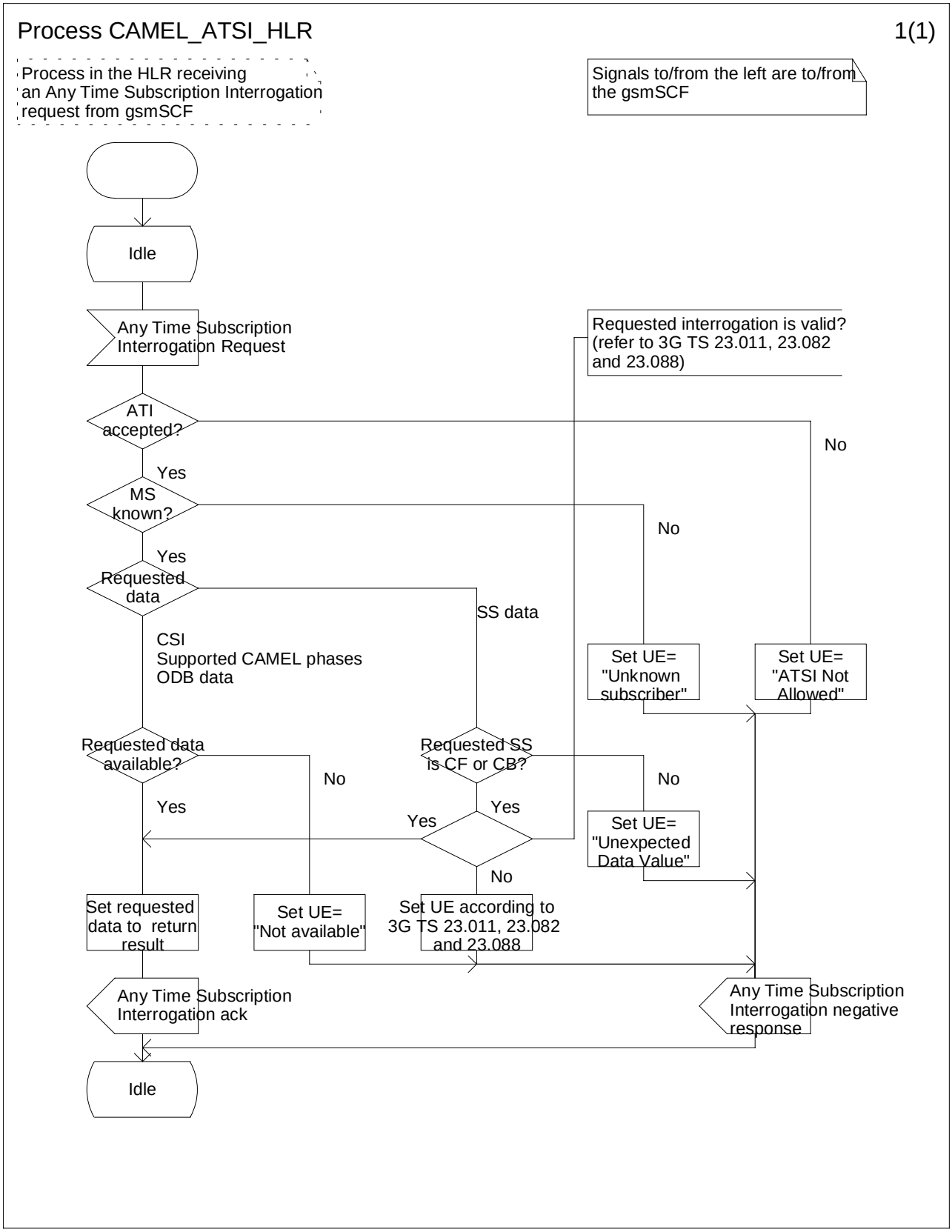

Figure 10.2: Process CAMEL_ATSI_HLR (sheet 1)

10.2.2 Any Time Modification

Handling of Any Time Modification involves the following process:

- CAMEL_ATM_HLR.

The following procedures are involved:

- ATM_Modify_Data
  This procedure checks which data shall be modified and calls the appropriate data modification procedure.

- ATM_Modify_CSI_Data
  If the CSI indicated in the ATM request is not available in the HLR, then an error is returned.
  Otherwise, the CSI state and/or Notification-to-CSE flag are set as instructed with the ATM request.

- ATM_Modify_CF_Data
  When only the SS-code and (optionally) a Basic Service code are present in the ATM request, then all Call Forwarding data is erased.
  Otherwise, the behaviour is as follows:

  - If a valid SS state is present in the ATM request, then an SS state transition is performed.

  - If a valid FTN, FTN sub address or No Reply Condition Time is present in the ATM request, then the indicated variable is modified.

  - If an instruction to modifiy the notification-to-CSE flag is present in the ATM request, then the notification-to-CSE flag is modified.

- ATM_Modify_CB_Data
  When only the SS-code and (optionally) a Basic Service code are present in the ATM request, then all Call Barring data is erased.
  Otherwise, the behaviour is as follows:

  - If a valid SS state is present in the ATM request, then an SS state transition is performed.

  - If a valid Password or ‘Wrong password attempt counter’ is present in the ATM request, then the indicated variable is modified.

  - If an instruction to modifiy the notification-to-CSE flag is present in the ATM request, then the notification-to-CSE flag is modified.

After having executed the Any Time Modification instruction from the gsmSCF, the HLR calls the procedure CAMEL_NSDC_HLR, which sends notifications to gsmSCF(s), if required.

