

**3GPP TSG\_CN#7**  
**ETSI SMG3 Plenary Meeting #7,**  
**Madrid, Spain**  
**13<sup>th</sup> – 15<sup>th</sup> March 2000**

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**NP-000188**

**Agenda item:** 5.2.3  
**Source:** TSG\_N WG 2  
**Title:** CRs for TCAP dialogue management for CAMEL control of GPRS

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**Introduction:**

This document contains “2” CRs on **Work Item CAMEL phase 3**, for TCAP dialogue management for CAMEL control of GPRS, that have been agreed by **TSG\_N WG 2**, and are forwarded to **TSG\_N Plenary** meeting #7 for approval.

<b>Tdoc</b>	<b>Spec</b>	<b>CR</b>	<b>Rev</b>	<b>Cat</b>	<b>Rel</b>	<b>Old ver</b>	<b>New ver</b>	<b>Subject</b>
N2A000277	23.078	056	3	F	R99	3.3.0	3.4.0	GPRS TCAP dialogues
N2A000278	29.078	018	3	R99	F	3.2.0	3.3.0	GPRS TCAP dialogues



# Introduction

The GPRS attach and PDB contexts can take for hours, even for days. For each TCAP dialogue the SGSN and SCP must maintain resources in order to link Transaction Id to correct software instance. Depending on the implementation of TCAP there may be also some other semi-permanent resources allocated for each ongoing TCAP dialogue.

The routing area update and change in QoS are not expected to occur in such great frequency that they would justify maintenance of long idle TCAP dialogues. In addition, long periods of silence in a TCAP connection add need to use ActivityTest and thus the savings in the signalling are somewhat reduced.

The proposal below is a similar approach to MAP in which dialogues are opened and closed in an efficient manner.

## Proposal

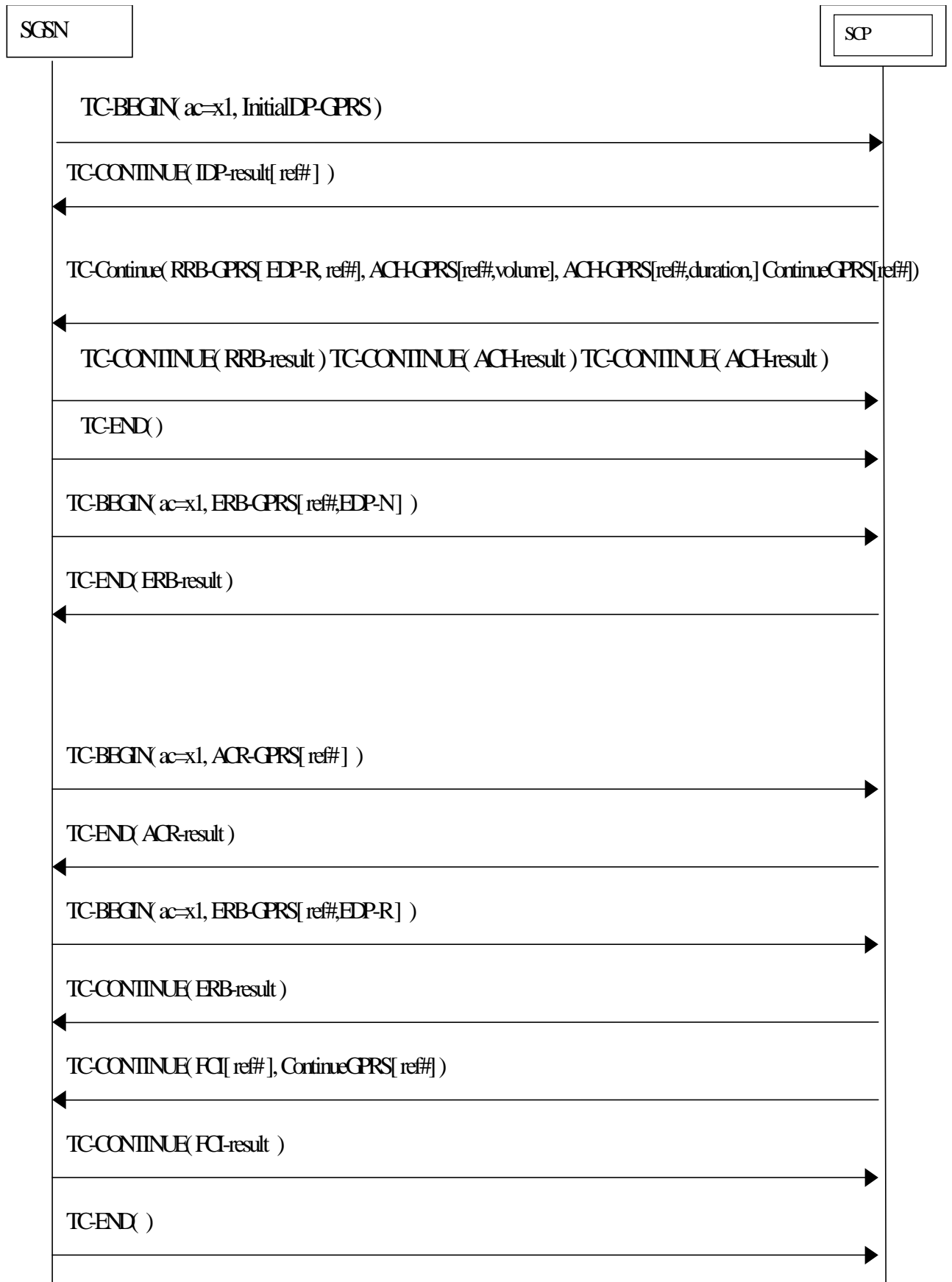
In order to restrict long idle of TC dialogues Nokia proposes that

1. In general, the CAMEL Stage 2 (23.078) parameters are not modified except in the application level must be a "gprsReference" in all operations. The gprsReference would be allocated by the SGSN and sent in InitialDP-GPRS operation for the first time. The gprsReference would include an integer and the SGSN address.
2. The CAMEL Stage 3 (29.078) is defined so that both GPRS mobility management (MM) and PDP context open and close TC-dialogue between the idle periods.
3. When an entity has no result nor error to send, it would send an empty TC-END.
4. Due to possible load sharing between SCPs the SGSN must memorise the SCP address in the InitialDP-GPRS-result. This address must be used in all other subsequent TCAP dialogues of that particular SSF instance.
5. In the SCP to SGSN direction multiple operations maybe packed to into a single TC-message or multiple TC-messages when the gprsSSF is in a DP. When there is multiple operations to sent then to maintain the correct sequence of operations the SCCP class 1 shall be used. If one of the following operations need to be sent, they are sent as the last operation: ContinueGPRS, CancelGPRS or ConnectGPRS.
6. The usage of TCAP would affect to Stage 3 section "12.1 Services assumed from TCAP" and possibly in each GPRS operation procedure section in Stage 3.
7. The ordering of reports and EventReportBCSM-GPRS would be similar as in call related cases, i.e. depends whether the DP is an EDP-R or EDP-N.
8. If there are no reports or EDPs armed then the service logic would make a final end and make a termination
9. Prearranged end would be used in a similar manner as in call related cases, not to terminate *dialogue*, but to terminate the *relationship*. In addition CAP operation ContinueGPRS and ConnectGPRS could mean pre-arranged end (of the *relationship*) in the end of DP. Concepts dialogue and relationship are explained in the section 12.1.x. of 29.078 CR.
10. At each moment of time there shall be only one TC dialogue open for each relation. In the case of a clitch problem the SCP opened dialogue should be closed and the SGSN opened dialogue is maintained. After the handling of the SGSN/gprsSSF operations, the SCP may have to resent the CAP operations, e.g. CancelGPRS or ReleaseGPRS. In some cases the resending is not needed / possible, e.g. when a Detach DP is reported as an EDP-N. The clitch problem in the case of ActivityTestGPRS needs to be discussed and resolved.
11. When the gprsSSF is in state WaitingForInstructions the dialogue is maintained. Once the gsmSSF received the last ContinueGPRS, ConnectGPRS or CancelGPRS, it shall send TC-END with zero components. For each ApplychargingReportGPRS and EDP-N a separate TC-dialogue is used.

The operations in each application context; (\* = may open a dialogue)

<b>SGSN -&gt; SCP</b>	<b>SCP -&gt; SGSN</b>
ApplyChargingReportGPRS *	ActivityTestGPRS *
EntityReleasedGPRS *	ApplyChargingGPRS *
EventReportGPRS *	CancelGPRS *
InitialEventGPRS *	ConnectGPRS
	ContinueGPRS
	FurnishChargingInformationGPRS *
	ReleaseGPRS *
	RequestReportGPRSEvent *
	ResetTimerGPRS
	SendChargingInformationGPRS *

# An example



## 6.5.6 GPRS SSF

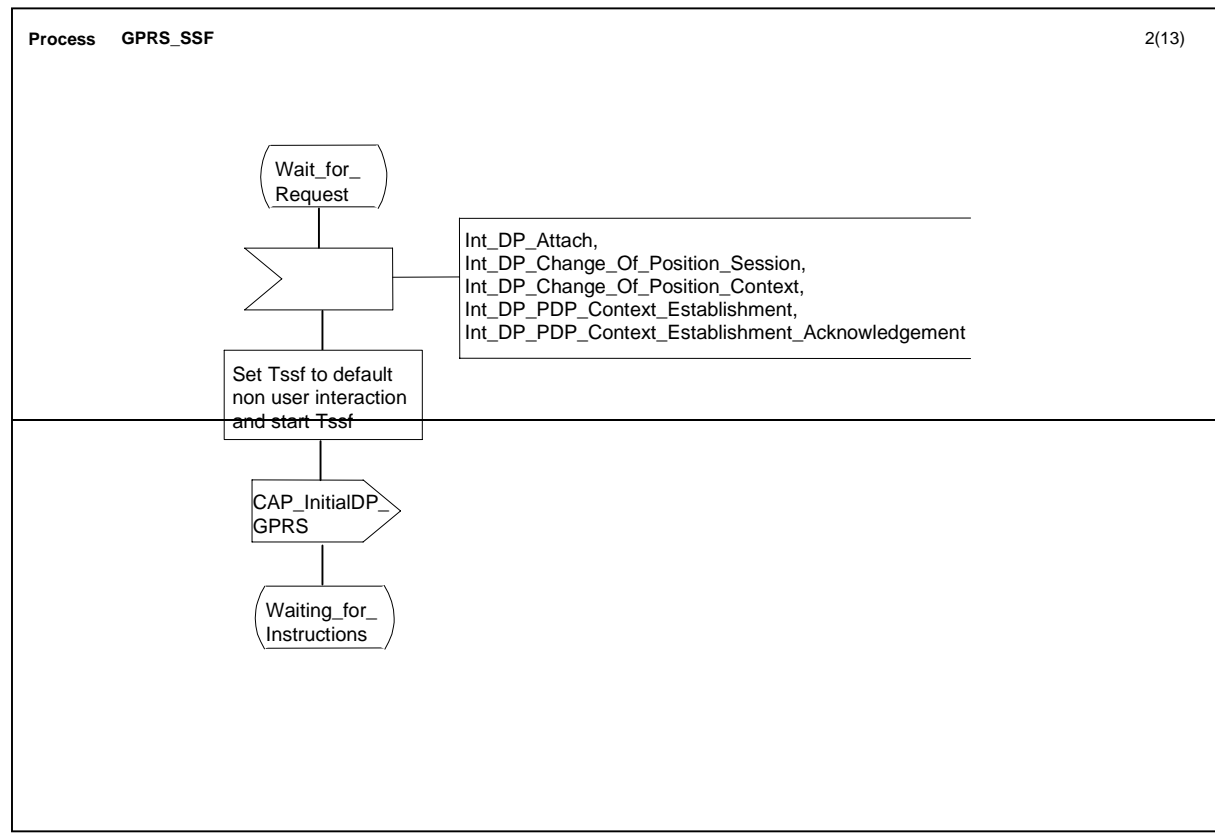


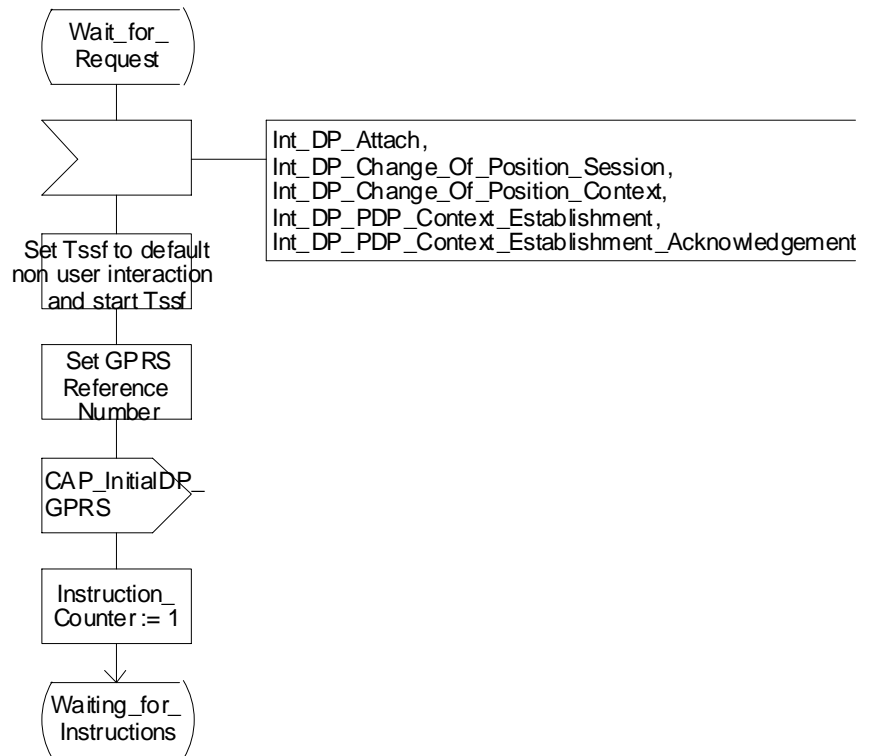
Figure 6.15 a: Process GPRS\_SSF (sheet 2)

## Process GPRS\_SSF

2(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/



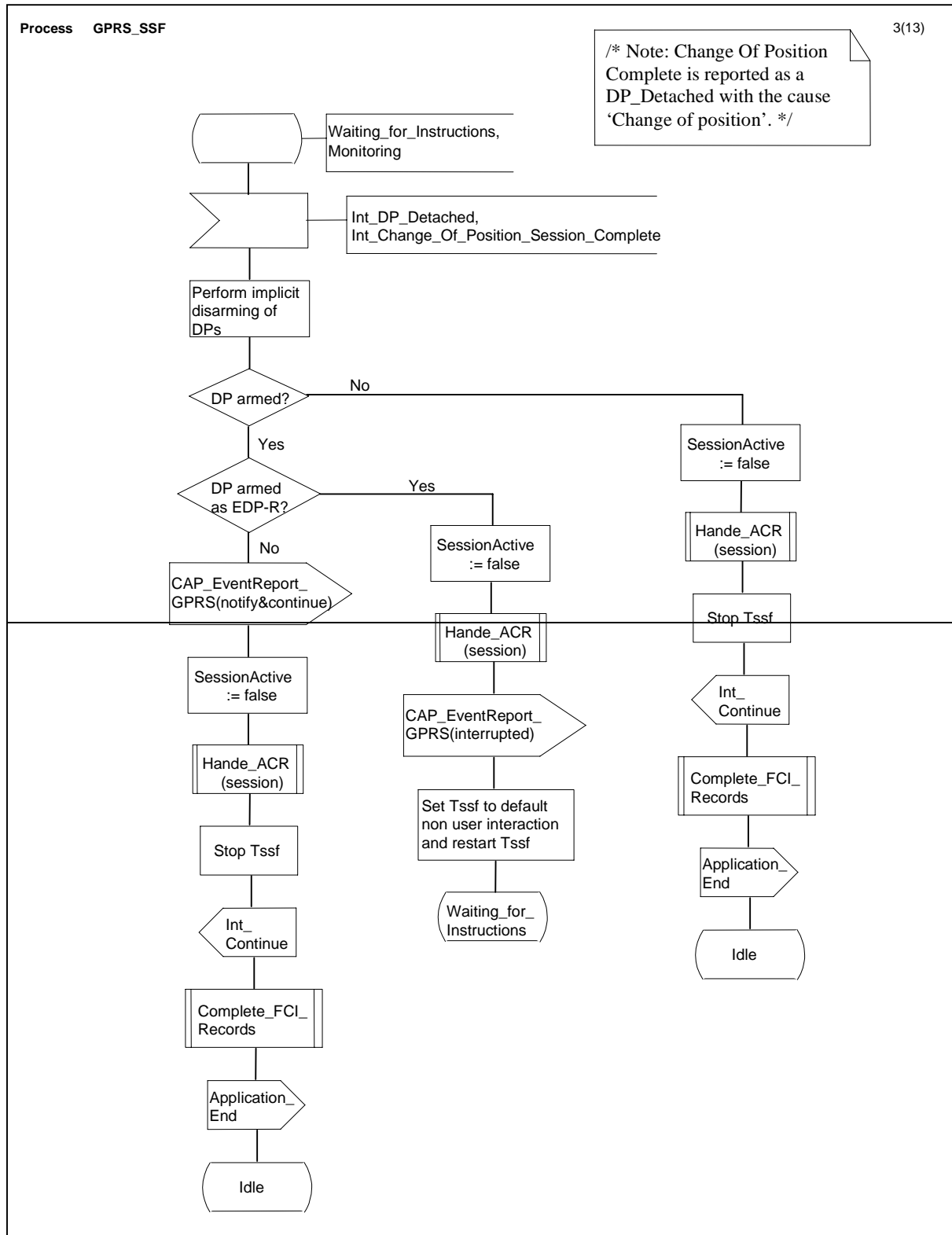


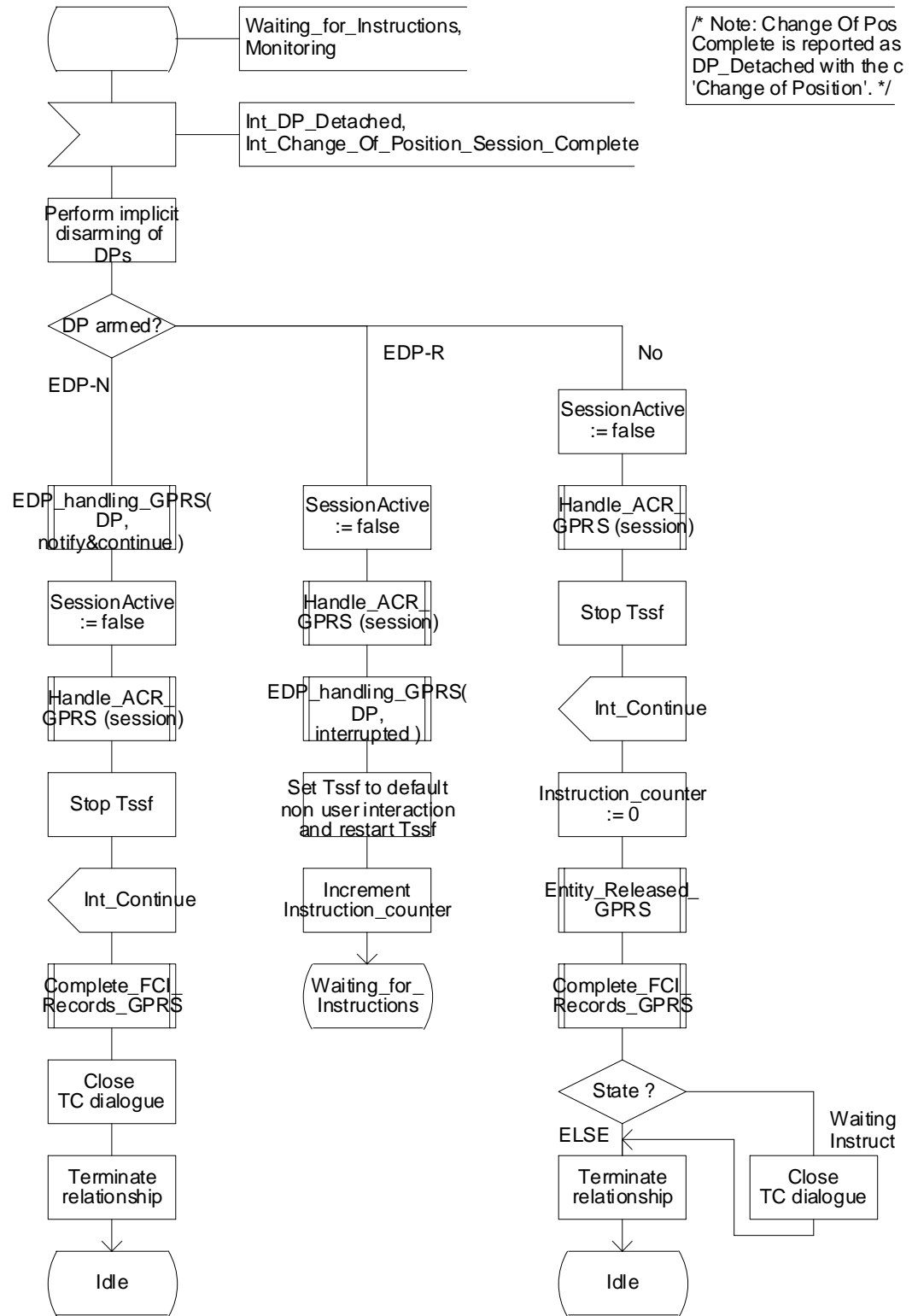
Figure 6.15 b: Process GPRS\_SSF (sheet 3)



