

Agenda item:**Source: TSG_N WG2****Title: CRs to 3G TS 23.008, 23.016, 23.018, 23.079, 29.002 (Work Item CAMEL Phase 3)**

Introduction:

This document contains **5** CRs on **Work Item CAMEL Phase 3** agreed by **TSG_N WG2** and forwarded to **TSG_N Plenary** meeting #6 for approval.

TDoc	Spec	CR	Rev	Ph.	Cat	Old v.	New v.	Subject
N2-99L21	23.008	010	1	R99	C	3.1.0	3.2.0	Combined CR to 23.008
N2-99L18	23.016	008	1	R99	B	3.2.1	3.3.0	Introduction of CAMEL phase 3
N2-99L16	23.018	027	3	R99	C	3.2.0	3.3.0	Introduction of CAMEL Phase 3
N2-99L05	23.079	008		R99	C	3.2.0	3.3.0	Introduction of CAMEL Phase 3
N2-99L20	29.002	073	1	R99	C	3.2.0	3.3.0	Introduction of CAMEL Phase 3 in 3G TS 29.002

2.14 Data related to CAMEL

2.14.1 Subscriber Data stored in HLR

2.14.1.1 Originating CAMEL Subscription Information (O-CSI)

This data defines the contents of the Originating CAMEL subscription information used to interwork with the gsmSCF for MO and MF call. It consists of:

1. A TDP list: DP Collected_Info, DP Route_Select_Failure are possible
2. A gsmSCF address. It is the gsmSCF address (E164 number) where the CAMEL service is treated for the subscriber. A gsmSCF address is associated to each serviceKey.
3. A serviceKey. The serviceKey identifies to the gsmSCF the service logic. A serviceKey is associated to each TDP.
4. A default Call Handling. The default call handling indicates whether the call shall be released or continued as requested in case of error in the gsmSSF to gsmSCF dialogue. A default Call Handling is associated to each serviceKey.
5. DP criteria: The DP criteria indicates on which criteria the gsmSSF shall access the gsmSCF
6. CAMEL capability handling. It gives the CAMEL phase associated to the O-CSI (CAMEL phase1, phase2, or phase3).
7. The CSI state, the CSI state activation flag indicates whether the O-CSI is active or not.
8. The notification flag, the notification flag indicates whether the changes of the O-CSI shall trigger Notification on Change of Subscriber Data..
9. The notification on change of subscriber data flag: this flag indicates whether the notification on change of subscriber data shall be sent to the gsmSCF.

TDP	Triggering Criteria (*)	ServiceKey	gsmSCF address	Default Call Handling	Activation flag CSI state	Notification flag	Net flag
DP Collected_ Info	<ul style="list-style-type: none"> No Criteria Number criteria Basic service code criteria Call type criteria 	One ServiceKey	One E164 gsmSCF address	One Default call handling	<u>set/reset active/inactive</u>	<u>set/reset</u>	<u>set/set</u>
DP Route_Select_Failure	<ul style="list-style-type: none"> No criteria Causes values criteria 	One ServiceKey	One <u>E164</u> gsmSCF address	One Default call handling	<u>set/reset active/inactive</u>	<u>set/reset</u>	<u>set/set</u>

(*) One or more TDP criteria shall be applicable. All applicable triggering criteria must be satisfied before the dialogue is established with the gsmSCF.

Editor's note : CAMEL capability handling. It was decided to have an unique CAMEL Capability handling per CSI to make easier the decision check in the HLR. This solution has the disadvantage to not be any more compatible with 09.02 MAP V3 used in CAMEL phase2.

Editor's note: What are the MAP/SUP causes values for the unsuccessful TDP's ?

2.14.1.2 Terminating CAMEL Subscription Information (T-CSI) and VMSC Terminating CAMEL Subscription Information (VT-CSI);

This data defines the contents of the terminating CAMEL subscription information used to interwork with the gsmSCF for MT call. It consists of:

1. A TDP list. DP Terminating_Attempt_Authorised, DP T_Busy, DP T_No_Answer
2. A gsmSCF address. It is the gsmSCF address (E164 number) where the CAMEL service is treated for the subscriber. A gsmSCF address is associated to each serviceKey.
3. A serviceKey. The serviceKey identifies to the gsmSCF the service logic. A serviceKey is associated to each TDP.
4. A default Call Handling. The default call handling indicates whether the call shall be released or continued as requested in case of error in the gsmSSF to gsmSCF dialogue. A default Call Handling is associated to each serviceKey.
5. DP criteria: The DP criteria indicates on which criteria the gsmSSF shall access the gsmSCF
6. CAMEL capability handling. It gives the CAMEL phase associated to the T-CSI/VT-CSI (CAMEL phase1, or phase2, or phase3).
 - The CSI state activation flag indicates whether the T-CSI/VT-CSI is active or not.
 - Notification flag, the notification flag indicates whether the change of the T-CSI/VT-CSI shall trigger Notification on Change of Subscriber data.
 - The notification on change of subscriber data flag: this flag indicates whether the notification on change of subscriber data shall be sent to the gsmSCF.

TDP	Triggerring Criteria	ServiceKey	gsmSCF address	Default Call Handling	Activ ation flag CSI state	Notifi- cation flag	Notify flag
DP Terminating_Attempt_Authorised	<ul style="list-style-type: none"> • No Criteria • Basic service criteria 	One serviceKey	One E164 gsmSCF address	One Default call handling	active /inacti ve	set/reset	set/res et
DP T_Busy	<ul style="list-style-type: none"> • No criteria • Causes values criteria 	One serviceKey	One E164 gsmSCF address	One Default call handling	set/re set	set/reset	set/res et
DP T_No_Answer	<ul style="list-style-type: none"> • No criteria • Causes values criteria 	One service Key	One gsmSCF address	One Default call handling	set/re set	set/reset	

Editor's note: What are the MAP/ISUP causes values for the unsuccessful TDP's ?

(*) One or more DP criteria shall be applicable. All applicable triggergerring criteria must be satisfied before the dialogue is established with the gsmSCF.

2.14.1.3 Location information/Subscriber state interrogation.

This data item indicates whether or not the HLR shall send the location information and state of the called subscriber , as available, when a GMSC requests routeing information for an MT call.~~additional-subscriber information shall be sent to the GMSC for MT call. It consists of an indication that the HLR shall send the location information of the called subscriber.~~
~~an indication that the HLR shall send the subscriber state of the called subscriber.~~

2.14.1.4 USSD CAMEL subscription information(U-CSI)

This data is used on USSD request receipt from the MS. It consists of a list of:

- service code. The service code defines a specific application in the gsmSCF;
- gsmSCFAddress. It is the gsmSCF address (E164 number) where the USSD application is treated for this subscriber

2.14.1.5 Supplementary Service invocation notification(SS-CSI)

This data is used to notify the gsmSCF about Supplementary service invocation. It consists of :

- notification criteria, which may be a list of Supplementary service(s). The possible Supplementary services are: ECT, CD or MPTY, CCBS
- gsmSCFaddress. It is the gsmSCF address (E164 number) where the notification of the Supplementary service invocation is treated for this subscriber
- CSI state,activation flag indicates whether the SS-CSI is active or not
- Notification flag, it indicates whether the change of the SS-CSI shall trigger Notification on Change of Subscriber data.

The notification on change of subscriber data flag: this flag indicates whether the notification on change of subscriber data shall be sent to the gsmSCF.

2.14.1.6 Translation Information flags (TIF-CSI)

- This flag is used to indicate that the HLR shall not attempt to perform any actions on the FTN (translation, prohibited FTN checks, call barring checks) at the registration procedure.
- Notification flag, the notification flag indicates whether the change of the ~~TCSI/VT-CSI~~-TIF-CSI shall trigger Notification on Change of Subscriber data.

2.14.1.A Mobility Management event notification (M-CSI)

This data indicates which Mobility Management events shall be reported to the gsmSCF. It consists of:

- gsmSCF address : This is the address of the gsmSCF where the Mobility Management event notification shall be sent to. The gsmSCF address must be in E.164 format.
- Service Key: The service key is included in the notification to the gsmSCF and indicates to the gsmSCF which Service Logic shall be applied.
- Mobility Management Triggers : These triggers define which Mobility Managements events shall be reported to the gsmSCF. The mobility managements triggers may contain one or any combination of the following elements:

- Location update in the same VLR service area
- Location update to another VLR service area
- IMSI attach
- MS initiated IMSI detach (explicit detach)
- Network initiated IMSI detach (implicit detach)

- The ~~CSI~~ state ,activation flag indicates whether the ~~M-CSI/T-CSI/VT-CSI~~ is active or not.
- Notification flag, the notification flag indicates whether the change of the ~~M-CSI/T-CSI/VT-CSI~~ shall trigger Notification on Change of Subscriber data.
- The notification on change of subscriber data flag: this flag indicates whether the notification on change of subscriber data shall be sent to the gsmSCF.

2.14.1.B Short Message Service CAMEL Subscription Information (SMS-CSI)

This data defines the contents of the SMS CAMEL subscription information. The SMS CAMEL Subscription Information is used for the following interworking:

- Interworking between gsmSCF and gsmSSF, for CAMEL control of circuit switched MO SMS

- Interworking between gsmSCF and gprsSSF, for CAMEL control of packet switched MO SMS

SMS-CSI consists of the following data items:

- TDP List. The TDP list is a list of SMS TDP descriptions. Each TDP description contains the following elements:
 - DP Value. The DP value identifies the DP in the MO SMS State Model where service triggering may take place.
For SMS-CSI, the only allowed DP value is *SMS_Collected_Info*.
 - gsmSCF Address. The gsmSCF address is the address (E164 number) of the gsmSCF where the MO SMS CAMEL Service associated with this TDP, is located for this subscriber.
 - Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.
 - Default SMS handling. The default SMS handling indicates whether the MO SMS submission request shall be rejected or continued in the case of error in the dialogue between the gprsSSF and gsmSCF or between the gprsSSF and gsmSCF;
- CAMEL Capability Handling. CAMEL Capability Handling indicates the CAMEL Phase that is required for the MO SMS service. The CAMEL Capability Handling for SMS-CSI shall have the value CAMEL phase 3.
- CSI state: activation flag indicates whether the SMS-CSI is active or not.
- Notification flag indicates whether the change of the SMS-CSI shall trigger Notification on change of subscriber Data or not.

2.14.1.C GPRS CAMEL Subscription Information (GPRS-CSI)

This data defines the contents of the GPRS CAMEL subscription information. The GPRS CAMEL Subscription Information is used for the following interworking:

- Interworking between gsmSCF and gprsSSF, for CAMEL control of packet switch call

GPRS-CSI consists of the following data items:

- TDP List. The TDP list is a list of GPRS TDP descriptions. Each TDP description contains the following elements:
 - DP Value. The DP value identifies the DP in the GPRS State Model where service triggering may take place.
 - gsmSCF Address. The gsmSCF address is the address (E164 number) of the gsmSCF where the GPRS CAMEL Service associated with this TDP, is located for this subscriber.
 - Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.
 - Default GPRS handling. The default GPRS handling indicates whether the GPRS submission request shall be rejected or continued in the case of error in the dialogue between the gprsSSF and gsmSCF.
- CAMEL Capability Handling. CAMEL Capability Handling indicates the CAMEL Phase that is required for the GPRS service. The CAMEL Capability Handling for GPRS-CSI shall have the value CAMEL phase 3.
- The CSI state activation flag indicates whether the GPRS-CSI is active or not.
- The notification flag indicates whether the change of the GPRS-CSI shall trigger Notification on change of subscriber Data or not.

2.14.1.D Dialed service CAMEL Subscription Information (D-CSI)

This data defines the contents of the Roaming dialed service CAMEL subscription information used to interwork with the gsmSCF for MO and MF call. It is applicable at TDP Analysed_Info. It consists of:

1. DP Criteria list: This consists of 1 to 10 entries containing:
 2. DP Criterion: It indicates when the gsmSSF shall request gsmSCF for instructions.
 3. A gsmSCF address. It is the gsmSCF address (E164 number) where this Subscribed Dialed CAMEL service is treated for the subscriber. A gsmSCF address is associated to each DP Criterion.
 4. A serviceKey. The serviceKey identifies to the gsmSCF the service logic. A serviceKey is associated to each DP Criterion.
 5. A default Call Handling. It indicates whether the call shall be released or continued as requested in case of error in the gsmSSF to gsmSCF dialogue. A default Call Handling is associated to each DP Criterion.
 6. CAMEL capability handling. It indicates the CAMEL phase associated to the D-CSI (CAMEL phase3 shall be indicated).
 7. CSI state : Activation Flag: It indicates whether the D-CSI is active or not.
 8. Notification Flag: It indicates whether the change of the D-CSI shall trigger the Notification on Change of Subscriber Data.
- The notification on change of subscriber data flag: this flag indicates whether the notification on change of subscriber data shall be sent to the gsmSCF.

2.14.2 Other Data stored in HLR

The following additional CAMEL related data shall be stored in the HLR:

- ~~Negotiated with VLR CAMEL Capability Handling~~
It is temporary data, stored conditionally in the HLR. It identifies the CAMEL phase that was negotiated between the HLR and the VLR at the time of GSM location update.
- ~~Negotiated with SGSN CAMEL Capability Handling~~
It is temporary data, stored conditionally in the HLR. It identifies the CAMEL Phase that was negotiated between the HLR and SGSN at the time of GPRS location update.

~~A negotiated capability handling is associated to each CAMEL capability handling.~~

~~The CAMEL related data, except for the Negotiated with VLR CAMEL Capability Handling and the Negotiated with SGSN CAMEL Capability Handling, is permanent subscriber data. It is stored conditionally in HLR.~~

2.14.2.1 Negotiated CAMEL Capability Handling

The HLR shall have a set of negotiated CAMEL Capability Handling variables. Each CSI that may be downloaded to the VLR or to the SGSN shall have a negotiated CAMEL Capability Handling (CCH) variable associated with it.

The negotiated CCH variable for a CSI indicates what CAMEL Phase is indicated in that CSI in the VLR or SGSN.

When the negotiated CCH variable has a value NULL, it indicates that that CSI has not been downloaded to the VLR or SGSN.

The following table shows the negotiated CAMEL Capability Handling variables.

<u>Variable name</u>	<u>Associated CSI</u>	<u>CSI stored in</u>	<u>Permissible values for negotiated CCH</u>
<u>O-CSI Negotiated CAMEL Capability Handling</u>	<u>O-CSI</u>	<u>VLR</u>	<u>NULL, 1, 2, 3</u>
<u>SS-CSI Negotiated CAMEL Capability Handling</u>	<u>SS-CSI</u>	<u>VLR</u>	<u>NULL, 2, 3</u>
<u>VT-CSI Negotiated CAMEL Capability Handling</u>	<u>VT-CSI</u>	<u>VLR</u>	<u>NULL, 3</u>
<u>SMS-CSI VLR Negotiated CAMEL Capability Handling</u>	<u>SMS-CSI</u>	<u>VLR</u>	<u>NULL, 3</u>
<u>M-CSI Negotiated CAMEL Capability Handling</u>	<u>M-CSI</u>	<u>VLR</u>	<u>NULL, 3</u>
<u>SMS-CSI SGSN Negotiated CAMEL Capability Handling</u>	<u>SMS-CSI</u>	<u>SGSN</u>	<u>NULL, 3</u>
<u>GPRS-CSI Negotiated CAMEL Capability Handling</u>	<u>GPRS-CSI</u>	<u>SGSN</u>	<u>NULL, 3</u>

There is no negotiated CAMEL Capability Handling variable associated with TIF-CSI.

The HLR does not store a Negotiated CAMEL Capability Handling for CSIs that are sent to the GMSC, since a subscriber is not permanently registered at a GMSC.

2.14.2.2 Supported CAMEL Phases

The HLR shall store the supported CAMEL Phases of the VLR where the subscriber is currently registered and the SGSN where the subscriber is currently attached.

The following variables are required:

- VLR Supported CAMEL Phases
- SGSN Supported CAMEL Phases

The HLR does not store the Supported CAMEL Phases of the GMSC, since a subscriber is not permanently registered at a GMSC.

2.14.2.3 UG-CSI

The USSD general CAMEL service(UG-CSI) is also stored in the HLR. This data is used on USSD request receipt from the MS. It consists of a list of:

- a service code. The service code defines a specific application in the gsmSCF;
- a gsmSCFaddress. It is the gsmSCF address (E164 number) where the USSD application is treated for this subscriber

2.14.3 Subscriber data stored in VLR

2.14.3.1 Originating CAMEL Subscription Information (O-CSI)

The Originating CAMEL Subscription Information (O-CSI) are stored in the VLR:

This data defines the contents of the originating CAMEL subscription information used to interwork with the gsmSCF for MO and CF call. It consists of:

1. A TDP list: DP Collected_Info, DP Route_Selection_Failure are possible
2. A gsmSCF address. It is the gsmSCF address (E164 number) where the CAMEL service is treated for the subscriber. A gsmSCF address is associated to each serviceKey.
3. A serviceKey. The serviceKey identifies to the gsmSCF the service logic.. A serviceKey is associated to each TDP.
4. A default Call Handling. The default call handling indicates whether the call shall be released or continued as requested in case of error in the gsmSSF to gsmSCF dialogue. A default Call Handling is associated to each serviceKey.
5. DP criteria: The DP criteria indicates on which criteria the gsmSSF shall access the gsmSCF
6. CAMEL capability handling. It gives the CAMEL phase associated to the O-CSI (CAMEL phase1, or phase2, or phase3).

2.14.3.2 VMSC Terminating CAMEL Subscription Information (VT-CSI)

This data defines the contents of the visited terminating CAMEL subscription information used by the VMSC to interwork with the gsmSCF for an MT call. It consists of:

1. A TDP list. DP Terminating_Attempt_Authorised, DP T_Busy, DP T_No_Answer
2. A gsmSCF address. It is the gsmSCF address (E164 number) where the CAMEL service is treated for the subscriber. A gsmSCF address is associated to each serviceKey.
3. A serviceKey. The serviceKey identifies to the gsmSCF the service logic. A serviceKey is associated to each TDP.
4. A default Call Handling. The default call handling indicates whether the call shall be released or continued as requested in case of error in the gsmSSF to gsmSCF dialogue. A default Call Handling is associated to each serviceKey.
5. DP criteria: The DP criteria indicates on which criteria the gsmSSF shall access the gsmSCF
6. CAMEL capability handling. It gives the CAMEL phase associated to the VT-CSI(CAMEL phase1, or phase2, or CAMEL phase3).

2.14.3.3 Supplementary Service invocation notification(SS-CSI)

This data is used to notify the gsmSCF about Supplementary service invocation. It consists of :

- a notification criteria, which may be ECT, CD or MPTY
- a gsmSCFaddress. It is the gsmSCF address (E164 number) where the notification of the Supplementary service invocation is treated for this subscriber

2.14.3.A Mobility Management event notification (M-CSI)

This data indicates which Mobility Management events shall be reported to the gsmSCF. It consists of:

- gsmSCF address : This is the address of the gsmSCF where the Mobility Management event notification shall be sent to. The gsmSCF address must be in E.164 format.
- Service Key: The service key is included in the notification to the gsmSCF and indicates to the gsmSCF which Service Logic shall be applied.
- Mobility Management Triggers : These triggers define which Mobility Managements events shall be reported to the gsmSCF. The mobility managements triggers may contain one or any combination of the following elements:
 - Location update in the same VLR service area
 - Location update to another VLR service area
 - IMSI attach
 - MS initiated IMSI detach (explicit detach)
 - Network initiated IMSI detach (implicit detach)

2.14.3.B Short Message Service CAMEL Subscription Information (SMS-CSI)

This data defines the contents of the SMS CAMEL subscription information. The SMS CAMEL Subscription Information is used for the following interworking:

- Interworking between gsmSCF and gsmSSF, for CAMEL control of circuit switched MO SMS

SMS-CSI consists of the following data items:

- TDP List. The TDP list is a list of SMS TDP descriptions. Each TDP description contains the following elements:
 - DP Value. The DP value identifies the DP in the MO SMS State Model where service triggering may take place.
For SMS-CSI, the only allowed DP value is *SMS_Collected_Info*.
 - gsmSCF Address. The gsmSCF address is the address (E164 number) of the gsmSCF where the MO SMS CAMEL Service associated with this TDP, is located for this subscriber.
 - Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.
 - Default SMS handling. The default SMS handling indicates whether the MO SMS submission request shall be rejected or continued in the case of error in the dialogue between the gsmSSF and gsmSCF or between the gprsSSF and gsmSCF;
- CAMEL Capability Handling. CAMEL Capability Handling indicates the CAMEL Phase that is required for the MO SMS service.
The CAMEL Capability Handling for SMS-CSI shall have the value CAMEL phase 3.

2.14.3.C Dialed service CAMEL Subscription Information (D-CSI)

This data defines the contents of the **Roaming dialed service** CAMEL subscription information used to interwork with the gsmSCF for MO and MF call. It is applicable at TDP Analysed Info. It consists of:

DP Criteria list: This consists of 1 to 10 entries containing:

- DP Criteria list, this consists of 1 to 10 entries containing : DP Criterion: It indicates when the gsmSSF shall request gsmSCF for instructions.
- A gsmSCF address. It is the gsmSCF address (E164 number) where this Subscribed Dialed CAMEL service is treated for the subscriber. A gsmSCF address is associated to each DP Criterion.
- A serviceKey. The serviceKey identifies to the gsmSCF the service logic. A serviceKey is associated to each DP Criterion.
- A default Call Handling. It indicates whether the call shall be released or continued as requested in case of error in the gsmSSF to gsmSCF dialogue. A default Call Handling is associated to each DP Criterion.
- CAMEL capability handling. It indicates the CAMEL phase associated to the D-CSI (CAMEL phase3 shall be indicated).

2.14.3.D Translation Information flag (TIF-CSI)

This flag is used to indicate that the VLR shall not attempt to perform any actions on the **deflected to number (DFTN)** (translation, prohibited FTN checks, call barring checks) at call deflection time.

2.14.A Data stored in SGSN

2.14.A.1 Short Message Service CAMEL Subscription Information (SMS-CSI)

This data defines the contents of the SMS CAMEL subscription information. The SMS-CSI in SGSN is used for the Interworking between SGSN and gsmSCF, for CAMEL control of packet switched MO SMS. SMS-CSI consists of the following data items:

- TDP List. The TDP list is a list of SMS TDP descriptions. Each TDP description contains the following elements:
 - DP Value. The DP value identifies the DP in the MO SMS State Model where service triggering may take place.
For SMS-CSI, the only allowed DP value is *SMS_Collected_Info*.
 - gsmSCF Address. The gsmSCF address is the address (E164 number) of the gsmSCF where the MO SMS CAMEL Service associated with this TDP, is located for this subscriber.
 - Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.
 - Default SMS handling. The default SMS handling indicates whether the MO SMS submission request shall be rejected or continued in the case of error in the dialogue between the gprsSSF and gsmSCF.
- CAMEL Capability Handling. CAMEL Capability Handling indicates the CAMEL Phase that is required for the MO SMS service.
The CAMEL Capability Handling for SMS-CSI in SGSN shall have the value CAMEL phase 3.

2.14.A.2 GPRS CAMEL Subscription Information (GPRS-CSI)

This data defines the contents of the GPRS CAMEL subscription information. The GPRS CAMEL Subscription Information is used for the following interworking:

- Interworking between gsmSCF and gprsSSF, for CAMEL control of packet switch call
- GPRS-CSI consists of the following data items:

- TDP List. The TDP list is a list of GPRS TDP descriptions. Each TDP description contains the following elements:
 - DP Value. The DP value identifies the DP in the GPRS State Model where service triggering may take place.
 - gsmSCF Address. The gsmSCF address is the address (E164 number) of the gsmSCF where the GPRS CAMEL Service associated with this TDP, is located for this subscriber.
 - Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.
 - Default GPRS handling. The default GPRS handling indicates whether the GPRS submission request shall be rejected or continued in the case of error in the dialogue between the gprsSSF and gsmSCF.
- CAMEL Capability Handling. CAMEL Capability Handling indicates the CAMEL Phase that is required for the GPRS service. The CAMEL Capability Handling for GPRS-CSI in SGSN shall have the value CAMEL phase 3.

Table 1: Overview of data stored for non-GPRS Network Access Mode

PARAMETER	SUB CLAUSE	HLR	VLR	TYPE
...				
Originating CAMEL Subscription Information (O-CSI)	2.14.1.1/3.1	C	C	P
Dialled Roaming service CAMEL Subscription Information (D-CSI)	2.14.1.D/3.C	C	C	P
Terminating CAMEL Subscription Information (T-CSI)	2.14.1.2	C	-	P
VMSC Terminating CAMEL Subscription Information (VT-CSI)	2.14.1.2/3.2	C	C	P
Location Information/Subscriber state Information	2.14.1.3	C	-	P
USSD CAMEL subscription information(U-CSI)	2.14.1.4	C	-	P
SS invocation notification (SS-CSI)	2.14.1.5/3.3	C	C	P
FTN translation information flag(TIF-CSI)	2.14.1.6/3.D	C	C-	P
Mobility Management event notification(M-CSI)	2.14.1.A/3.A	C	C-	P
Short Message Service CAMEL Subscription Information (SMS-CSI)	2.14.1.B/3.B	C	C-	P
USSD General CAMEL service information (UG—CSI)	2.14.2.3	C	-	P
Negotiated with VLR CAMEL Capability Handling	2.14.2	C	-	T
O-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C	-	P
SS-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C	-	P
VT-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C	-	P
SMS-CSI VLR Negotiated CAMEL Capability Handling	2.14.2.1	C	-	P
M-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C	-	P
VLR Supported CAMEL Phases	2.14.2.3	C	-	P

Table 2: Overview of data used for GPRS Network Access Mode

PARAMETER	SUB CLAUSE	HLR	VLR	SGSN	GGSN	TYPE
...						
Short Message Service CAMEL Subscription Information (SMS-CSI)	2.14.A.1/2.14.1.B	C	-	C	-	P
GPRS CAMEL Subscription Information (GPRS-CSI)	2.14.A.2/2.14.1.C	C	-	C	-	C
Negotiated SGSN CAMEL Capability Handling	2.14.2x	C	-	-	-	T
SMS-CSI SGSN Negotiated CAMEL Capability Handling	2.14.2.1	C	-	-	-	P
GPRS-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C	-	-	-	P
SGSN Supported CAMEL Phases	2.14.2.3	C	-	-	-	P

CHANGE REQUEST

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

23.016 CR 008r1

Current Version: **3.2.0**

GSM (AA.BB) or 3G (AA.BBB) specification number ↑

↑ CR number as allocated by MCC support team

For submission to: **CN#6**
list expected approval meeting # here ↑

for approval **X**
for information

strategic (for SMG use only)
non-strategic

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

Proposed change affects:

(at least one should be marked with an X)

(U)SIM ME UTRAN / Radio Core Network

Source:

Siemens

Date:

Subject:

Introduction of CAMEL phase 3

Work item:

CAMEL Phase 3

Category:

(only one category shall be marked with an X)

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

Release:

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

Reason for change:

Introduction of CAMEL ph3. Following items are added:
 - Short Message Service CSI (SMS-CSI) for CAMEL control of MO SMS, initiated in the VMSC or in the SGSN;
 - Mobility Management Triggers;
 - GPRS CSI;
 - VT-CSI;
 - D-CSI;

Clauses affected:

Other specs affected:

- Other 3G core specifications → List of CRs:
- Other GSM core specifications → List of CRs: 22.078, 23.008, 23.018, 23.078, 29.002
- MS test specifications → List of CRs:
- BSS test specifications → List of CRs:
- O&M specifications → List of CRs:

Other comments:

This CR is part of CR package for introduction of CAMEL ph3.
 It collects changes from Tdocs N2-99206 + N2-99C07, N2-99210, N2-99547 as modified by discussion and N2-99577.
 Tdoc N2-99E29 on GPRS CAMEL Data included.
 Tdoc N2-99H63 on VT-CSI and Tdoc N2-99J15 on D-CSI included.
 Alignment with the latest 23.078 for the CSI elements was made.
 Alignment with the latest 23.016 for the documentation was made.