~~Support for this procedure is a network operator option.~~

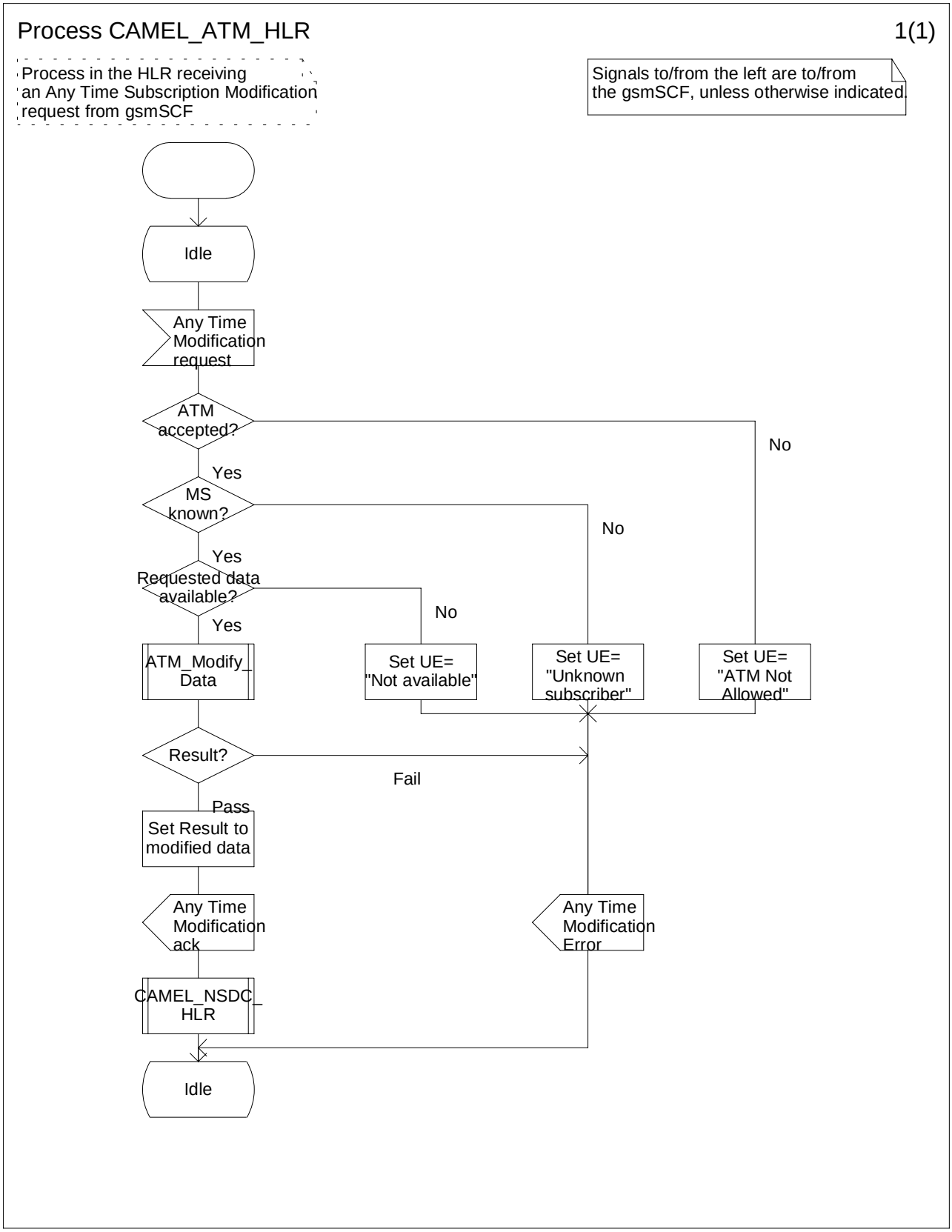

Figure 10.3: Process CAMEL_ATM_HLR (sheet 1)

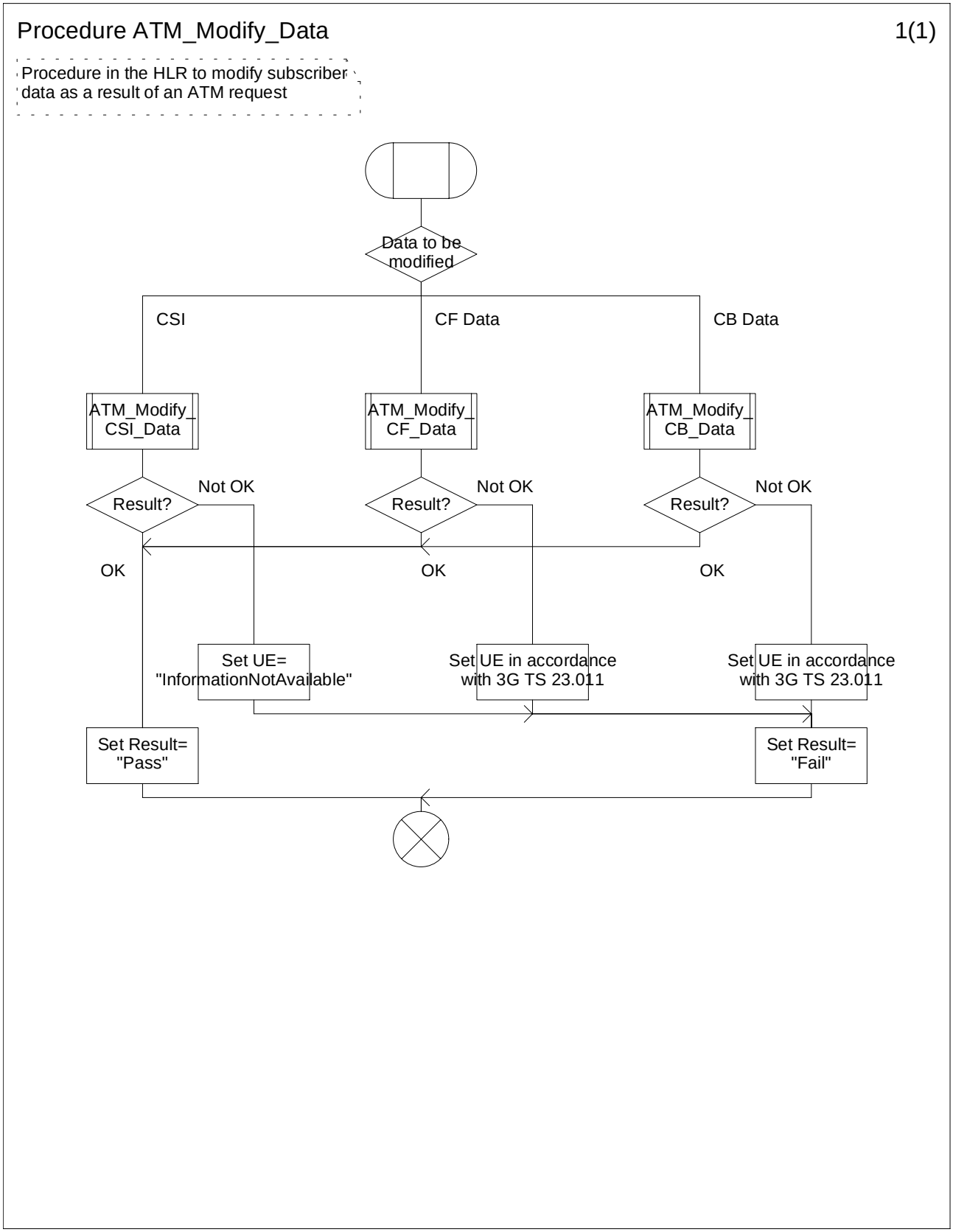

Figure 10.4: Procedure ATM_Modify_Data (sheet 1)