Process GPRS\_SSF

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/



Process GPRS\_SSF

4(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/

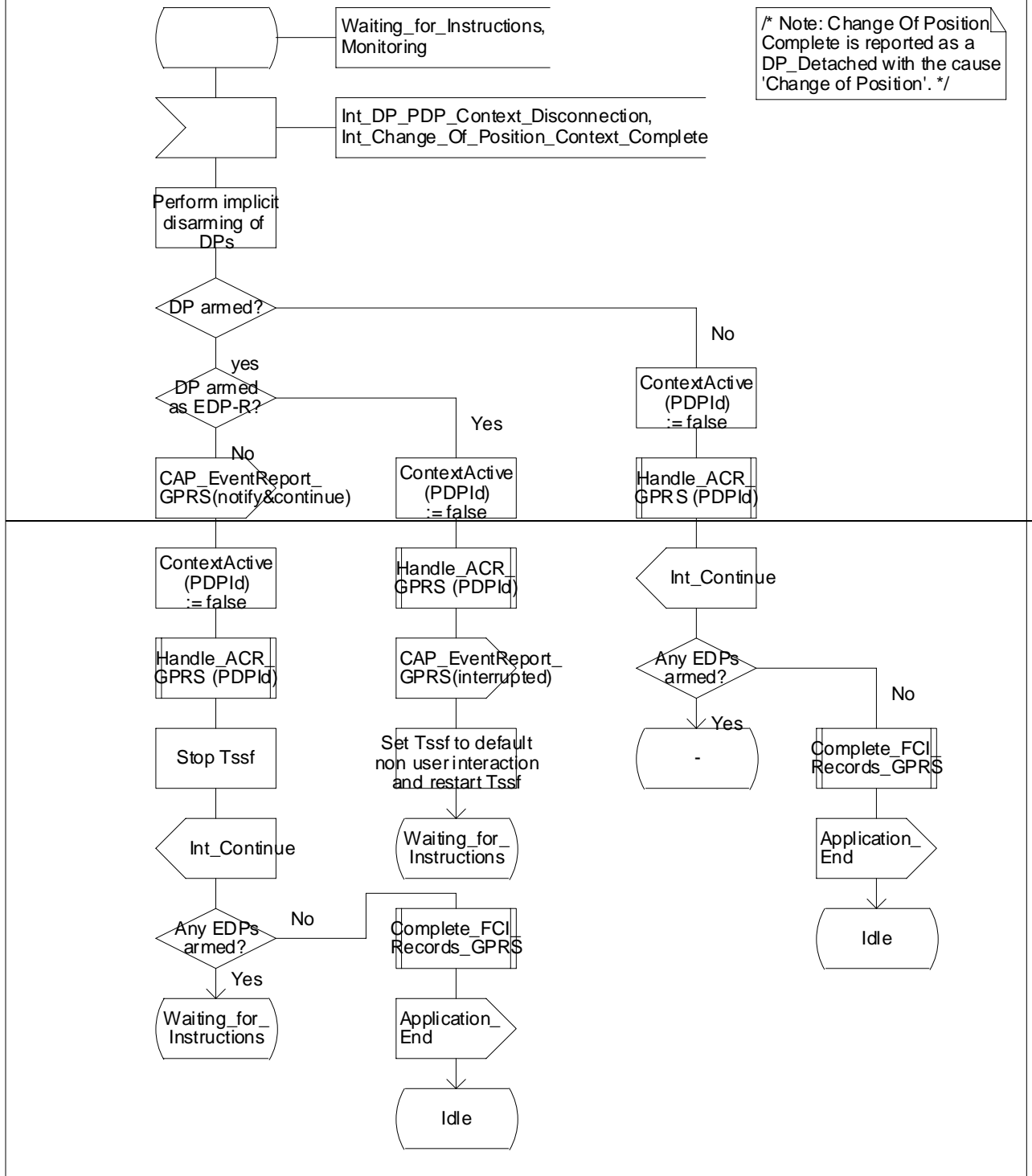


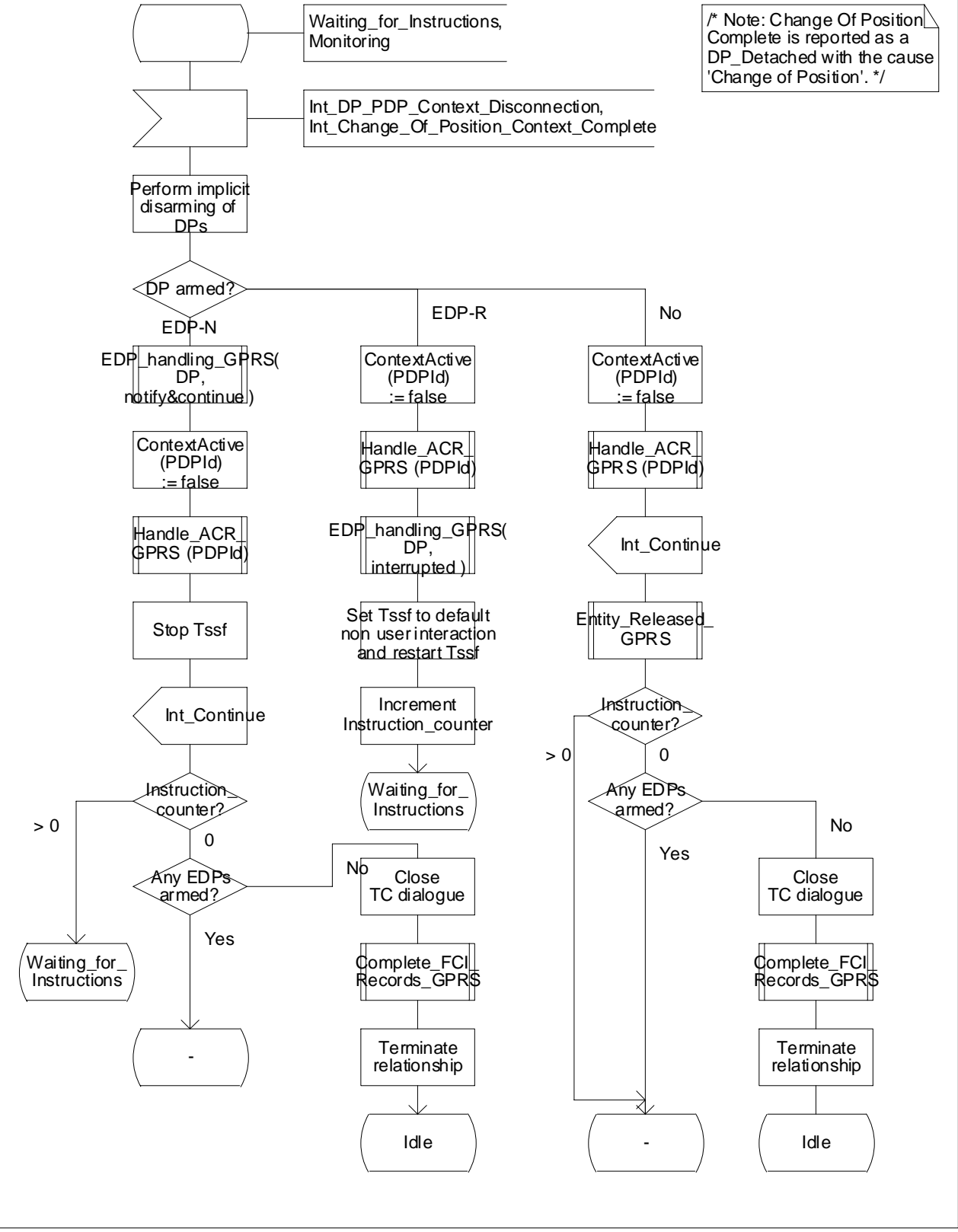
Figure 6.15d: Process GPRS\_SSF (sheet 4)

Process GPRS\_SSF

4(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/



Process GPRS\_SSF

5(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/

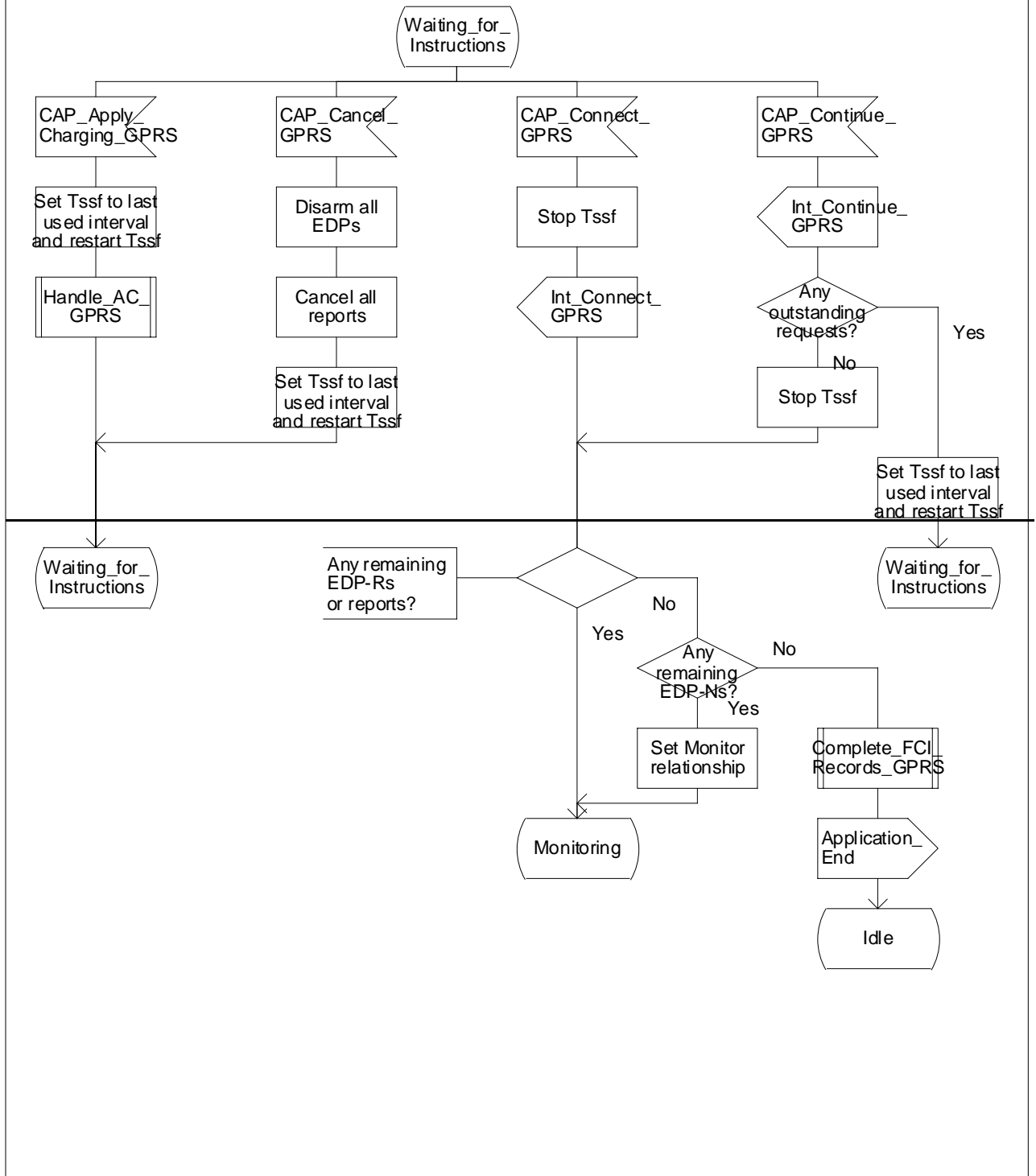


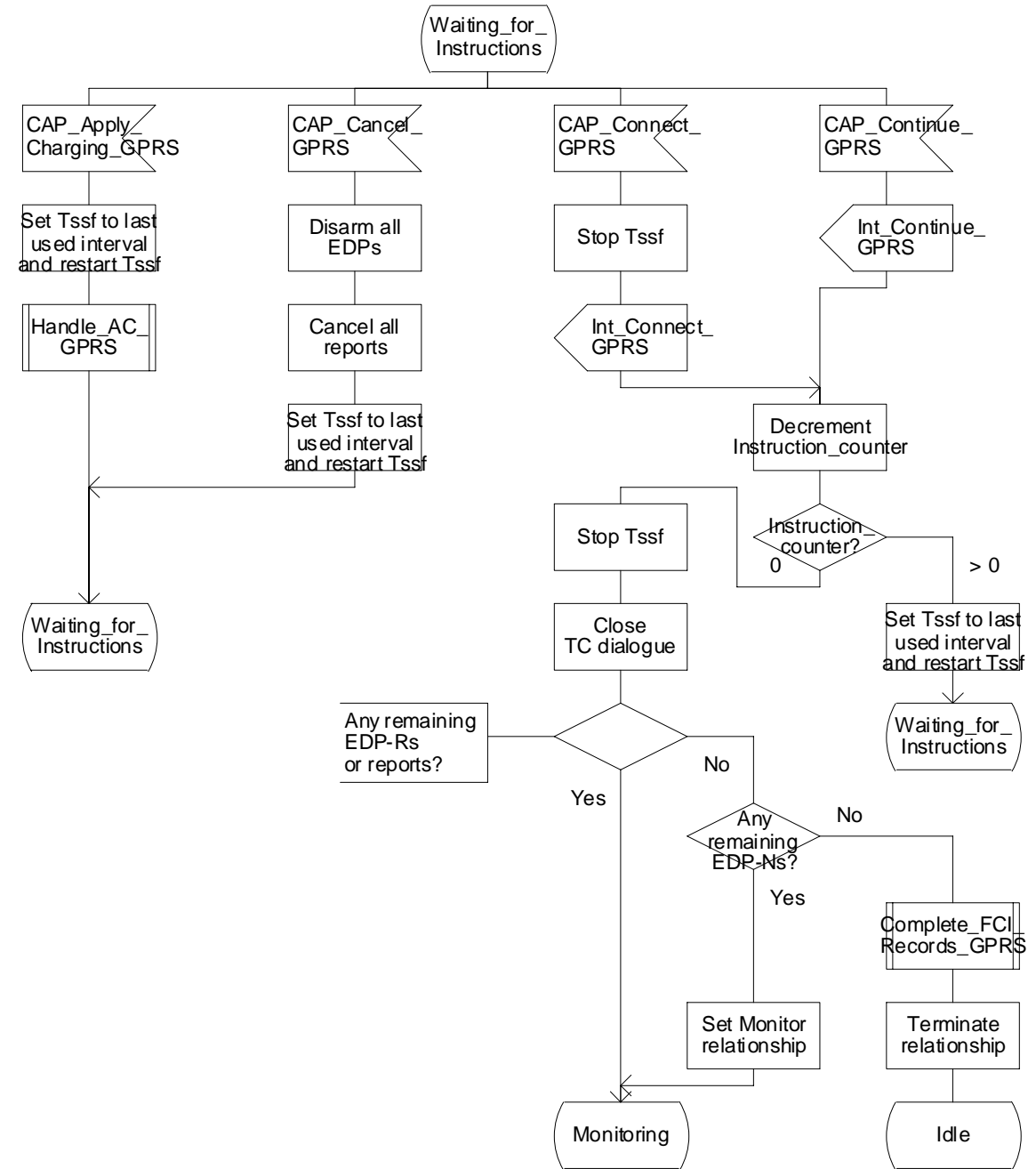
Figure 6.15e: Process GPRS\_SSF (sheet 5)