***** First modified section *****

3.2 Definitions

.....

- CAMEL subscription information (Group H):
 - Originating CAMEL Subscription Information ([O-CSD](#));
 - [Dialled Service CAMEL Subscription Information \(D-CSD\)](#);
 - [VMSC Terminating CAMEL Subscription Information \(VT-CSD\)](#);
 - [Supplementary Service Invocation Notification CAMEL Subscription Information \(SS-CSD\)](#);
 - [Translation Information Flag CAMEL Subscription Information \(TIF-CSD\)](#);
 - [SMS CAMEL Subscription Information \(SMS-CSD\)](#);
 - [Mobility Management Event Notification CAMEL Subscription Information \(M-CSD\)](#).
- LSA Information (Group I):
 - LSA data.
- Location Services (LCS) information (Group X)
 - HPLMN GMLC List
 - LCS Privacy Exception List.
- IST Information (Group J):
 - IST data.

The following **groups of GPRS subscriber information** are defined:

- Subscriber information (Group P1):
 - International Mobile Subscriber Identity (IMSI);
 - basic Mobile Station International ISDN Number (MSISDN);
 - subscriber status;
- Basic service information (Group P2):
 - Teleservice list.
- Operator Determined Barring (ODB) information (Group P3):
 - ODB Data for GPRS services;
- Roaming restriction information (Group P4):
 - roaming restriction in SGSN due to unsupported feature;
- Regional subscription information (Group P5):
 - regional subscription data.

- GPRS subscription information (Group P6):
 - GPRS subscription data.
- SGSN CAMEL subscription information (Group P7):
 - GPRS CAMEL subscription information;
 - SMS CAMEL subscription information.
- LSA Information (Group ~~P7~~P8):
 - LSA data.

***** *Next modified section* *****

4.3.1 Order of information sent by the HLR

The order of information is defined by the order in which the transfer syntax is generated by the HLR. This includes a sequence of messages as well as the syntax within a message (first to last message, component, operation, parameter, etc.).

With the above definitions, the following rules shall apply for non-GPRS subscriber data for the order of information within an HLR-VLR dialogue:

- Group A information (subscriber status) shall be sent first;
- Group B information shall be sent after Group A information and before any Group C, E, F, G, H, J or X information;
- Group D information shall be sent after Group A information and in any order with respect to Group B, C, E, F, G, H, J and X information.
- a specific order of Group C, E, F, G, H, J or X information is not required.

There is no requirement for the sending of subscriber information groups in the same message.

With the above definitions, the following rules shall apply for GPRS subscriber data for the order of information within a dialogue:

- Group P1 information (subscriber status) shall be sent first;
- Group P2 information shall be sent after P1 information and before P4 and P5 information
- Group P3 information shall be sent after Group P1 information and in any order with respect to Group P2, P4, P5 ~~and~~, P6, [P7](#) and [P8](#) information.
- a specific order of Group P4, P5 and P6 information is not required.

***** Next modified section *****

4.5.4 Consistency of supplementary service data

.....

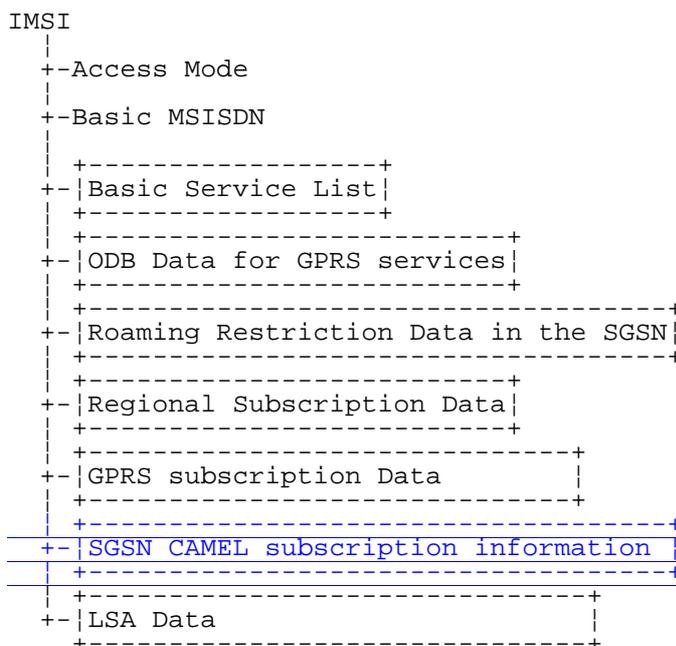
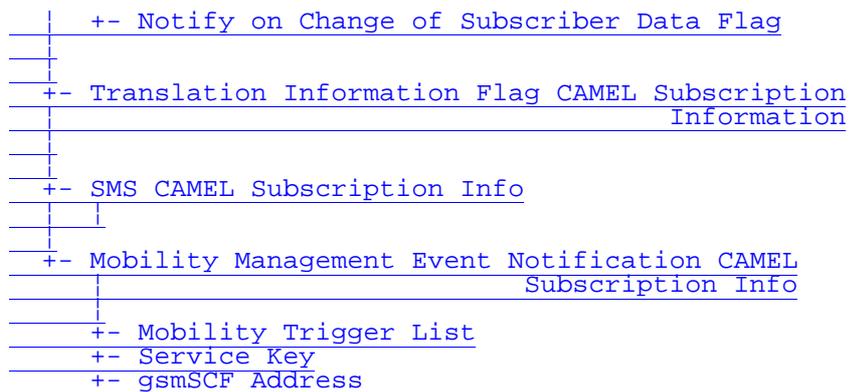


Figure 2: Abstract data structure of GPRS Subscriber Data (Data sent to the SGSN)

```
+ CAMEL Subscription Information
+ CAMEL Capability Handling
+ originating CAMEL Subscription Info
+ O-Besm CAMEL TDP Data (1)
+ O-Besm TDP
+ DP Criteria
+ Service Key
+ gsmSCF Address
+ Default Call Handling
+ .....
+ O-Besm CAMEL TDP Data (n)
+ O-Besm TDP
+ DP Criteria
+ Service Key
+ gsmSCF Address
+ Default Call Handling
+ SS Invocation Notification CAMEL Subscription Info
+ Notification Criteria
+ gsmSCF address
+ Translation Information Flag
```

```
+--CAMEL Subscription Information
  +- Originating CAMEL Subscription Info
    +- TDP Data List
      +- O-BCSM CAMEL TDP Data (1)
        +- O-BCSM TDP
        +- DP Criteria
        +- Service Key
        +- gsmSCF Address
        +- Default Call Handling
      +-.....
      +- O-BCSM CAMEL TDP Data (n)
        +- O-BCSM TDP
        +- DP Criteria
        +- Service Key
        +- gsmSCF Address
        +- Default Call Handling
    +- CAMEL Capability Handling
  +- Dialled Service CAMEL Subscription Info
    +- DP Criteria List
      +- DP Criterion (1)
        +- Service Key
        +- gsmSCF Address
        +- Default Call Handling
      +-.....
      +- DP Criterion (n)
        +- Service Key
        +- gsmSCF Address
        +- Default Call Handling
    +- CAMEL Capability Handling
  +- VMSC Terminating CAMEL Subscription Info
    +- TDP Data List
      +- VT-BCSM CAMEL TDP Data (1)
        +- VT-BCSM TDP
        +- DP Criteria
        +- Service Key
        +- gsmSCF Address
        +- Default Call Handling
      +-.....
      +- VT-BCSM CAMEL TDP Data (n)
        +- VT-BCSM TDP
        +- DP Criteria
        +- Service Key
        +- gsmSCF Address
        +- Default Call Handling
    +- CAMEL Capability Handling
  +- SS Invocation Notification CAMEL Subscription Info
    +- Notification Criterion
    +- gsmSCF Address
    +- Activation Flag
    +- Notification Flag
```



NOTE: For detailed information see GSM 03.72, GSM 03.78 and GSM 09.02.

Figure 15: CAMEL subscription info

~~CR editor's note: TIF CSI above shall be replaced by "Translation Information Flag CAMEL Subscription Info", after adjusting the line width.~~

```

+--SGSN CAMEL subscription information
|
|  +-- GPRS CAMEL Subscription Information
|  |
|  |  +-- TDP Data List
|  |  |
|  |  |  +-- GPRS CAMEL TDP Data (1)
|  |  |  |
|  |  |  |  +-- GPRS TDP
|  |  |  |  +-- Service Key
|  |  |  |  +-- gsmSCF Address
|  |  |  |  +-- Default GPRS Handling
|  |  |  |
|  |  |  |  +--.....
|  |  |  |
|  |  |  |  +-- GPRS CAMEL TDP Data (n)
|  |  |  |  |
|  |  |  |  |  +-- GPRS TDP
|  |  |  |  |  +-- Service Key
|  |  |  |  |  +-- gsmSCF Address
|  |  |  |  |  +-- Default GPRS Handling
|  |  |  |  |
|  |  |  |  |  +-- CAMEL Capability Handling
|  |  |  |  |
|  |  |  |  |  +-- SMS CAMEL Subscription Info

```

Figure A: SGSN CAMEL subscription info and GPRS CAMEL subscription info

```

+-- SMS CAMEL Subscription Info
|
|  +-- TDP Data List
|  |
|  |  +-- SMS CAMEL TDP Data (1)
|  |  |
|  |  |  +-- SMS TDP
|  |  |  +-- Service Key
|  |  |  +-- gsmSCF Address
|  |  |  +-- Default SMS Handling
|  |  |
|  |  |  +--.....
|  |  |
|  |  |  +-- SMS CAMEL TDP Data (n)
|  |  |  |
|  |  |  |  +-- SMS TDP
|  |  |  |  +-- Service Key
|  |  |  |  +-- gsmSCF Address
|  |  |  |  +-- Default SMS Handling
|  |  |  |
|  |  |  |  +-- CAMEL Capability Handling

```

Figure B: SMS CAMEL Subscription Info

3G CHANGE REQUEST

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

23.018 CR 027r3

Current Version: **3.2.0**

3G specification number ↑

↑ CR number as allocated by 3G support team

For submission to TSG **CN#06** for approval (only one box should be marked with an X)
 list TSG meeting no. here ↑ for information

Form: 3G CR cover sheet, version 1.0 The latest version of this form is available from: ftp://ftp.3gpp.org/Information/3GCRF-xx.rtf

Proposed change affects: USIM ME UTRAN Core Network
 (at least one should be marked with an X)

Source: Vodafone Airtouch **Date:** 1/12/1999

Subject: Introduction of CAMEL Phase 3

3G Work item: CAMEL Phase 3

Category: F Correction
 A Corresponds to a correction in a 2G specification
 B Addition of feature
 C Functional modification of feature
 D Editorial modification
 (only one category shall be marked with an X)

Reason for change:
 1. To allow the instantiation of a T-BCSM in the destination VMSC.
 2. To allow the transfer of the destination address for a call leg to the gsmSCF. This is necessary for the correct operation of prepayment services.
 3. To define the handling for the ITU-T calling geodetic location information.
 4. To define the handling of the Service Interaction Indicators Two parameter.
 5. To provide support for dialled services.
 6. To reflect the fact that the procedure CAMEL_MT_GMSC_INIT can no longer return a result of Camel Modified Number.

Clauses affected: 2; 7.1.1.3; figures 8b, 8c, 8d; 7.2.1.1; 7.2.1.2; 7.2.1.8; figures 21b, 35a, 36a - d, 37, 41, 42a - e; 7.2.3.4; 7.3.1.1; 7.3.1.4; 7.3.1.5; figures 62a - 62m (replacing 62a - 62f), 65a - h (replacing 65a - e), 66a - h (replacing 66a - e); 7.3.2.1; figures 72a, 72b; 8.3.5.1; 8.5.2

Other specs affected:
 Other 3G core specifications → List of CRs: CR 23.078-???
 Other 2G core specifications → List of CRs:
 MS test specifications → List of CRs:
 BSS test specifications → List of CRs:
 O&M specifications → List of CRs:

Other comments: This CR is a composition of the changes in documents N2-99806, N2-99H16, N2-99J40, N2-99J93 & N2-99J97, updated to base them on 23.018 v3.2.0. The changes from the revised version of N2-99J31 have also been incorporated. For clarity, the consequential changes from the insertion of new normative references have not been shown.



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

2 Normative references

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
 - For a specific reference, subsequent revisions do not apply.
 - For a non-specific reference, the latest version applies.
 - A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
 - For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).
- [1] GSM 02.01: "Digital cellular telecommunications system (Phase 2+); Principles of telecommunication services supported by a GSM Public Land Mobile Network (PLMN)".
 - [2] GSM 03.03: " Digital cellular telecommunications system (Phase 2+); Numbering, addressing & identification".
 - [3] GSM 03.20: " Digital cellular telecommunications system (Phase 2+); Security related network functions".
 - [4] GSM 03.54 (TS 101 252) "Digital cellular telecommunications system (Phase 2+);Description for the use of a Shared Inter Working Function /SIWF) in a GSM PLMN Stage 2 ".
 - [5] GSM 03.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service; Service description; Stage 2".
 - [6] GSM 03.66: "Digital cellular telecommunications system (Phase 2+); Support of Mobile Number Portability (MNP); Technical Realization – Stage 2"
 - [7] GSM 03.72: " Digital cellular telecommunications system; Call Deflection (CD) supplementary service; Stage2"
 - [8] GSM 03.78 (TS 101 044): "Digital cellular telecommunications system (Phase 2+); Customized Applications for Mobile network Enhanced Logic (CAMEL) - Stage 2".
 - [9] GSM 03.78: "Digital cellular telecommunications system (Phase 2+); Customized Applications for Mobile network Enhanced Logic (CAMEL) - Phase 2; Stage 2".
 - [10] GSM 03.79 (TS 101 045): "Digital cellular telecommunications system (Phase 2+); Support of Optimal Routeing (SOR); Technical Realization".
 - [11] GSM 03.81: " Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 2 ".
 - [12] GSM 03.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 2".
 - [13] GSM 03.83: "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 2".
 - [14] GSM 03.84: "Digital cellular telecommunications system (Phase 2+); Multi Party (MPTY) supplementary services - Stage 2".
 - [15] GSM 03.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 2".

- [16] GSM 03.86: "Digital cellular telecommunications system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 2".
- [17] GSM 03.87: "Digital cellular telecommunications system (Phase 2+); User –to-User Signalling (UUS) Supplementary Services - Stage 2".
- [18] GSM 03.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 2 (GSM 03.88)".
- [19] GSM 03.93: "Digital cellular telecommunications system (Phase 2+); Technical realization of Completion of Calls to Busy Subscriber (CCBS) - Stage 2".
- [20] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".
- [21] GSM 07.01: "Digital cellular telecommunications system (Phase 2+); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".
- [22] GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile-services Switching Centre - Base Station System (MSC - BSS) interface Layer 3 specification".
- [23] GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".
- [24] GSM 09.07: "Digital cellular telecommunications system (Phase 2+); General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".
- [25] GSM 09.10: "Digital cellular telecommunications system (Phase 2+); Information element mapping between Mobile Station - Base Station System (MS - BSS) and Base Station System - Mobile-services Switching Centre (BSS - MSC) Signalling procedures and the Mobile Application Part (MAP) (GSM 09.10)".
- [26] GSM 12.08: "Digital cellular telecommunications system (Phase 2+); Subscriber and equipment trace (GSM 12.08)".
- [27] [3GPP TS 23.072: "Technical Specification Group Core Network; Call Deflection \(CD\) supplementary service; Stage2".](#)
- [28] [3GPP TS 23.078: "Technical Specification Group Core Network; Customized Applications for Mobile network Enhanced Logic \(CAMEL\) - Phase 3; Stage 2".](#)
- [29] [3GPP TS 23.079: " Technical Specification Group Core Network; Support of Optimal Routing \(SOR\); Technical Realization".](#)
- [30] ETS 300 356-1 (1995): "Integrated Services Digital Network (ISDN); Signalling System No. 7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services".
- [31] [ITU-T Q.763, December 1999: "Signalling System No. 7 – ISDN user part formats and codes".](#)
- [32] ITU-T Recommendation Q.850 (1996): "Usage of cause and location in the Digital Subscriber Signalling System No. 1 and the Signalling System No. 7 ISDN User Part".

****** Next Modified Section ******

7.1.1.3 Procedure OG_Call_Setup_MSC

Sheet 1: the variables Alerting sent, MS connected and Reconnect are global data, accessible to the procedures CCBS_Check_OG_Call, CCBS_OCH_Report_Failure, CCBS_OCH_Report_Success, CCBS_Check_If_CCBS_Possible, Send_Alerting_If_Required and Send_Access_Connect_If_Required.

Sheet 1: the VMSC converts the GSM bearer capability negotiated between the VMSC and the MS to a GSM basic service according to the rules defined in GSM 07.01 [21].

Sheet 1: the variable UUS1 result sent is specific to UUS. This variable is accessible to all UUS specific procedures.

Sheet 1: the procedure UUS_OCH_Check_Setup is specific to UUS; it is specified in GSM 03.87 [17].

Sheet 1, sheet 2, sheet 5: the procedure CCBS_OCH_Report_Failure is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 1, sheet 5, sheet 6, sheet 8: at any stage after the Setup has been received, the MS may terminate the transaction with the network by sending a Release transaction request.

Sheet 2: the procedure Set_CLI_Presentation_Indicator_MSC is specific to CLIR. If the VMSC does not support CLIR, processing continues from the "Yes" exit of the test "Result=Call allowed?".

Sheet 2: the procedure CAMEL_OCH_MSC_INIT is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9]. If the VMSC does not support CAMEL, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 2: the procedure CAMEL_MO_Dialled_Services is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28]. If the VMSC does not support CAMEL phase 3, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 2: the procedure CCBS_Check_OG_Call is specific to CCBS; it is specified in GSM 03.93 [19]. If the VMSC does not support CCBS, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 2: the procedure UUS_OCH_Set_Info_In_IAM is specific to UUS; it is specified in GSM 03.87 [17].

Sheet 2: the procedure MOBILE_NUMBER_PORTABILITY_IN_OQoD is specific to Mobile Number Portability; it is specified in GSM 03.66 [6].

Sheet 2: the procedure UUS_OCH_Set_Info_In_IAM is specific to UUS; it is specified in GSM 03.87 [17].

Sheet 2: the procedure CAMEL_Store_Destination_Address is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet 3: the procedure CCBS_OCH_Report_Success is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 3, sheet 6: the procedures CAMEL_Start_TNRy and CAMEL_Stop_TNRy are specific to CAMEL phase 2; they are specified in GSM 03.78 for CAMEL Phase 2 [9].

Sheet 3: the task "UTU2Cnt := 0" is executed only if the VMSC supports UUS

Sheet 4: the procedure CAMEL_OCH_MSC_ANSWER is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9]. If the VMSC does not support CAMEL, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 4: the procedure Set_COLP_Info_MSC is specific to COLP.

Sheet 4: the procedure Handle_AoC_MO_MSC is specific to AoC.

Sheet 4: the task "Store CW treatment indicator for this call if received in SII2" is executed only if the VMSC supports CAMEL phase 3.

Sheet 5: the procedures CCBS_Check_If_CCBS_Possible and CCBS_Activation_MSC are specific to CCBS; they are specified in GSM 03.93 [19]. The task "Store CCBS Result" is executed only if the VMSC supports CCBS. If the VMSC does not support CCBS, processing continues from the "CCBS Not Possible" exit of the test "CCBS Result".

Sheet 5, sheet 6: the procedures CAMEL_OCH_MSC_DISC3 and CAMEL_OCH_MSC_DISC4 are specific to CAMEL; they are specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9] respectively.

Sheet 5, sheet 6: the procedure CAMEL_OCH_MSC1 is specific to CAMEL phase 2; it is specified in GSM 03.78 for CAMEL Phase 2 [9]. If the VMSC does not support CAMEL phase 2, processing continues from the "No" exit of the test "Result=Reconnect?"

Sheet 5, sheet 6, sheet 8: the processing in the branch beginning with the Int_Release_Call input will occur only if the MSC supports CAMEL.

Sheet 6, sheet 8: the procedure UUS_MSC_Check_UUS1_UI is specific to UUS; it is specified in GSM 03.87 [17].

Sheet 7: the input signal TNRY expired and all the subsequent processing are specific to CAMEL phase 2, and will occur only if the VMSC supports CAMEL phase 2. The procedure CAMEL_OCH_MSC2 is specified in GSM 03.78 for CAMEL Phase 2 [9].

Sheet 7: the input signal User To User is specific to UUS; it is discarded if the VMSC does not support UUS.

Sheet 7: the procedures UUS_MSC_Check_UUS2_UI_to_MS and UUS_MSC_Check_UUS2_UI_to_NW are specific to UUS; they are specified in GSM 03.87 [17].

Sheet 8: the procedure CAMEL_OCH_MSC_DISC1 is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9]. If the VMSC does not support CAMEL, processing continues from the "No" exit of the test "Result=CAMEL handling?".

Sheet 8: the procedure CAMEL_OCH_MSC_DISC2 is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9]. If the VMSC does not support CAMEL, processing continues from the "No" exit of the test "Result=CAMEL handling?".

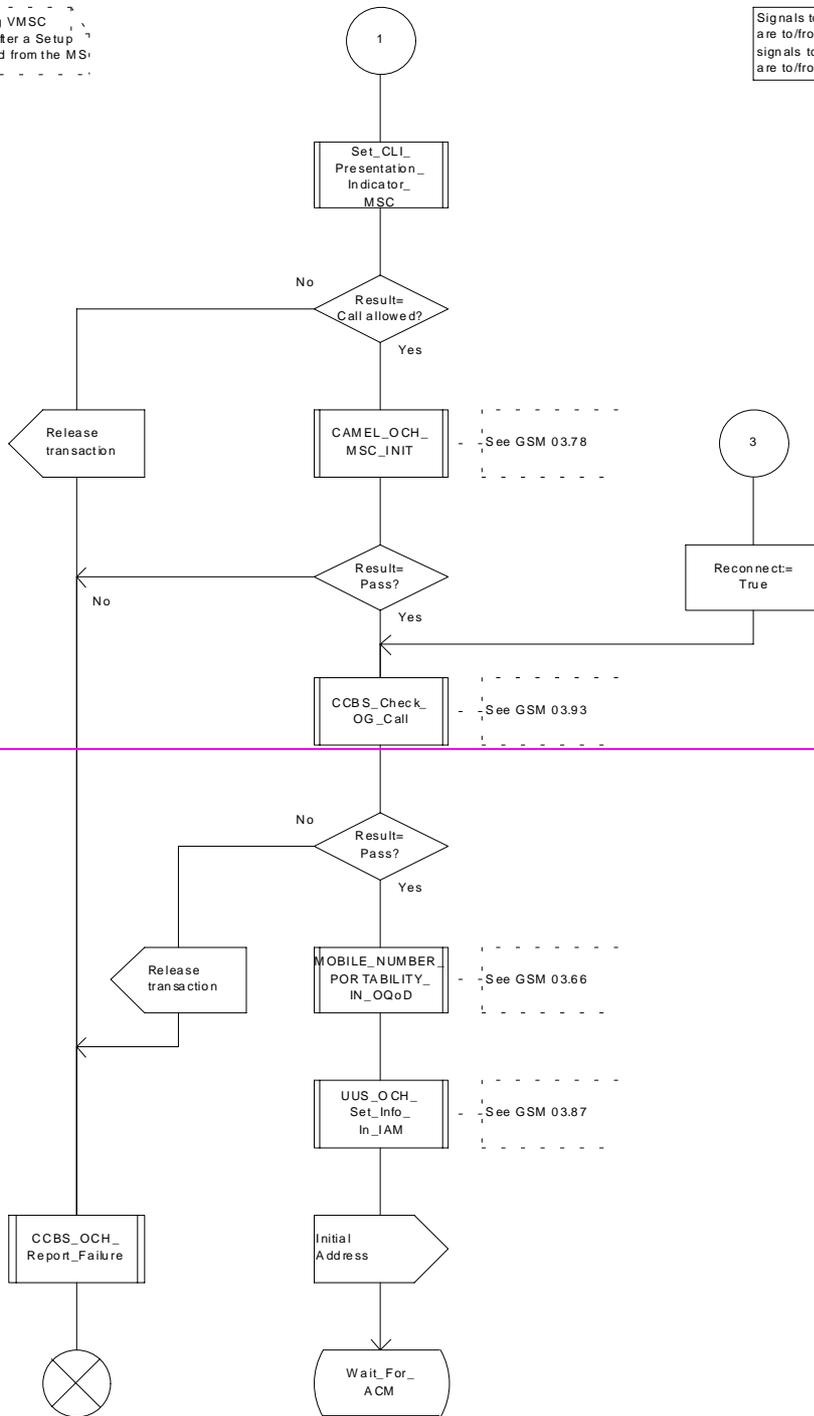
**** Next Modified Section ****

Procedure OG_Call_Setup_MSC

OCS_MSC2(8)

Procedure in the originating VMSC to set up an outgoing call after a Setup message has been received from the MS.