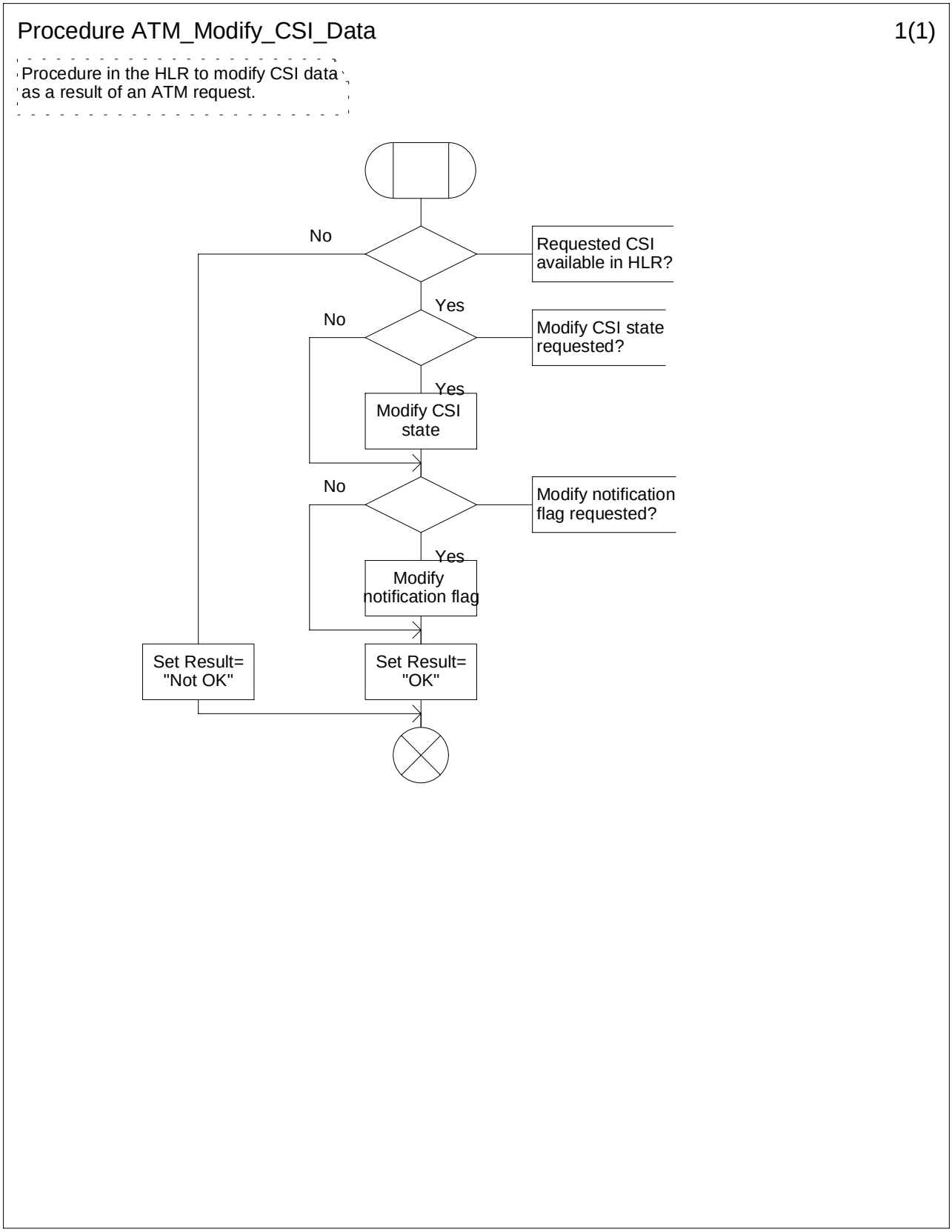

Figure 10.5: Procedure ATM_Modify_CSI_Data (sheet 1)

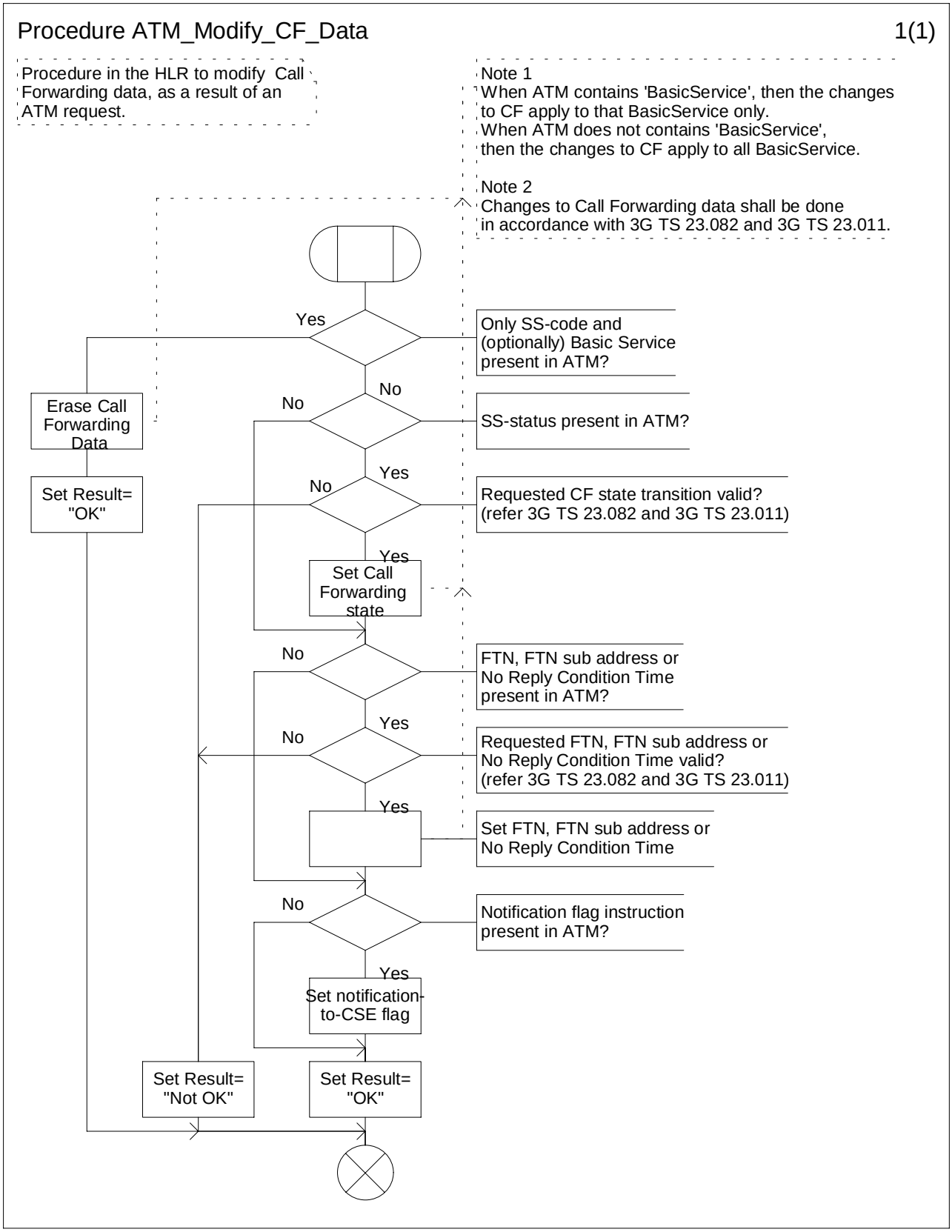

Figure 10.6: Procedure ATM_Modify_CF_Data (sheet 1)