Process GPRS\_SSF

5(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/



Process GPRS\_SSF

6(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/

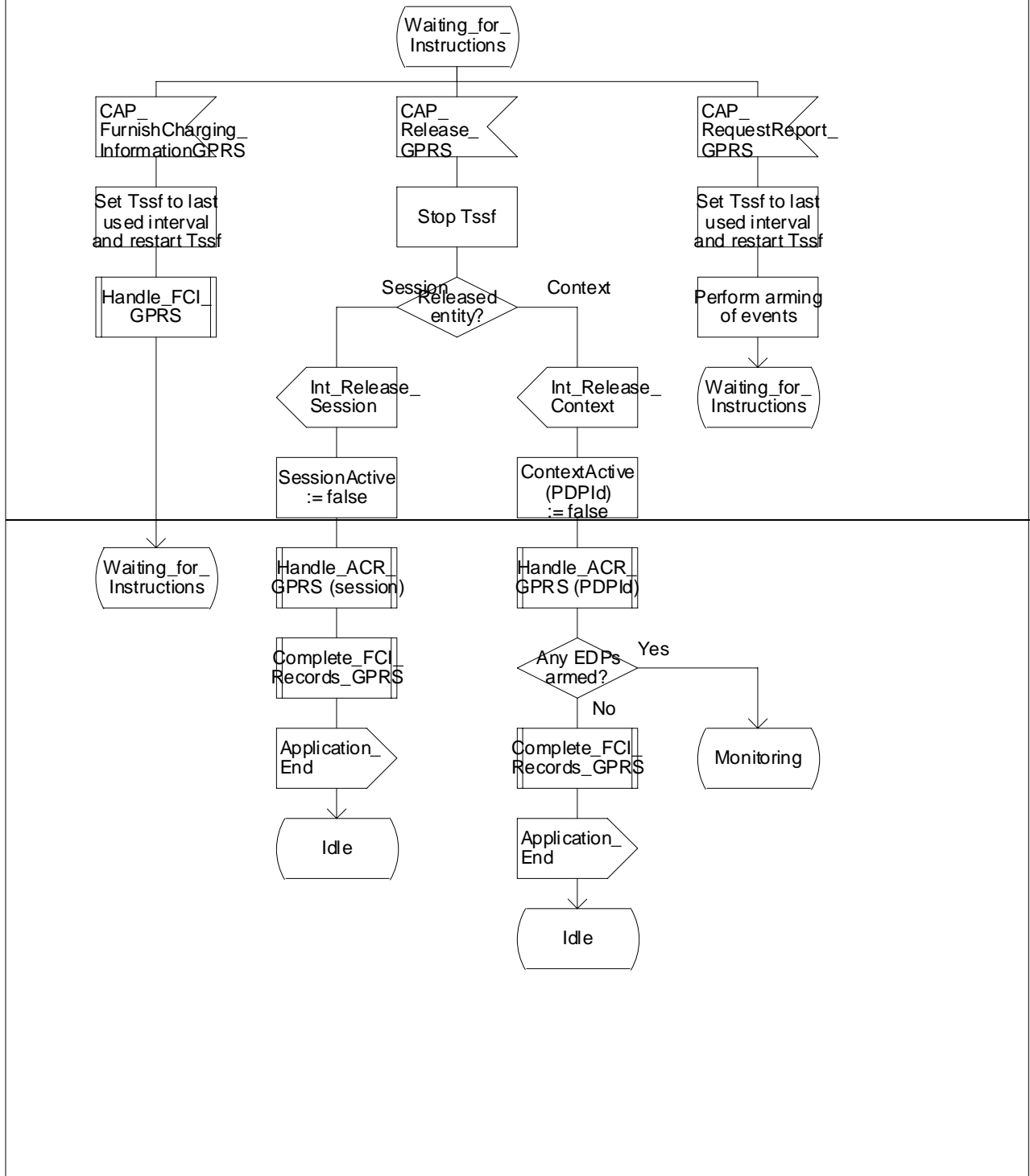


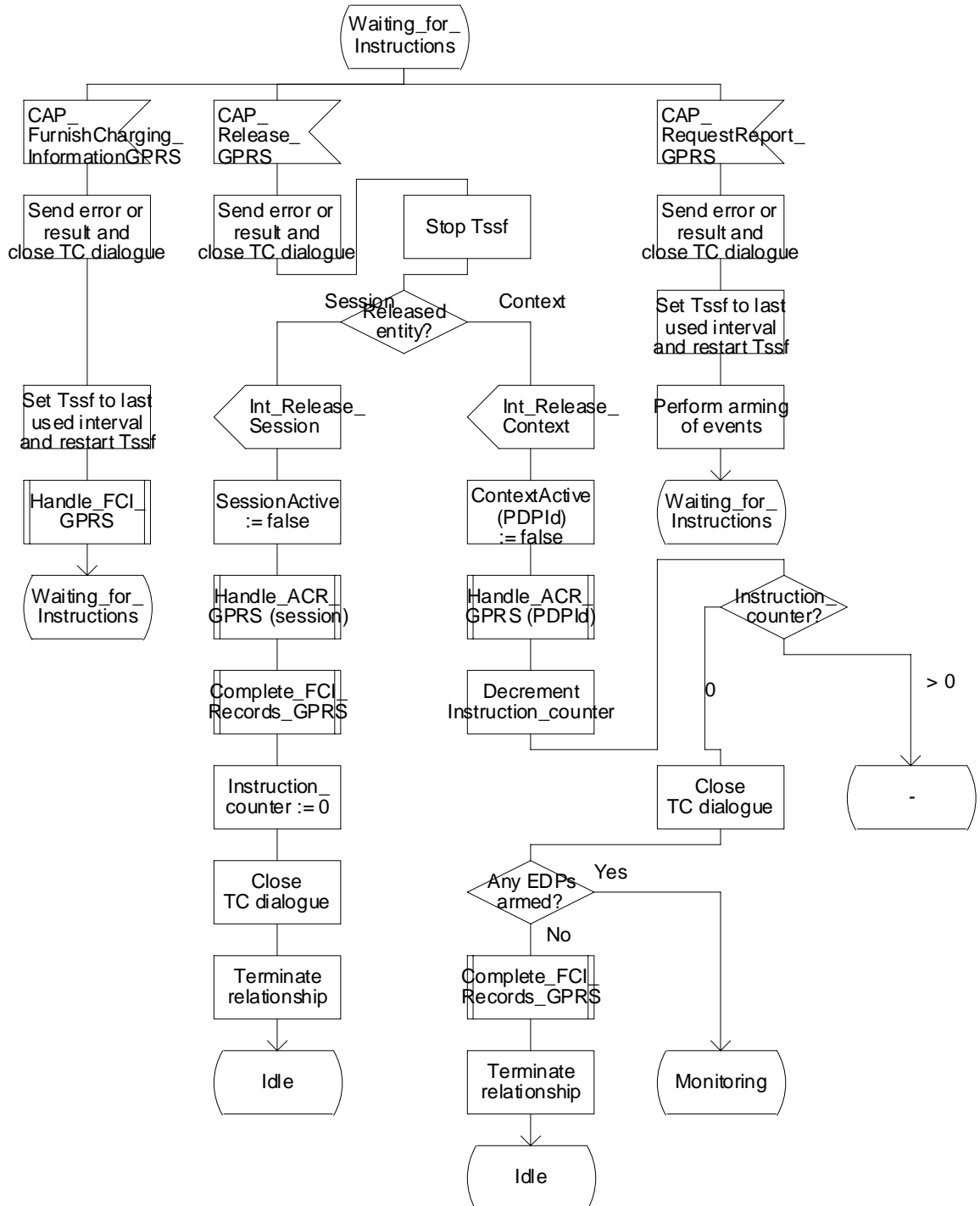
Figure 6.15f: Process GPRS\_SSF (sheet 6)

Process GPRS\_SSF

6(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/



Process GPRS\_SSF

8(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/

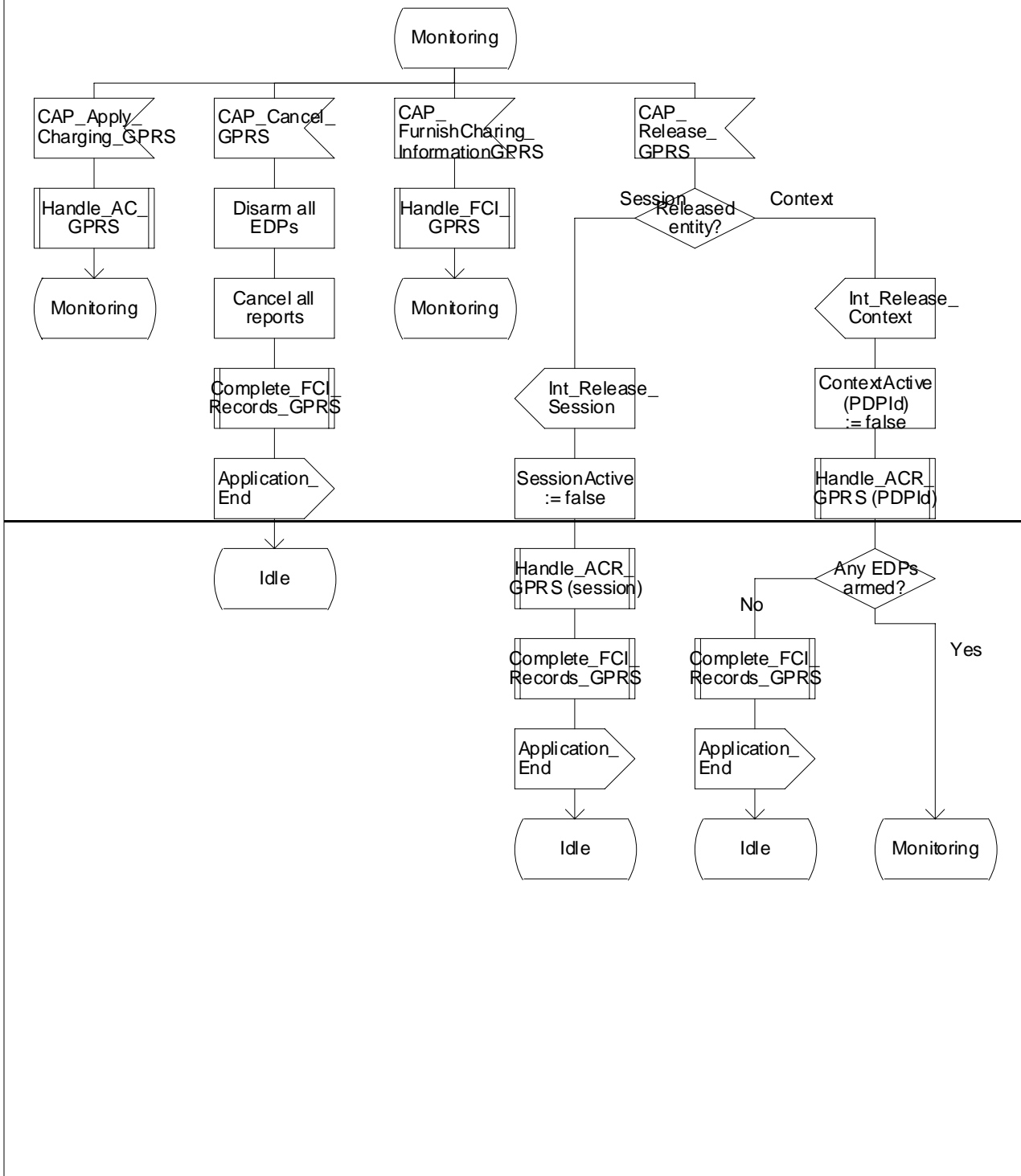


Figure 6.15h: Process GPRS\_SSF (sheet 8)

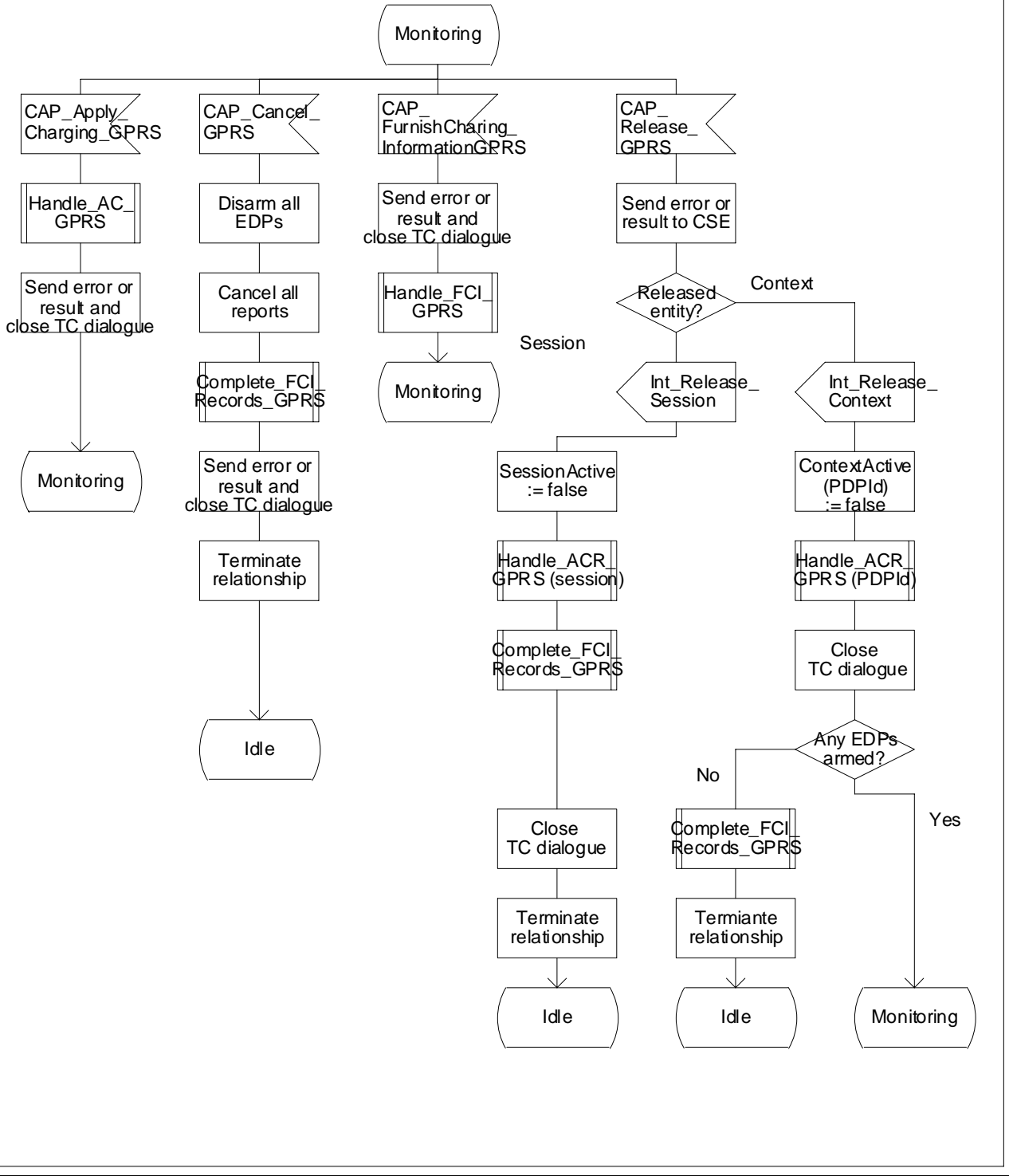


Process GPRS\_SSF

8(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/



## Process GPRS\_SSF

9(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/

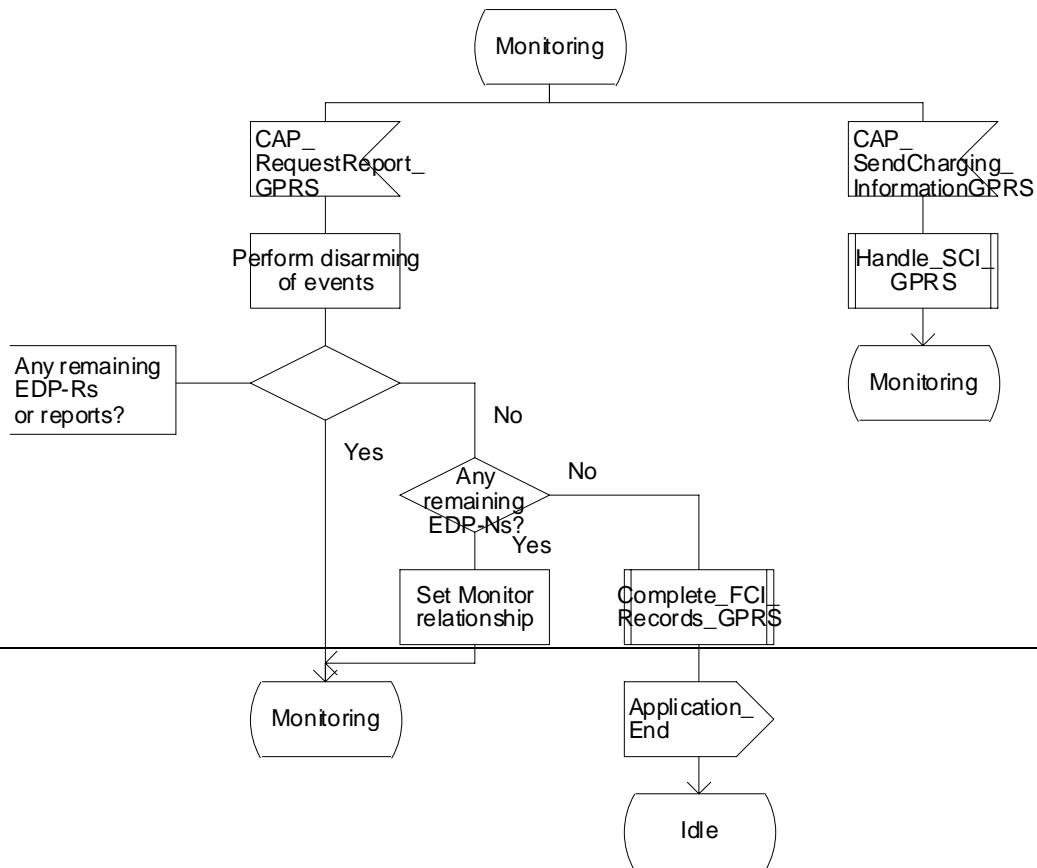


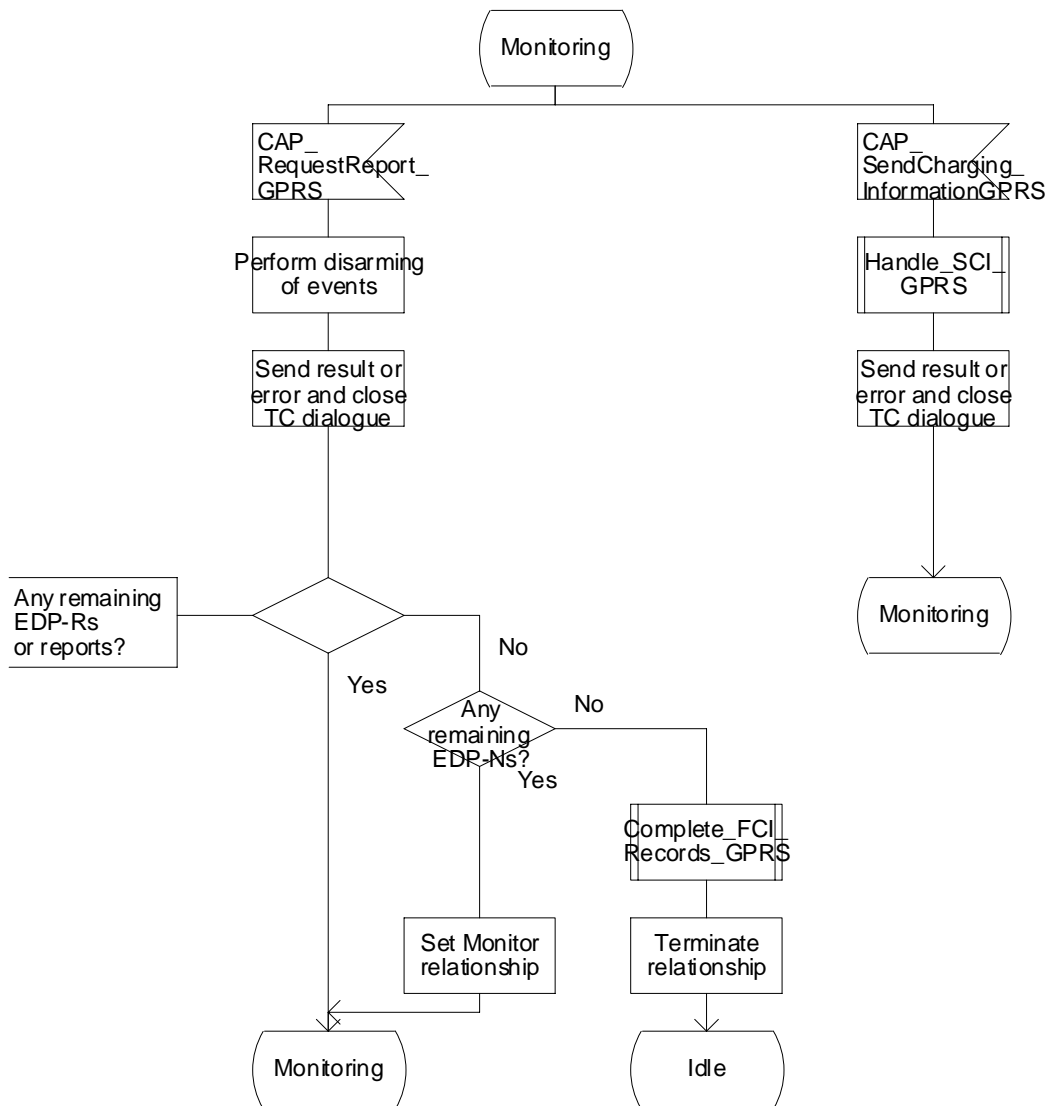
Figure 6.15i: Process GPRS\_SSF (sheet 9)