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the destination exchange.



Procedure OG_Call_Setup_MSC

OCS_MSC2(8)

Procedure in the originating VMSC to set up an outgoing call after a Setup message has been received from the MS

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the destination exchange.

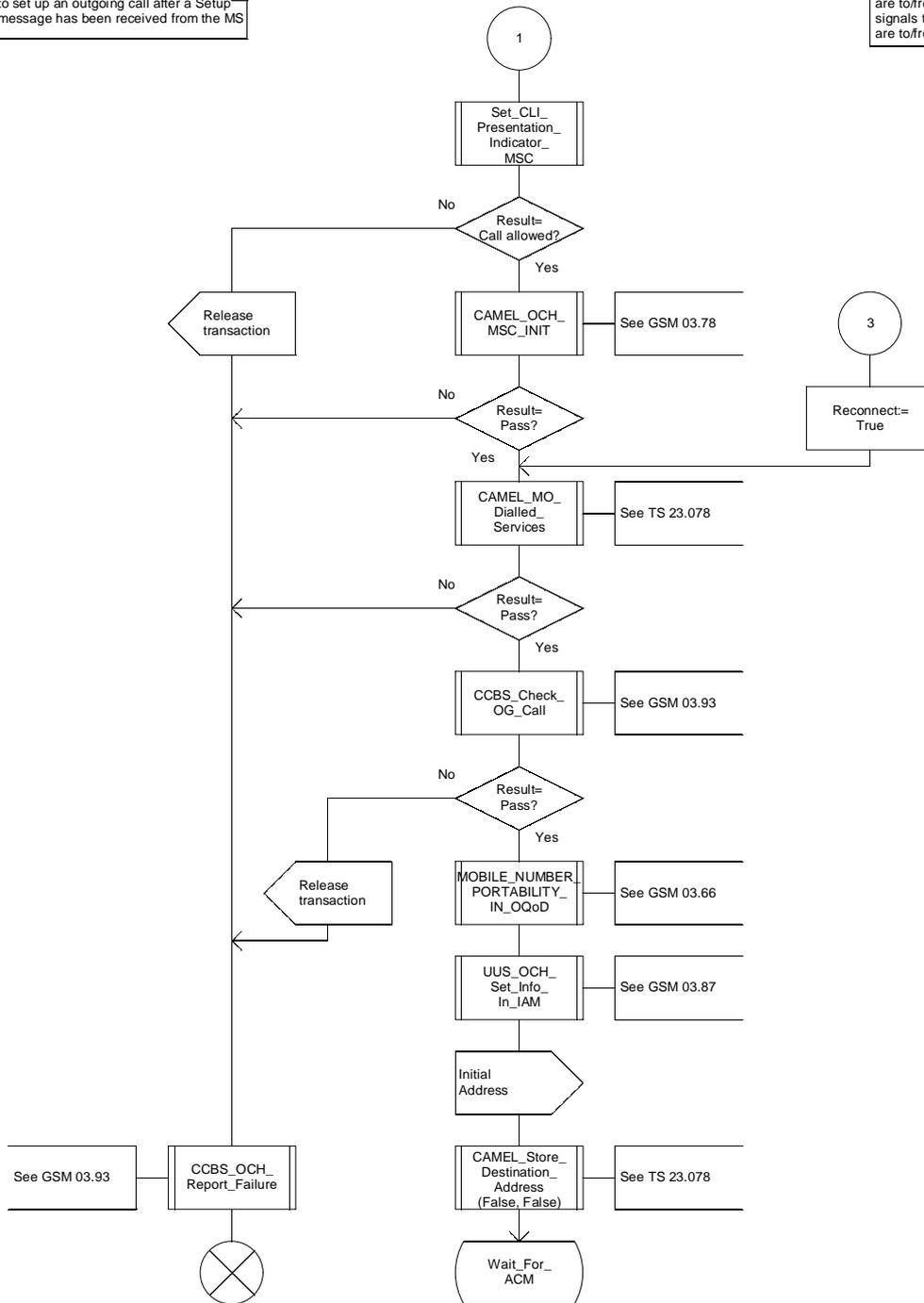


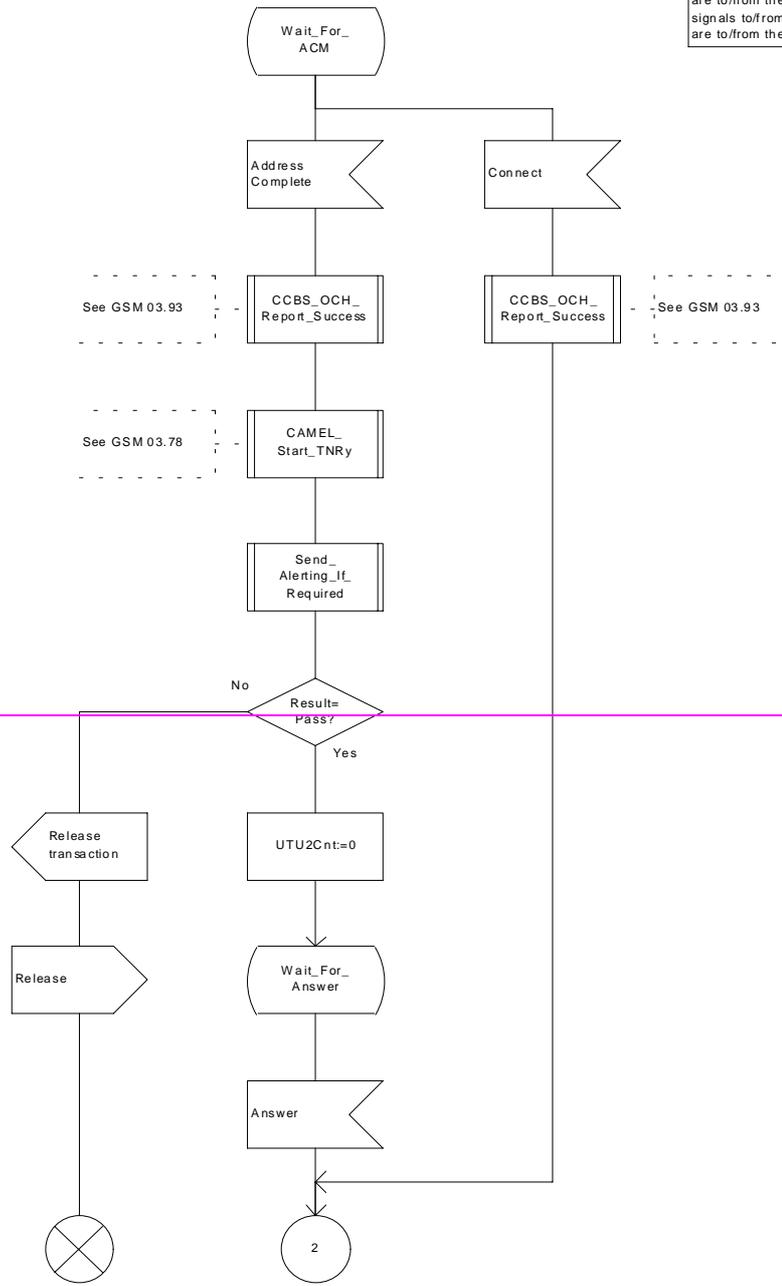
Figure 8b: Procedure Outgoing_Call_Setup_MSC (sheet 2)

Procedure OG_Call_Setup_MSC

OCS_MSC3(8)

Procedure in the originating VMSC to set up an outgoing call after a Setup message has been received from the MS

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the destination exchange



Procedure OG_Call_Setup_MSC

OCS_MSC3(8)

Procedure in the originating VMSC to set up an outgoing call after a Setup message has been received from the MS

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the destination exchange.

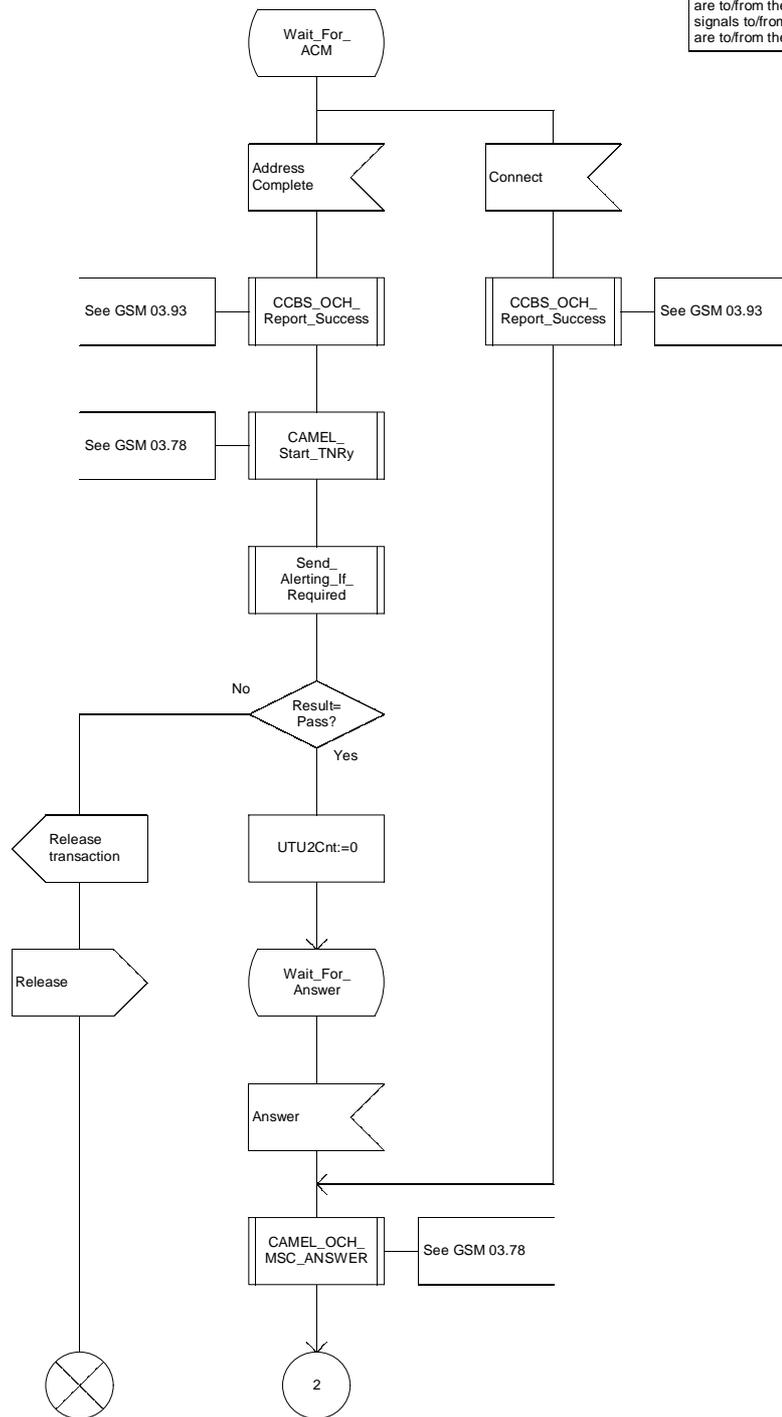


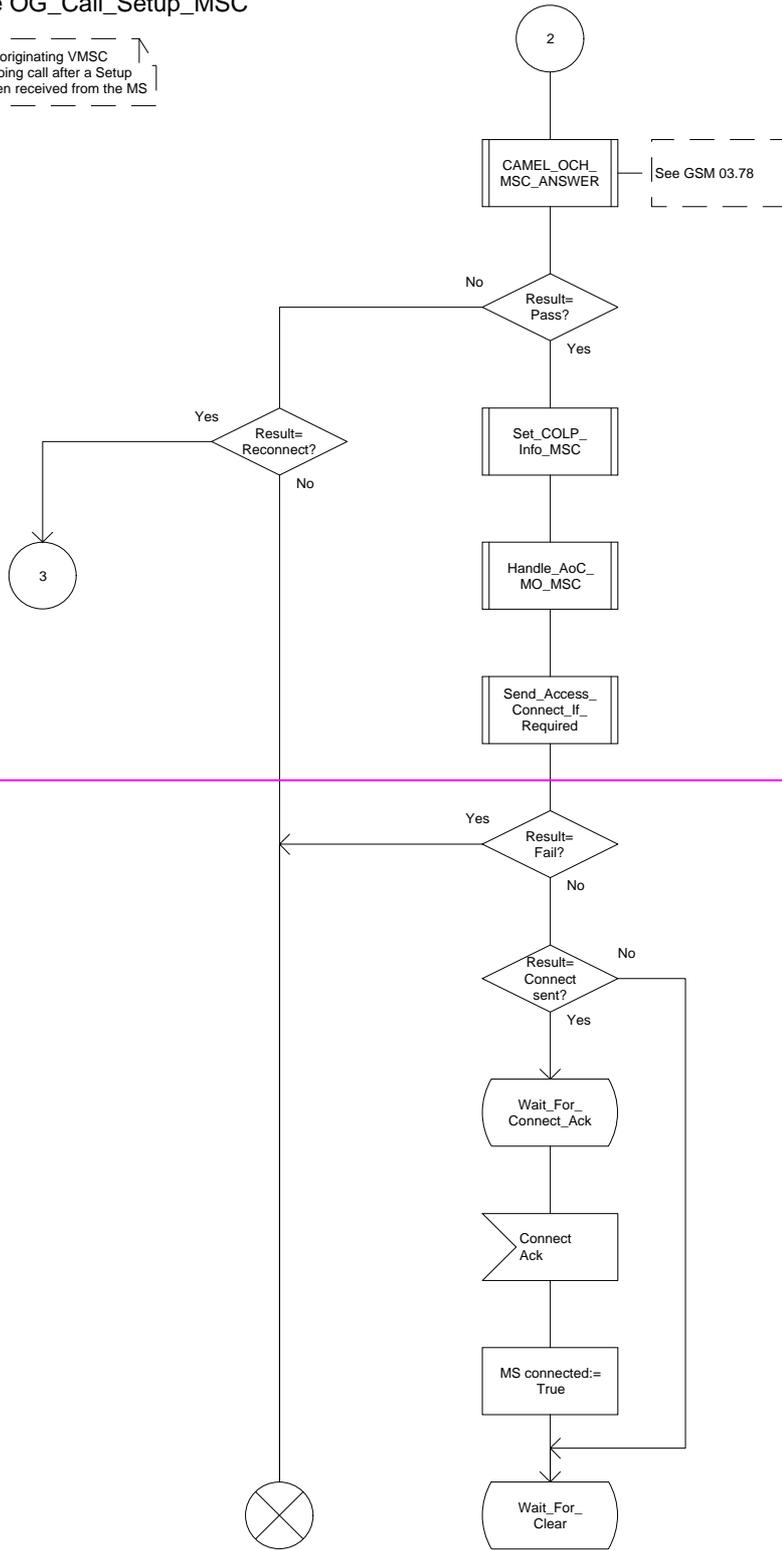
Figure 8c: Procedure Outgoing_Call_Setup_MSC (sheet 3)

Procedure OG_Call_Setup_MSC

OCS_MSC4(8)

Procedure in the originating VMSC to set up an outgoing call after a Setup message has been received from the MS

Signals from the left are from the BSS



Procedure OG_Call_Setup_MSC

OCS_MSC4(8)

Procedure in the originating VMSC to set up an outgoing call after a Setup message has been received from the MS

Signals from the left are from the BSS

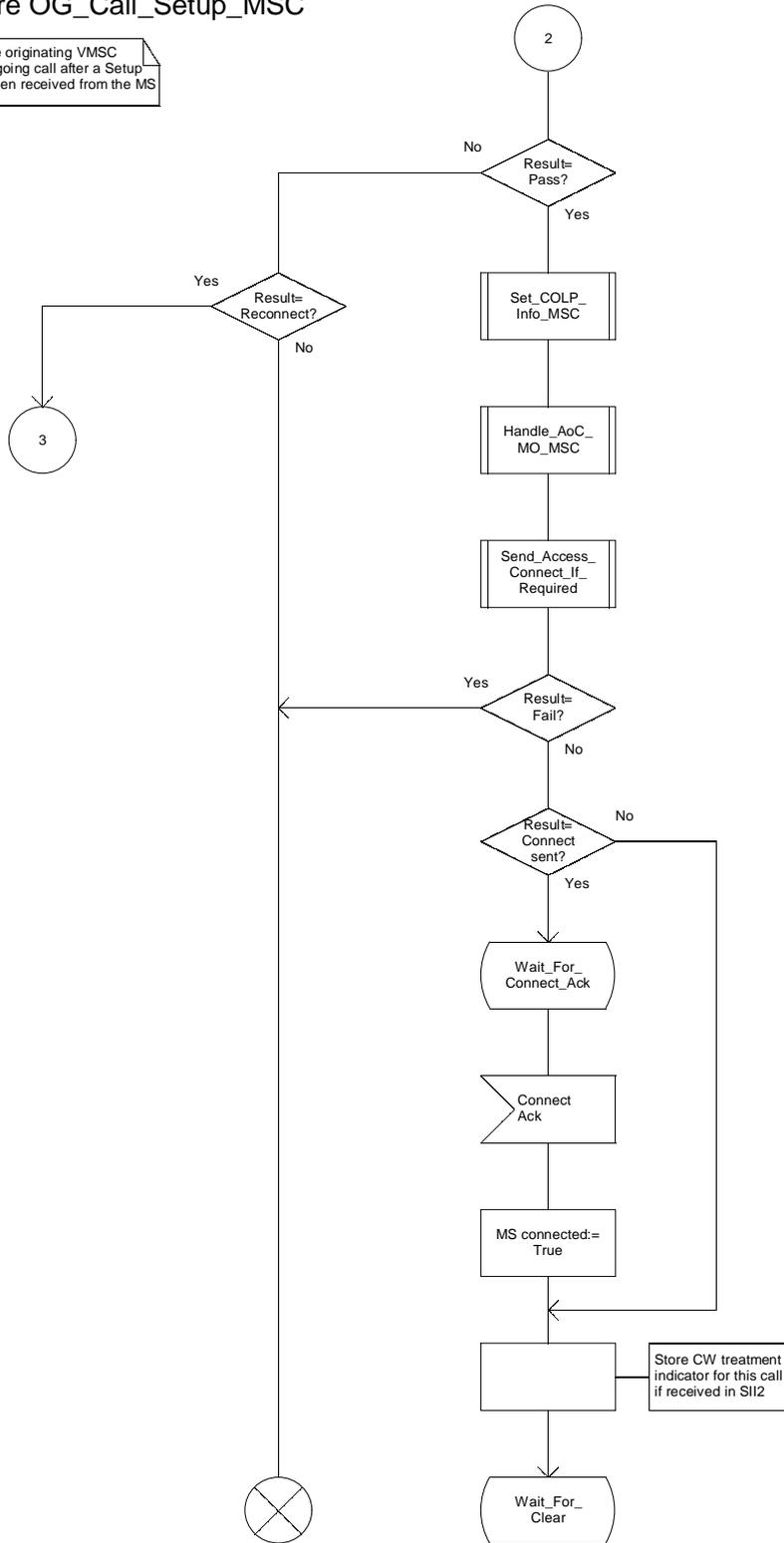


Figure 8d: Procedure Outgoing_Call_Setup_MSC (sheet 4)

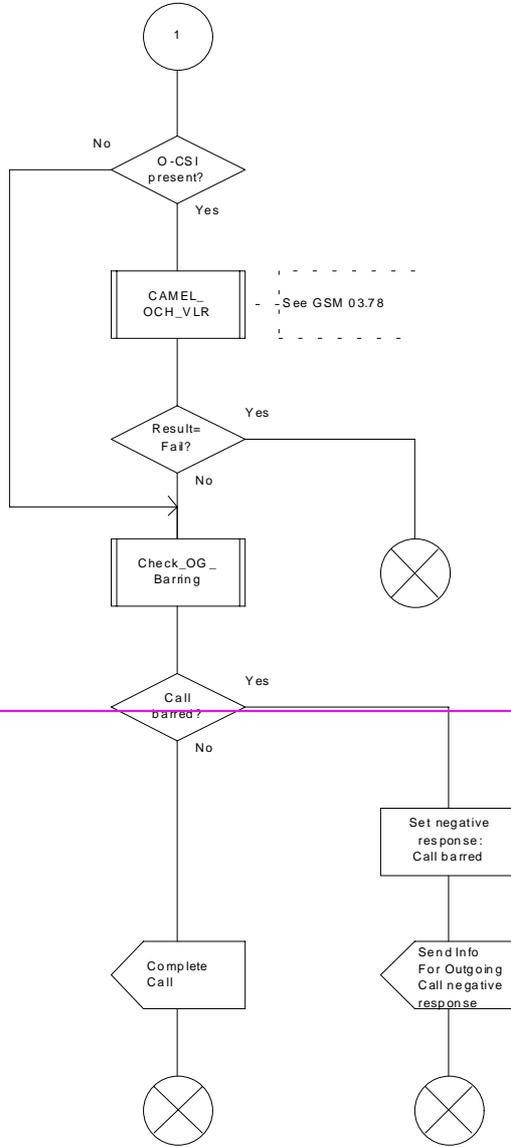
****** Next Modified Section ******

Procedure OG_Call_Subscription_Check_VLR

OCSCVLR2(2)

Procedure in the VLR to perform subscription checks for an outgoing call

Signals to the left are to the MSC



Procedure OG_Call_Subscription_Check_VLR

OCSCVLR2(2)

Procedure in the VLR to perform subscription checks for an outgoing call

Signals to the left are to the MSC

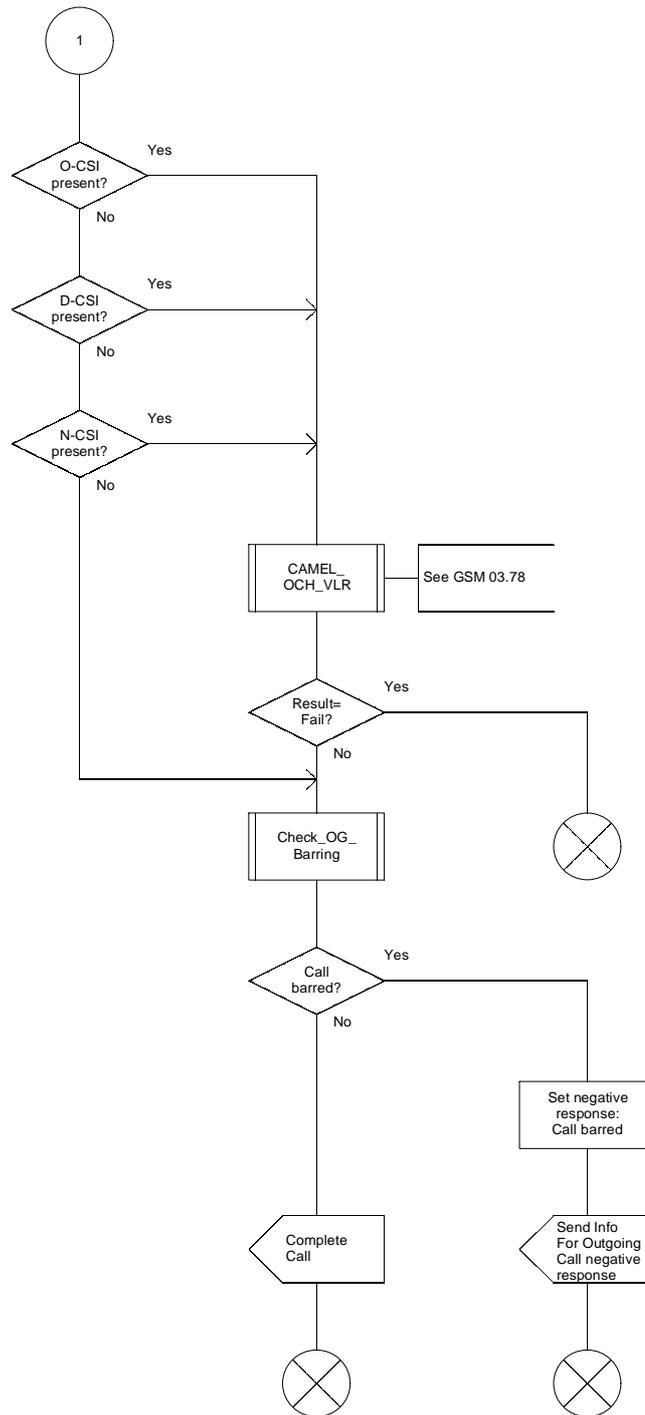


Figure 21b: Procedure OG_Call_Subscription_Check_VLR (sheet 2)

**** Next Modified Section ****

7.2.1.1 Process MT_GMSC

Sheet 1: the variables ACM sent, Answer sent, Network connect sent, Reconnect and Resume call are global data, accessible to the procedures CCBS_MT_GMSC_Check_CCBS Possible, CCBS_Set_Diagnostic_For_Release, Obtain_Routeing_Address, Send_ACM_If_Required, Send_Answer_If_Required and Send_Network_Connect_If_Required.

Sheet 1: the variable UUS CF interaction is specific to UUS; it is accessible to all UUS specific procedures in the GMSC.

Sheet 1: the procedure OR_Set_ORA_Parameters is specific to Support of Optimal Routeing; it is specified in GSM 03.79 [10].

Sheet 1: the procedure CAMEL_Set_ORA_Parameters is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9].

Sheet 1: the parameters "Reference address", "OR" and "Own PLMN" are passed to the procedure Obtain_Routeing_Address only if the GMSC supports Optimal Routeing. The parameter "Destination address" is returned by the procedure Obtain_Routeing_Address only if the GMSC supports Optimal Routeing of mobile-to-mobile calls. The Send Routeing Info negative response information element received in the execution of the procedure Obtain_Routeing_Address is global data, available to the parent process.

Sheet 1: the suggested mapping from values of the Send Routeing Info negative response information element to values of the ISUP release cause (see ITU-T Recommendation Q.850 [32]) is shown in table 1. The mapping used is a matter for the network operator, depending on the telephony signalling system used.