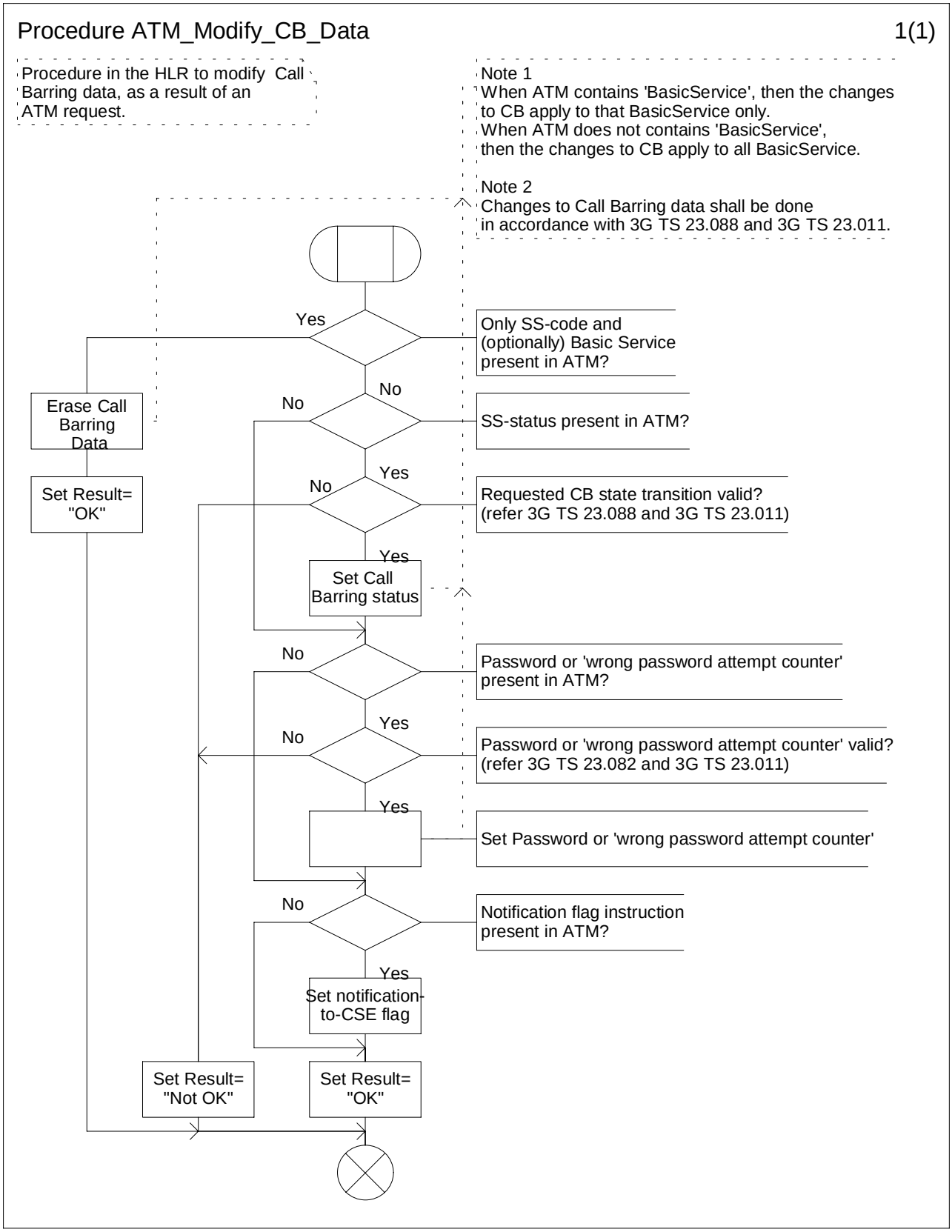

Figure 10.7: Procedure ATM_Modify_CB_Data (sheet 1)

10.2.3 Notify Subscriber Data Change

Changes of CSI, Call Forwarding data, Call Barring data or ODB data shall be notified only if the CSI, Call Forwarding data, Call Barring data or ODB data is marked with the Notification-to-CSE flag.

The HLR maintains a list of gsmSCF address(es) for Call Forwarding Data, Call Barring Data, ODB and CSI. When any of these items has been modified, a notification shall be sent to each gsmSCF in the corresponding list.

The sending of a notification to the gsmSCF may be triggered by the following processes:

- subscriber data change by administrative procedure;
- subscriber data changed by subscriber;
- subscriber data changed by Any Time Modification request from gsmSCF;
- subscriber data changed due to a change of other subscriber data;
- subscriber data change due to Location Update.

When the change of subscriber data was requested by Any Time Modification the notification of change of subscriber data shall not be sent to the gsmSCF which originated this Any Time Modification request.

Each gsmSCF shall be notified only once. Multiple occurrence of gsmSCF Address in these lists shall not lead to multiple notification.

Handling of Notify Subscriber Data Change involves the following procedure:

- CAMEL_NSDC_HLR.

If a change of subscriber data needs to be notified to the gsmSCF, then the HLR initiates a transaction to the gsmSCF by sending Notify Subscriber Data Change message.