### Process GPRS\_SSF

9(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/



Process GPRS\_SSF

10(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/

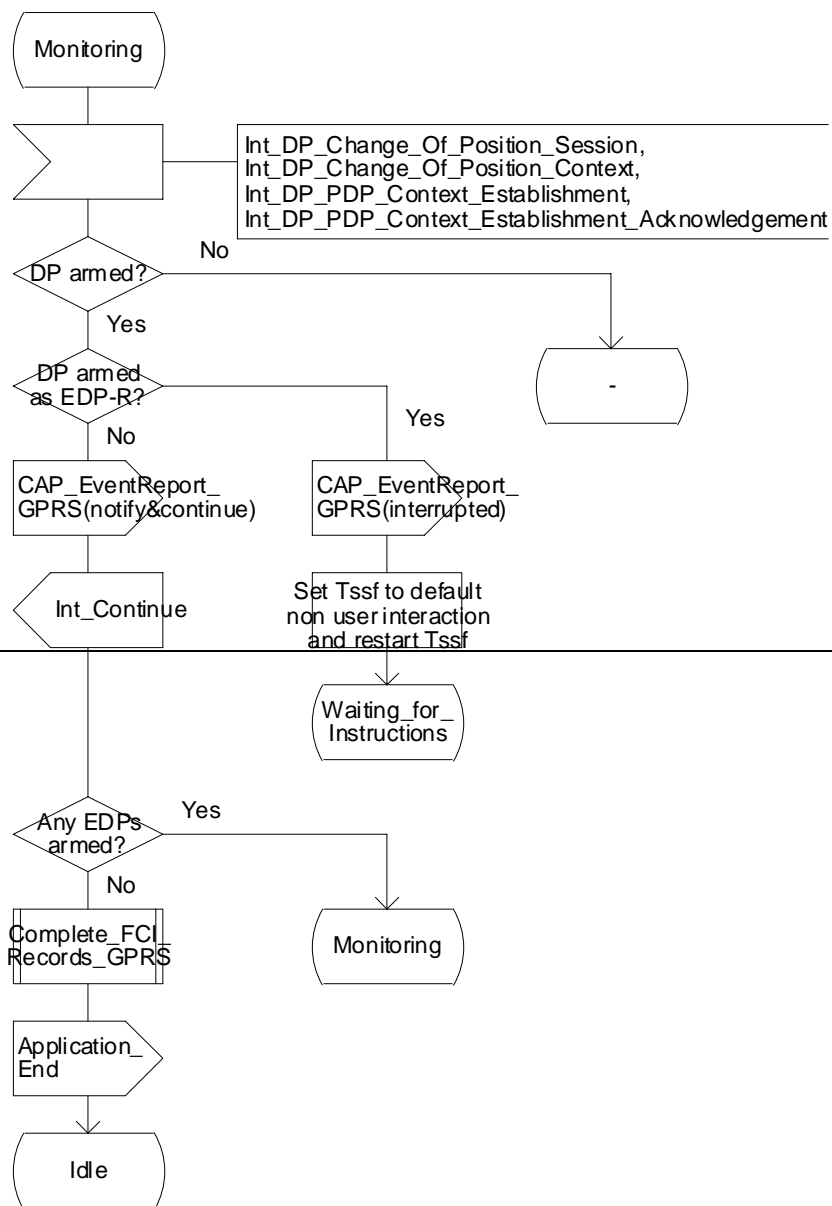


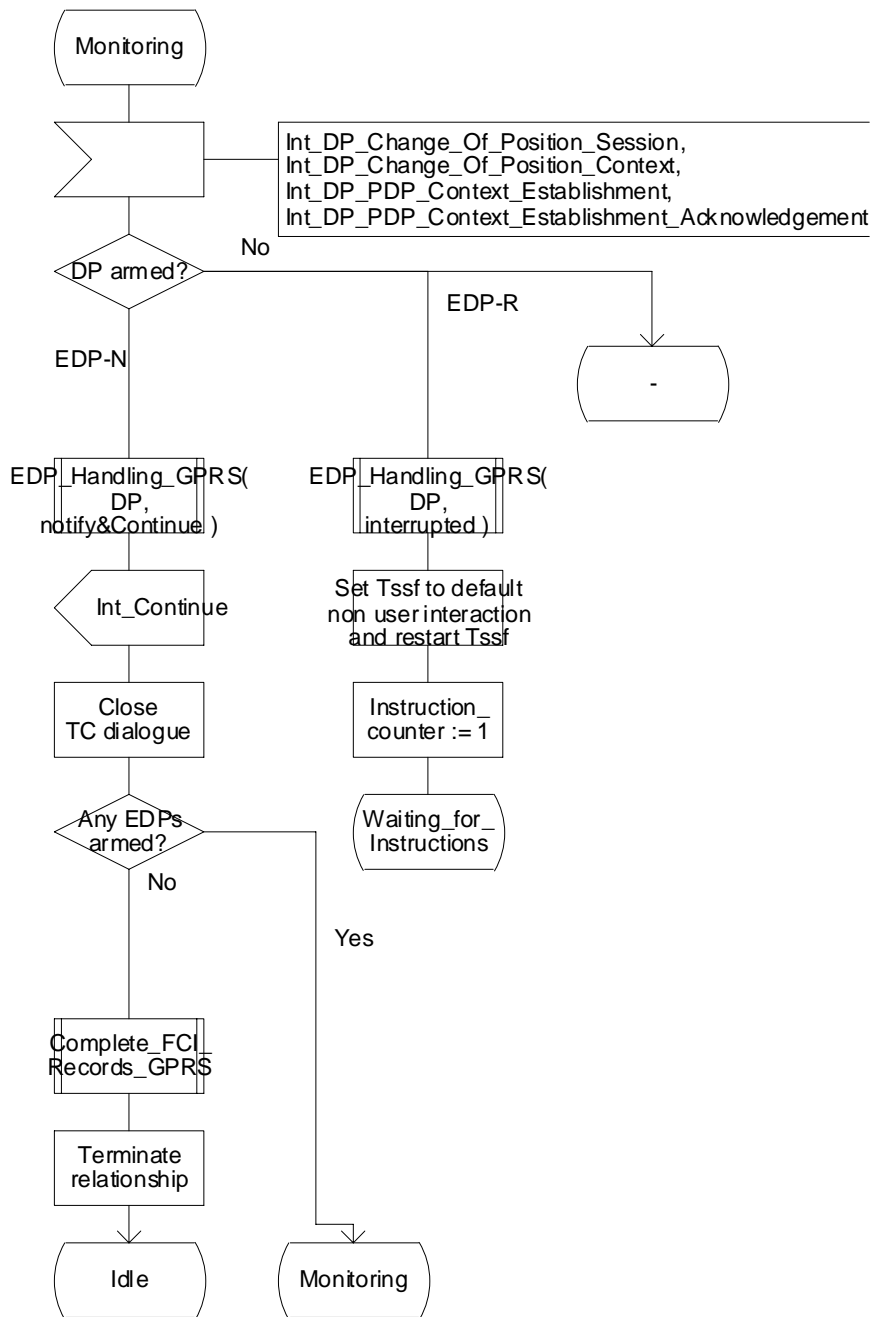
Figure 6.15j: Process GPRS\_SSF (sheet 10)

Process GPRS\_SSF

10(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/



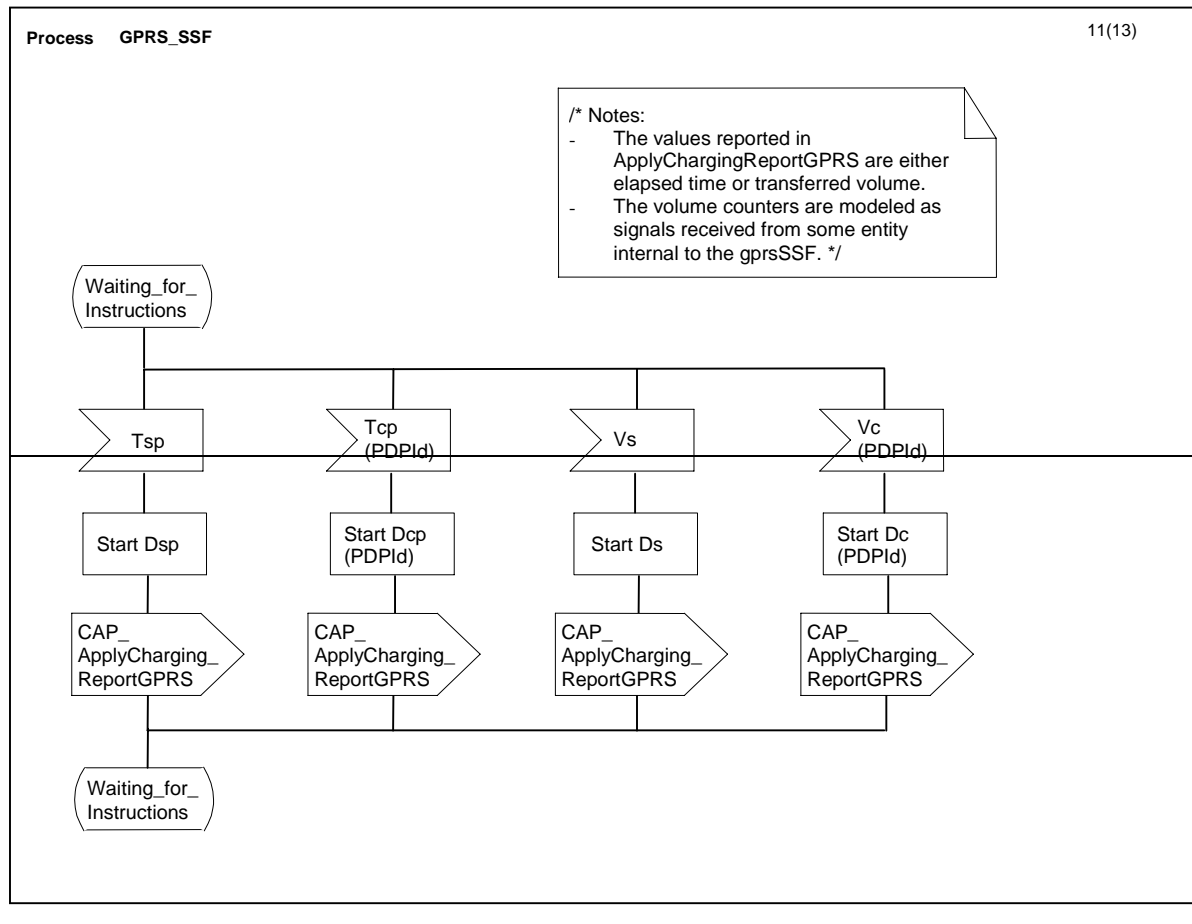


Figure 6.15k: Process GPRS\_SSF (sheet 11)

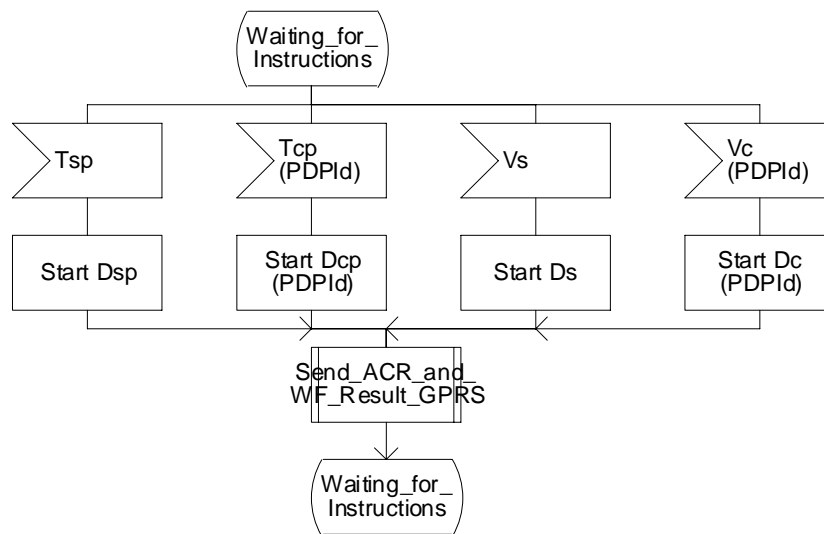
## Process GPRS\_SSF

11(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/

/\* Notes:  
 - The values reported in ApplyChargingReportGPRS are either elapsed timer or transferred volume.  
 - The volume counters are modeled as signals received from some entity internal to the gprsSSF  
 \*/



Process GPRS\_SSF

12(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/

/\* Notes:  
 - The values reported in ApplyChargingReportGPRS are either elapsed timer or transferred volume.  
 - The volume counters are modeled as signals received from some entity internal to the gprsSSF  
 \*/

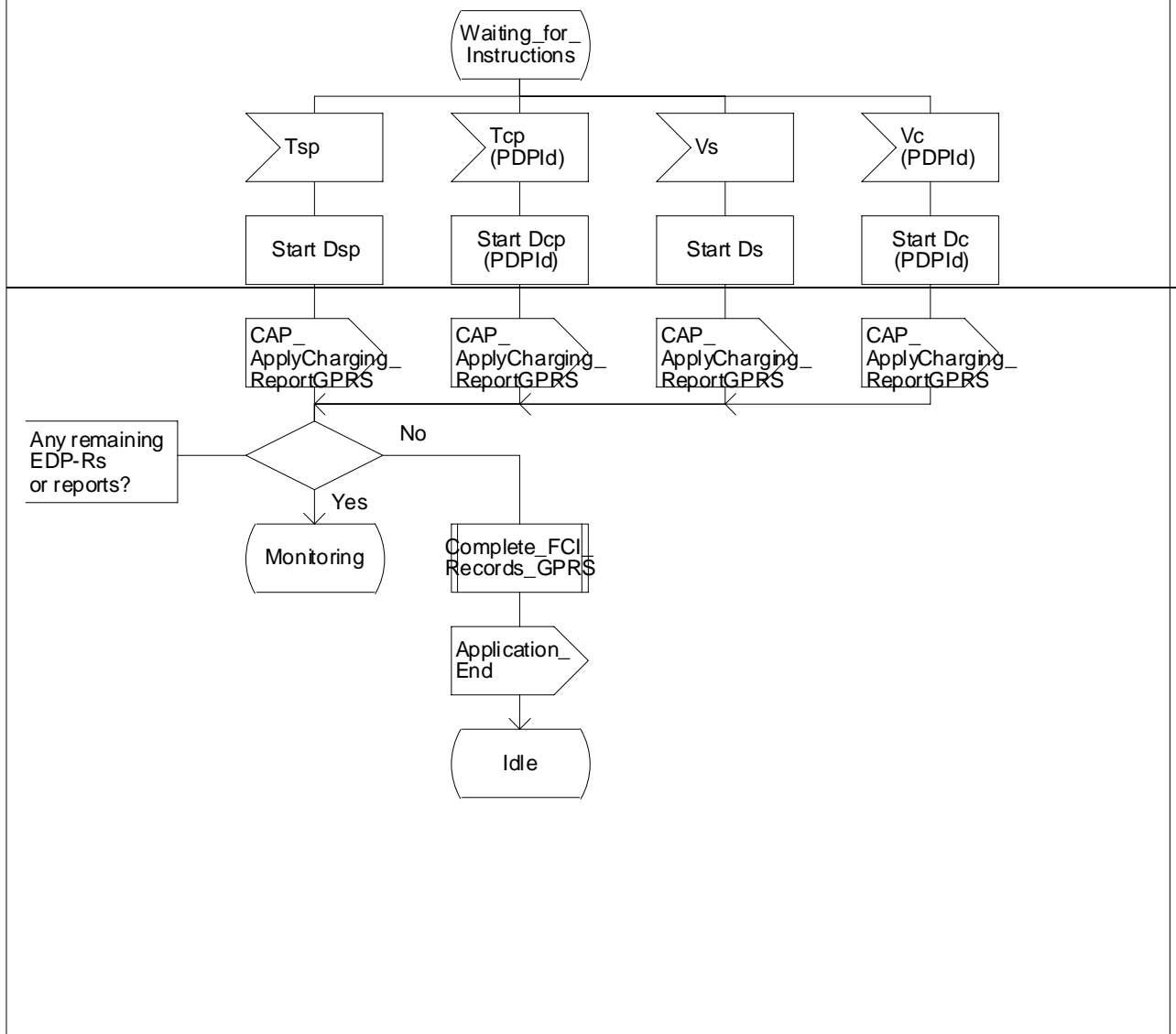


Figure 6.16l: Process GPRS\_SSF (sheet 12)



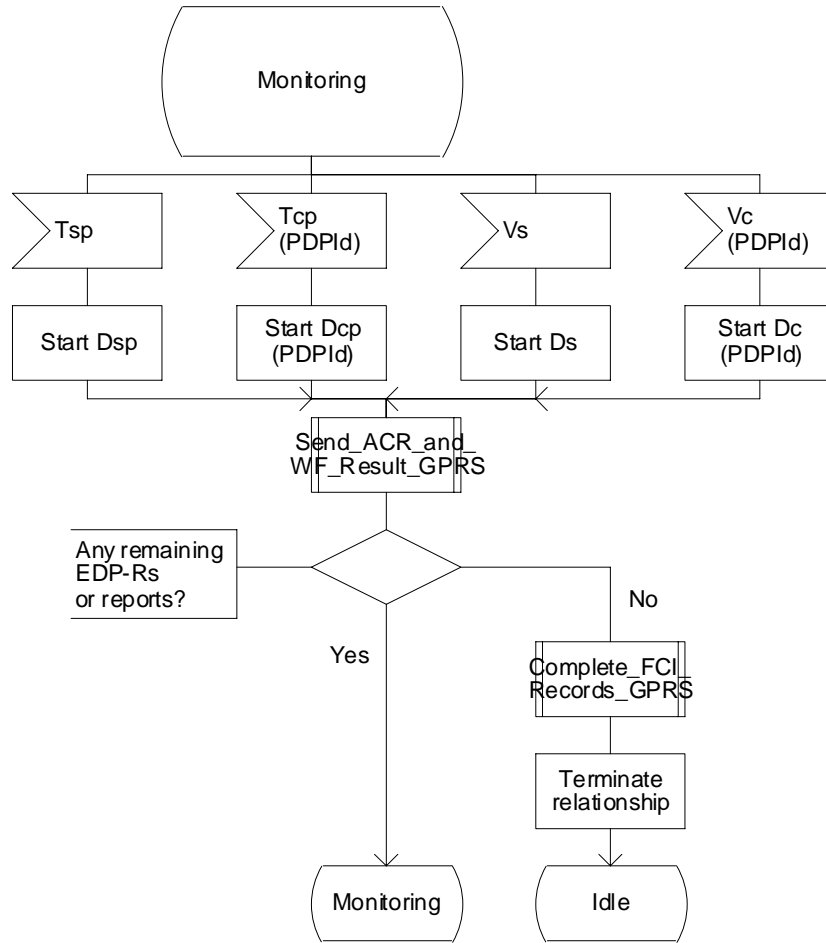
Process GPRS\_SSF

12(13)

/\* Process to describe the behaviour of the gprsSSF. \*/

/\* Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the gsmSCF \*/

/\* Notes:  
 - The values reported in ApplyChargingReportGPRS are either elapsed timer or transferred volume.  
 - The volume counters are modeled as signals received from some entity internal to the gprsSSF  
 \*/