Table 1: Suggested mapping of Send Routeing Info (SRI) negative responses to ISUP release causes

SRI negative response	ISUP release cause number	ISUP release cause name
Absent subscriber	20	Subscriber absent
Bearer service not provisioned	57	Bearer capability not authorised
Call barred (ODB)	21	Call rejected
Call barred (SS barring)	21	Call rejected
CUG reject (Called party SS interaction violation)	21	Call rejected
CUG reject (Incoming calls barred within CUG)	55	Incoming calls barred within CUG
CUG reject (Subscriber not member of CUG)	87	User not member of CUG
CUG reject (Requested basic service violates CUG constraints)	87	User not member of CUG
Data missing	111	Protocol error, unspecified
Facility not supported	69	Requested facility not implemented
Forwarding violation	21	Call rejected
Number changed	22	Number changed
System failure	111	Protocol error, unspecified
Teleservice not provisioned	57	Bearer capability not authorised
Unexpected data value	111	Protocol error, unspecified
Unknown subscriber	1	Unallocated (unassigned) number

Sheet 1: it is an operator option whether to send an Address Complete message if the Number Portability Database returns a routeing number. If the GMSC sends an Address Complete message, it shall include the called party's status field of the Backward call indicator set to "no indication".

Sheet 1: the called party address sent in the IAM to the process MT_CF_MSC is the Forwarded-to number received in the Perform Call Forwarding ack.

Sheet 1: the procedure CAMEL_Store_Destination_Address is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet 1: it is an operator option whether to send an Address Complete message if the HLR returns forwarding information. If the GMSC sends an Address Complete message, it shall include the called party's status field of the Backward call indicator set to "no indication".

Sheet 1: it is an operator option whether to send an Address Complete message if the Number Portability Database returns a routing number. If the GMSC sends an Address Complete message, it shall include the called party's status field of the Backward call indicator set to "no indication".

Sheet 2: the procedures CAMEL_Start_TNRy and CAMEL_Stop_TNRy are specific to CAMEL phase 2; they are specified in GSM 03.78 for CAMEL Phase 2 [9].

Sheet 2, sheet 3: the procedure CAMEL_MT_GMSC_ANSWER is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9]. If the GMSC does not support CAMEL, processing continues from the "Pass" exit of the test "Result".

Sheet 2, sheet 3: the task "Set destination address parameter" is executed only if the GMSC supports Optimal Routing of mobile-to-mobile calls.

Sheet 3: the procedure Handle_COLP_Forwarding_Interaction is specific to COLP.

Sheet 4: the input signal Resume Call Handling and all the subsequent processing on this sheet are specific to Support of Optimal Routing, and will occur only if the GMSC supports Optimal Routing. The procedure OR_Handle_RCH is specified in GSM 03.79 [10].

Sheet 4, sheet 6: the procedure CCBS_MT_GMSC_Check_CCBS_Possible is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 5: the input signal TNRy expired and all the subsequent processing are specific to CAMEL phase 2, and will occur only if the GMSC supports CAMEL phase 2. The procedure CAMEL_MT_GMSC_DISC5 is specified in GSM 03.78 for CAMEL phase 2 [9].

Sheet 6: the procedures CAMEL_MT_GMSC_DISC3, CAMEL_MT_GMSC_DISC4 and CAMEL_MT_GMSC_DISC6 are specific to CAMEL; they are specified in GSM 03.78 for CAMEL Phase 1 [8] (CAMEL_MT_GMSC_DISC3) and GSM 03.78 for CAMEL Phase 2 [9] (CAMEL_MT_GMSC_DISC4 and CAMEL_MT_GMSC_DISC6)..

Sheet 6: the procedure CCBS_Set_Diagnostic_For_Release is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 5: the procedures CAMEL_MT_GMSC_DISC1 and CAMEL_MT_GMSC_DISC2 are specific to CAMEL; they are specified in GSM 03.78 [8]. If the GMSC does not support CAMEL, processing continues from the "No" exit of the test "Result=CAMEL handling?".

Sheet 6: the processing in the branch beginning with the Int_Release_Call input will occur only if the MSC supports CAMEL.

Sheet 7: the procedure CAMEL_MT_GMSC_DISC1 is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9]. If the GMSC does not support CAMEL, processing continues from the "No" exit of the test "Result=CAMEL handling?".

Sheet 7: the procedure CAMEL_MT_GMSC_DISC2 is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9]. If the GMSC does not support CAMEL, processing continues from the "Normal handling" exit of the test "Result?".

Sheet 7: in the upper subtree, the processing in the branch beginning with the Int_Release_Call input will occur only if the GMSC supports CAMEL.

Sheet 7: after the GMSC has sent an IAM to the destination VMSC or the forwarded-to exchange (via the process MT_CF_MSC), it acts as a relay for messages received from the originating exchange and the destination VMSC or the process MT_CF_MSC. Any message other than Address Complete, Connect, Answer or Release causes no change of state in the process MT_GMSC.

7.2.1.2 Procedure Obtain_Routeing_Address

Sheet 1: the procedure MOBILE_NUMBER_PORTABILITY_IN_TQoD is specific to Mobile Number Portability; it is specified in GSM 03.66 [6].

Sheet 1: the procedure CCBS_MT_GMSC_Check_CCBS_Call is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 1: the procedure CLI_MT_GMSC is specific to Enhanced CLI Handling. It is specified in GSM 03.81 [11].

Sheet 2: the procedure OR_Handle_SRI_Negative_Response is specific to Support of Optimal Routeing. It is specified in GSM 03.79 [10]. If the GMSC does not support Optimal Routeing, processing continues from the "No" exit of the test "Result=Pass?".

Sheet 2: the test "Error=Unknown subscriber" refers to the negative response value received from the HLR.

Sheet 2: the procedure MOBILE_NUMBER_PORTABILITY_IN_QoHR is specific to Mobile Number Portability; it is specified in GSM 03.66 [6].

Sheet ~~32~~: the procedure CAMEL_MT_GMSC_INIT is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9].

Sheet ~~32~~: the procedure CCBS_MT_GMSC_Check_CCBS_Indicators is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 2: the task "Store Forwarding Interrogation Required indicator" is executed only if the GMSC supports Optimal Routeing.

~~Sheet 2: the task "Destination address:=VMSC address" is executed only if the GMSC supports Optimal Routeing of mobile-to-mobile calls.~~

Sheet ~~32~~: The decision "MSRN contains a Routeing Number" is executed only if the SRF solution for call related MNP is used. If the SRF solution for call related MNP is not used, processing continues from the "No" exit of the test "MSRN contains a Routeing Number".

~~Sheet 3: the procedure CAMEL_MT_GMSC_Notify_CF is specific to CAMEL phase 2; it is specified in GSM 03.78 for CAMEL Phase 2 [7]. If the GMSC does not support CAMEL, processing continues from the "Continue" exit of the test "Result".~~

~~Sheet 4: the task "BOR:=OR" is executed only if the GMSC supports Optimal Routeing of mobile-to-mobile calls.~~

Sheet ~~43~~: the procedures ~~CCBS_MT_GMSC_Remove_Indicators and CCBS_MT_GMSC_Remove_Indicators_Store_FWT~~ ~~are is~~ specific to CCBS; ~~they are it is~~ specified in GSM 03.93 [19].

Sheet ~~43~~: the procedure Route_Permitted is specific to Support of Optimal Routeing. It is specified in GSM 03.79 [10]. If the GMSC does not support Optimal Routeing, processing continues from the "True" exit of the test "Route permitted".

~~Sheet 3: the tasks "Destination address:=FTN" and "OR:=True" are executed only if the GMSC supports Optimal Routeing of mobile-to-mobile calls.~~

Sheet ~~43~~: the procedures CAMEL_MT_MSC_DISC3 and CAMEL_MT_MSC_DISC4 are specific to CAMEL; they are specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9] respectively.

~~Sheet 3: if the GMSC does not support CAMEL and the Send Routeing Info ack contains neither an MSRN nor an FTN, processing continues from the "No" exit of the test "CMN?".~~

Sheet ~~34~~: the tasks ~~"Destination address:=CMN" and "OR:= True"~~ ~~are is~~ executed only if the GMSC supports Optimal Routeing of mobile-to-mobile calls.

~~Sheet 1: the procedure CAMEL_MT_GMSC_Notify_CF is specific to CAMEL phase 2; it is specified in GSM 03.78 for CAMEL Phase 2 [7]. If the GMSC does not support CAMEL, processing continues from the "Continue" exit of the test "Result".~~

****** Next Modified Section ********7.2.1.8 Process MT_CF_MSC**

Sheet 1: the procedure CAMEL_CF_MSC_INIT is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9]. If the MSC does not support CAMEL, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 1, sheet 4: the procedure CAMEL_CF_Dialled_Services is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28]. If the MSC does not support CAMEL phase 3, processing continues from the "Pass" exit of the test "Result?".

Sheet 1, sheet 3, sheet 4: the procedure CAMEL_OCH_MSC1 is specific to CAMEL phase 2; it is specified in GSM 03.78 for CAMEL Phase 2 [9]. If the MSC does not support CAMEL phase 2, processing continues from the "Yes" exit of the test "Result=Reconnect?".

Sheet 1: the procedure MOBILE_NUMBER_PORTABILITY_IN_OQoD is specific to Mobile Number Portability; it is specified in GSM 03.66 [6].

Sheet 1: the procedure CAMEL_Store_Destination_Address is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet 1: the procedures CAMEL_OCH_MSC_DISC3 and CAMEL_OCH_MSC_DISC4 are specific to CAMEL; they are specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9] respectively.

~~Sheet 1: the procedure MOBILE_NUMBER_PORTABILITY_IN_OQoD is specific to Mobile Number Portability; it is specified in GSM 03.66 [6].~~

Sheet 2: the procedures CAMEL_Start_TNRy and CAMEL_Stop_TNRy are specific to CAMEL phase 2; they are specified in GSM 03.78 for CAMEL Phase 2 [9].

Sheet 2: the procedure CAMEL_CF_MSC_ANSWER is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9]. If the MSC does not support CAMEL, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 2: the procedure UUS_MSC_Clear_UUS is specific to UUS; it is specified in GSM 03.87 [17].

Sheet 3: the procedures CAMEL_OCH_MSC_DISC3 and CAMEL_OCH_MSC_DISC4 are specific to CAMEL; they are specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9] respectively.

~~Sheet 3: the procedure CAMEL_OCH_MSC1 is specific to CAMEL phase 2; it is specified in GSM 03.78 for CAMEL Phase 2 [9].~~

Sheet 3: the procedure CAMEL_Stop_TNRy is specific to CAMEL phase 2; it is specified in GSM 03.78 for CAMEL Phase 2 [9].

Sheet 3: the processing in the branch beginning with the Int_O_Release input will occur only if the MSC supports CAMEL.

Sheet 4: the input signal TNRy expired and all the subsequent processing are specific to ~~Support of~~ CAMEL phase 2, and will occur only if the GMSC supports CAMEL phase 2. The procedure CAMEL_OCH_MSC2 is specified in GSM 03.78 for CAMEL Phase 2 [9].

Sheet 5: the procedure CAMEL_OCH_MSC_DISC1 is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9]. If the MSC does not support CAMEL, processing continues from the "No" exit of the test "Result=CAMEL handling?".

Sheet 5: the procedure CAMEL_OCH_MSC_DISC2 is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9]. If the MSC does not support CAMEL, processing continues from the "No" exit of the test "Result=Reconnect?" .

Sheet 5: the processing in the branch beginning with the Int_O_Release input will occur only if the MSC supports CAMEL.

Sheet 5: after the process MT_CF_MSC has sent an IAM to the forwarded-to exchange, it acts as a relay for messages received from the parent process and the forwarded-to exchange. Any message other than Address Complete, Connect, Answer or Release causes no change of state in the process MT_GMSC

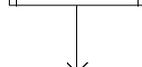
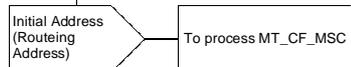
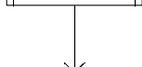
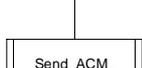
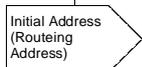
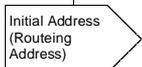
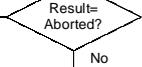
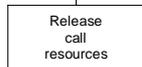
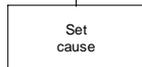
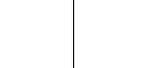
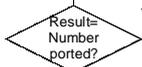
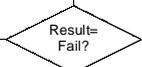
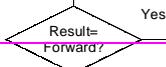
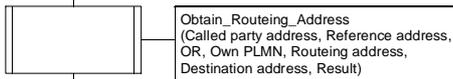
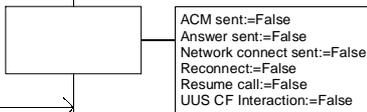
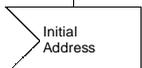
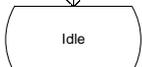
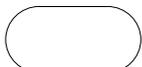
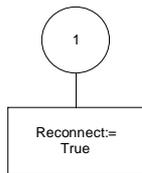
****** Next Modified Section ******

Process MT_GMSC

MT_GMSC1(7)

Process in the GMSC to handle a mobile-terminated call request

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the destination MSC unless marked otherwise



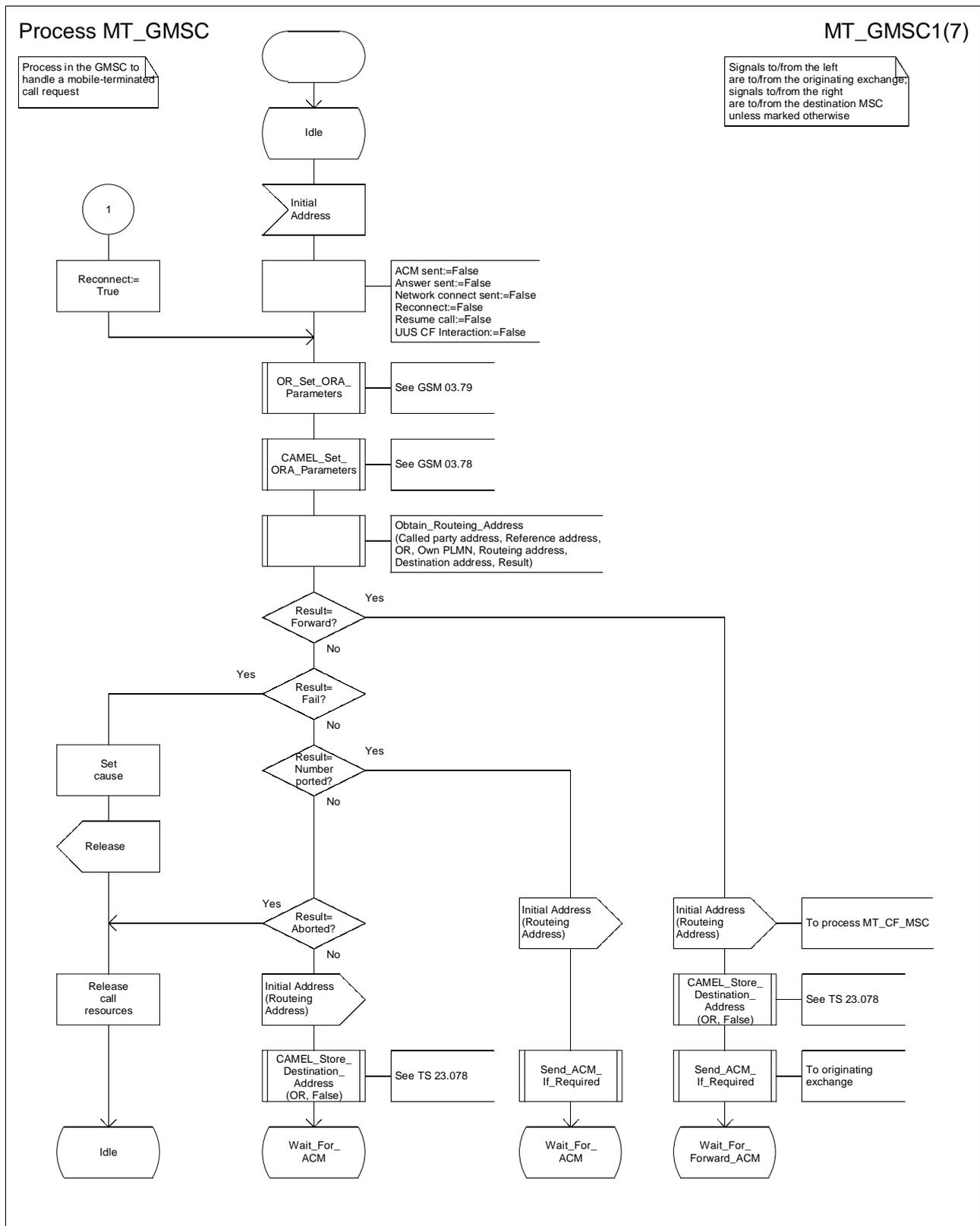
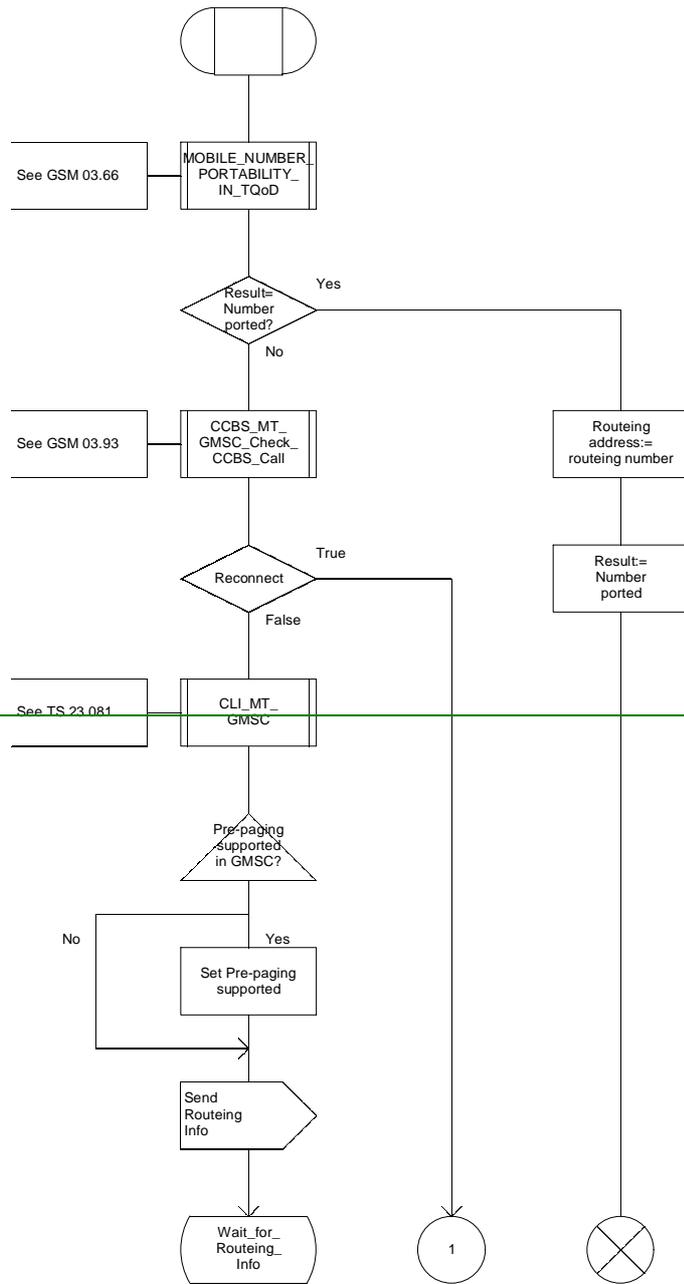


Figure 35a: Process MT_GMSC (sheet 1)

Procedure Obtain_Routeing_Address

ORA1(4)

Procedure in a GMSC to determine the address to which a call should be routed



Procedure Obtain_Routeing_Address

ORA1(4)

Procedure in a GMSC to determine the address to which a call should be routed.

Procedure Obtain_Routeing_Address
 FPAR IN Input address, Reference address, Own PLMN
 IN/OUT Routeing address, Destination address, OR, Result

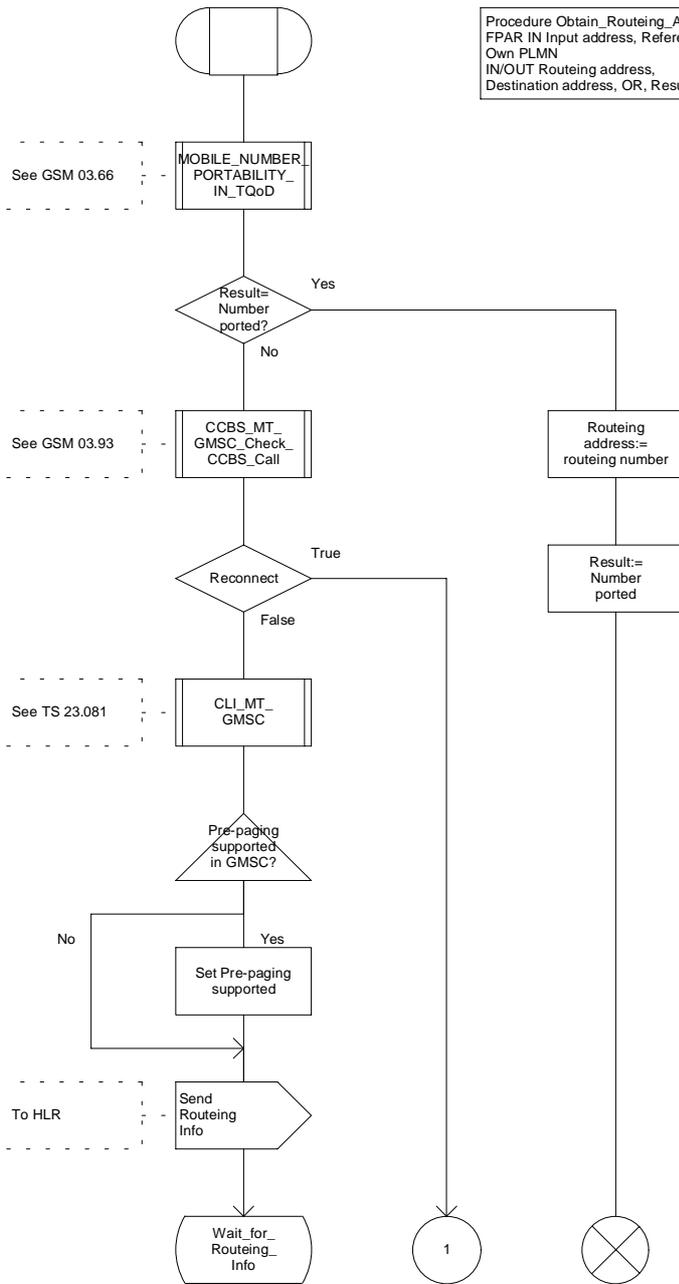


Figure 136a: Procedure Obtain_Routeing_Address (sheet 1)

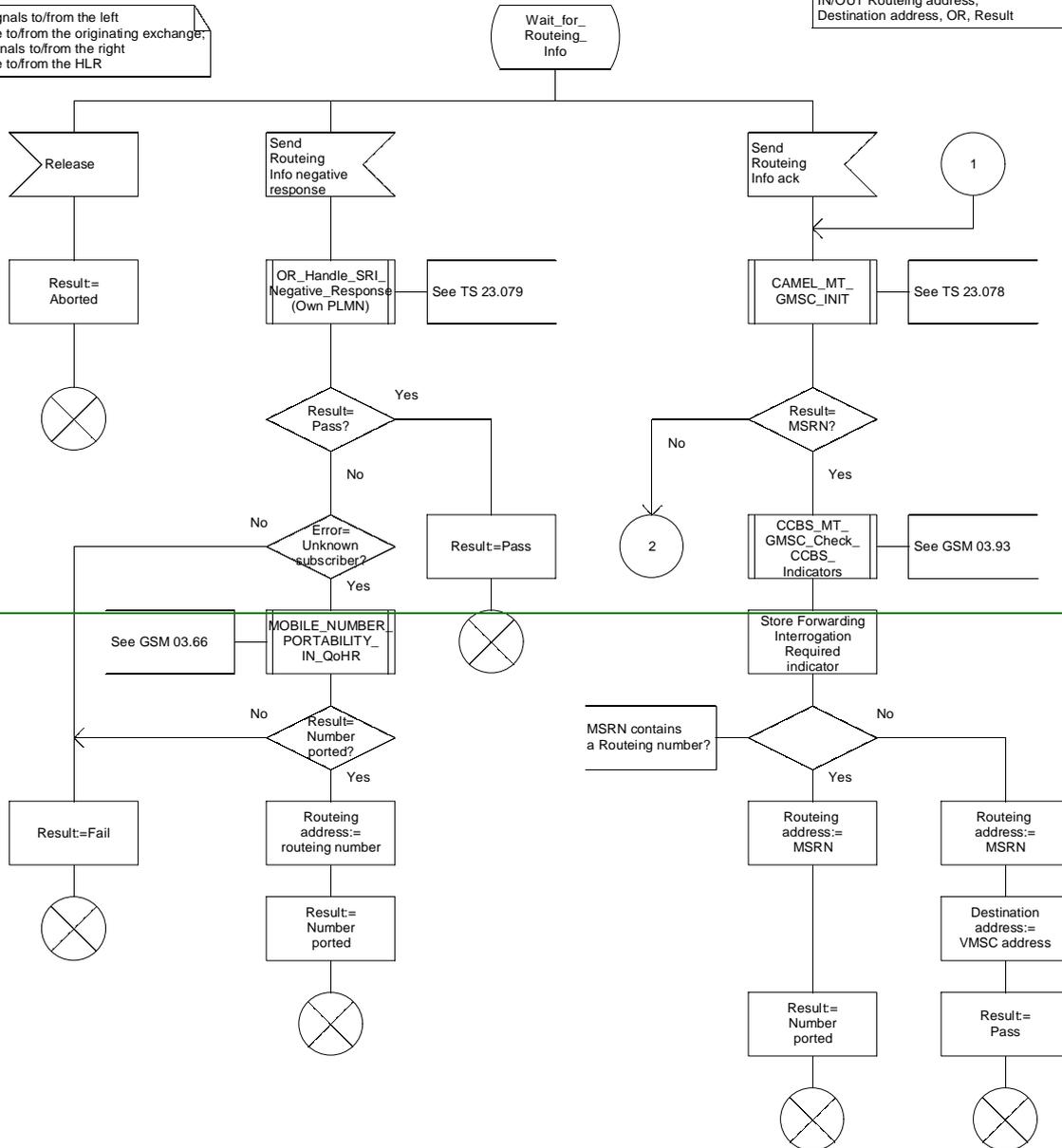
Procedure Obtain_Routeing_Address

ORA2(4)

Procedure in a GMSC to determine the address to which a call should be routed

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the HLR

Procedure Obtain_Routeing_Address
 FPAR IN Input address, Reference address, Own PLMN
 IN/OUT Routeing address, Destination address, OR, Result



Procedure Obtain_Routeing_Address

ORA2(4)

Procedure in a GMSC to determine the address to which a call should be routed.