~~Support for this procedure is a network operator option.~~

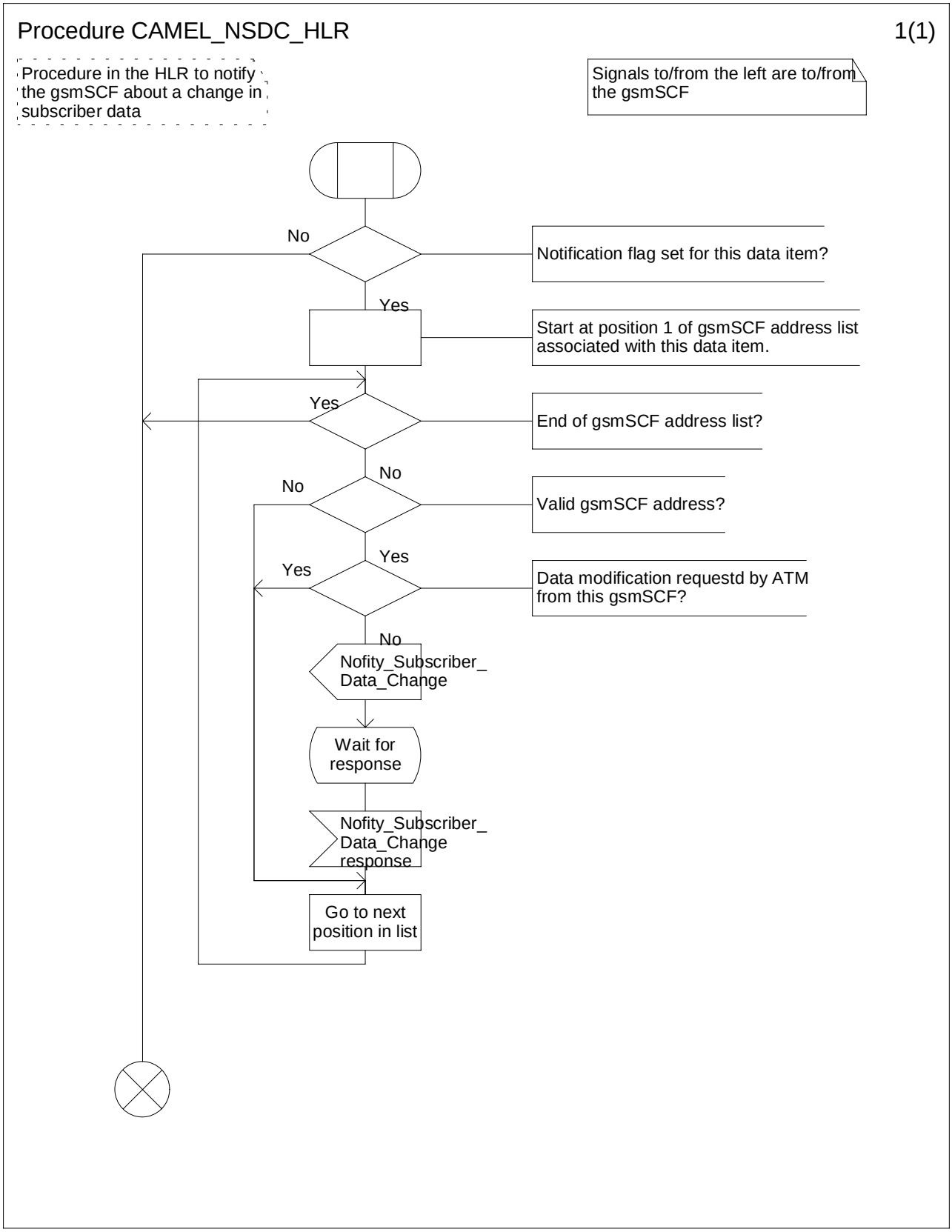

Figure 10.8: Procedure CAMEL_NSDC_HLR (sheet1)

10.3 Description of information flows

This subclause 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 an IE which it receives.

Details of errors and exceptions to these rules are specified in 3G TS 29.002 [4].

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:

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 subscriber information being requested: This can be one of: - supplementary service, described in a table below - Operator Determined Barring - CAMEL Subscription Information, described in a table below - supported CAMEL phases in VLR - supported CAMEL phases in SGSN
Subscriber Identity	M	This IE identifies the subscriber for which the information is requested. The identity can be one of: - IMSI - MSISDN

M Mandatory (The IE shall always be sent).

Supplementary service contains the following information:

Information element name	Required	Description
SS code	M	This IE indicates a supplementary service as defined in 3G TS 22.004 [25]. Only the Call Forwarding and Call Barring supplementary services are allowed for this IE.
Basic Service	O	See 3G TS 22.002 [24].

M Mandatory (The IE shall always be sent).

O Optional (Service Logic Dependent).

CAMEL subscription information contains the following information:

Information element name	Required	Description
CAMEL subscription information	M	This IE indicates which CAMEL Subscription Information is requested. It may be one of the following elementsw: O-CSI/T-CSI/VT-CSI/TIF-CSI/GPRS-CSI/SMS-CSI/SS-CSI/M-CSI/D-CSI

M Mandatory (The IE shall always be sent).

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:

Information element name	Required	Description
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
Modification Request for Call Forwarding SS data	C	This IE indicates the data of Call Forwarding data to be modified. It is described in a table below.
Modification Request for Call Barring SS data	C	This IE indicates the data of call barring data to be modified. It is described in a table below.
Modification Request for CAMEL Subscription Information	C	This IE indicates the Modification Request for CAMEL Subscription Information. It is described in a table below.

M Mandatory (The IE shall always be sent).

C Conditional (The IE shall be sent, if available).

Modification Request for Call Forwarding SS data contains the following information:

Information element name	Required	Description
SS Code	M	This IE indicates Call Forwarding supplementary service as defined in 3G TS 22.004 [25].
Basic Service	O	See 3G TS 22.002 [24].
SS Status	O	See 3G TS 23.011 [26].
Forwarded-to Number	O	See 3G TS 23.082 [27].
Forwarded-to Subaddress	O	See 3G TS 23.082 [27].
No Reply Condition Time	O	See 3G TS 23.082 [27].
Modify Notification Flag	O	This IE contains an instruction to activate or de-activate the Notification-to-CSE flag.

M Mandatory (The IE shall always be sent).

O Optional (Service Logic dependent).

Modification Request for Call Barring SS data contains the following information:

Information element name	Required	Description
SS Code	M	This IE indicates Call Barring supplementary service as defined in 3G TS 22.004 [25].
Basic Service	O	See 3G TS 22.002 [24].
SS Status	O	See 3G TS 23.011 [26].
Password	O	See 3G TS 23.011 [26].
Wrong password attempts counter	O	See 3G TS 23.011 [26].
Modify Notification flag	O	This IE contains an instruction to activate or de-activate the Notification-to-CSE flag.

M Mandatory (The IE shall always be sent).

O Optional (Service Logic dependent).

Modification Request for CAMEL Subscription Information contains the following information:

Information element name	Required	Description
Requested CSI	M	This IE indicates which CSI shall be modified. Only one CSI may be changed in one ATM Request.
Modify Notification flag	O	This IE contains an instruction to activate or de-activate the Notification-to-CSE flag.
Modify CSI state	O	This IE contains an instruction to activate or de-activate the CSI.

M Mandatory (The IE shall always be sent).

O Optional (Service Logic dependent).

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:

Information element name	Required	Description
Call Forwarding SS data	C	This IE is described in a table below.
Call B~~b~~arring SS data	C	This IE is described in a table below.
Operator Determined Barring data	C	This IE is described in a table below.
CAMEL Subscription I~~S~~nformation	C	This IE is described in a table below.
Supported CAMEL phases in VLR	C	This IE indicates the CAMEL phase supported in the VLR.
Supported CAMEL phases in SGSN	C	This IE indicates the CAMEL phase supported in the SGSN.

C Conditional (The IE shall be sent, if requested and available).

Call Forwarding SS data contains the following information:

Information element name	Required	Description
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-to-CSE Flag	C	This IE indicates whether the gsmSCF is notified of a change of Call Forwarding SS data.

C Conditional (The IE shall be sent, if available).