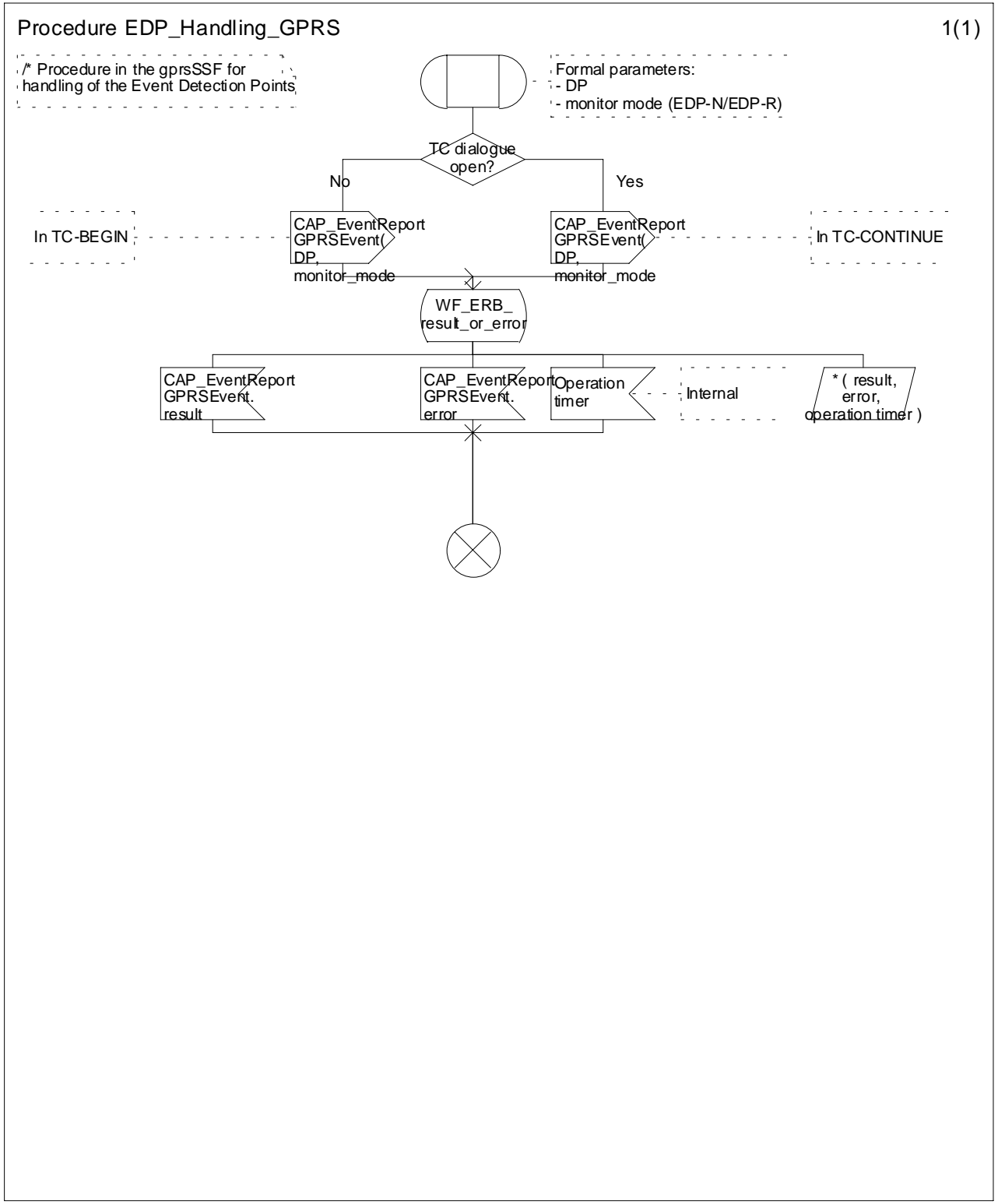


Figure 6.xx: Procedure EDP\_Handling\_GPRS

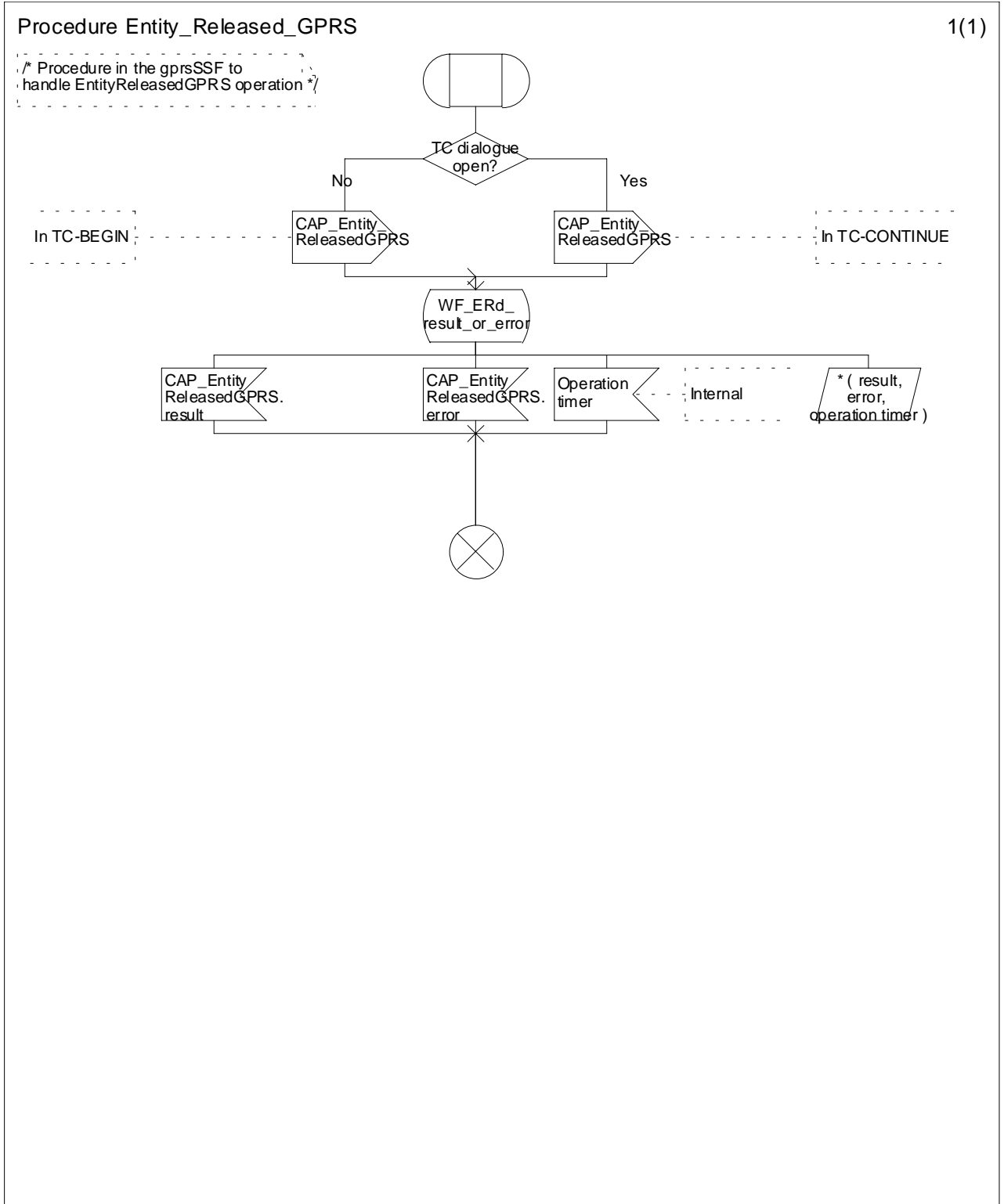
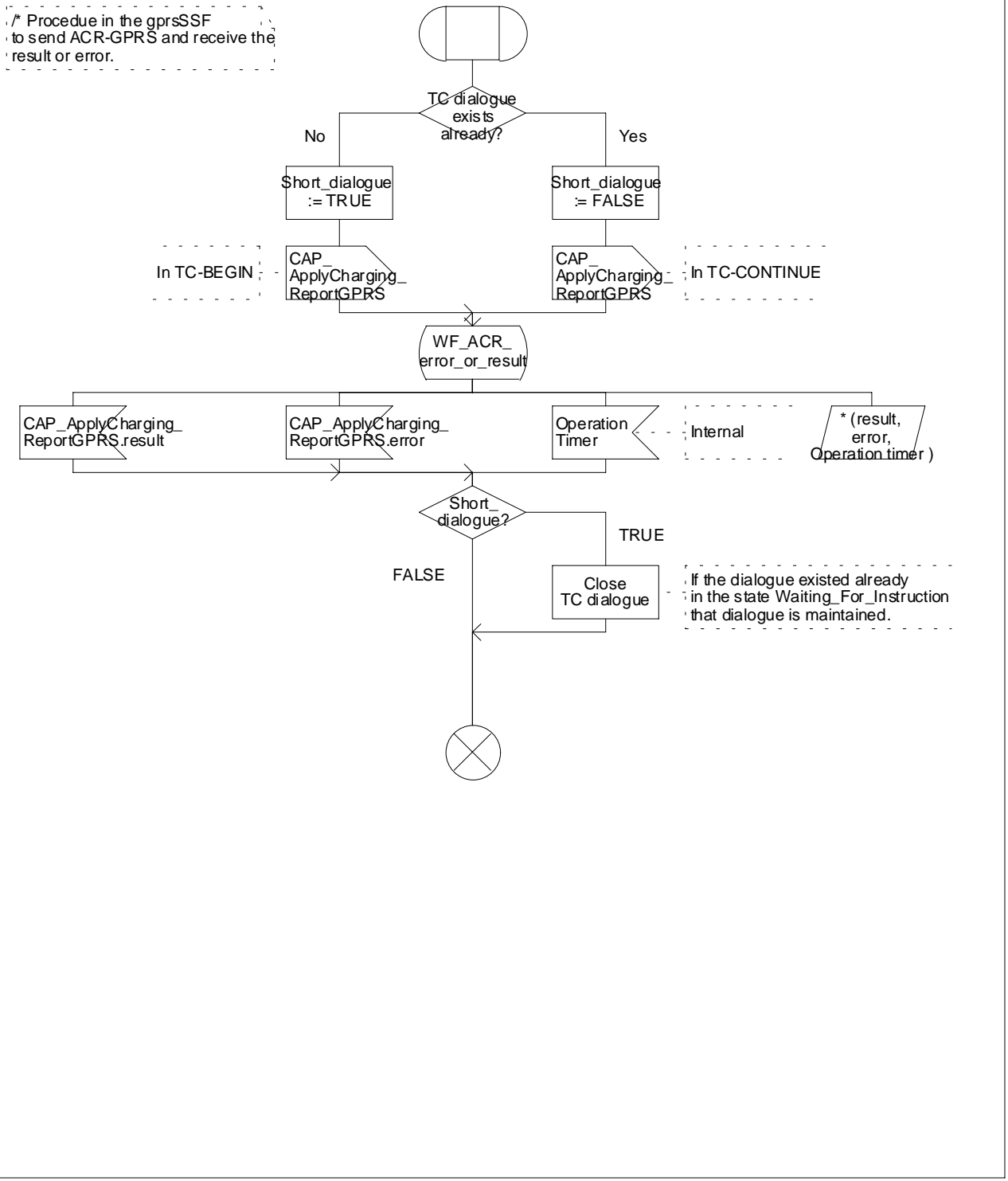


Figure 6.yy: Procedure Entity\_Released\_GPRS

Procedure Send\_ACR\_and\_WF\_result\_GPRS

1(1)

/\* Procudue in the gprsSSF  
to send ACR-GPRS and receive the  
result or error.



**Figure 6.kk: Procedure Send ACR and WF Result GPRS**

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Procedure Handle\_ACR\_GPRS

1(2)

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

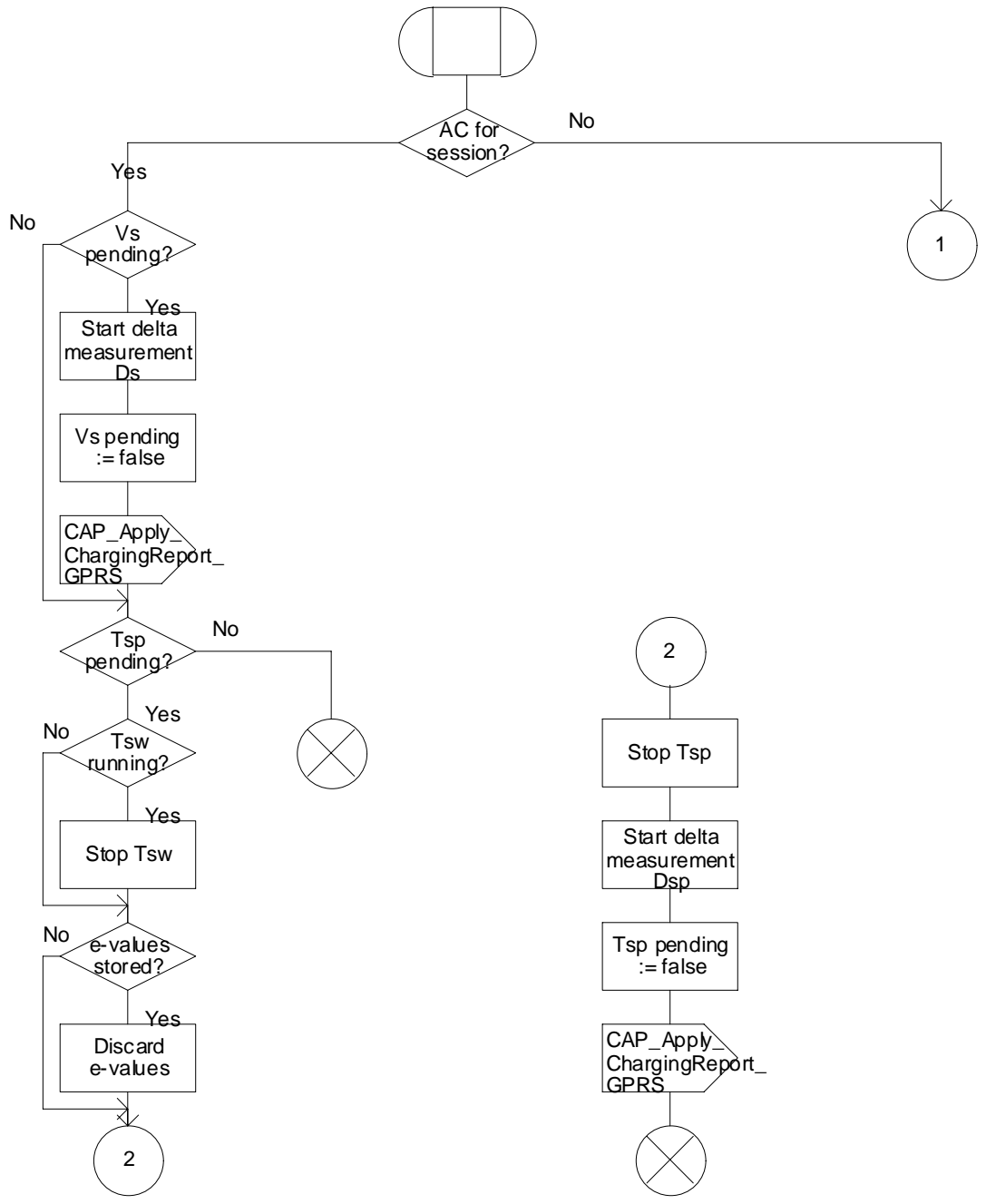
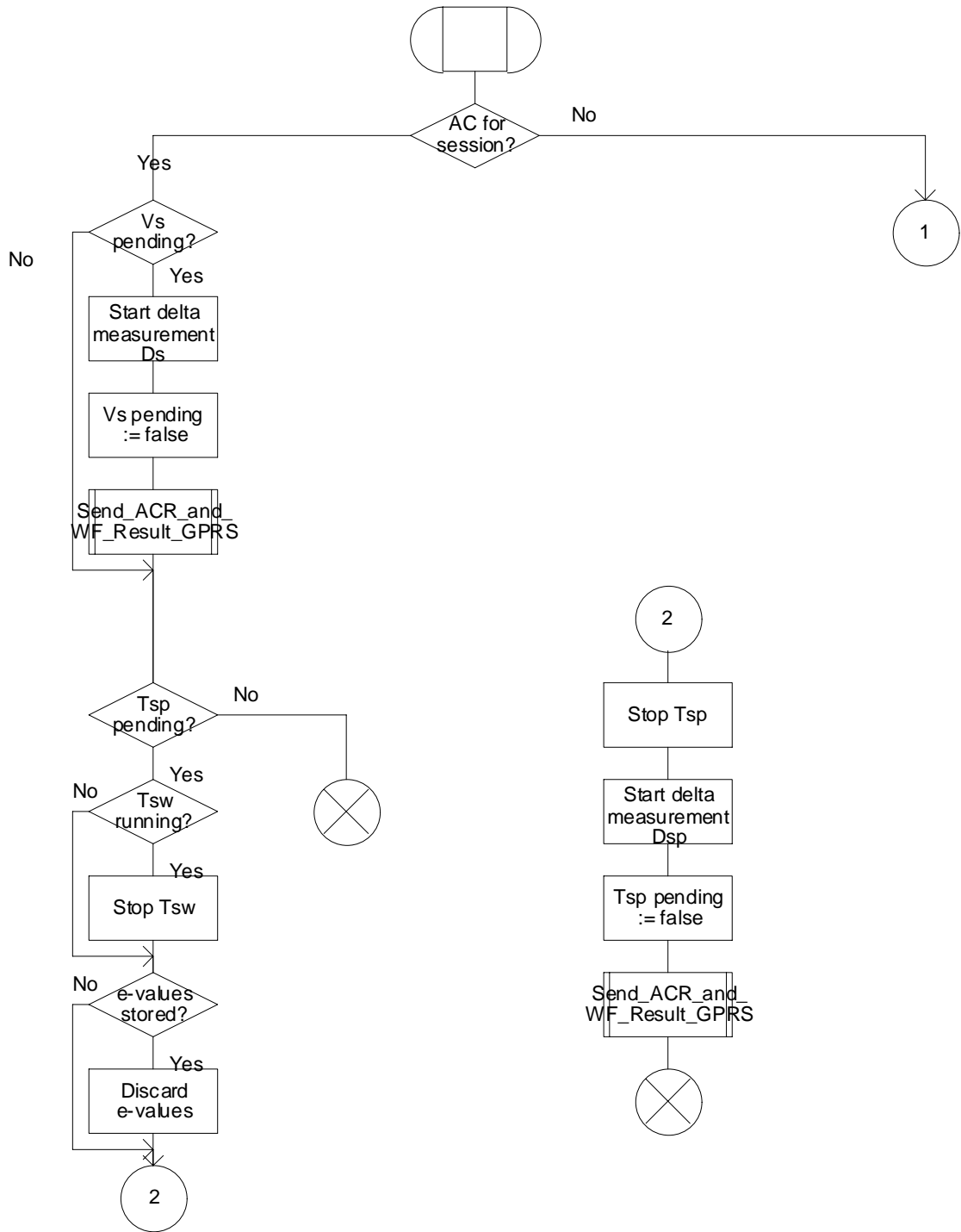


Figure 6.17a: Procedure Handle\_ACR\_GPRS

Procedure Handle\_ACR\_GPRS

1(2)

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



Procedure Handle\_ACR\_GPRS

2(2)

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

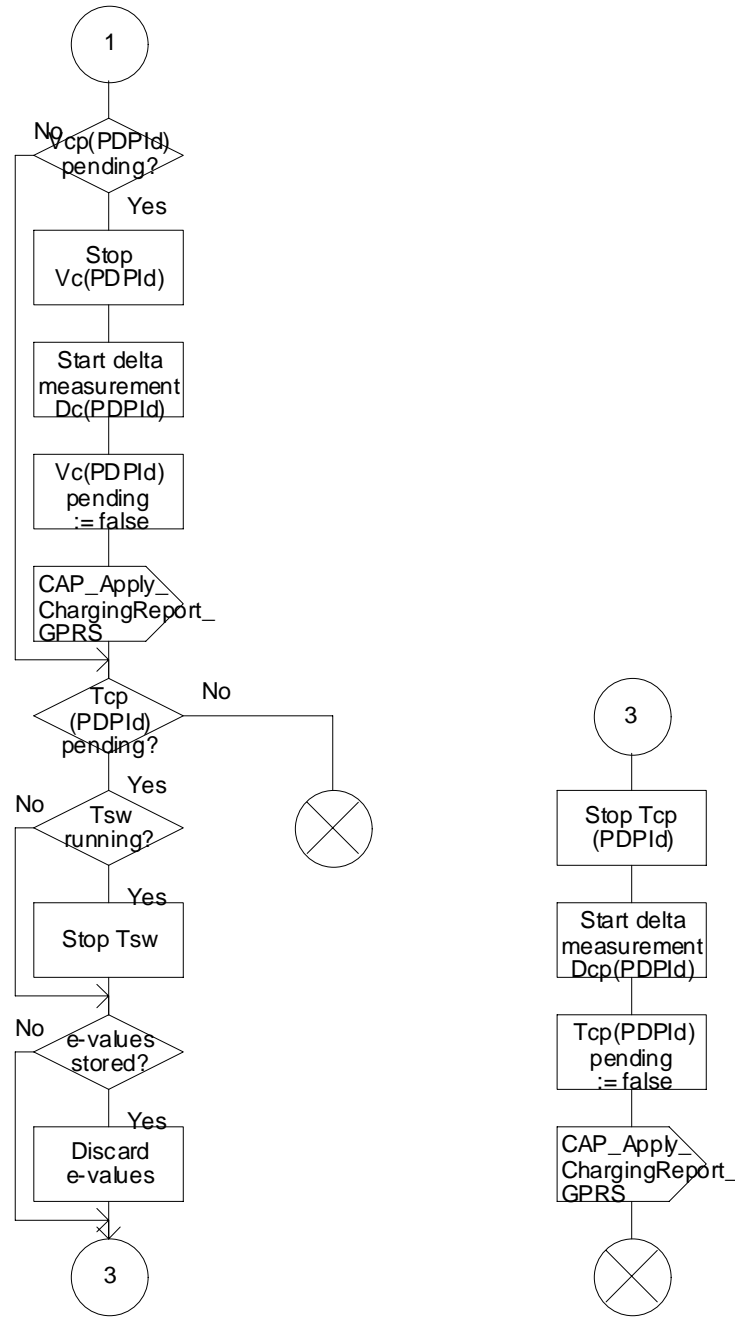


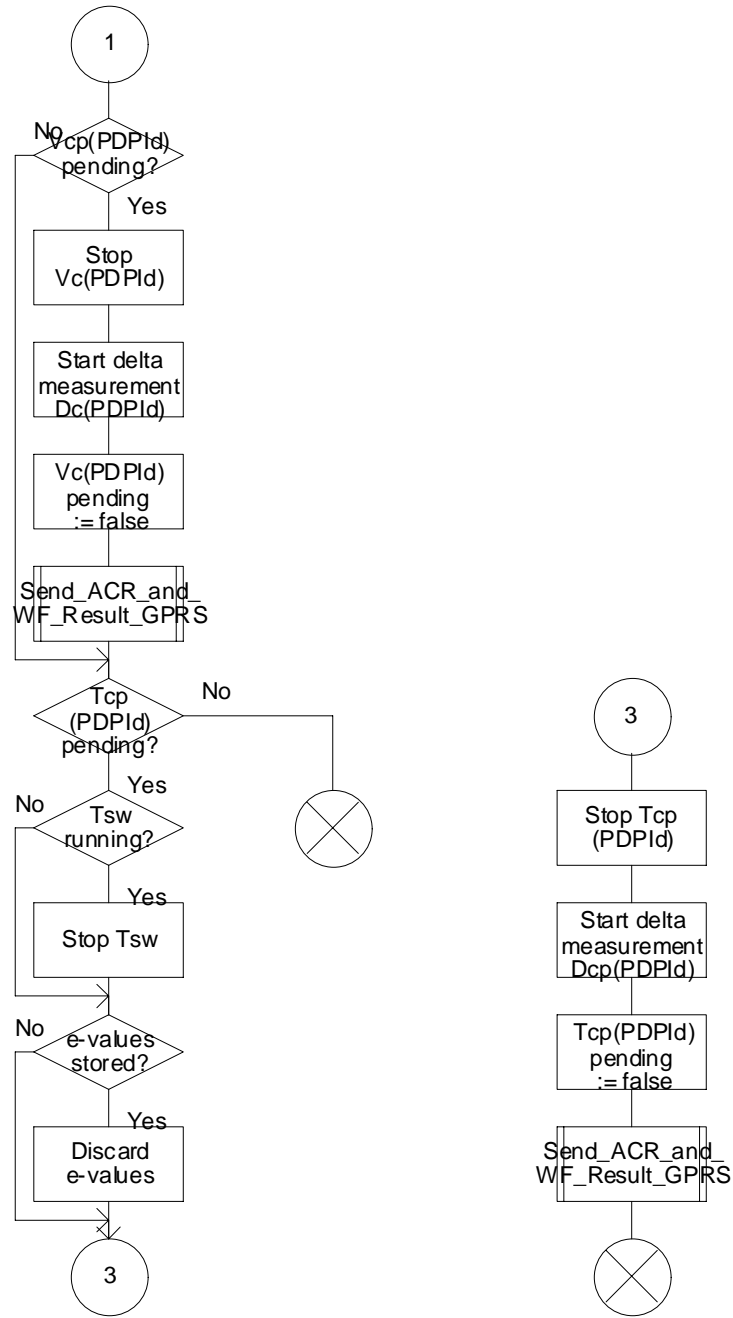
Figure 6.17b: Procedure Handle\_ACR\_GPRS