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the HLR

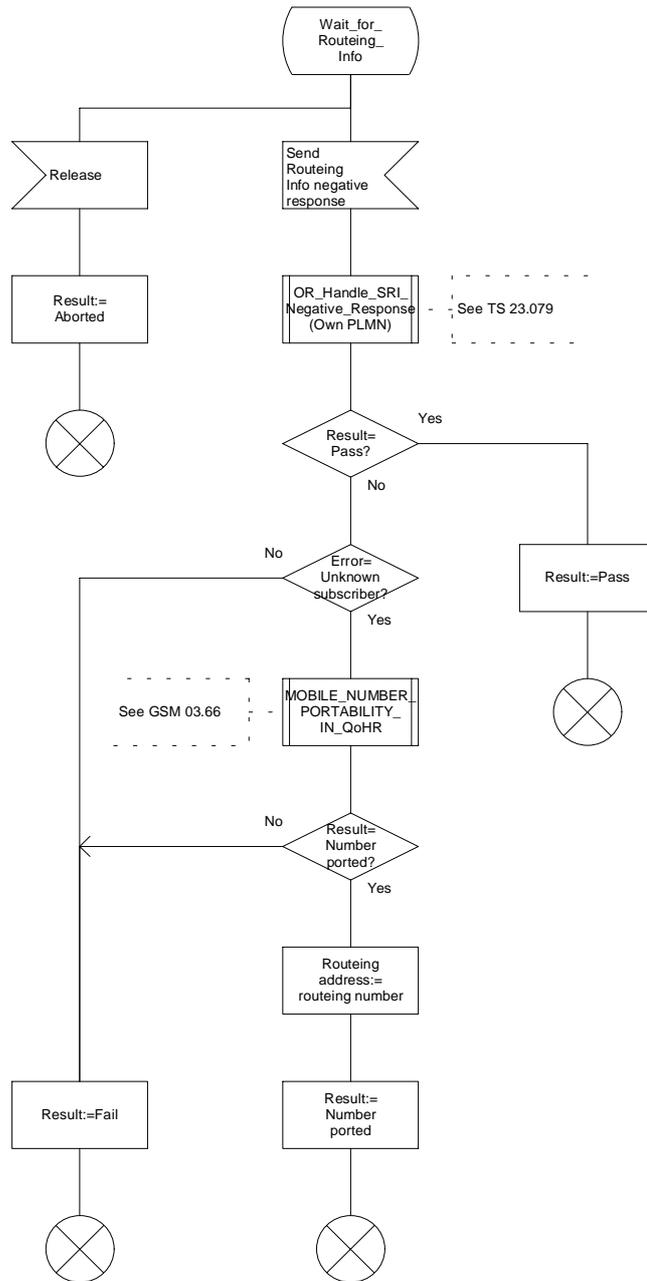
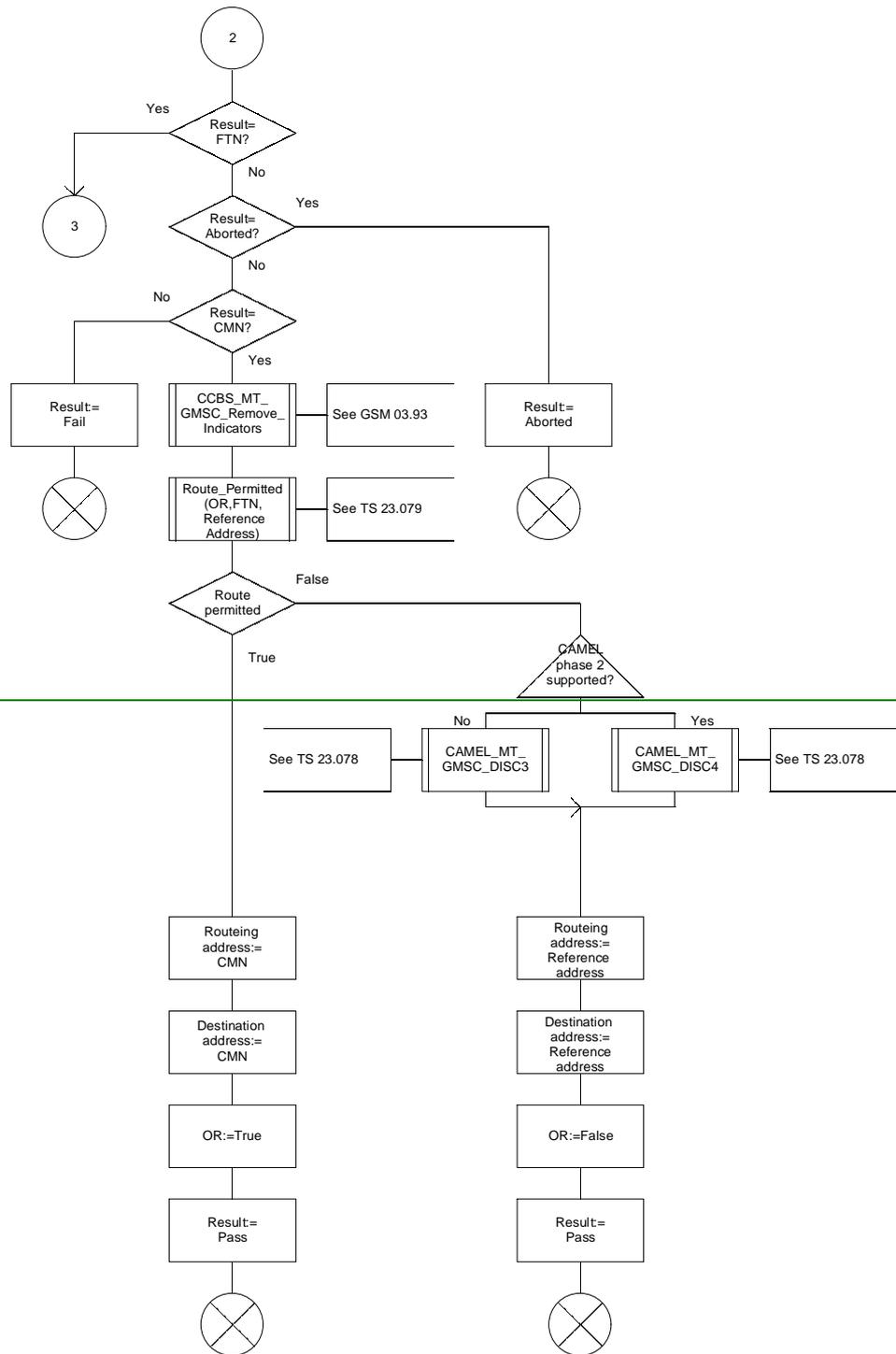


Figure 136b: Procedure Obtain_Routeing_Address (sheet 2)

Procedure Obtain_Routeing_Address

ORA3(4)

Procedure in a GMSC to determine the address to which a call should be routed



Procedure Obtain_Routeing_Address

ORA3(4)

Procedure in a GMSC to determine the address to which a call should be routed.

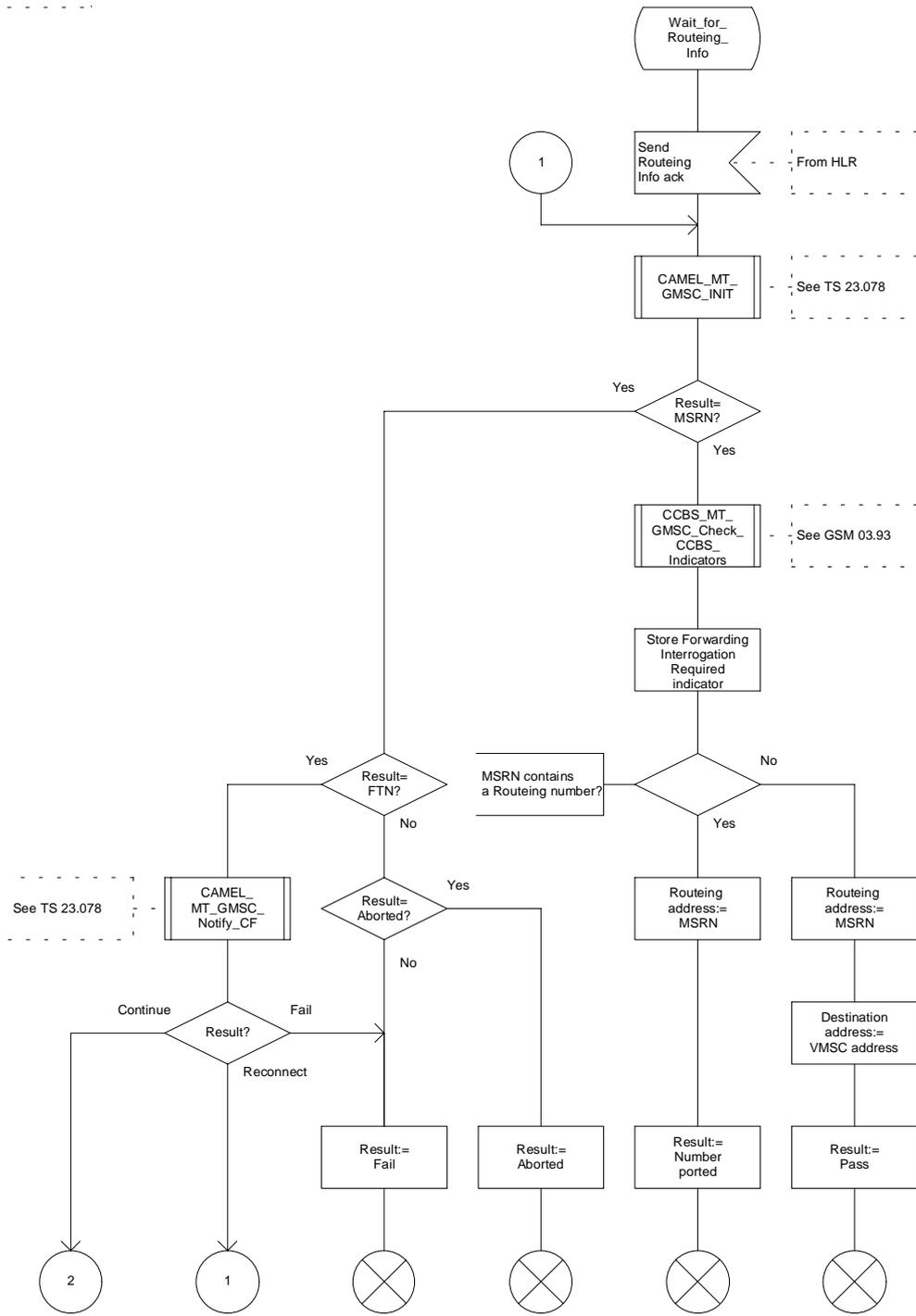
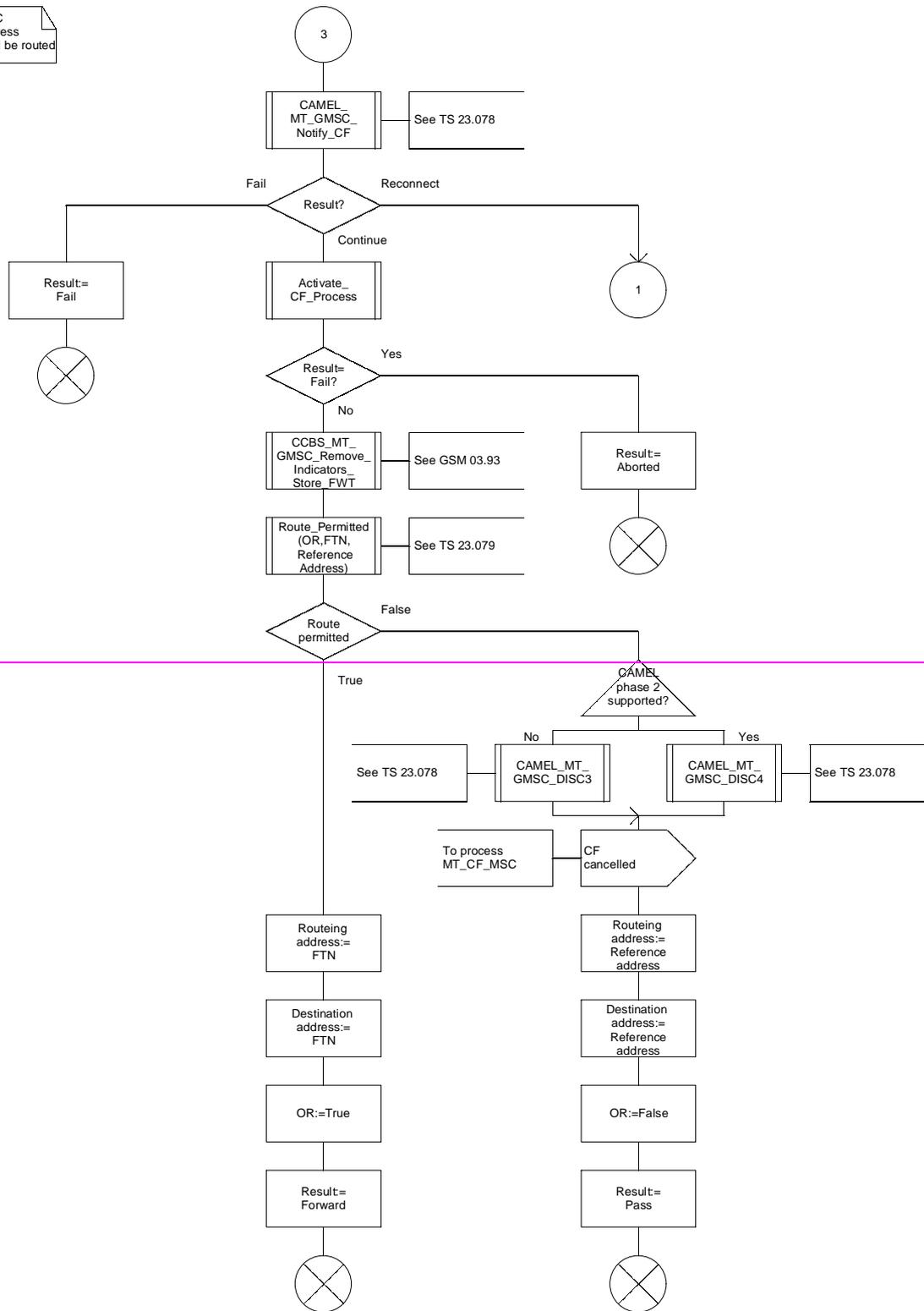


Figure 136c: Procedure Obtain_Routeing_Address (sheet 3)

Procedure Obtain_Routeing_Address

ORA4(4)

Procedure in a GMSC to determine the address to which a call should be routed



Procedure Obtain_Routeing_Address

ORA4(4)

Procedure in a GMSC to determine the address to which a call should be routed.

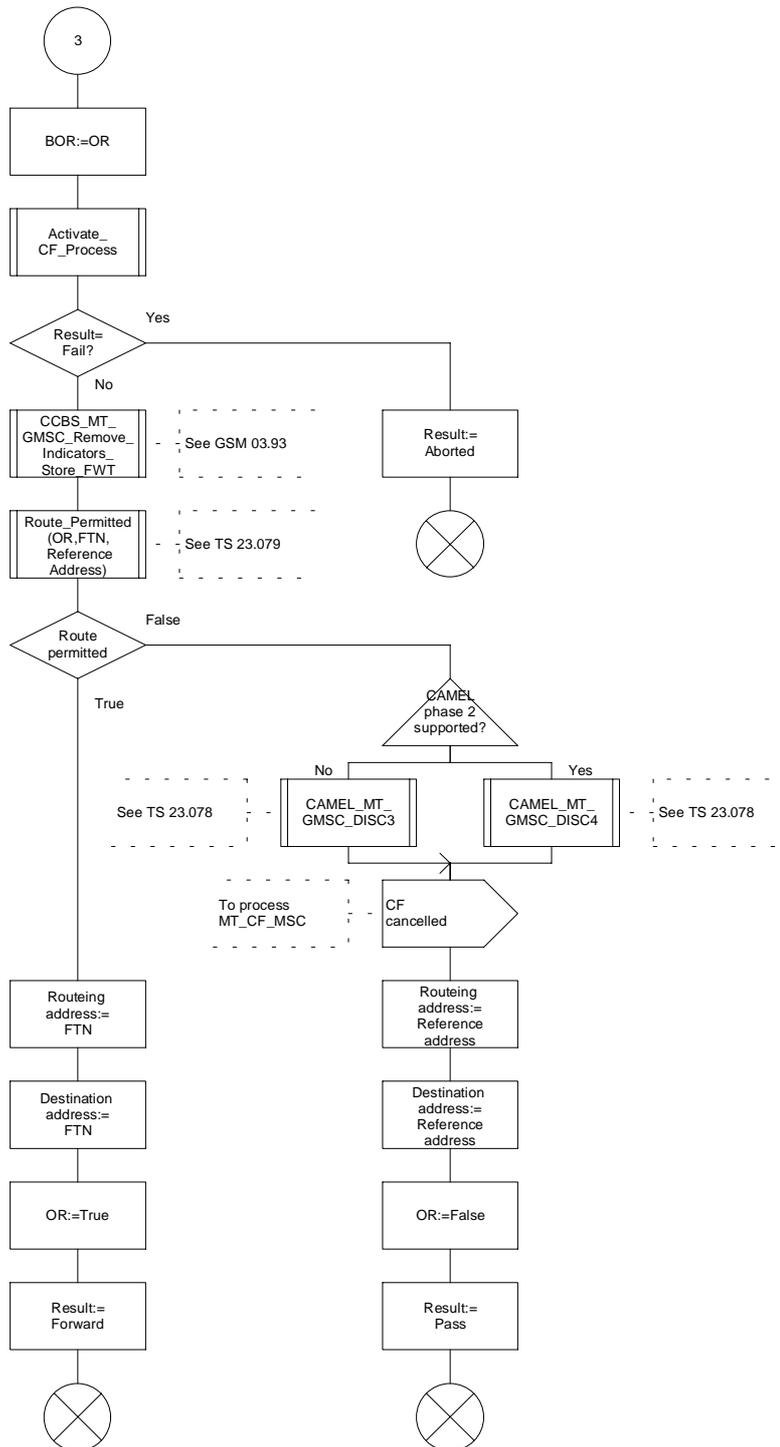


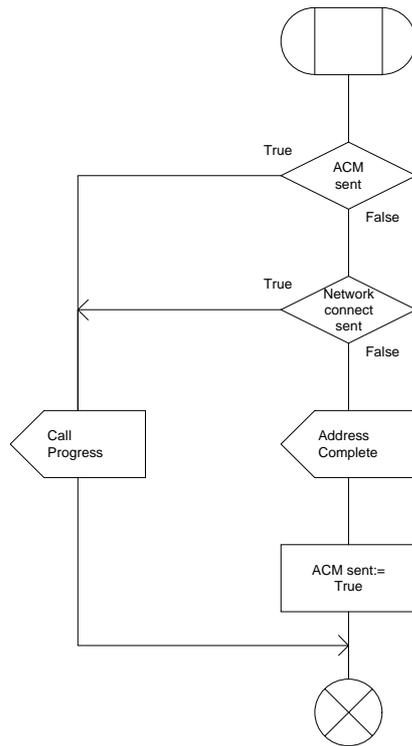
Figure 36d: Procedure Obtain_Routeing_Address (sheet 4)

Procedure Send_ACM_If_Required

SACMIR1(1)

Procedure to send an Address Complete Message to the preceding exchange if one is required for this call

Signals to the left are to the originating exchange



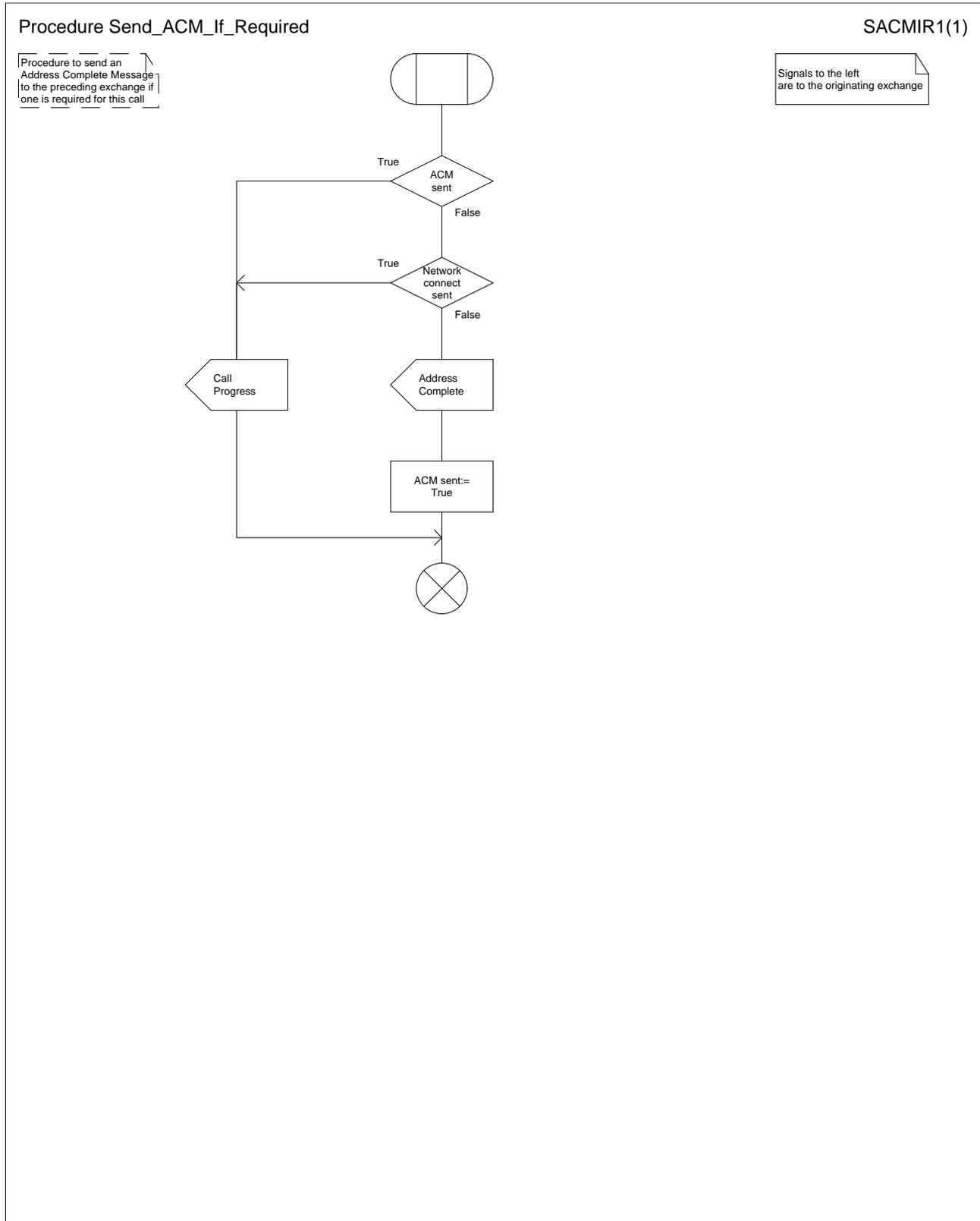


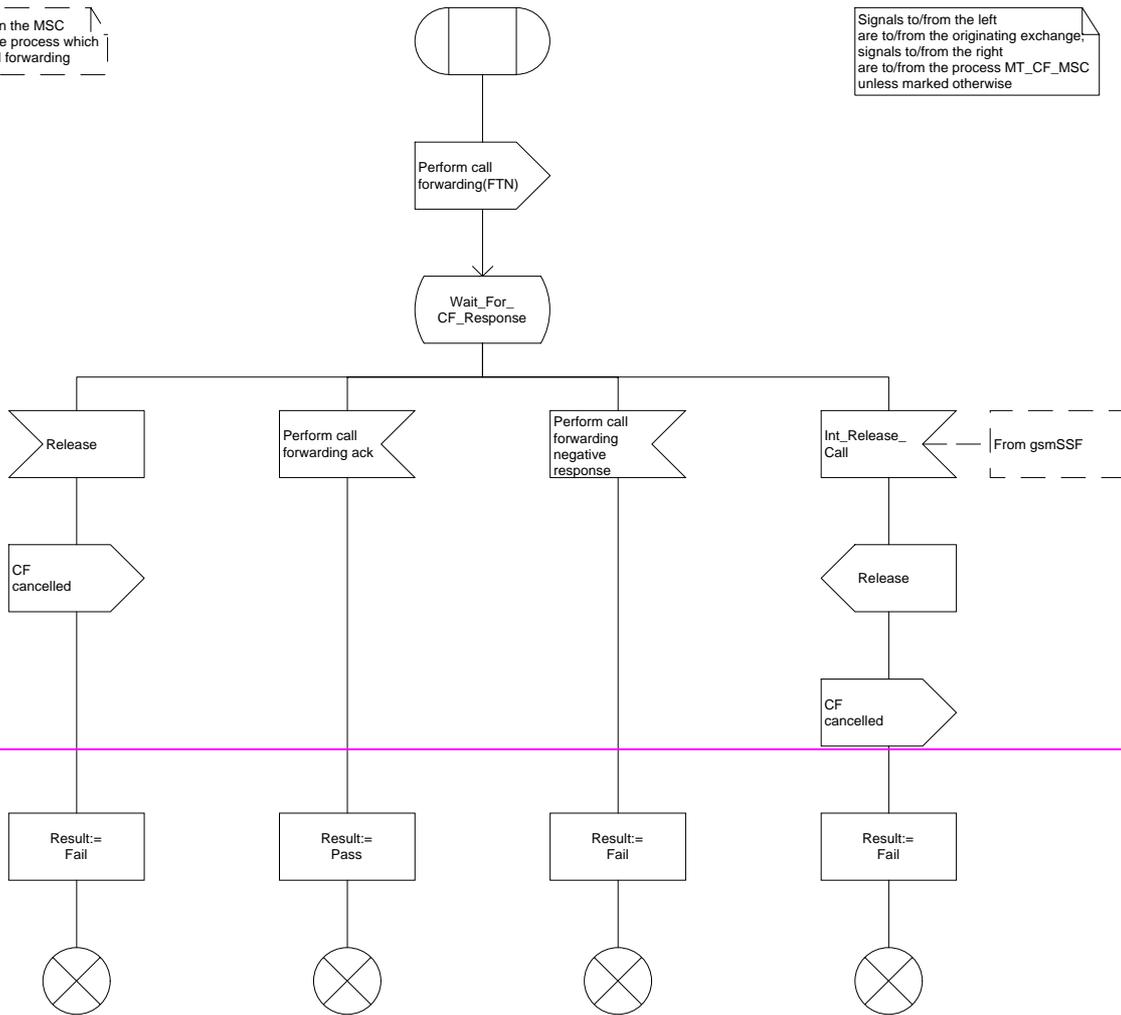
Figure 37: Procedure Send_ACM_If_Required