Call Barring SS data contains the following information:

Information element name	Required	Description
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-to-CSE flag	C	This IE indicates whether the gsmSCF is notified of a change of Call Barring SS data.

C Conditional (The IE shall be sent, if available).

Operator determined barring data contains the following information:

Information element name	Required	Description
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-to-CSE flag	C	This IE indicates whether the gsmSCF is notified of a change of ODB data.

C Conditional (The IE shall be sent, if available).

CAMEL Subscription Information contains the following information:

Information element name	Required	Description
O-CSI	C	See subclause 4.3.1.
D-CSI	C	See subclause 4.3.2.
T-CSI	C	See subclause 4.3.4.
VT-CSI	C	See subclause 4.3.5.
TIF-CSI	C	See subclause 4.3.6.2.
GPRS-CSI	C	See subclause 6.3.1.
SMS-CSI	C	See subclause 7.3.1.
SS-CSI	C	See subclause 8.2.1.~~1.~~
M-CSI	C	See subclause 9.2.1.~~1~~

C Conditional (The IE shall be sent, if requested and 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:

Information element name	Required	Description
Call Forwarding SS data	C	This IE is described in a table below.
Call Barring SS data	C	This IE is described in a table below.
CAMEL Subscription Information	C	This IE is described in a table below.

C Conditional (The IE shall be sent if it was modified).

Call Forwarding SS data contains the following information:

Information element name	Required	Description
SS Code	C	This IE indicates Call Forwarding supplementary service 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-to-CSE Flag	C	This IE indicates whether the gsmSCF is notified of a change of Call Forwarding SS data.

C Conditional (The IE shall be sent, if available).

Call Barring SS data contains the following information:

Information element name	Required	Description
SS Code	C	This IE indicates Call Barring supplementary service 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-to-CSE flag	C	This IE indicates whether the gsmSCF is notified of a change of Call Barring SS data.

C Conditional (The IE shall be sent, if available).

CAMEL Subscription Information contains the following information:

Information element name	Required	Description

O-CSI	C	See subclause 4.3.1.
D-CSI	C	See subclause 4.3.2.
T-CSI	C	See subclause 4.3.4.
VT-CSI	C	See subclause 4.3.5.
TIF-CSI	C	See subclause 4.3.6.2.
GPRS-CSI	C	See subclause 6.3.1.
SMS-CSI	C	See subclause 7.3.1.
SS-CSI	C	See subclause 8.2.1.~~1.~~
M-CSI	C	See subclause 9.2.1.~~1~~

C Conditional (The IE shall be sent, if it was modified).

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:

Information element name	Required	Description
IMSI	M	The IMSI is used to identify the subscriber.
MSISDN	M	The MSISDN is used to identify the subscriber.
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 - Operator Determined Barring - CAMEL Su~~s~~bscription Information

M Mandatory (The IE shall always be sent).

3GPP N2 Meeting
Rotenburg, Germany, 22-26 May 2000

***Document* N2-000243**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.078	CR	175r1	Current Version:	3.4.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	CN#8	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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 [X]
(at least one should be marked with an X)

Source: N2 **Date:** 26 May 2000

Subject: Editorial corrections in the clause 11

Work item: CAMEL Phase 3

Category: *(only one category shall be marked with an X)*

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	X

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: Various editorial corrections.

Clauses affected: 11

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

11 Subscriber Location and State retrieval

Support of the procedures described in this clause~~chapter~~ in CAMEL Phase 3 is a network operator option.

11.1 Architecture

11.1.1 Functional Entities used for CAMEL

This subclause describes Any Time Interrogation and CAMEL support of Location Services. Location Services is only supported in CAMEL Phase 3.

Figure 11.1 indicates the functional entities involved in Any Time Interrogation and Location Services.

This chapter defines two procedures for Location Services:

(1) The interfaces between gsmSCF and GMLC for Location Services via the GMLC.

(2) The interface between gsmSCF and HLR for Any Time Interrogation and Active Location Retrieval.

The operation of Location Services is described in 3G TS 22.071 [17].