Procedure Handle\_ACR\_GPRS

2(2)

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



## \*\*\*\* NEXT MODIFIED SECTION \*\*\*\*

## 6.6 Description of information flows

### 6.6.1 gprsSSF to gsmSCF Information Flows

#### 6.6.1.1 Activity Test GPRS Ack

##### 6.6.1.1.1 Description

This IF is the response to the Activity Test GPRS.

##### 6.6.1.1.2 Information Elements

This IF contains no information elements.

#### 6.6.1.2 Apply Charging Report GPRS

##### 6.6.1.2.1 Description

This IF is used by the gprsSSF to report to the gsmSCF the information requested in the Apply Charging GPRS IF. In addition, this IF is used to notify the gsmSCF of user initiated change in QoS. Note that there are several possible QoS profiles defined by the combinations of the different QoS attributes as defined in 3G TS 23.060, see reference [11]. A PLMN may only support and charge on a limited subset of those QoS. It is recommended that changes in QoS are only reported in Apply Charging Report GPRS for those QoS profiles.

##### 6.6.1.2.2 Information Elements

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>Gprs Reference Number</u>	<u>M</u>	<u>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.</u>
Charging Result	M	This IE contains the charging information for the PDP provided by the gsmSSF. It is a choice between elapsed time and data volume.
Quality of Service	C	This IE identifies the QoS requested by the user and granted by the SGSN due to 'Modify PDP Context request. If not present the report is sent due to PDP context or GPRS session termination or Charging threshold reached.
Active	M	This IE indicates if the GPRS session or PDP context is still established e, or if it has been detached or deactivated.

PDP ID	C	This IE identifies the PDP context which the Apply Charging Report is applicable for. If not present the dialogue corresponds to the session or to one single PDP context.
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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 gsmSSFSCF at any phase that a GPRS session or PDP context ~~within one dialogue~~ has been terminated ~~abnormally~~ by the SGSN without reporting any EDP.

#### 6.6.1.3.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>Gprs Reference Number</u>	<u>M</u>	<u>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.</u>
GPRS Cause	M	This IE contains the Cause value indicating the reason for discontinuation of the PDP context.
PDP ID	M	This IE identifies the PDP context which has been terminated by the SGSN.

M Mandatory (The IE shall always be sent)

### 6.6.1.4 Event Report GPRS

#### 6.6.1.4.1 Description

This IF is used to notify the gsmSCF of a GPRS event (e.g. Attach or Detach) previously requested by the gsmSCF in a Request Report GPRS Event IF.

#### 6.6.1.4.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>Gprs Reference Number</u>	<u>M</u>	<u>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.</u>
GPRS Event type	M	This IE specifies the type of event that is reported.
Misc GPRS Info	M	This IE indicates the DP type (EDP-N or EDP-R).

GPRS Event Specific Information	C	This IE contains information specific to the reported event, e.g. new routing area in case of change of position or charging id in case of PDP Context Establishment Acknowledgement.
PDP ID	C	This IE identifies the PDP context, which the Report GPRS Event is applicable for. If not present the dialogue corresponds to the Attach/Detach FSM or to one single PDP context.

M Mandatory (The IE shall always be sent)

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

## 6.6.1.5 Initial DP GPRS

### 6.6.1.5.1 Description

This IF is generated by the gprsSSF when a trigger is detected at a DP in the GPRS state machines, to request instructions from the gsmSCF.

## 6.6.1.5.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>Gprs Reference Number</u>	<u>M</u>	<u>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.</u>
ServiceKey	M	This IE identifies for the gsmSCF the requested set of one or more CAMEL services. It is used to address the correct application/SLP within the gsmSCF.
GPRS Event Type	M	This IE indicates the armed GPRS DP event resulting in the Initial Data Event IF.
MSISDN	M	This IE contains the basic MSISDN of the MS.
IMSI	M	This IE identifies the mobile subscriber.
Time and Time zone	M	This IE contains the time that the gprsSSF was triggered, and the time zone the gprsSSF resides in.
GPRS MS Class	C	This IE contains the MS network and radio access capabilities.
PDP Type	C	This IE identifies the PDP Type, e.g. X.25 or IP.
Quality of Service	C	This IE identifies the QoS (subscribed, requested or negotiated).
Access Point Name	C	This IE identifies the address Access Point Name the MS has requested to connect to.
Routeing Area Identity	C	This IE contains the location information of the MS.
Charging ID	C	This IE contains the Charging ID received from the GGSN for the PDP context.
SGSN Capabilities	C	This IE specifies the capabilities of the SGSN node to support the CAMEL interwork, e.g. support of Advice of Charge.

M Mandatory (The IE shall always be sent)

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

\*\*\*\* NEXT MODIFIED SECTION \*\*\*\*

## 6.6.2 gsmSCF to gprsSSF Information Flows

### 6.6.2.1 Activity Test GPRS

#### 6.6.2.1.1 Description

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

#### 6.6.2.1.2 Information Elements

~~This IF contains no information elements.~~

The following information elements are used:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>Gprs Reference Number</u>	<u>M</u>	<u>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.</u>

### 6.6.2.2 Apply Charging GPRS

#### 6.6.2.2.1 Description

This IF is used for interacting from the gsmSCF with the gprsSSF charging mechanisms to control the charging of a GPRS session or PDP Context.

#### 6.6.2.2.2 Information Elements

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>Gprs Reference Number</u>	<u>M</u>	<u>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.</u>
Charging Characteristics	M	This IE specifies the charging related information to be provided by the gsmSSF and the conditions on which this information has to be provided back to the gsmSCF. It is a choice between granted volume and granted time for the data transfer.
Tariff Switch Interval	O	This information element specifies the time duration until the next tariff switch occurrence.
PDP ID	C	This IE identifies the PDP context, which the Apply GPRS Charging is applicable for. If not present the dialogue corresponds to the session or to one single PDP context.

M Mandatory (The IE shall always be sent)

- O Optional (Service logic dependent).
- C Conditional (The IE shall be sent, if available)

### 6.6.2.3 Cancel GPRS

#### 6.6.2.3.1 Description

This IF is used by the gsmSCF to request the gprsSSF to cancel all EDPs and reports.

#### 6.6.2.3.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>Gprs Reference Number</u>	<u>M</u>	<u>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.</u>
<u>all requests</u>	<u>M</u>	<u>This IE indicates that all active requests for EventReportGPRS and ApplyCharging shall be cancelled.</u>
<u>PDP ID</u>	<u>C</u>	<u>This IE identifies the PDP context which is to be cancelled. If not present the dialogue corresponds to the session or to one single PDP context.</u>

M Mandatory (The IE shall always be sent)

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

### 6.6.2.4 Connect GPRS

#### 6.6.2.4.1 Description

This IF is used by the gsmSCF to request the gprsSSF to modify the APN used when establishing a PDP Context.

#### 6.6.2.4.2 Information Elements

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>Access Point Name</u>	<u>M</u>	<u>This IE contains the Access Point Name to be used when establishing the PDP Context.</u>
<u>PDP Id</u>	<u>C</u>	<u>This IE identifies the PDP Context where the new Access Point Name shall be used.</u>

M Mandatory (The IE shall always be sent)

### 6.6.2.5 Continue GPRS

#### 6.6.2.5.1 Description

This information flow requests the gprsSSF to proceed with processing at the DP at which it previously suspended processing to await gsmSCF instructions. The gprsSSF completes DP processing, and continues processing (i.e., proceeds to the next point in the Attach/Detach FSM or PDP Context FSM) without substituting new data from the gsmSCF.

### 6.6.2.5.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
PDP ID	C	This IE identifies the PDP context which processing shall continue for. If not present the dialogue corresponds to the session or to one single PDP context.

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

### 6.6.2.6 Furnish Charging Information GPRS

#### 6.6.2.6.1 Description

This IF is used to request the gprsSSF to include information in the CAMEL specific logical call record.

The logical call record is created when FCI-GPRS is received and a logical call record for that FSM does not exist. For modelling purposes the logical call record is buffered in the gprsSSF. The gprsSSF completes logical call records as defined in the SDLs. Once the logical call record is completed, then its free format data is moved to the corresponding CDR and the logical call record is deleted.

In the SGSN there is a separate Logical call record for the attach/detach state model and for each PDP context.

The CSE can send multiple concatenated FCIs per Logical Call Record for completion. The total maximum of free format data is 160 octets per Logical Call Record. The 160 octets may be sent in one or more FCI operations. If there is non-completed free format data and new FCI operation(s) is/are received to overwrite the non-completed data, then the non-completed data is discarded and the gsmSCF can send another 160 octets per CDR.

#### 6.6.2.6.2 Information Elements

<b>Information element name</b>	<b>Required</b>	<b>Description</b>
<u>Gprs Reference Number</u>	<u>M</u>	<u>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.</u>
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:

<b>Information element name</b>	<b>Required</b>	<b>Description</b>
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:

<b>Information element name</b>	<b>Required</b>	<b>Description</b>
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



		<p>a separate Logical call record for the attach/detach state model and for each PDP context.</p> <ul style="list-style-type: none"> <li>• If this IE is present indicating “Append”, the gprsSSF shall append the free format data received in this IF to the free format data already present in the Logical call record for that session or PDP Context.</li> <li>• If this IE is absent or in value “Overwrite”, then the gprsSSF shall overwrite all free format data already present in the Logical call record for that session or PDP Context, by the free format data received in this IF.</li> </ul> <p>If no Logical call record exists yet for that session or PDP Context, then the gprsSSF shall ignore this IE.</p>
PDP Id	C	<p>This IE identifies the PDP context’s Logical call record to which the free format data shall be appended or overwritten. If not present, the free format data belong to a Logical call record for a session or a single PDP context for the dialogue.</p>

M Mandatory (The IE shall always be sent)

O Optimal (Service logic dependent)

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

## 6.6.2.7 Release GPRS

### 6.6.2.7.1 Description

This IF is used by the gsmSCF to tear down an existing GPRS session or PDP Context at any phase.

### 6.6.2.7.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>Gprs Reference Number</u>	<u>M</u>	<u>This IE contains an identifier that is allocated by the gprsSSF and used further on to identify the gprsSSF instance taking care of GPRS session or PDP context.</u>
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 session or to one single PDP context.

M Mandatory (The IE shall always be sent)

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

## 6.6.2.8 Request Report GPRS Event

### 6.6.2.8.1 Description

This IF is used to request the gprsSSF to monitor for an event and send a notification back to the gsmSCF when the event is detected (see Event Report Data).

### 6.6.2.8.2 Information Elements

The following information elements are used:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>Gprs Reference Number</u>	M	This IE contains an identifier that is allocated by the gprsSSF and used further on 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 session or to one single PDP context.

M Mandatory (The IE shall always be sent)

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

Data Event contains the following information:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
GPRS Event type	M	This IE specifies the type of event of which a report is requested.
Monitor Mode	M	This IE indicates how the event shall be reported.

M Mandatory (The IE shall always be sent)

## 6.6.2.9 Reset Timer GPRS

### 6.6.2.9.1 Description

This IF is used to refresh the gprsSSF timer.

### 6.6.2.9.2 Information Elements

The following information elements are required:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
Timer ID	M	This IE specifies the default value for the Tssf timer. <no underline>
Timer Value	M	This IE specifies the value to which the timer Tssf shall be set.

PDP ID	C	This IE identifies the PDP context, which the Reset of the timer is applicable for. If not present the dialogue corresponds to the session or to one single PDP context.
--------	---	--

M Mandatory (The IE shall always be sent)

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

## 6.6.2.10 Send Charging Information GPRS

### 6.6.2.10.1 Description

This IF is used to send e-parameters from the gsmSCF to the gprsSSF. If charge advice information is received from the gsmSCF, it shall replace the charge advice information which would be generated by the SGSN and inhibit any further generation of CAI by the SGSN. Further processing of the charge advice information by the SGSN shall be in accordance with the GSM Advice of Charge Supplementary Service.

NOTE: If charge advice information is received from the gsmSCF after charge information has been generated by the SGSN and sent to the MS, the behaviour of the service may be unpredictable or incorrect; the service designer should therefore ensure that the first set of charge advice information is sent to the gprsSSF before charge information is sent to the MS.

### 6.6.2.10.2 Information Elements

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
<u>Gprs Reference Number</u>	<u>M</u>	<u>This IE contains an identifier that is allocated by the gprsSSF and used further on to identify the gprsSSF instance taking care of GPRS session or PDP context.</u>
SCI GPRS Billing ChargingCharacteristics	M	This IE defines the Advice Of Charge related information to be provided to the Mobile Station, if supported by the SGSN.

M Mandatory (The IE shall always be sent)

GPRS SCI Billing Charging Characteristics is defined as:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
AOC GPRS	M	This IE is sent after an Activate PDP Context Accept or Attach Accept has been received from the SGSN. This IE defines the Advice Of Charge related information to be provided to the Mobile Station, if supported by the SGSN.
PDP Id	C	This IE is included if the AoC is applicable to a PDP context. If not present the AoC is applicable to the session or for a single PDP context for the dialogue.

M Mandatory (The IE shall always be sent)

~~C Conditional (only one of these IEs may be sent)~~

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

AOC GPRS is defined as:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
AOC Initial	M	This IE contains CAI elements as defined in 3G TS 22.024 [x].
AOC Subsequent	O	See definition in the next table.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

AOC Subsequent is defined as:

<u>Information element name</u>	<u>Required</u>	<u>Description</u>
CAI Elements	M	This IE contains CAI elements as defined in 3G TS 22.024 [x].
Tariff Switch Interval	O	This IE indicates the tariff switch time until the next tariff switch applies.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)



\*\*\*\* FIRST MODIFIED SECTION \*\*\*\*

## 5.1 Data types

```
CAMEL-FCIGPRSBillingChargingCharacteristics {PARAMETERS-BOUND : bound} ::= CHOICESEQUENCE {
  GPRS-ReferenceNumber [0] GPRS-ReferenceNumber,
  fCIBCCAMELsequence1 [01] SEQUENCE {
    freeFormatData [0] OCTET STRING (SIZE
(bound.&minFCIBillingChargingDataLength..
  bound.&maxFCIBillingChargingDataLength)),
  appendFreeFormatData [12] AppendFreeFormatData DEFAULT override,
  pDPID [23] PDPID OPTIONAL
  }
}
```

```
CAMEL-SCIBillingChargingCharacteristics ::= CHOICESEQUENCE {
  GPRS-ReferenceNumber [0] GPRS-ReferenceNumber,
  aOCBeforeAnswer [01] AOCBeforeAnswer,
  aOCAfterAnswer [12] AOCSubsequent
}
```

```
GPRS-ReferenceNumber ::= SEQUENCE {
  gPRS-Reference [0] Integer4,
  gprsSSF-Address [1] ISDN-AddressString
}
```

```
-- Indicates the software instance that takes care of the FSM in the SCP.
-- This Ie is used to identify the relationship between SGSN and the SCP.
```

\*\*\*\* NEXT MODIFIED SECTION \*\*\*\*

## 5.2 Error types

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

```
DEFINITIONS IMPLICIT TAGS ::=
BEGIN
IMPORTS
ros-InformationObjects, datatypes, errorcodes FROM CAP-object-identifiers
  {ccitt(0) identified-organization(4) etsi(0) 3gpp(?) umts-network(1) module(0) CAP-object-
  identifiers(17) version3(0)}
  ERROR
FROM Remote-Operations-Information-Objects ros-InformationObjects
  InvokeID,
  UnavailableNetworkResource
FROM CAP-datatypes datatypes
  errcode-canceled,
  errcode-cancelFailed,
  errcode-eTCFailed,
  errcode-improperCallerResponse,
  errcode-missingCustomerRecord,
  errcode-missingParameter,
  errcode-parameterOutOfRange,
  errcode-requestedInfoError,
  errcode-systemFailure,
  errcode-taskRefused,
  errcode-unavailableResource,
  errcode-unexpectedComponentSequence,
  errcode-unexpectedDataValue,
  errcode-unexpectedParameter,
  errcode-unknownLegID,
  errcode-unknownPDPID,
  errcode-unknownGPRSReference,
  errcode-overlappingDialogue
FROM CAP-errorcodes errorcodes;

-- TYPE DEFINITION FOR CAP ERRORS FOLLOWS
```

```

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

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

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

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

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

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

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

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

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

taskRefused ERROR ::= {
  PARAMETER ENUMERATED {
    generic (0),
    unobtainable (1),
    congestion (2)
    --other values FOR FURTHER STUDY
  }
  CODE    errcode-taskRefused
}
-- An entity normally capable of the task requested cannot or chooses not to perform the task at
-- this time. This includes error situations like congestion and unobtainable address as used in
-- e.g. the connect operation.)

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

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

unexpectedDataValue ERROR ::= {

```

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

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

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

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

unknownGPRSReference ERROR      ::= {
    CODE    errcode-unknownGPRSReference
}
-- GPRS Reference not known by the receiving entity.

overlappingDialogue ERROR      ::= {
    CODE    errcode-overlappingDialogue
}
-- For the same relationship already exists a dialogue.