Procedure Activate_CF_Process

ACFP1(1)

Procedure in the MSC to initiate the process which handles call forwarding

Signals to/from the left are to/from the originating exchange, signals to/from the right are to/from the process MT_CF_MSC unless marked otherwise



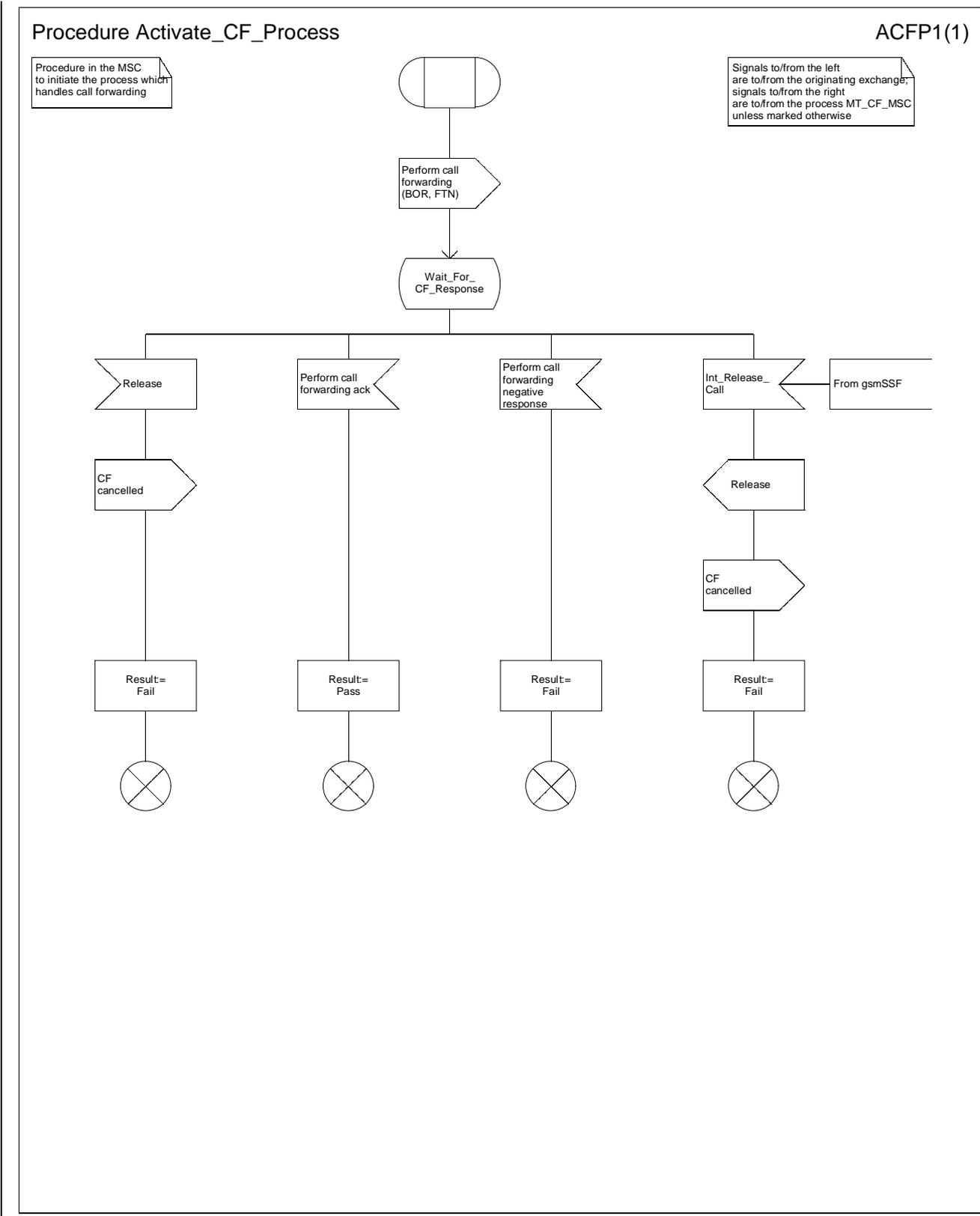


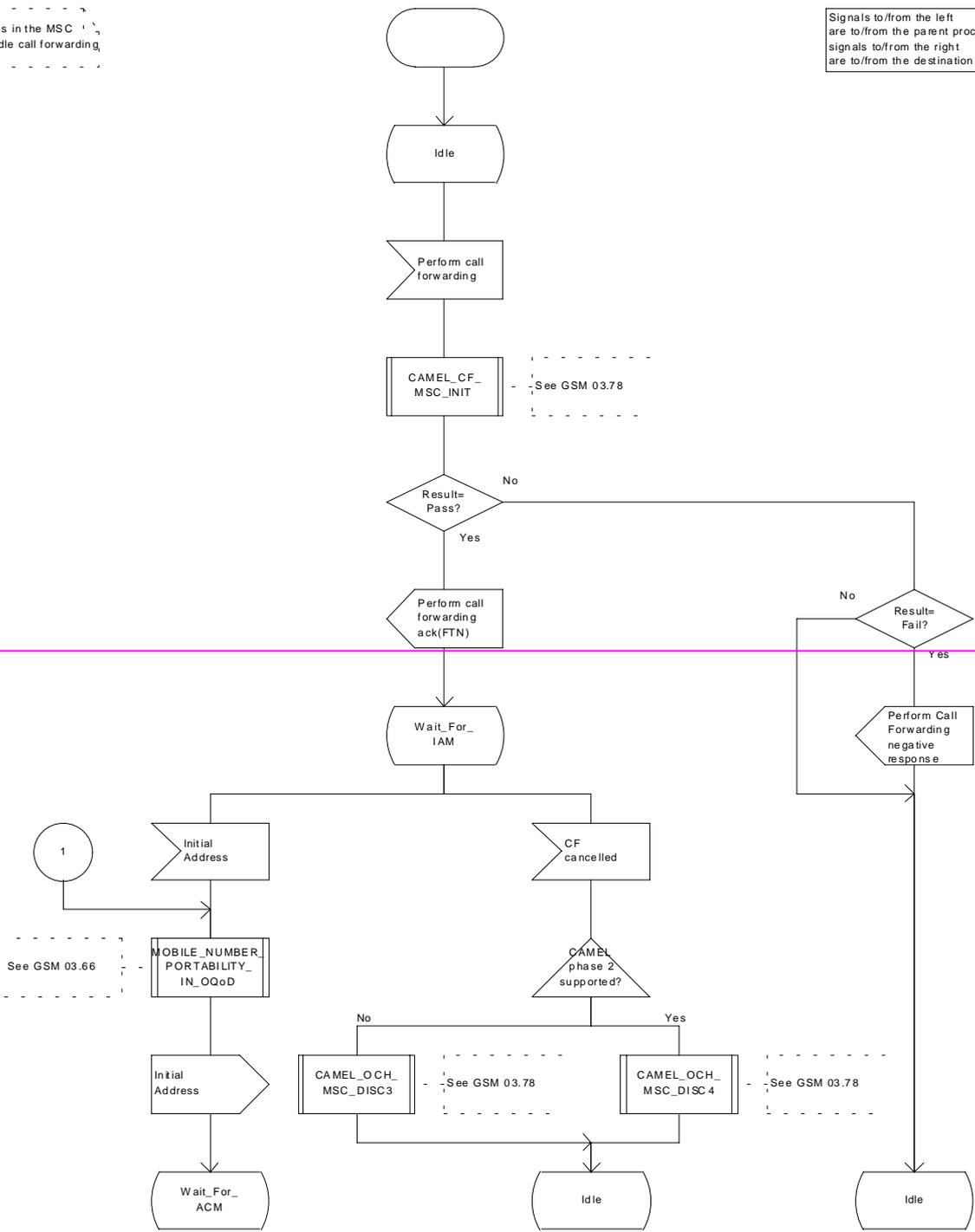
Figure 41: Procedure Activate_Call_Forwarding_Process

Process MT_CF_MSC

MTCFMSC1(5)

Process in the MSC to handle call forwarding

Signals to/from the left are to/from the parent process; signals to/from the right are to/from the destination exchange



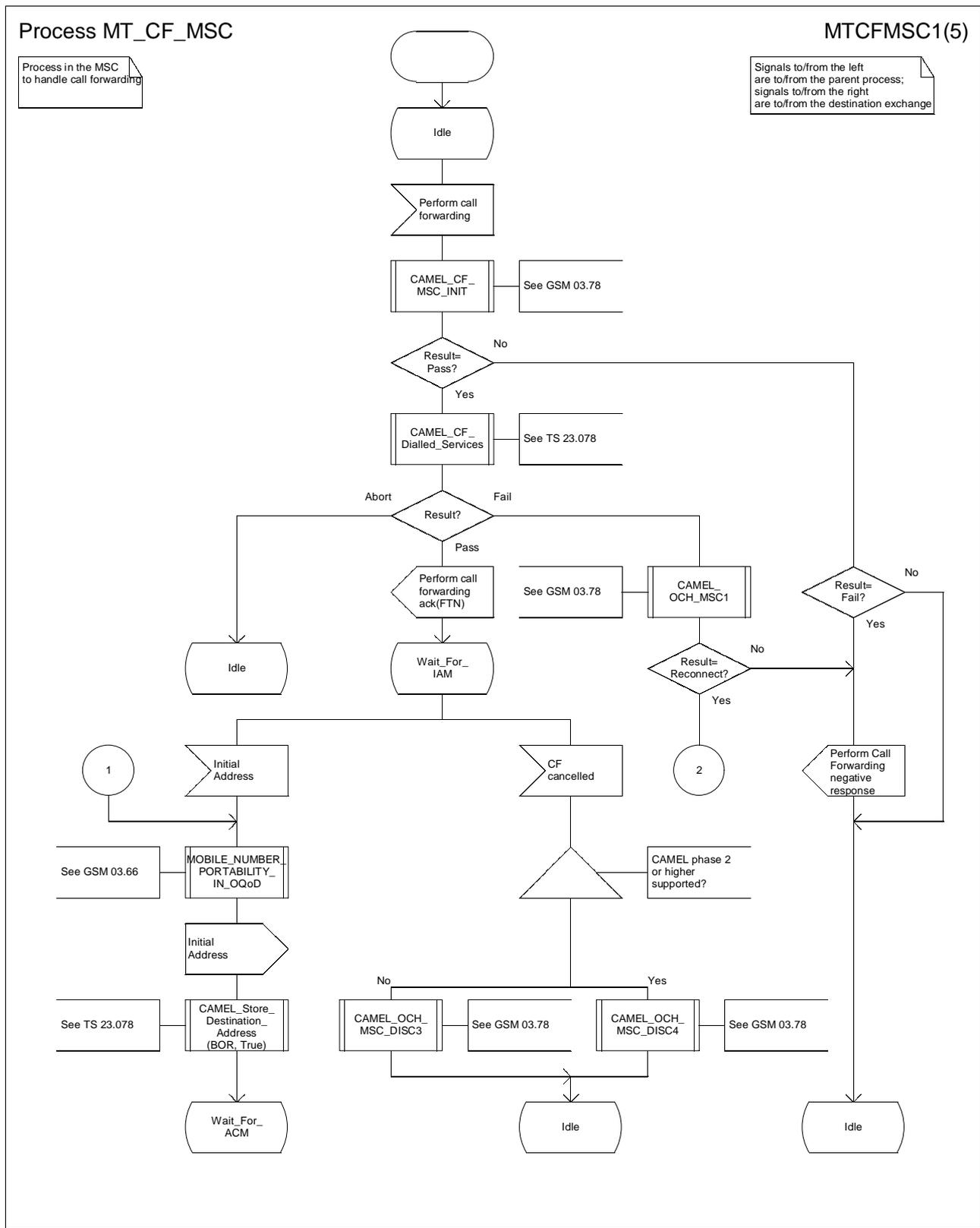


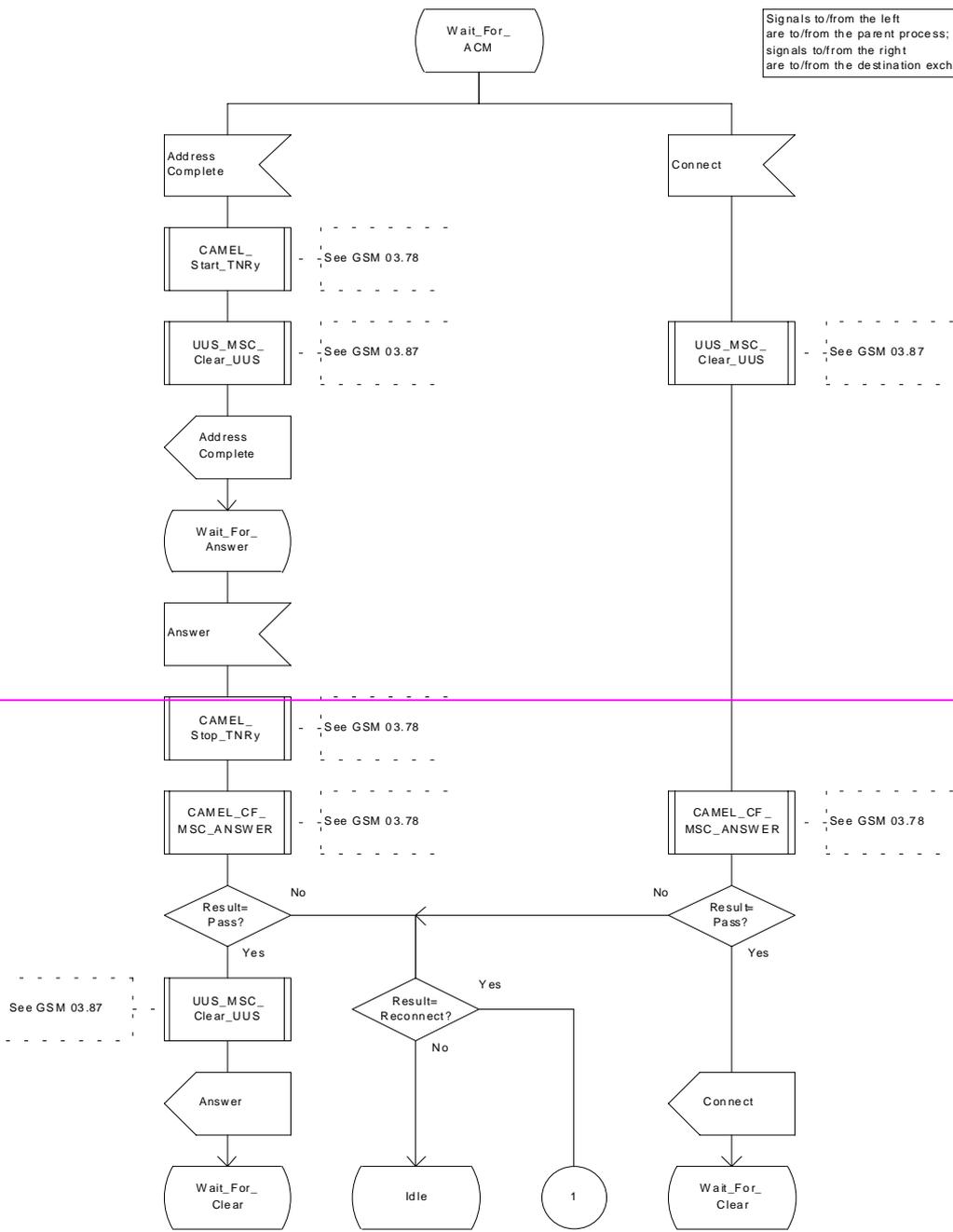
Figure 42a: Process MT_CF_MSC (sheet 1)

Process MT_CF_MSC

MTCFMSC2(5)

Process in the MSC to handle call forwarding

Signals to/from the left are to/from the parent process; signals to/from the right are to/from the destination exchange



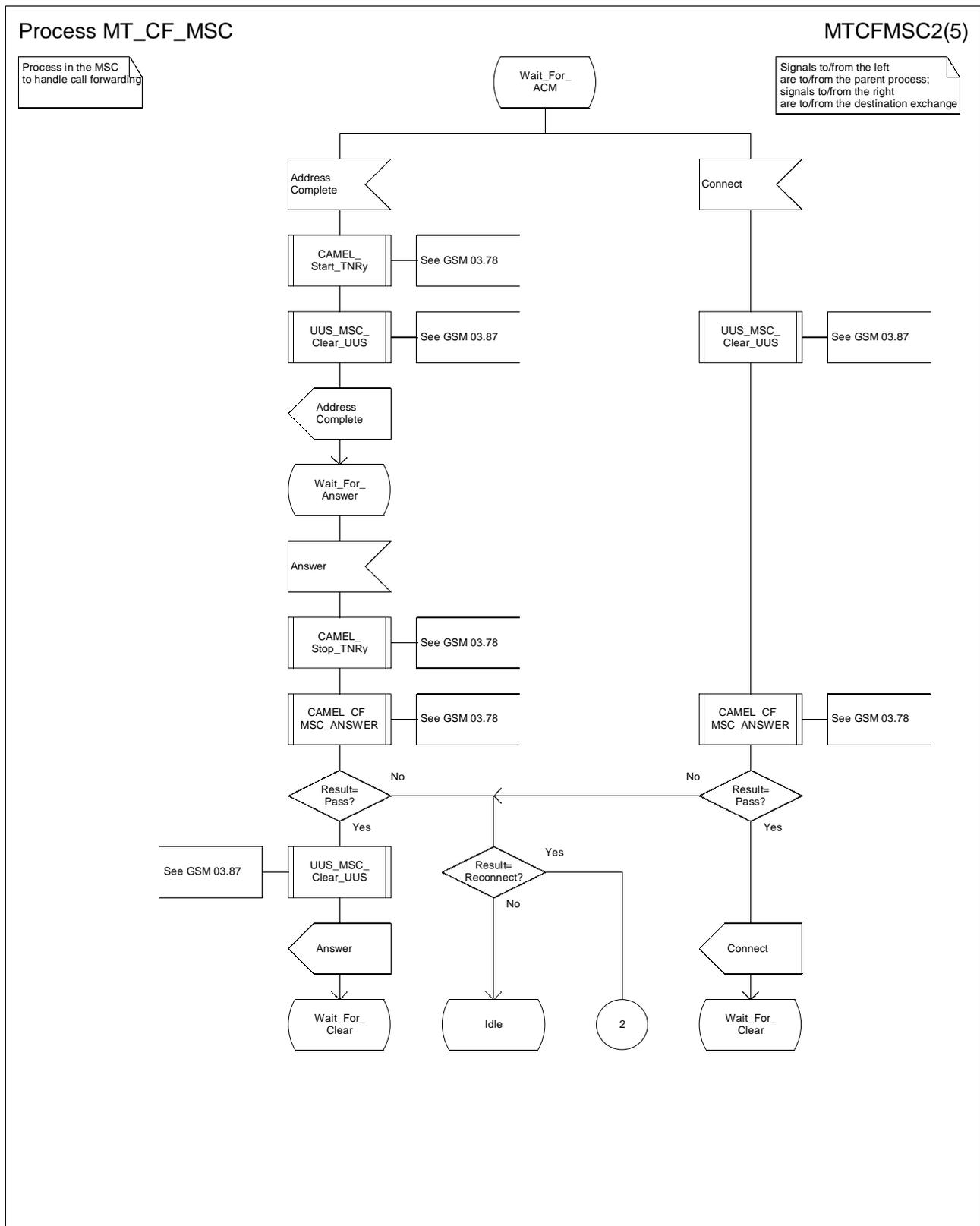


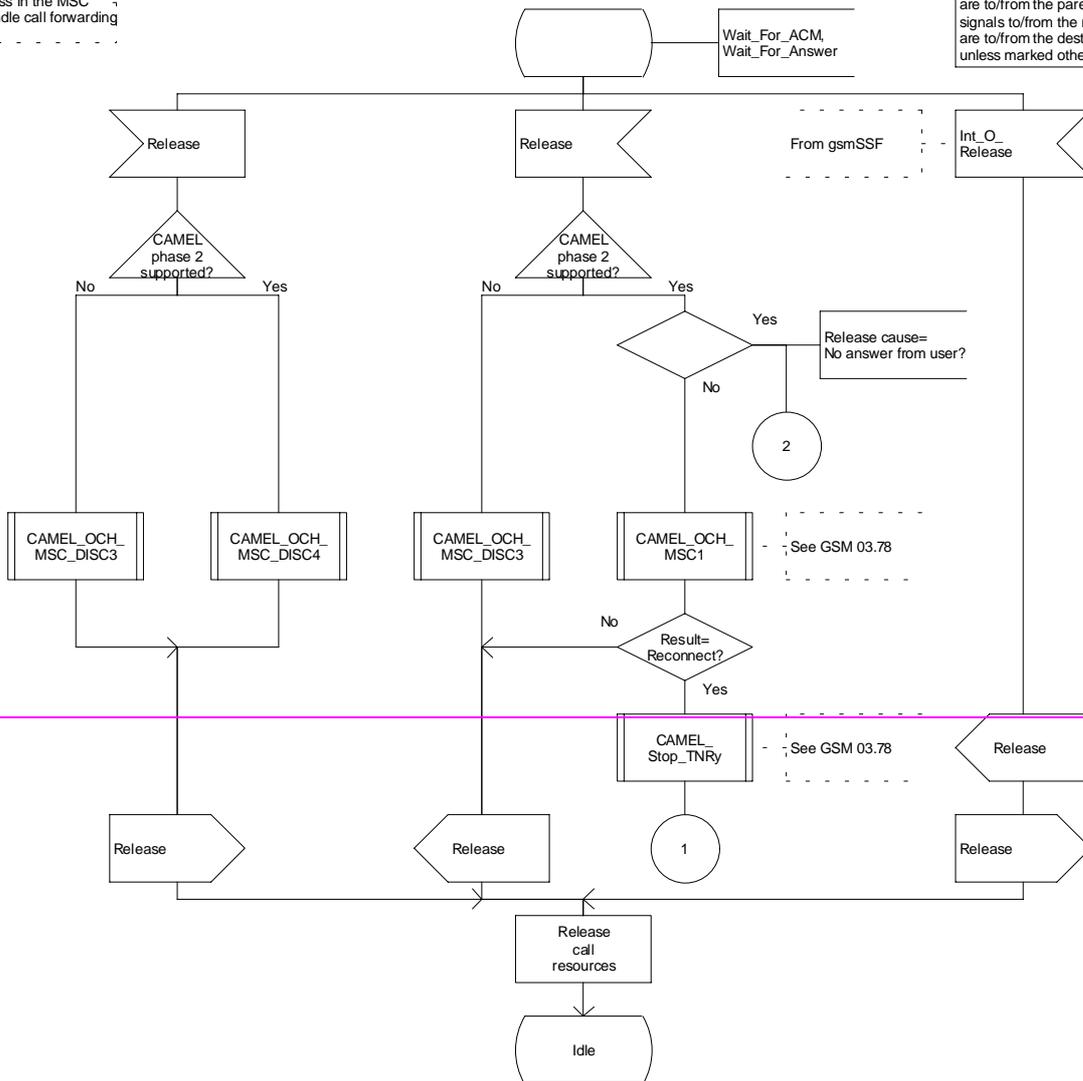
Figure 42b: Process MT_CF_MSC (sheet 2)

Process MT_CF_MSC

MTCFMSC3(5)

'Process in the MSC
'to handle call forwarding

Signals to/from the left
are to/from the parent process;
signals to/from the right
are to/from the destination exchange
unless marked otherwise

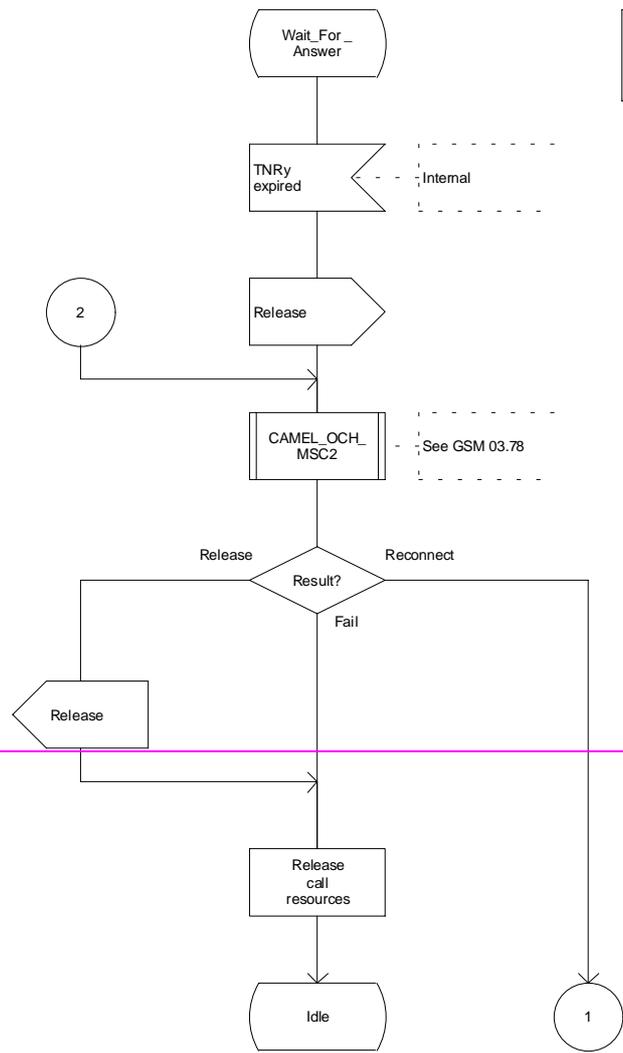


Process MT_CF_MSC

MTCFMSC4(5)

Process in the MSC to handle call forwarding

Signals to/from the left are to/from the parent process; signals to/from the right are to/from the destination exchange unless marked otherwise