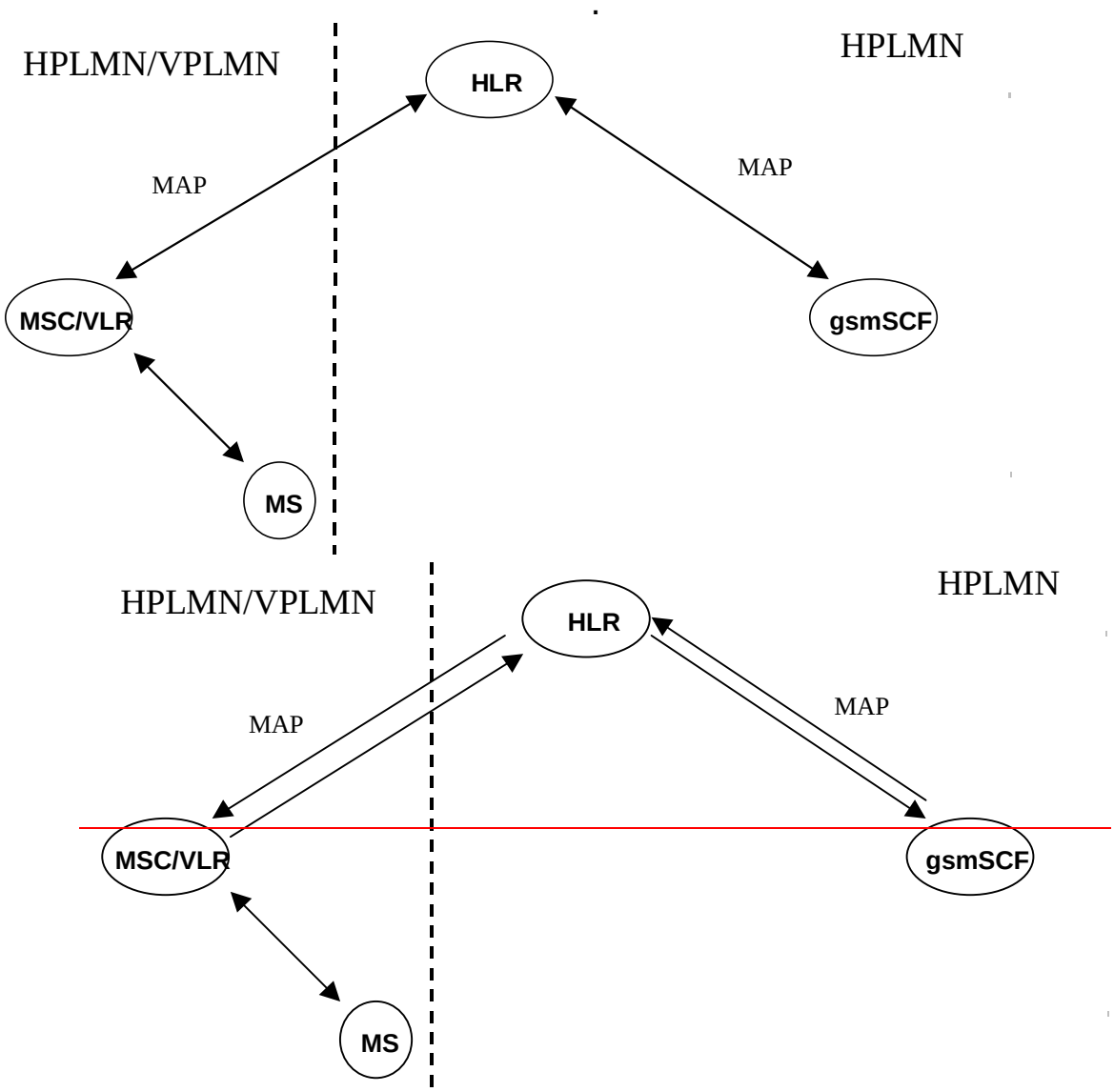

Figure 11.1 a: Functional architecture for Any Time Interrogation

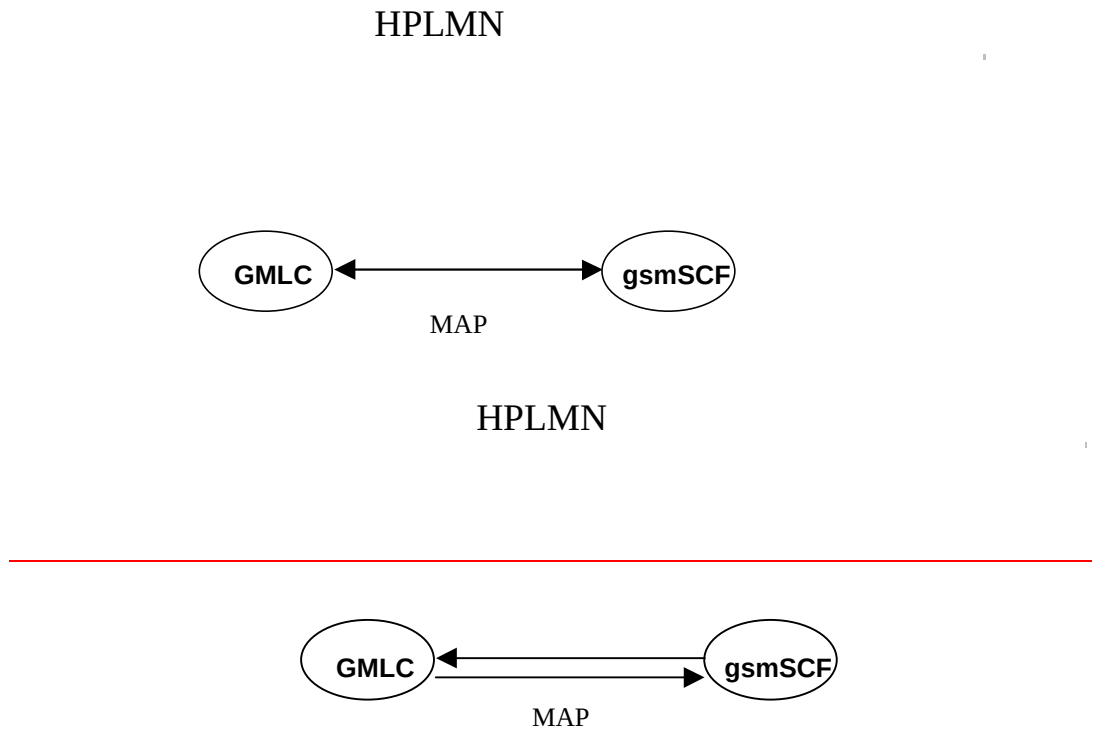

Figure 11.1 b: Functional architecture for CAMEL Support of Location Services

gsmSCF: see subclause 3.14.1.

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**.**

HLR: see subclause 4.1.

MSC/VLR: see subclause 4.1.

The information flows between the GMLC and functional entities other than the gsmSCF, have not been indicated in the functional architecture shown in figures 11.1. These information flows are outside the scope of this specification.

11.1.2 Interfaces defined for CAMEL

This subclause describes the 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 as requested by the gsmSCF via the Any Time Interrogation procedure.

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.

11.1.2.4 HLR - gsmSCF

This interface is used by the HLR to return the requested information (Mobile Station location and/or Mobile Station state) to the gsmSCF as requested by the gsmSCF via the Any Time Interrogation procedure.

11.2 Procedures for CAMEL

11.2.1 Location Services

Handling of Any Time Interrogation to obtain Location Information 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.