END
```



<b>**** NEXT MODIFIED SECTION ****</b>
--

## 5.4 Error codes

```

CAP-errorcodes {ccitt(0) identified-organization(4) etsi(0) 3gpp(?) umts-network(1) modules(0) CAP-
errorcodes (3) version3(0)}
DEFINITIONS ::=
BEGIN
IMPORTS
ros-InformationObjects FROM CAP-object-identifiers
    {ccitt(0) identified-organization(4) etsi(0) 3gpp(?) umts-network(1) modules(0) CAP-object-
identifiers(17) version3(0)}
    Code
FROM Remote-Operations-Information-Objects ros-InformationObjects
;
    errcode-canceled                Code ::= local: 0
    errcode-cancelFailed             Code ::= local: 1
    errcode-eTCFailed               Code ::= local: 3
    errcode-improperCallerResponse  Code ::= local: 4
    errcode-missingCustomerRecord   Code ::= local: 6
    errcode-missingParameter        Code ::= local: 7
    errcode-parameterOutOfRange      Code ::= local: 8
    errcode-requestedInfoError      Code ::= local: 10
    errcode-systemFailure            Code ::= local: 11
    errcode-taskRefused              Code ::= local: 12
    errcode-unavailableResource      Code ::= local: 13
    errcode-unexpectedComponentSequence Code ::= local: 14
    errcode-unexpectedDataValue     Code ::= local: 15
    errcode-unexpectedParameter     Code ::= local: 16
    errcode-unknownLegID            Code ::= local: 17
    errcode-unknownPDPIID           Code ::= local: 18
    errcode-unknownGPRSReference   Code ::= local: 19
    errcode-overlappingDialogue   Code ::= local: 20
END

```

**** NEXT MODIFIED SECTION ****
---------------------------------

## 5.6 Object Identifiers (IDs)

```

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

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

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

-- gsmSSF/gsmSCF Contracts
id-CAPSsfToScfGeneric                  OBJECT IDENTIFIER ::= {id-contractE 3}
id-CAPAssistHandoffssfToScf            OBJECT IDENTIFIER ::= {id-contractE 5}
id-CAPScfToSsfGeneric                  OBJECT IDENTIFIER ::= {id-contractE 6}

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

-- gprsSSF/gsmSCF Contracts
id-cap3GprsSsfTogsmScf                 OBJECT IDENTIFIER ::= {id-contract 14}
id-cap3GgsmSCFTogprsSSF                 OBJECT IDENTIFIER ::= {id-contract 15}

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

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

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

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

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

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

```

END

<b>**** NEXT MODIFIED SECTION ****</b>
--

## 8 GPRS Control

### 8.1 gsmSCF/gprsSSF operations and arguments

```

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

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

    {ccitt(0) identified-organization(4) etsi(0) 3gpp(?) umts-network(1) modules(0) CAP-object-
identifiers(17) version3(0)}
OPERATION
FROM Remote-Operations-Information-Objects ros-InformationObjects

tc-Messages, classes FROM CAP-object-identifiers
    {ccitt(0) identified-organization(4) etsi(0) 3gpp(?) umts-network(1) module(0) CAP-object-
identifiers(17) version3(0)}
    InvokeIdType
FROM TCAPMessages tc-Messages

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

PARAMETERS-BOUND
FROM CAP-classes classes

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

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

    cancelFailed,
    missingCustomerRecord,
    missingParameter,
    parameterOutOfRange,

```

```

    systemFailure,
    taskRefused,
    unexpectedComonentSequence,
    unexpectedDataValue,
    unexpectedParameter,
    unknownPDPID,
    unknownGPRSReference,
    overlappingDialogue
}

FROM CAP-errorotypes errorotypes
;

activityTestGPRS OPERATION ::= {
    ARGUMENT
    ActivityTestGPRSArg {bound}
    RETURN RESULT TRUE
    CODE opcode-activityTest
}
-- Direction: gsmSCF -> gprsSSF, Timer: Tatg
-- This operation is used to check for the continued existence of a relationship between the gsmSCF
-- and gprsSSF. If the relationship is still in existence, then the gprsSSF will respond. If no
-- reply is received, then the gsmSCF will assume that the gsmSSF has failed in some way and will
-- take the appropriate action.

ActivityTestGPRSArg ::= SEQUENCE {
    gPRS-ReferenceNumber [0] GPRS-ReferenceNumber
}

ApplyChargingGPRS ::= OPERATION
    ARGUMENT
    ApplyChargingGPRSArg
    RETURN RESULT TRUE
    ERRORS {
        MissingParameter |
        UnexpectedComponentSequence |
        UnexpectedParameter |
        UnexpectedDataValue |
        ParameterOutOfRange |
        SystemFailure |
        TaskRefused |
        UnknownPDPID |
        UnknownGPRSReference |
        OverlappingDialogue
    }

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

ApplyChargingGPRSArg ::= SEQUENCE {
    gPRS-ReferenceNumber [0] GPRS-ReferenceNumber,
    chargingCharacteristics [01] ChargingCharacteristics,
    tariffSwitchInterval [12] INTEGER (1..86400) OPTIONAL,
    pDPID [23] PDPID OPTIONAL
}

-- tariffSwitchInterval is measured in 1 second units.

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

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

ApplyChargingReportGPRSArg ::= SEQUENCE {
    gPRS-ReferenceNumber [0] GPRS-ReferenceNumber,
    chargingResult [01] ChargingResult,

```

```

    qualityOfService          [12] QualityOfService          OPTIONAL,
    active                    [23] BOOLEAN                  DEFAULT TRUE,
    pDPID                     [34] PDPid                    OPTIONAL
}

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

CancelGPRS ::= OPERATION
ARGUMENT
    CancelGPRSArg
RETURN RESULT TRUE
ERRORS {
    CancelFailed |
    MissingParameter |
    TaskRefused |
    UnknownPDPID |
    UnknownGPRSReference |
    OverlappingDialogue
}

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

CancelGPRSArg ::= CHOICE-SEQUENCE {
    gPRS-ReferenceNumber [0] GPRS-ReferenceNumber,
    allRequests          [0] NULL, <CR editor's note: will be removed by Rogier>
    pDPID                [1] PDPid OPTIONAL,
}

connectGPRS {PARAMETERS-BOUND: bound} OPERATION ::= {
    ARGUMENT    ConnectGPRSArg {bound}
    RETURN RESULT FALSE
    ERRORS {missingParameter |
            parameterOutOfRange |
            unknownPDPid |
            systemFailure |
            taskRefused |
            unexpectedComponentSequence |
            unexpectedDataValue |
            unexpectedParameter}
    CODE        opcode-connect
}

-- Direction: gsmSCF -> gprsSSF, Timer: Tcon
-- This operation is used to modify the Access Point Name used when establishing a PDP Context.

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

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

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

ContinueGPRSArg ::= SEQUENCE {
    pDPID [0] PDPid
}

EntityReleasedGPRS ::= OPERATION
ARGUMENT
    EntityReleasedGPRSArg
RETURN RESULT TRUE
ERRORS {
    CancelFailed |
    MissingParameter |
    TaskRefused |
    UnknownPDPID |
    UnknownGPRSReference
}

```

```

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

```

```

EntityReleasedGPRSArg ::= SEQUENCE {
  gPRS-ReferenceNumber [0] GPRS-ReferenceNumber,
  gPRSCause [01] GPRSCause,
  pDPID [12] PDPid
}

```

```

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

```

```

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

```

```

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

```

```

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

```

```

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

```

```

InitialGPRSEventArg ::= SEQUENCE {
  gPRS-ReferenceNumber [0] GPRS-ReferenceNumber,
  serviceKey [01] ServiceKey,
  gPRSEventType [12] GPRSEventType,
  mSISDN [23] MSISDN,
  iMSI [24] IMSI,
  timeAndTimeZone [35] TimeAndTimeZone,
  gPRSMSCClass [46] GPRSMSCClass OPTIONAL,
  pDPType [57] PDPTYPE OPTIONAL,
  qualityOfService [18] QualityOfService OPTIONAL,
  accessPointName [79] AccessPointName OPTIONAL,
  routingAreaIdentity [810] RAIdentity OPTIONAL,
  chargingID [911] GPRSChargingId OPTIONAL,
  sGSNCapabilities [1012]SGSNCapabilities OPTIONAL
}

```

```

ReleaseGPRS ::= OPERATION
  ARGUMENT
    ReleaseGPRSArg
  RETURN RESULT TRUE
  ERRORS {
    CancelFailed |
    MissingParameter |
    TaskRefused |
    UnknownPDPID |
    UnknownGPRSReference |
    OverlappingDialogue
}

```

```

-- Direction: gsmSCF -> gprsSSF, Timer: Trg

```

-- This operation is used to tear down an existing GPRS session or PDP Context at any phase.

```
ReleaseGPRSArg ::= SEQUENCE {
  gPRS-ReferenceNumber [0] GPRS-ReferenceNumber,
  gprsCause [01] GPRSCause,
  pDPID [12] PDPid OPTIONAL
}
```

```
EventReportGPRS ::= OPERATION
  ARGUMENT
  EventReportGPRSArg
  RETURN RESULT TRUE
  ERRORS {
    UnknownGPRSReference
  }
```

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

```
EventReportGPRSArg ::= SEQUENCE {
  gPRS-ReferenceNumber [0] GPRS-ReferenceNumber,
  gPRSEventType [01] GPRSEventType,
  miscGPRSInfo [12] MiscGPRSInfo DEFAULT {messageType request},
  gPRSEventSpecificInformation [23] GPRSEventSpecificInformation OPTIONAL,
  pDPID [34] PDPid OPTIONAL
}
```

```
RequestReportGRSEvent ::= OPERATION
  ARGUMENT
  RequestReportGPRSEvent
  RETURN RESULT TRUE
  ERRORS {
    MissingParameter |
    ParameterOutOfRange |
    SystemFailure |
    TaskRefused |
    UnexpectedComponentSequence |
    UnexpectedDataValue |
    UnexpectedParameter |
    UnknownPDPID |
    UnknownGPRSReference |
    OverlappingDialogue
  }
```

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

```
RequestReportGPRSEventArg ::= SEQUENCE
  gPRS-ReferenceNumber [0] GPRS-ReferenceNumber,
  gPRSEvent [01] SEQUENCE SIZE (1..numOfGPRSEvents) OF GPRSEvent,
  pDPID [12] PDPid OPTIONAL
}
```

-- Indicates the GPRS related events for notification.

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

-- Direction: *gsmSCF* -> *gprsSSF*, Timer: *T<sub>rtg</sub>*  
 -- This operation is used to request the *gprsSSF* to refresh an application timer in the *gprsSSF*.

```
ResetTimerGPRSArg ::= SEQUENCE {
```

```

timerID          [0] TimerID          DEFAULT tssf,
timervalue       [12] TimerValue,
pDPID            [23] PDPID OPTIONAL
}

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

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

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

```



\*\*\*\* NEXT MODIFIED SECTION \*\*\*\*

## 8.2 gsmSCF/gprsSSF contracts, packages and ACs

### 8.2.1.1 gprsSSF/gsmSCF ASN.1 module

```

CAP-gprsSSF-gsmSCF-pkgs-contracts-acs {ccitt(0) identified-organization(4) etsi(0) 3gpp(?) umts-
network(1) modules(0) CAP-gprsSSF-gsmSCF-pkgs-contracts-acs (6) version3(0)}
DEFINITIONS ::=
BEGIN

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

IMPORTS

    PARAMETERS-BOUND,
    networkSpecificBoundSet
FROM CAP-classes classes

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

    TCMessage {}
FROM TCAPMessages tc-Messages

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

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

=
FROM CAP-object-identifiers {ccitt(0) identified-organization(4) etsi(0) 3gpp(?) umts-network(1)
modules(0) CAP-object-identifiers (17) version3(0)}

;
-- Application Contexts

cap3-gprssf-scfAC APPLICATION-CONTEXT ::= {
    CONTRACT                cap3GprsSsfToScf
    DIALOGUE MODE           structured
    ABSTRACT SYNTAXES       {dialogue-abstract-syntax |
                             gprsSSF-scfAbstractSyntax}
    APPLICATION CONTEXT NAME id-ac-cap3-gprsSSF-scfAC}

cap3-gsmscf-gprsssfAC APPLICATION-CONTEXT ::= {
    CONTRACT                cap3GsmScfToGprsSsf
    DIALOGUE MODE           structured
    ABSTRACT SYNTAXES       {dialogue-abstract-syntax |
                             gsmSCF-gprsssfAbstractSyntax}
    APPLICATION CONTEXT NAME id-ac-CAP-gsmSCF-gprsssf-AC }
-- Contracts

cap3GprsSsfToScf CONTRACT ::= {
-- dialogue initiated by gprsSSF with InitialDPGPRS, ApplyChargingReportGPRS,
-- EntityReleaseGPRS and EventReportGPRS Operations
    INITIATOR CONSUMER OF
    _____ {
        gprSsfActivationPackage {networkSpecificBoundSet}}
    RESPONDER CONSUMER OF
    _____ {
        gprsConnectPackage {networkSpecificBoundSet} |
        gprsReleasePackage {networkSpecificBoundSet} |
        gprsEventHandlingPackage {networkSpecificBoundSet} |
        gprsTimerPackage {networkSpecificBoundSet} |

```

```

gprsBillingPackage {networkSpecificBoundSet} |
gprsChargingPackage {networkSpecificBoundSet} |
gprsActivityTestPackage {networkSpecificBoundSet} |
gprsCancelPackage {networkSpecificBoundSet} |
gprsChargeAdvicePackage {networkSpecificBoundSet}
}
ID id-cap3GprsSsfToScf
}

```

```

cap3GsmScfToGprsSsf CONTRACT ::= {
-- dialogue initiated by gsmSCF with ApplyCharginGPRS, ActivityTestGPRS,
-- CancelGPRS, FurnishChargingInformationGPRS, ReleaseGPRS,
-- RequestReportGPRSEvent ResetTimerGPRS and SendChargingInformationGPRS Operations
INITIATOR CONSUMER OF
{
gprsReleasePackage {networkSpecificBoundSet} |
gprsEventHandlingPackage {networkSpecificBoundSet} |
gprsTimerPackage {networkSpecificBoundSet} |
gprsBillingPackage {networkSpecificBoundSet} |
gprsChargingPackage {networkSpecificBoundSet} |
gprsActivityTestPackage {networkSpecificBoundSet} |
gprsCancelPackage {networkSpecificBoundSet} |
gprsChargeAdvicePackage {networkSpecificBoundSet}
}
RESPONDER CONSUMER OF
{
gprsEventHandlingPackage {networkSpecificBoundSet} |
gprsChargingPackage {networkSpecificBoundSet} |
gprsExceptionInformationPackage
}
ID id-cap3GprsSsfToGsmScf
}

```

-- Operation Packages

```

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

```

-- Abstract Syntaxes

```

gprsSSF-gsmSCFAbstractSyntax ABSTRACT-SYNTAX ::= {
GenericPprsSSF-gsmSCF-PDUs
IDENTIFIED BY id-as-gprsSSF-gsmSCF-AS}
GenericSSF-gsmSCF-PDUs ::= TCMMessage {{GprsSsfToGsmScfInvokable},
{GprsSsfToGsmScfReturnable}}
GprsSsfToGsmScfGenericInvokable OPERATION ::= {
activityTestGPRS {networkSpecificBoundSet} |
applyChargingGPRS {networkSpecificBoundSet} |
applyChargingReportGPRS {networkSpecificBoundSet} |
cancelGPRS {networkSpecificBoundSet} |
}

```

```

connectGPRS {networkSpecificBoundSet} |
eventReportGPRS {networkSpecificBoundSet} |
furnishChargingInformationGPRS {networkSpecificBoundSet} |
initialDPGPRS {networkSpecificBoundSet} |
releaseGPRS {networkSpecificBoundSet} |
requestReportGPRSEvent {networkSpecificBoundSet} |
resetTimerGPRS {networkSpecificBoundSet} |
sendChargingInformationGPRS {networkSpecificBoundSet} |
}