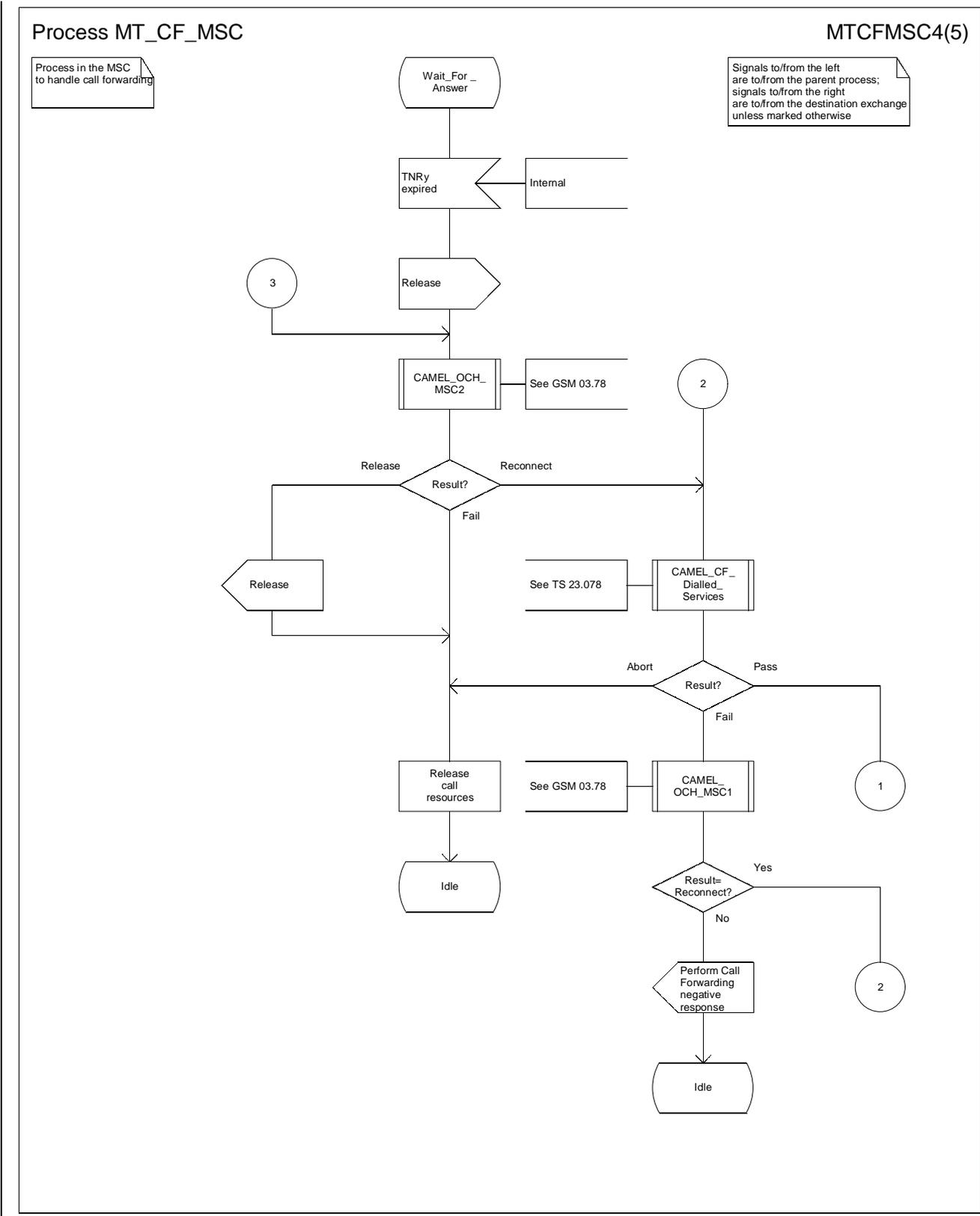


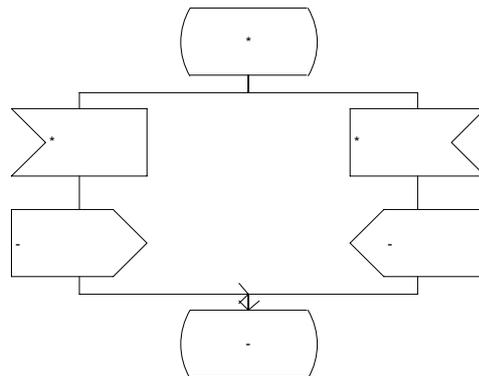
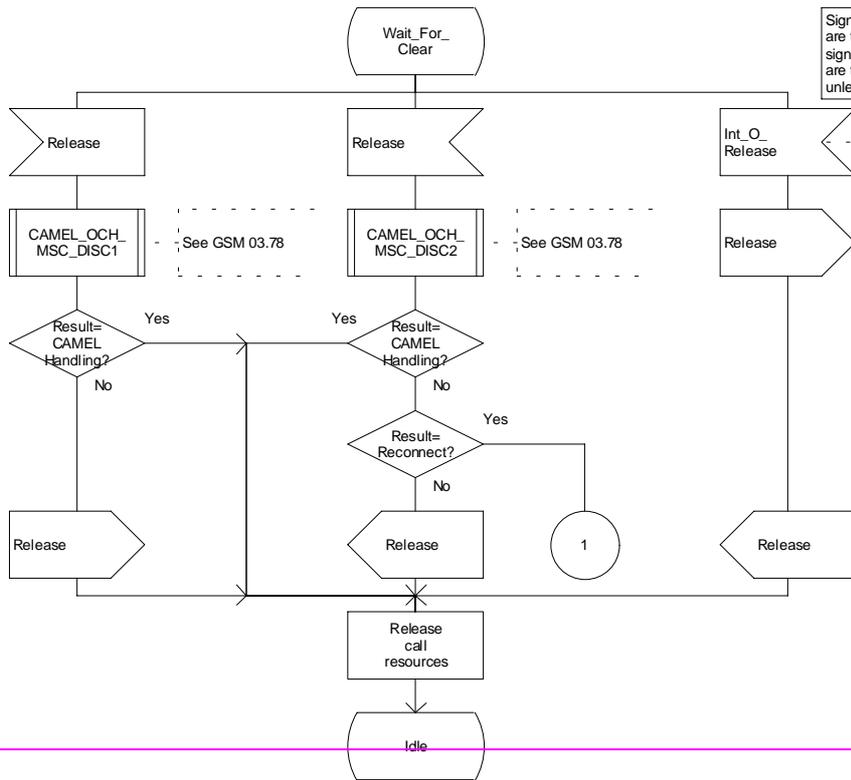
Figure 42d: Process MT_CF_MSC (sheet 4)

Process MT_CF_MSC

MTCFMSC5(5)

'Process in the MSC
'to handle call forwarding

Signals to/from the left
are to/from the parent process;
signals to/from the right
are to/from the destination exchange
unless marked otherwise



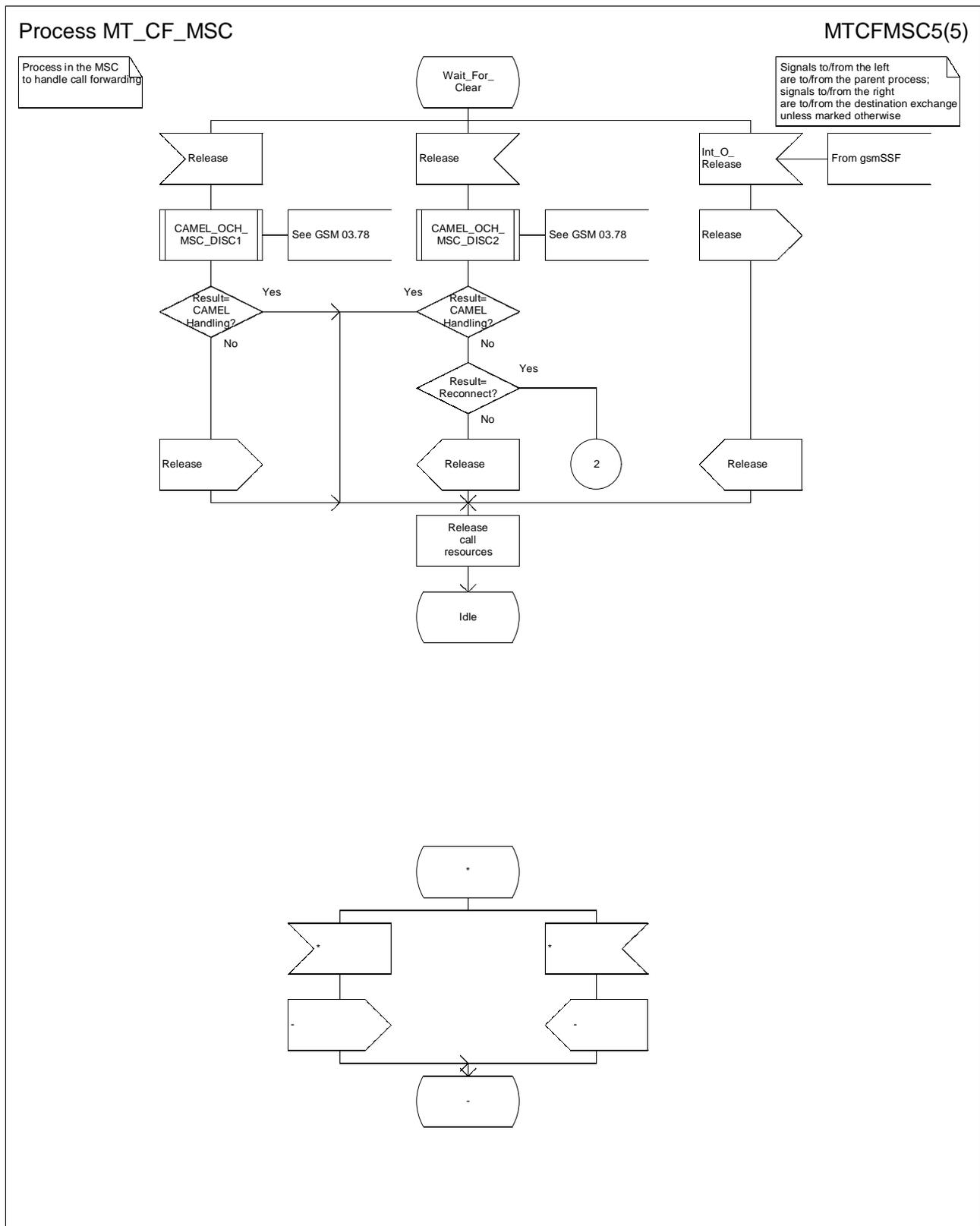


Figure 42e: Process MT_CF_MSC (sheet 5)

****** Next Modified Section ********7.2.3.4 Procedure Retrieve_Location_Info_VLR**

The test "Retrieve location info from SGSN" takes the "Yes" exit if:

- the Gs interface is implemented; and
- there is an association established between the MSC/VLR and the SGSN.

The stored location information consists of:

- the cell ID of the cell in which the MS last established radio contact;
- the location number, [geodetic information](#) and geographical information derived from the cell ID if the VLR is capable of doing so (the mapping from cell ID to location number is network-specific and outside the scope of the GSM standard);
- the age of the location information.

The output signal Send MS information towards the SGSN indicates that the required information is mobile location information.

The derivation of the location number, [geodetic information](#) and geographical information from the received cell ID is a VLR operator option (the mapping from cell ID to location number is network-specific and outside the scope of the GSM standard).

****** Next Modified Section ********7.3.1.1 Process ICH_MSC**

Sheet 1: the rules for converting the ISDN BC/LLC/HLC to a GSM bearer service or teleservice are specified in GSM 09.07 [24].

Sheet 1: the task "Store UUS information (if received)" is executed only if the VMSC supports UUS.

Sheet 1: the variables TCH allocated, ACM sent, Answer sent and Network connect sent are global data, accessible to the procedures Establish_Terminating_TCH_If_Required, Send_ACM_If_Required, Send_Answer_If_Required and Send_Network_Connect_If_Required.

Sheet 1: the variables UUS result sent, UUS1 implicit active, UUS1 explicit active, UUS2 active, UUS3 active and UUS CF interaction are specific to UUS. They are accessible to all UUS specific procedures.

[Sheet 1: the handling starting with the input signal "Continue CAMEL handling" is specific to CAMEL phase 3. If the VMSC does not support CAMEL phase 3, this signal will not be received from the VLR.](#)

[Sheet 1: the procedure CAMEL_ICH_MSC_INIT is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 \[28\].](#)

Sheet ~~2~~: the procedure Process_Access_Request_MSC is specified in subclause 7.1.1.2.

Sheet ~~2~~: the signal input Complete Call will be received in the state Wait_For_Page_Request only if the MSC/VLR supports pre-paging.

Sheet ~~2~~, sheet ~~3~~: the suggested mapping from values of the Send Info For Incoming Call negative response information element to values of the ISUP release cause (see ITU-T Recommendation Q.850 [32]) is shown in table 2. The mapping used is a matter for the network operator, depending on the telephony signalling system used.

Table 2: Suggested mapping of Send Info For Incoming Call (SIFIC) negative responses to ISUP release causes

SIFIC negative response	ISUP release cause number	ISUP release cause name
Absent subscriber	20	Subscriber absent
Busy subscriber	17	User busy
CUG reject (Called party SS interaction violation)	21	Call rejected
Forwarding violation	21	Call rejected
Impossible call completion	111	Protocol error, unspecified
No subscriber reply	19	No answer from user (user alerted)
System failure	111	Protocol error, unspecified
Unallocated roaming number	111	Protocol error, unspecified

Sheet 2, sheet 3, sheet 5, sheet 7, sheet 8, sheet 10: the procedure CAMEL_MT_GMSC_DISC4 is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28]. If the VMSC does not support CAMEL phase 3, processing continues from the "No" exit of the test "Result=Reconnect?".

Sheet 2, sheet 4, sheet 7, sheet 8, sheet 10: the procedure CAMEL_MT_GMSC_DISC6 is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet 3: the procedure CAMEL_MT_GMSC_DISC5 is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28]. If the VMSC does not support CAMEL phase 3, processing continues from the "No" exit of the test "Result=Reconnect?".

Sheet 3: the task "Store CW treatment indicator for this call if received in SII2" is executed only if the VMSC supports CAMEL phase 3.

Sheet 3: If the VMSC does not support CAMEL phase 3, the procedure Complete_Call_In_MSC and the procedure Process_Call_Waiting_MSC will not return a "Reconnect" result.

Sheet 32: the processing in the branch starting with the input signal "Process Call Waiting" is specific to Call Wait. If the VMSC does not support CW this signal will not be received from the VLR.

Sheet 23, sheet 8, the procedure CD_Reject is specific to Call Deflection; it is specified in GSM 03.72 [7].

Sheet 32, sheet 84: the procedure CCBS_Set_Diagnostic_For_Release is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 2: the procedure UUS_ICH_Check_Support is specific to UUS; it is specified in GSM 03.87 [17].

Sheet 32, sheet 43, sheet 105, sheet 11: the procedure CCBS_Check_Last_Call is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 4: the procedure UUS_ICH_Check_Support is specific to UUS; it is specified in GSM 03.87 [17].

Sheet 43: the procedure CAMEL_Check_ORLCF_VMSC is specific to CAMEL phase 2; it is specified in GSM 03.78 for CAMEL Phase 2 [9]. If the VMSC does not support CAMEL, processing continues from the "ORLCF" exit of the test "Result?"

Sheet 43: the procedure Handle_ORLCF_VMSC is specific to Support of Optimal Routing. It is specified in TS 100 045 [10]. If the VMSC does not support Optimal Routing, processing continues from the "Continue" exit of the test "Result?".

Sheet 43; the procedures CD_Failure and CD_Success are specific to Call Deflection; they are specified in GSM 03.72 [7].

Sheet 5: the procedure CAMEL_MT_VMSC_Notify_CF is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet 5: If the VMSC does not support CAMEL phase 3, processing starts with the possible call of the procedure CCBS_Check_Last_Call.

Sheet ~~53~~: The task "set redirection information" includes the the mapping of the MSISDN parameter received in the Send Info For Incoming Call ack message to the redirecting number of the IAM message and the setting of the presentation indicator of the redirecting number of the IAM message according to the value of the Redirecting presentation parameter received in the Send Info For Incoming Call ack message.

Sheet ~~53~~: it is an operator option whether to send an Address Complete message if the VLR returns forwarding information. If the VMSC sends an Address Complete message, it shall include the called party's status field of the Backward call indicator set to "no indication".

Sheet ~~53~~, sheet ~~74~~: the procedure Send_ACM_If_Required is specified in subclause 7.2.1.3.

Sheet ~~53~~: the procedure Activate_CF_Process is specified in subclause 7.2.1.7.

Sheet ~~53~~: the procedure UUS_ICH_Set_Info_In_IAM is specific to UUS, it is specified in GSM 03.87 [17].

Sheet ~~53~~: the called party address sent in the IAM to the process MT_CF_MSC is the Forwarded-to number received in the Perform Call Forwarding ack.

Sheet 5: the procedure CAMEL_Store_Destination_Address is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet 5: the procedure CD_Success is specific to Call Deflection; it is specified in GSM 03.72 [7].

Sheet 6: The processing on this sheet is specific to CAMEL phase 3. If the VMSC does not support CAMEL phase 3, the input signal Int_Release Call will not be received.

Sheet 7: the procedure CAMEL_MT_GMSC_ANSWER is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28]. If the VMSC does not support CAMEL phase 3, processing continues from the "No" exit of the test "Result=Reconnect?".

Sheet 4: the procedure CCBS_MT_MSC_Check_Forwarding is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet ~~74~~: the procedure Handle_COLP_Forwarding_Interaction is specified in subclause 7.2.1.6.

Sheet ~~74~~: the procedure Send_Answer_If_Required is specified in subclause 7.2.1.4.

Sheet ~~74~~: the procedure Send_Network_Connect_If_Required is specified in subclause 7.2.1.5.

Sheet 8: the procedure CCBS_MT_MSC_Check_Forwarding is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 11, sheet 12: the procedure CAMEL_MT_GMSC_DISC1 is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet 11, sheet 12: the procedure CAMEL_MT_GMSC_DISC2 is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28]. If the VMSC does not support CAMEL phase 3, processing continues from the "No" exit of the test "Result=Reconnect?".

Sheet ~~115~~: the procedure UUS_MSC_Check_UUS1_UI is specific to UUS; it is specified in GSM 03.87 [17].

Sheet ~~126~~: after the VMSC has sent an IAM to the process MT_CF_MSC, it acts as a transparent relay for messages received from the GMSC and the process MT_CF_MSC. Any message other than Address Complete, Connect, Answer or Release causes no change of state in the process ICH_MSC.

Sheet 13: The processing on this sheet is specific to CAMEL phase 3. If the VMSC does not support CAMEL phase 3, the input signal Int_Release Call will not be received.

****** Next Modified Section ********7.3.1.4 Procedure Complete_Call_In_MSC**

Sheet 1: the procedure Set_CLIP_Info_MSC is specific to CLIP.

Sheet 1: the VMSC and the MS may negotiate the bearer capability to be used for the call by the exchange of information in the Setup and Call Confirmed messages.

Sheet 1: the procedure UUS_ICH_UUS1_Implicit_Active is specific to UUS, it is specified in GSM 03.87 [17].

Sheet 1: the procedure CCBS_Report_Not_Idle is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 1, sheet 2, sheet 3, sheet 4: the procedure CAMEL_MT_GMSC_DISC4 is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28]. If the VMSC does not support CAMEL phase 3, processing continues from the "No" exit of the test "Result=Reconnect?".

Sheet 1, sheet 6: the procedure CAMEL_MT_GMSC_DISC6 is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet 1, sheet 32, sheet 64: the procedure CCBS_ICH_MSC_Report_Failure is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 2: the procedure CCBS_ICH_MSC_Report_Success is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 2, sheet 5, sheet 8: the procedure Check_CD_SII2 is specific to Call Deflection; it is specified in TS 23.072 [27]. If the VMSC does not support Call Deflection, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 2: the procedure CAMEL_Start_TNRy is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet 2, sheet 4: the procedure CAMEL_MT_GMSC_ANSWER is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28]. If the VMSC does not support CAMEL phase 3, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 2, sheet 5: the processing in the branch starting with the input "CD Request" is specific to Call Deflection; if the VMSC does not support Call Deflection the input is discarded.

Sheet 2, sheet 5: the procedure Handling_CD_MSC is specific to Call Deflection; it is specified in GSM 03.72 [7].

Sheet 2, sheet 43: the procedure UUS_ICH_Check_Support is specific to UUS, it is specified in GSM 03.87 [17]. If the VMSC does not support UUS, the execution continues from the "Yes" exit of the test "Result=Pass?".

Sheet 2: the task "UTU2Cnt:=0" is executed only if the VMSC supports UUS.

Sheet 2: the procedure Send_ACM_If_Required is specified in subclause 7.2.1.3.

Sheet 2, sheet 43: the procedure Handle_AoC_MT_MSC is specific to AoC. If the VMSC does not support AoC, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 2, sheet 43: the procedure Set_COL_Presentation_Indicator_MSC is specific to COLP.

Sheet 2: the procedure Send_Network_Connect_If_Required is specified in subclause 7.2.1.5.

Sheet 3, sheet 8: the processing in the branch starting with the input "CD Request" is specific to Call Deflection; if the VMSC does not support Call Deflection the input is discarded.

Sheet 3, sheet 8: the procedure Handling_CD_MSC is specific to Call Deflection; it is specified in GSM 03.72 [7].

Sheet 2: the procedure CAMEL_Stop_TNRy is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet 4: the procedure Send_Answer_If_Required is specified in subclause 7.2.1.4.

Sheet 5: the input signal "CAMEL TNRY expired" will be received only if the VMSC supports CAMEL phase 3.

Sheet ~~53~~, sheet ~~85~~: the procedure UUS_ICH_Check_Forwarding is specific to UUS, it is specified in GSM 03.87 [17]. If the VMSC does not support UUS, the execution continues from the "Yes" exit of the test "Result=Pass?".

Sheet 3: the procedure Send_Answer_If_Required is specified in subclause 7.2.1.4.

Sheet ~~64~~, sheet ~~75~~: the procedure UUS_MSC_Check_UUS1_UUI is specific to UUS; it is specified in GSM 03.87 [17].

Sheet ~~85~~: the procedures UUS_MSC_Check_UUS2_UUI_to MS and UUS_MSC_Check_UUS2_UUI_to NW are specific to UUS, they are specified in GSM 03.87 [17].

Sheet ~~85~~: the procedure CD_UUS_Interaction is specific to Call Deflection; it is specified in GSM 03. 72 [7].

7.3.1.5 Procedure Process_Call_Waiting_MSC

Sheet 1: the procedure Set_CLIP_Info_MSC is specific to CLIP.

Sheet 1, sheet 2: the VMSC and the MS may negotiate the bearer capability to be used for the call by the exchange of information in the Setup and Call Confirmed messages.

Sheet 1: the procedure UUS_ICH_UUS1_Implicit_Active is specific to UUS; it is specified in GSM 03.87 [17].

Sheet 1: the procedure CCBS_Report_Not_Idle is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 2, sheet 3, sheet ~~54~~: the procedure UUS_ICH_Check_Support is specific to UUS; it is specified in GSM 03.87 [17]. If the VMSC does not support UUS, the execution continues from the "Yes" exit of the test "Result=Pass?" where the test follows the procedure call.

Sheet 2: the procedure CCBS_ICH_MSC_Report_Success is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 2, sheet ~~85~~: the processing in the branch starting with the input "CD Request" is specific to Call Deflection; if the VMSC does not support Call Deflection the input is discarded.

Sheet 2, sheet ~~85~~: the procedure Handling_CD_MSC is specific to Call Deflection; it is specified in GSM 03.72 [7].

Sheet 2: the task "UTU2Cnt:=0" is executed only if the VMSC supports UUS.

Sheet 2, sheet 3, sheet 5, sheet 7: the procedure CAMEL_MT_GMSC_DISC4 is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28]. If the VMSC does not support CAMEL phase 3, processing continues from the "No" exit of the test "Result=Reconnect?".

Sheet 2, sheet 3, sheet 4, sheet ~~85~~: the procedure CCBS_ICH_MSC_Report_Failure is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 2: the Call Confirmed message indicates "busy" for the successful case.

Sheet 2: the procedure CAMEL_Start_TNRY is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet 2: the procedure Send_ACM_If_Required is specified in subclause 7.2.1.3.

Sheet ~~32~~, sheet ~~74~~: the Release transaction (reject) message covers all unsuccessful cases not otherwise indicated.

Sheet 4, sheet 8: the procedure CAMEL_MT_GMSC_DISC6 is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet 4, sheet 7: the procedure UUS_MSC_Check_UUS1_UUI is specific to UUS; it is specified in GSM 03.87 [17].

Sheet 5: the procedure CAMEL_Stop_TNRY is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28].

Sheet ~~53~~: the procedure Handle_AoC_MT_MSC is specific to AoC. If the VMSC does not support AoC, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 5: the procedure CAMEL_MT_GMSC_ANSWER is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28]. If the VMSC does not support CAMEL phase 3, processing continues from the "Yes" exit of the test "Result=Pass?" on sheet 6.

Sheet ~~63~~: the procedure Set_COL_Presentation_Indicator_MSC is specific to COLP.

Sheet ~~63~~: the procedure Send_Answer_If_Required is specified in subclause 7.2.1.4.

Sheet 7: the input signal "CAMEL TNRY expired" will be received only if the VMSC supports CAMEL phase 3.

Sheet 7: the procedure CAMEL_MT_GMSC_DISC5 is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28]. If the VMSC does not support CAMEL phase 3, processing continues from the "No" exit of the test "Result=Reconnect?".

Sheet ~~74~~, sheet ~~85~~: the procedure UUS_ICH_Check_Forwarding is specific to UUS; it is specified in GSM 03.87 [17]. If the VMSC does not support UUS, the execution continues from the "Yes" exit of the test "Result=Pass?".

Sheet 5: the procedures UUS_MSC_Check_UUS1_UUI, UUS_MSC_Check_UUS2_UUI_to_MS and UUS_MSC_Check_UUS2_UUI_to_NW are specific to UUS; they are specified in GSM 03.87 [17].

Sheet 8: the procedures UUS_MSC_Check_UUS2_UUI_to_MS and UUS_MSC_Check_UUS2_UUI_to_NW are specific to UUS; they are specified in GSM 03.87 [17].

Sheet ~~85~~: the procedure CD_UUS_Interaction is specific to Call Deflection; it is specified in GSM 03. 72 [7].