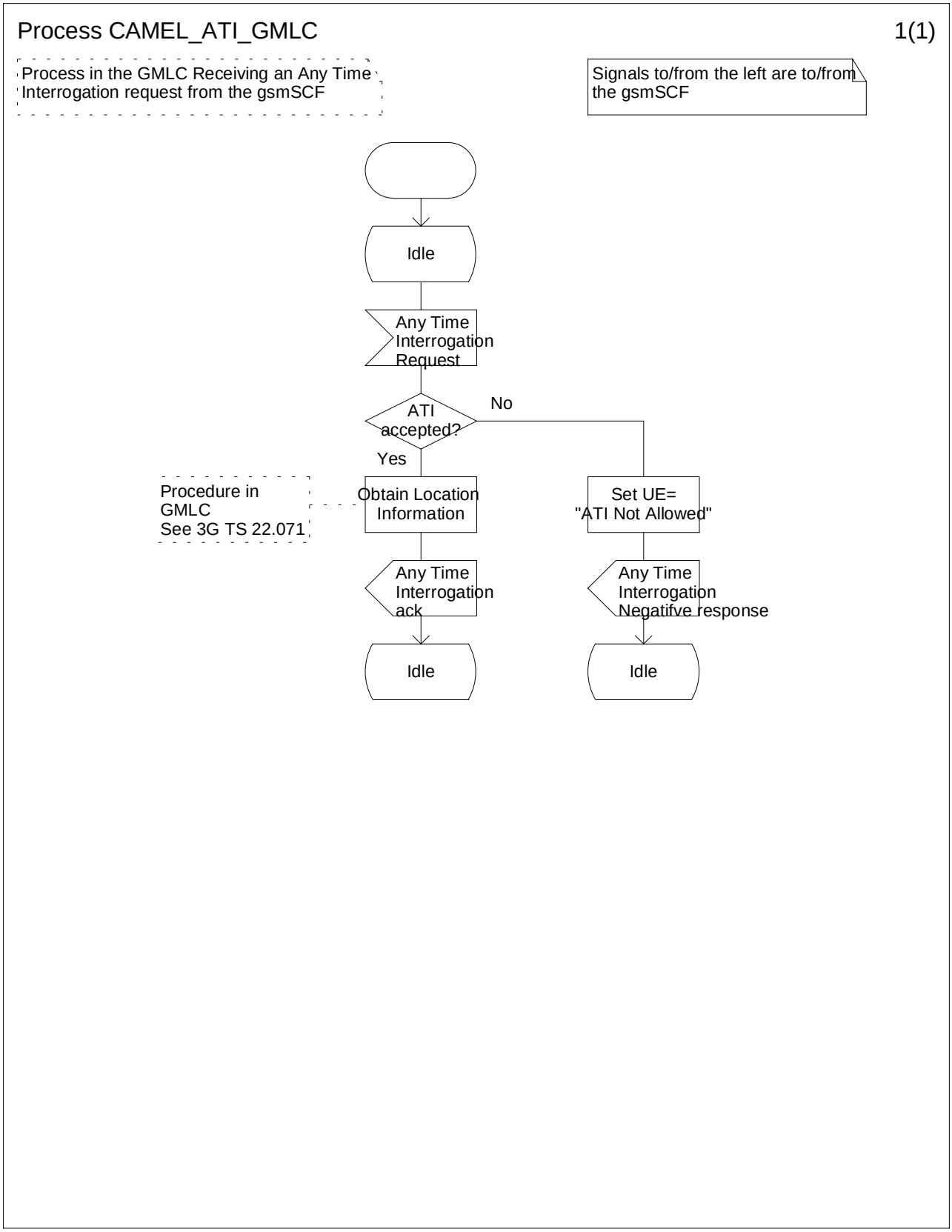

Figure 11.2: Process CAMEL_ATI_GMLC

11.2.2 Any Time Interrogation

Handling of Any Time Interrogation to obtain 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 an Any_Time_Interrogation Request. ~~Support for this procedure is a network operator option.~~

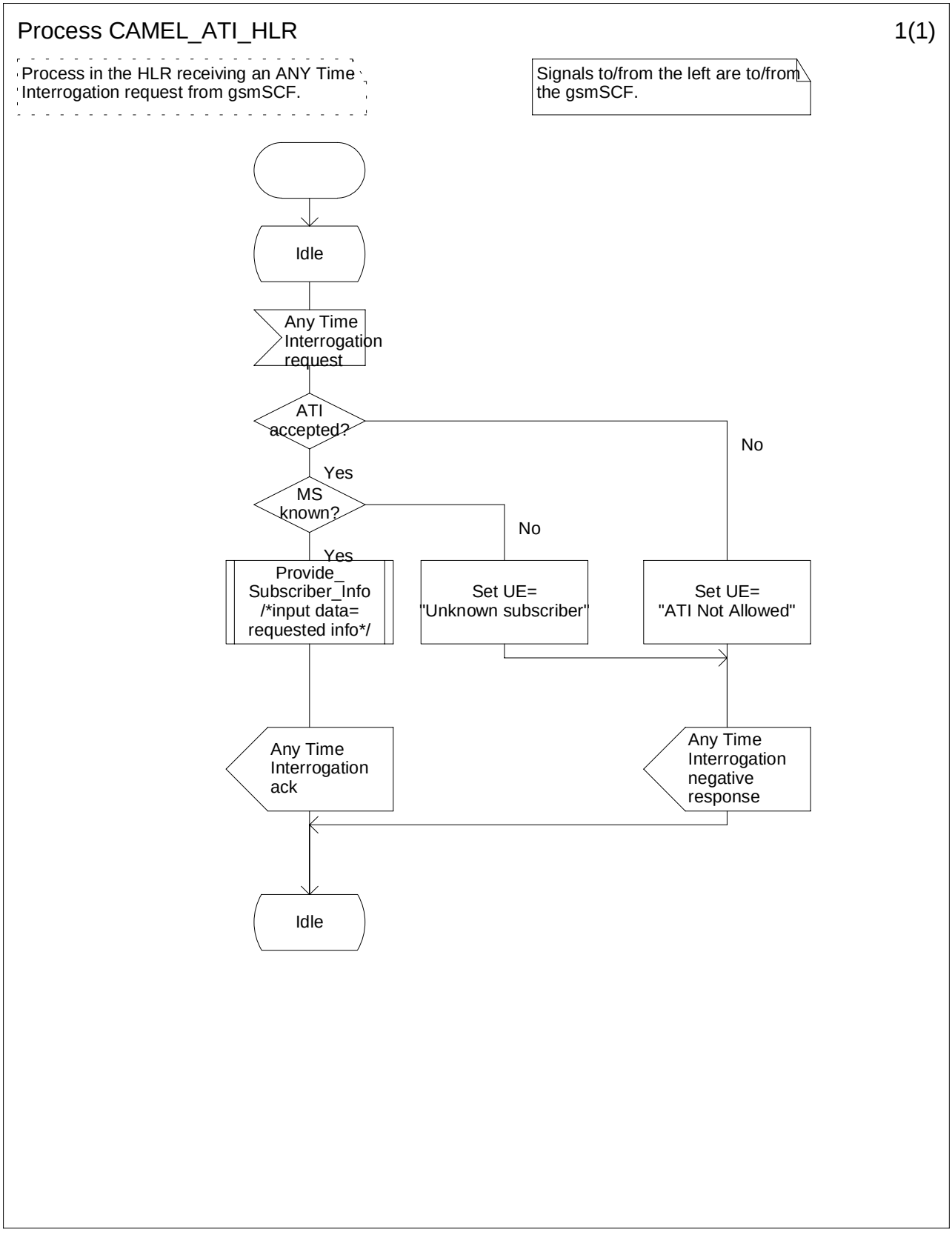

Figure 11.3: Process CAMEL_ATI_HLR

11.3 Description of information flows

This subclause 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 an IE which it receives.

Details of errors and exceptions to these rules 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.

11.3.2.1.2 Information Elements

The following information element~~s~~ is~~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
Geographical Information	C	See 3G TS 23.032 [34~~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].
MSC number	C	See 3G TS 23.032 [34]. ~~-~~The GMLC receives the MSC number from the HLR in the SendRoutingInfoForLCS MAP message.

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:

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 subscriber information being requested: - Location Information - Subscriber State - C~~e~~urrent Location Current Location shall not be present if Location Information is not present in Requested Info
Subscriber Identity	M	This IE identifies the subscriber for which the information is requested. The identity can be one of: - IMSI - MSISDN

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:

Information element name	Required	Description
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: - CAMELBusy: The VLR has indicated that the MS is engaged in 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.

C Conditional (The IE shall be sent, if requested and available).

Location Information contains the following information:

Information element name	Required	Description
Location Number	C	See 3G TS 23.018 [3].
CellGlobalIDOrServiceAreaIdOrLAI	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]
Current Location Retrieved	C	See 3G TS 23.018 [3]

C Conditional (The IE shall be sent, if available).