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

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

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

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

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

END

```

\*\*\*\* NEXT MODIFIED SECTION \*\*\*\*

## 10 Error procedures

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

### 10.1 Operation related error procedures

.....

#### 10.1.xx UnknownGPRSReference

##### General description

##### 10.1.xx.1 Error description

This error is used to indicate to the gsmSCF or to gprsSSF that a specific instance, indicated by the GPRS-ReferenceNumber parameter value in the operation, is unknown to the gprsSSF or gsmSCF.

##### Operations gsmSCF→gprsSSF

##### ActivityTestGPRS

- ApplyChargingGPRS
- CancelGPRS
- FurnishChargingInformationGPRS
- RequestReportBCSMEEvent
- SendChargingInformation

##### Operations gprsSSF→gsmSCF

- ApplyChargingReportGPRS
- EventReportGPRSEvent
- EntityReleasedGPRS

#### 10.1.zz OverlappingDialogue

##### General description

##### 10.1.zz.1 Error description

This error is used to indicate to the gsmSCF a specific instance, indicated by the GPRS-ReferenceNumber parameter value in the operation, already has an TCAP dialogue open. This error cause typically is obtained when both the gsmSCF and gprsSSF open a new dialogue at the same time. While the gprsSSF waits for response to an operation send

in TC-BEGIN it may receive an operation from the gsmSCF in TC-BEGIN. In such cases the dialogue opened by the gprsSSF is maintained and the dialogue opened by the gsmSCF is closed with this error code.

### Operations gsmSCF→gprsSSF

- ApplyChargingGPRS
- CancelGPRS
- FurnishChargingInformationGPRS
- ReleaseGPRS
- RequestReportGPRSEvent
- SendChargingInformationGPRS

**** NEXT MODIFIED SECTION ****
---------------------------------

## 11.2 ActivityTestGPRS procedure

### General description

This operation is used to check for the continued existence of a relationship between the gsmSCF and gprsSSF. If the relationship is still in existence, then the identified instance of gprsSSF will respond. If no reply is received within a given time period, then the gsmSCF which sent this operation will assume that the receiving entity has failed in some way and will take the appropriate action. This operation opens a new SS7 dialogue between gsmSCF and gprsSSF.

### Parameters

— ~~None.~~

– GPRS-ReferenceNumber:

This parameter identifies the instance of the gprsSSF. Each gprsSSF instance is uniquely related to a gsmSCF instance in the SCP.

### Responding entity (gprsSSF)

#### Normal procedure

gprsSSF precondition:

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

gprsSSF postcondition:

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

(3) The temporary TC dialogue is closed.

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

### Error handling

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

## 11.5 ApplyChargingGPRS procedure

### General description

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

### Parameters

– GPRS-ReferenceNumber:

This parameter identifies the instance of the gprsSSF. Each gprsSSF instance is uniquely related to a gsmSCF instance in the SCP.

- chargingCharacteristics:

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

- maxTransferredVolume:

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

- maxElapsedTime:

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

- tariffSwitchInterval:

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

- pDPID:

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

### Responding entity (gprsSSF)

#### Normal procedure

gprsSSF preconditions:

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

"Waiting for Instructions"; or

"Monitoring"

SSF postcondition:

- (1) No gprsSSF state transition

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

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

## Error handling

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

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

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



## 11.7 ApplyChargingReportGPRS procedure

### General description

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

### Parameters

– GPRS-ReferenceNumber:

This parameter identifies the instance of the gprsSSF. Each gprsSSF instance is uniquely related to a gsmSCF instance in the SCP.

- ChargingResult:

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

- transferredVolume:

This is a choice of the following parameters:

- volumeIfNoTariffSwitch

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

- volumeIfTariffSwitch

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

- volumeSinceLastTariffSwitch

The volume since the last tariffSwitch is reported.

- volumeTariffSwitchInterval

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

- elapsedTime:

This is a choice of the following parameters:

- timeGPRSIfNoTariffSwitch

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

- timeGPRSIFTariffSwitch
 

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

  - timeGPRSSinceLastTariffSwitch
 

The time since the last tariffSwitch is reported.
  - timeGPRSTariffSwitchInterval
 

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

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

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

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

## Invoking entity (gprsSSF)

### Normal procedure

gprsSSF preconditions:

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

gprsSSF postconditions:

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

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

### Error handling

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

**** NEXT MODIFIED SECTION ****
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## 11.12 CancelGPRS procedure

### General description

The gsmSCF uses this class 21 operation to request the gprsSSF to cancel all outstanding requests for a session or a specific PDP context and enable the state machine in the gprsSSF to go to "Idle" if there are no further PDP contexts pending. The CancelGPRS operation does not specify any specific operation to be cancelled.

### Parameters

– GPRS-ReferenceNumber:

This parameter identifies the instance of the gprsSSF. Each gprsSSF instance is uniquely related to a gsmSCF instance in the SCP.

- allRequests:

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

- pDPID:

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

### Responding entity (gprsSSF)

#### Normal procedure

gprsSSF precondition:

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

gprsSSF postcondition:

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

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

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

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

#### Error handling

~~Sending of return error on cancel is not applicable in the cancel "allRequests" case. Otherwise g~~Generic error handling for the operation related errors is described in Clause 8 and the TCAP services which are used for reporting operation errors are described in Clause 10.

## 11.14 ConnectGPRS procedure

### General description

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

### Parameters

- AccessPointName:

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

- PDPIId:

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

### Responding entity (gprsSSF)

#### Normal procedure

gprsSSF preconditions:

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

gprsSSF postcondition:

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

No implicit activation or deactivation of DPs occurs.

### Error handling

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

## 11.18 ContinueGPRS procedure

### General description

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

### Parameters

- pDPID:

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

### Responding entity (gprsSSF)

#### Normal procedure

gprsSSF precondition:

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

gsmSSF postcondition:

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

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

### Error handling

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

\*\*\*\* NEXT MODIFIED SECTION \*\*\*\*

## 11.21 EntityReleasedGPRS procedure

### General description

This operation is used by the gprsSSF to inform the gsmSCF that a PDP context has terminated abnormally. It is sent if the TC dialogue relationship has to be kept because of other existing PDP context within this GPRS-ReferenceNumber which are not affected by this error/exception. The operation can only be sent within a control relationship and is not allowed in a monitor relationship.

#### Parameters

– GPRS-ReferenceNumber:

This parameter identifies the instance of the gprsSSF. Each gprsSSF instance is uniquely related to a gsmSCF instance in the SCP.

- GPRSCause

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

- pDPID:

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

### Invoking entity (gprsSSF)

#### Normal procedure

gprsSSF preconditions:

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

gprsSSF postcondition:

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

#### Error handling

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

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

## 11.24 EventReportGPRS procedure

### General description

This operation is used to notify the gsmSCF of a GPRS session or PDP context event previously requested by the gsmSCF in a RequestGPRSReportGPRSEvent operation. The monitoring of more than one event could be requested with a RequestReportGPRSEvent operation, but each of these requested events is reported in a separate EventReportGPRS operation.

### Parameters

– GPRS-ReferenceNumber:

This parameter identifies the instance of the gprsSSF. Each gprsSSF instance is uniquely related to a gsmSCF instance in the SCP.

- gPRSEventType:  
This parameter specifies the type of event that is reported.
- gPRSEventSpecificInformation:  
This parameter indicates the session or PDP context related information specific to the event.

For Change of Position it will contain the "newRoutingAreaIdentity", if available.

For Detach and Disconnect it will contain the "initiatingEntity".

For PDP context establishment it will contain the "accessPointName".

For PDP context establishment acknowledge it will contain the "chargingID".

- miscGPRSInfo:  
This parameter indicates DP related information.
  - messageType:  
This parameter indicates whether the message is a request, i.e. resulting from a RequestReportGPRSEvent with "monitorMode" = "interrupted", or a notification, i.e. resulting from a RequestReportGPRSEvent with "monitorMode" = "notifyAndContinue".
- pDPID:  
This parameter if present identifies the PDP context within the control relationship for which the event is reported.

### Invoking entity (gprsSSF)

#### Normal procedure

gprsSSF preconditions:

- (1) The gprsSSF shall be in the state "Monitoring"; or the gprsSSF may be in state "Waiting for Instructions" if the PDP context deactivate or Detach DP is armed and encountered.
- (2) The GPRS session or PDP context SM proceeds to an EDP that is armed.

gprsSSF postconditions:

- (1) The gprsSSF stays in the state "Monitoring" if the message type was notification and there are still EDPs armed that can be met or an ApplyChargingReportGPRS is requested.

- (2) The gprsSSF moves to the state "Idle" if the message type was notification and there are no more EDPs armed, that can be met or no more ApplyChargingReportGPRS is requested or no more PDP contexts pending.
- (3) The gprsSSF moves to the state "Waiting for Instructions" if the message type was request. GPRS session or PDP context processing is interrupted.

If a EDP-R is met that causes the release of a GPRS session or PDP context , all EDPs related to the session including all PDP contexts are disarmed and the event is reported via EventReportGPRS.

## Error handling

In case the message type is request, on expiration of  $T_{SSF}$  before receiving any operation, the gprsSSF aborts the interaction with the gsmSCF and instructs the SGSN to handle the session or PDP context according to the default session and PDP context handling parameters of the valid CSI.

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



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

**** NEXT MODIFIED SECTION ****
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## 11.27 FurnishChargingInformationGPRS procedure

### General description

This operation is used to send charge related information to a logical GPRS record. This logical GPRS record is CAMEL specific. The first GPRS FCI leads to the generation of a logical GPRS record. Receipt of subsequent FCIs shall overwrite or append the contents of the logical record.

### Parameters

– GPRS-ReferenceNumber:

This parameter identifies the instance of the gprsSSF. Each gprsSSF instance is uniquely related to a gsmSCF instance in the SCP.

– FCIGPRSBillingChargingCharacteristics:

This parameter contains the following sub-parameters;

- FCIBCCCAMELsequence1:

This parameter contains the following sub-parameters;

- FreeFormatData

This parameter contains free-format billing and/or charging characteristics.

- AppendFreeFormatData

This parameter indicates that the free-format in the FCI operation shall be appended to the data in the logical GPRS context record.

- PDPIId

This parameter if present, indicates the PDP context's logical call record to which the free format data belongs to.

### Responding entity (gprsSSF)

#### Normal procedure

gprsSSF preconditions:

- 1) gprsSSF State "Waiting for Instructions"

gprsSSF postcondition:

- (1) No FSM state transition.

On receipt of this operation the SSF performs actions to create the GPRS charging record if necessary, and writes the free-format information carried in the operation into the GPRS record. Note that an FCI operation will create a Logical GPRS Data Record (CDR) if such a record does not already exist. Subsequent FCI operations received, will either overwrite or append the data previously written in the free-format CDR field depending on the presence of the IE Append Free Format Data

The Logical CDRs will be associated for a given session or PDP context into one or more physical CDRs, as specified in 3G TS 22.105.

## Error handling

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

**** NEXT MODIFIED SECTION ****
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## 11.30 InitialDPGPRS procedure

### General description

This operation is sent by the gprsSSF after detection of a TDP-R in the GPRS session or PDP context state machine, to request the gsmSCF for instructions to complete the session or PDP context.

### Parameters

- serviceKey:

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

- gPRSEventType:

This parameter indicates the armed GPRS Attach/Detach SM or PDP Context SM DP event, resulting in the InitialDPGPRS operation.

- mSISDN:

MSISDN of the mobile subscriber for which the CAMEL service is invoked. For encoding see 3G TS 29.002 [15].

- iMSI:

IMSI of the mobile subscriber for which the CAMEL service is invoked. For encoding see 3G TS 29.002 [15].

- timeAndTimezone:

This parameter contains the time that the gprsSSF was triggered, and the time zone that the invoking gprsSSF resides in.

- gPRSMSCClass:

This parameter contains the MS Station capabilities of the mobile subscriber for which the CAMEL service is invoked.

- mSNetworkCapabilities

This parameter contains the Network Capabilities for the session.

- mSRadioAccessCapabilities

This parameter contains the Radio Access Capabilities of the MS.

- pDPTType:

This parameter identifies the PDP type and the actual PDP address.

- pDPTTypeOrganization:

This parameter contains the type of PDP address, e.g. ETSI or an IETF type of address. For encoding see GSM 29.060.

- pDPTTypeNumber:

This parameter is the address that the PDP context of the MS for which the CAMEL service is invoked for, that identifies the MS from the external packet data network. For encoding see 3G TS 29.060.

- qualityOfService:

This parameter contains the negotiated quality of service for the PDP current PDP context. For encoding see 3G TS 24.008.

- accessPointName:

This parameter contains the requested address that the MS for which the CAMEL service is invoked for wants to connect to. For encoding see 3G TS 29.060 [X].

- routeingAreaIdentity:

This parameter contains the location information of the MS for which the CAMEL service is invoked from. For encoding see 3G TS 29.060.

- chargingID:

This parameter contains the charging ID that uniquely identifies the PDP context for the MS for which the CAMEL service is invoked from. For encoding see 3G TS 32.015.

- sGSNcapabilities:

This parameter specifies the capabilities which the SGSN node can provide for the CAMEL service control.

- GPRS-ReferenceNumber:

This parameter identifies the instance of the gprsSSF. Each gprsSSF instance is uniquely related to a gsmSCF instance in the SCP.

## Invoking entity (gprsSSF)

### Normal procedure

gprsSSF preconditions:

- 1) An attach or PDP context activation attempt has been initiated and the event was armed as a TDP

gprsSSF postcondition:

- 1) A control relationship has been established and the gprsSSF is in state "waiting for instructions".

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

The gprsSSF shall memorise the address of the response message and use it in the future TCAP dialogues.

A control relationship is established to the gsmSCF. The gprsSSF application timer  $T_{SSF}$  is set when the gprsSSF sends InitialDPGPRS for requesting instructions from the gsmSCF. It is used to prevent from excessive session or PDP context duration or volume usage.

### Error handling

If the destination gsmSCF is not accessible then the gprsSSF instructs the SGSN to handle the session or PDP context according to the Default session or PDP context handling parameter of the valid CSI.

On expiration of  $T_{SSF}$  before receiving any operation, the gprsSSF aborts the interaction with the gsmSCF and instructs the SGSN to handle the call according to the Default session or PDP context handling parameter of the valid CSI.

If the MS abandons the establishment of a session or PDP context after the sending of InitialGPRSEvent, then the gprsSSF aborts the control relationship after the first response from the gsmSCF has been received.

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

\*\*\*\* NEXT MODIFIED SECTION \*\*\*\*

## 11.35 ReleaseGPRS procedure

### General description

This operation is used to tear down by the gsmSCF an existing GPRS session or PDP context at any phase. The operation can only be sent within a control relationship and is not allowed in a monitor relationship.

### Parameters

– GPRS-ReferenceNumber:

This parameter identifies the instance of the gprsSSF. Each gprsSSF instance is uniquely related to a gsmSCF instance in the SCP.

- GPRSCause

A number giving an indication to the gprsSSF about the reason of releasing the session or a specific PDP context. This may be used by gprsSSF for generating specific indications to the MS or to fill in the "cause" in the release message.

- pDPID:

This parameter if present identifies the PDP context within the control relationship for which the processing shall be released.

### Responding entity (gprsSSF)

#### Normal procedure

gprsSSF preconditions:

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

gprsSSF postcondition:

- 1) "Idle", after sending any outstanding ApplyGPRSChargingReport and no more PDP contexts are pending. Possible armed EDPs are ignored. All connections and resources related to the session or PDP context for the corresponding pDPID are released.

#### Error handling

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

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

## 11.38 RequestReportGPRSEvent procedure

### General description

This operation is used to request the gprsSSF to monitor for a session or PDP context related event (e.g., events such as PDP context establishment or detach), then send a notification back to the gsmSCF when the event is detected.

### Parameters

– GPRS-ReferenceNumber:

This parameter identifies the instance of the gprsSSF. Each gprsSSF instance is uniquely related to a gsmSCF instance in the SCP.

- gPRSEvent:

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

- gPRSEventType:

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

- monitorMode:

This parameter indicates how the event should be reported. When the "monitorMode" is "interrupted", the event shall be reported as a request, if the "monitorMode" is "notifyAndContinue", the event shall be reported as a notification, if the "monitorMode" is "transparent", the event shall not be reported.

- pDPID:

This parameter if present identifies the PDP context within the control relationship for which the event reporting is requested.

### Responding entity (gprsSSF)

#### Normal procedure

gprsSSF precondition:

- 1) A control relationship exists between the gprsSSF and the gsmSCF.
- 2) The gprsSSF is in either the state "Waiting for Instructions" or the state "Monitoring".

NOTE: In state "monitoring" only requests to disarm detection points (with MonitorMode set to "Transparent") or send notifications of events (with MonitorMode set to "NotifyAndContinue") shall be accepted.

gprsSSF postconditions:

- 1) The requested EDPs have been armed as indicated.
- 2) Previously requested events are monitored until ended by a transparent monitor mode, until the end of the session or PDP context or until the EDPs are detected.
- 3) The gprsSSF remains in the same state, unless all EDPs have been disarmed and no more ApplyChargingReportGPRS has been requested. If no more PDP contexts are pending the gprsSSF moves to the state "Idle".

## Error handling

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



\*\*\*\* NEXT MODIFIED SECTION \*\*\*\*

## 11.41 ResetTimerGPRS procedure

### General description

This class 2 operation is used by the gsmSCF to refresh the  $T_{SSF}$  application timer, in order to avoid the  $T_{SSF}$  time-out at the gprsSSF.

### Parameters

- timerValue:  
This parameter specifies the value to which the  $T_{SSF}$  timer is to be set.
- timerID:  
This parameter has a default value identifying the  $T_{SSF}$  timer.
- pDPID:  
This parameter if present specifies the identifier of a PDP context within a control relationship.

### Responding entity (gprsSSF)

#### Normal procedure

gprsSSF preconditions:

- 1) Session or PDP context establishment attempt has been initiated.
- 2) Session or PDP context processing has been suspended at a DP.
- 3) The gprsSSF is in the "Waiting for Instruction" state.

gprsSSF postconditions:

- 1) The  $T_{SSF}$  timer has been reset.
- 2) The gprsSSF remains in the same state.

#### Error handling

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

\*\*\*\* NEXT MODIFIED SECTION \*\*\*\*

## 11.44 SendChargingInformationGPRS Procedure

This operation is used to instruct the gprsSSF on the advice of charge information to be sent by the gprsSSF, provided the SGSN supports Advice Of Charge. The operation may be invoked on multiple occasions.

### Parameters

– GPRS-ReferenceNumber:

This parameter identifies the instance of the gprsSSF. Each gprsSSF instance is uniquely related to a gsmSCF instance in the SCP.

- SCIGPRSBillingChargingCharacteristics:

This parameter contains the Advice of Charge information:

- aOCGPRS:

This parameter specifies the Advice of Charge information that shall be forwarded to the MS. It may contain one or more of the following parameters:

- aOCInitial:

This is a set of GSM Charge Advice Information elements, as defined in 3G TS 22.024. These CAI elements are sent by the gprsSSF to the MS when an Activate PDP Context Accept or Attach Accept is sent to MS and a tariff switch has not yet occurred. It may also be sent at any other time e.g. upon change of QoS or RAI.

- aOCSubsequent:

This parameter may indicate the following information:

- CAIElements

This is a set of GSM Charge Advice Information elements, as defined in 3G TS 22.024. These CAI elements are sent to the MS when an Activate PDP Context Accept or Attach Accept is detected and a tariff switch has occurred previously, or when Activate PDP Context Accept or Attach Accept has previously been detected and a tariff switch occurs.

- tariffSwitchInterval:

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

### Responding Entity (gprsSSF)

#### Normal Procedure

gprsSSF preconditions:

A control relationship exist between the gprsSSF and the gsmSCF.

The gprsSSF FSM is in state “Waiting for Instructions” or in state “Monitoring”.

gprsSSF postconditions:

No state transition.

On receipt of this operation the gprsSSF performs actions to send the advice of charge information to the MS, provided Advice Of Charge is supported by the SGSN.

If advice of charge is to be provided to a GSM MS in conjunction with CSE control of session or PDP context duration or volume, then the following sequence of operations shall be sent from the gsmSCF to the gprsSSF in the following order and in the same TCAP TC-CONTINUE or TC-BEGIN component:

ApplyChargingGPRS; SendChargingInformationGPRS.

These operations will be processed sequentially by the gprsSSF, in the order that they are sent by the gsmSCF. Note also that in this case parameter TariffSwitchInterval may be present in either in the ApplyChargingGPRS operation or the SendChargingInformationGPRS operation, but not in both operations. It is recommended that it shall be transported in the ApplyGPRSCharging operation.

The TariffSwitchInterval information received with either of these operations shall set the same tariff switch timer in the gprsSSF, and this duration timer shall run from the time of successful operation execution.

## Error handling

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

- a tariffSwitchInterval is indicated when a previously received tariffSwitchInterval is pending.

Generic error handling for the operation related errors is described in Clause 13 and the TCAP services which are used for reporting operation errors are described in Clause 15.

\*\*\*\* NEXT MODIFIED SECTION \*\*\*\*

12.1.2 gsmSSF-gsmSCF and ~~gprsSSF-gsmSCF~~ interfaces

\*\*\*\* NEXT MODIFIED SECTION \*\*\*\*

## 12.1.x gprsSSF-gsmSCF interface

### 12.1.x.1 Normal procedures

#### 12.1.x.1.1 TC-dialogues and relationships

A *relationship* exists between gprsSSF and gsmSCF if at least one of the following conditions is fulfilled:

- There is at least one EDP armed.
- At least one report is pending.
- gprsSSF is in a TDP or EDP in state WaitingForInstructions.

The gprsSSF and gsmSCF *relationship* can consist of multiple *TC-dialogues*. The TC-dialogues are closed and (re)opened whenever necessary.

#### 12.1.x.1.2 gprsSSF-to-gsmSCF messages

This subclause defines the normal procedures for TC messages from the gprsSSF to the gsmSCF.

##### *gsmSSF-FSM related messages*

A dialogue shall be established for the first time when the gprsSSF moves from the state **Idle** to the state **Active**. The InitialDPGPRS operation shall be transmitted in the same message. The gprsSSF may initiate the dialogue with the following operations:

- ApplyChargingReportGPRS
- EntityReleasedGPRS
- EventReportGPRS
- InitialDPGPRS

The gprsSSF shall memorise the gsmSCF address from the InitialDPGPRS response, and use it in the further dialogues. The gsmSCF shall memorise the gprsSSF address received along with the InitialDPGPRS, and use it in the further dialogues. The gsmSCF may open a dialogue with the following CAP operations:

- ActivityTestGPRS
- ApplyChargingGPRS
- CancelGPRS
- FurnishChargingInformationGPRS
- ReleaseGPRS
- RequestReportGPRSEvent
  
- SendChargingInformationGPRS

The CAP operation that opens a dialogue shall be sent with a TC-BEGIN request primitive.

The dialogue shall be closed for the idle periods, i.e. in the end of a DP, in the end end of a GPRS session or PDB context. Each *dialogue* shall be terminated by using basic end. Similarly each *relationship* may be terminated in a pre-arranged way or explicitly by using EntityReleasedGPRS operation. The following operations can cause pre-arranged end of the *relationship*:

- ContinueGPRS
- ConnectGPRS
- ApplyChargingReportGPRS
- EntityReleasedGPRS
- EventReportGPRS (EDP-N).
- CancelGPRS
- ReleaseGPRS
- RequestReportGPRSEvent (disarming of DPs)

When the gprsSSF makes a non-error case state transition to the state **Idle** and there is one or more pending operation and TCAP dialogue is established, TCAP dialogue may be terminated by TC-END primitive with zero component(s) after all pending operations have been sent. When the gsmSSF sends the last EventReportGPRS or ApplyChargingReportGPRS the relationship may be ended from the gprsSSF by a TC-END request primitive with basic end.

In the case that there is no pending operation, result nor error, and TCAP dialogue is established, TCAP dialogue shall be terminated by TC-END primitive with zero component.

In the case where a PDP context release or detach is initiated by any other entity than an gsmSCF, the gprsSSF shall end a relationship with the EntityReleasedGPRS operation if the gprsSSF has no armed DP to report nor pending ApplyChargingReportGPRS which should be reported.

When the gprsSSF has sent the last EventReportGPRS or ApplyChargingReportGPRS the relationship may be ended from the gsmSCF by a TC-END request primitive with basic end.

In the case of overlapping dialogues for the same relationship the gsmSCF opened dialogue is closed by the gprsSSF with an error code as specified in clause 10.

#### SSME-FSM related messages

The following procedures shall be followed:

- The dialogue shall be ended with basic end when the ActivityTestGPRS Return Result is sent.

#### 12.1.x.1.3 gsmSCF-to-gprsSSF messages

This subclause defines the normal procedures for TC messages from the gsmSCF to the gprsSSF.

In the case that there is no pending operation, result nor error, and TCAP dialogue is established, TCAP dialogue shall be terminated by TC-END primitive with zero components, or by packing a CAP operation, result or error into the TC-END.

In the case of overlapping dialogues for the same relationship the gsmSCF opened dialogue is closed by the gprsSSF with an error code as specified in clause 10. The gsmSCF shall first respond normally to the operations sent by the gprsSSF, and then decide on the further actions.

#### SCME-FSM related messages

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

- A new dialogue dialogue is established when the ActivityTestGPRS operation is sent.