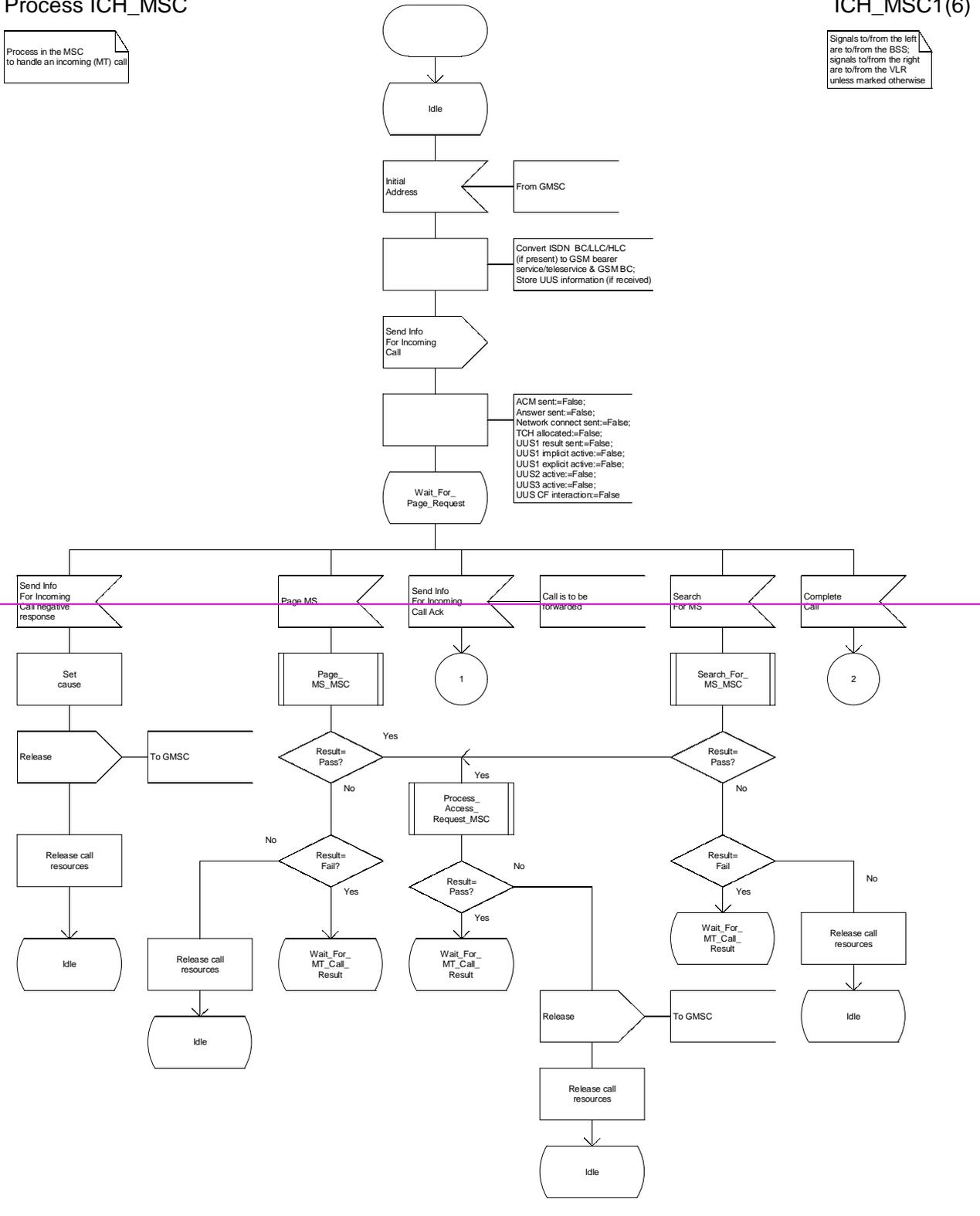
**** Next Modified Section ****

Process ICH_MSC

Process in the MSC to handle an incoming (MT) call

ICH_MSC1(6)

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise



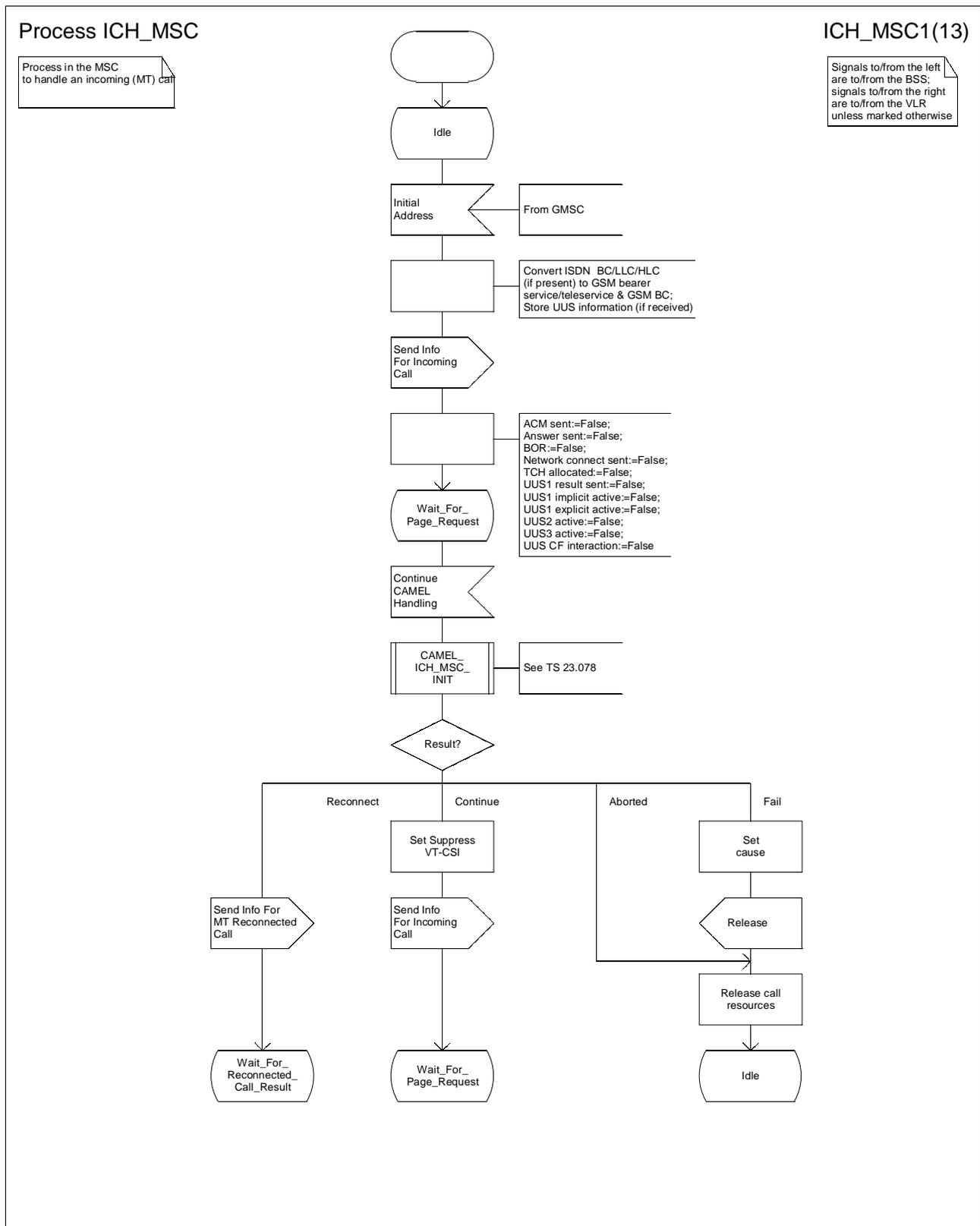


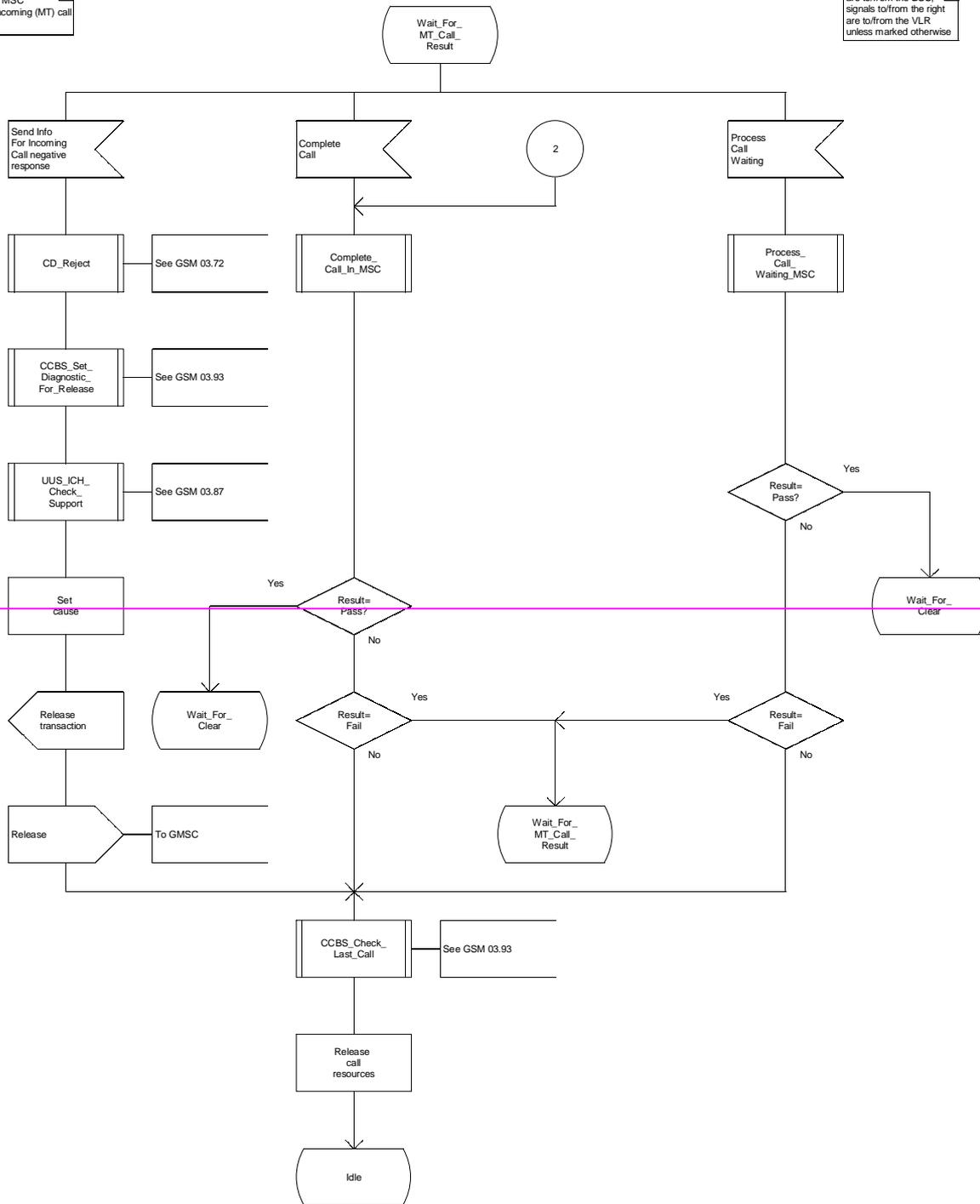
Figure 62a: Process ICH_MSC (sheet 1)

Process ICH_MSC

ICH_MSC2(6)

Process in the MSC to handle an incoming (MT) call

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise



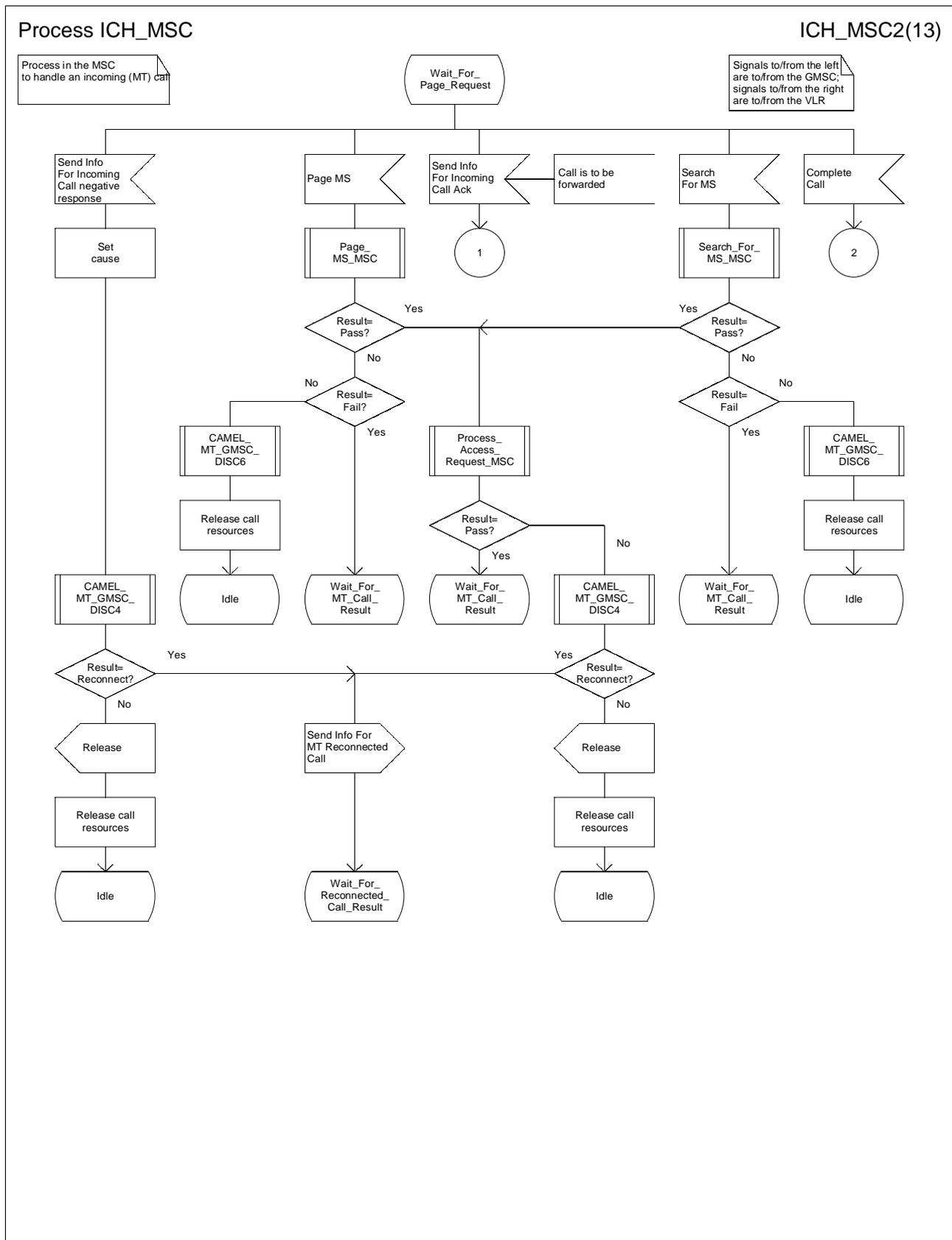


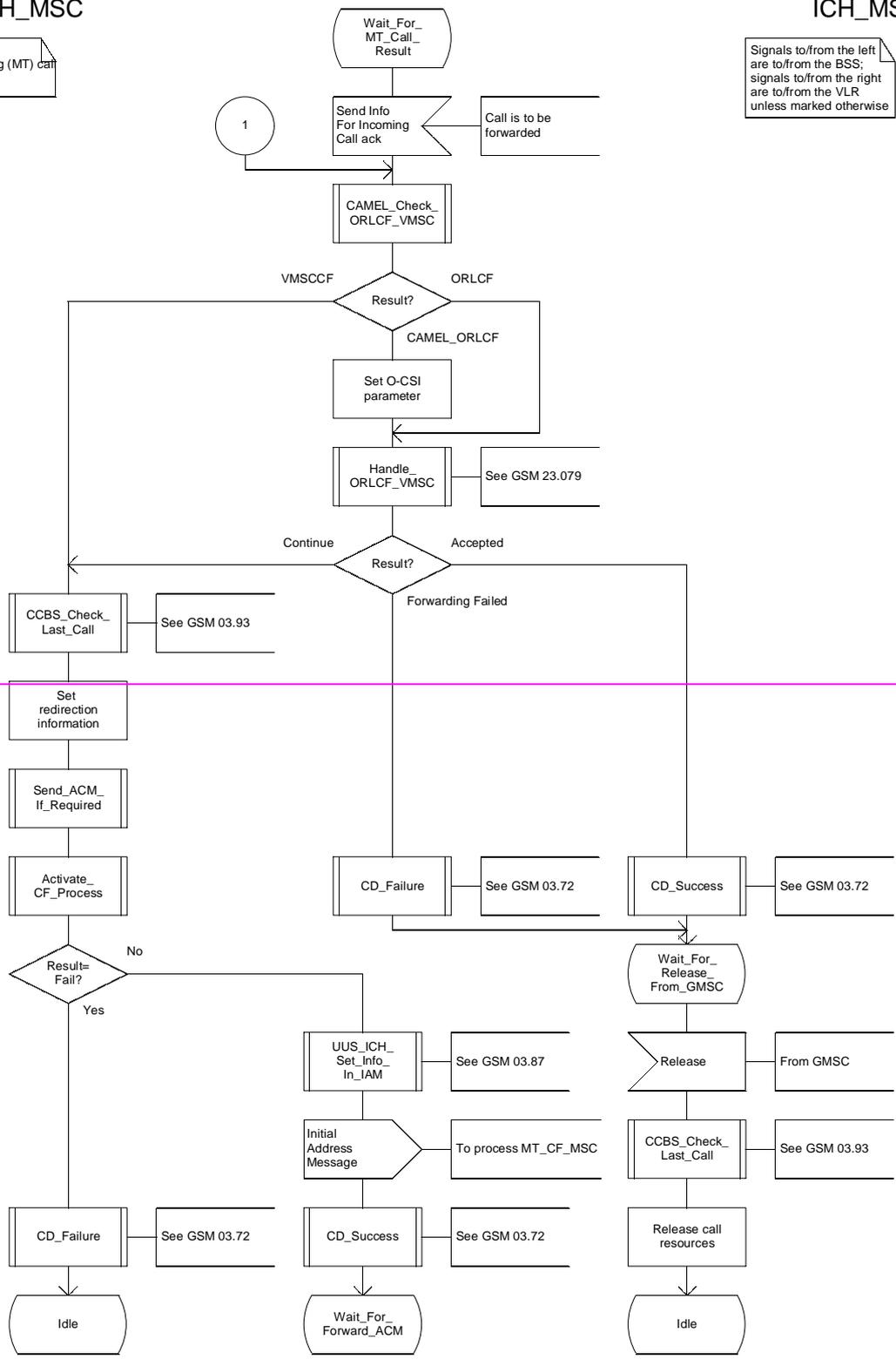
Figure 62b: Process ICH_MSC (sheet 2)

Process ICH_MSC

ICH_MSC3(6)

Process in the MSC to handle an incoming (MT) call

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise



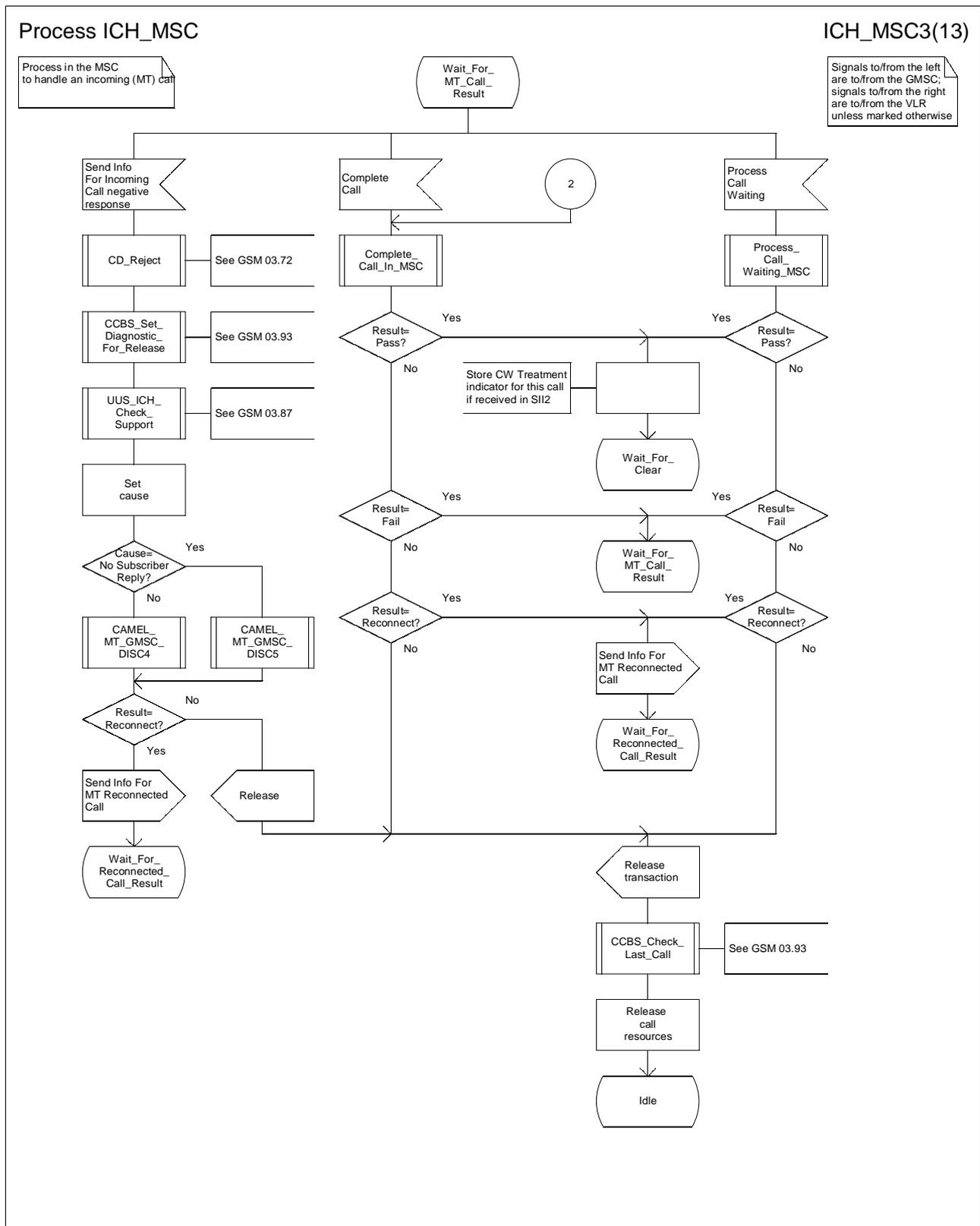


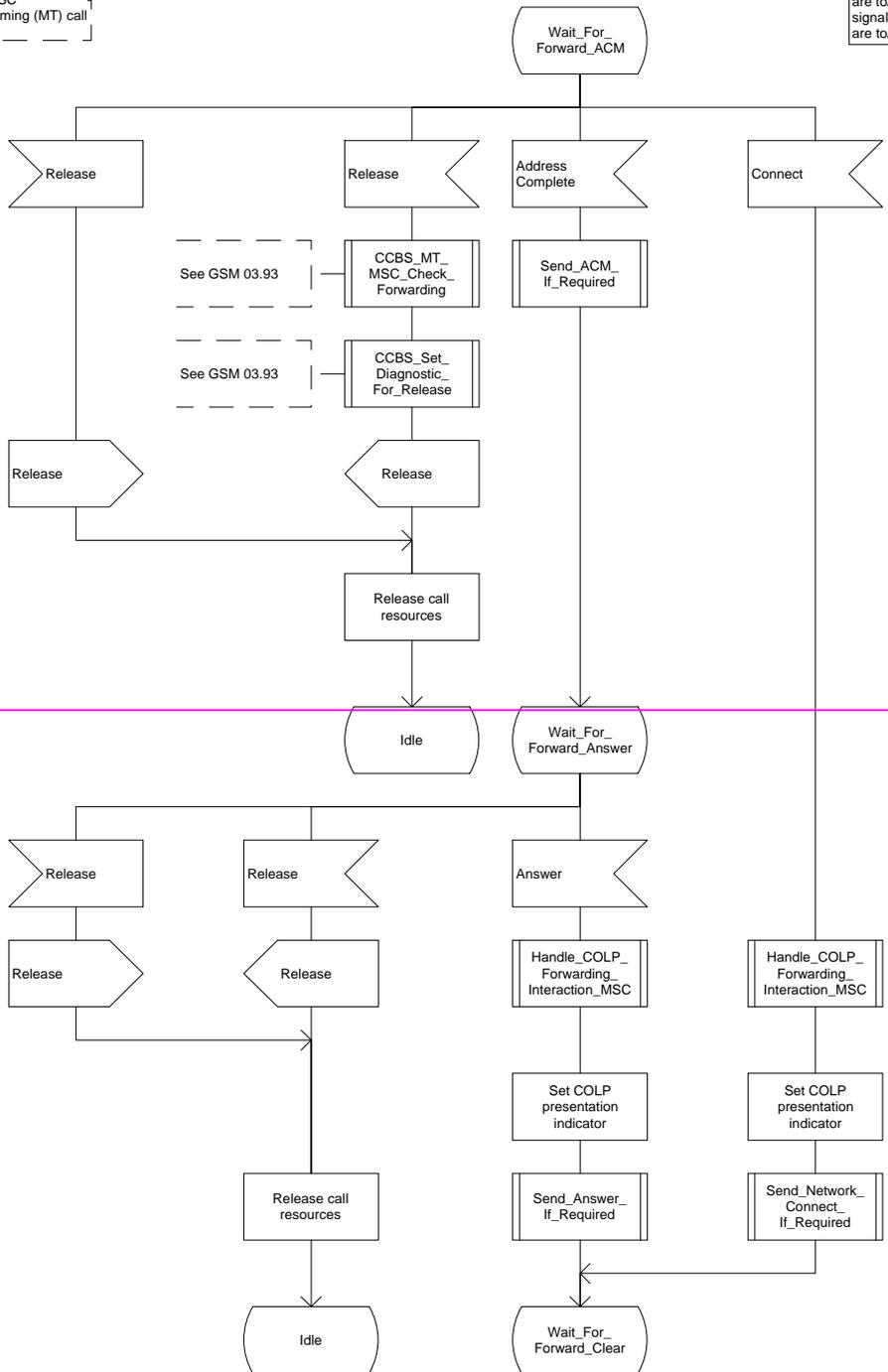
Figure 62c: Process ICH_MSC (sheet 3)

Process ICH_MSC

ICH_MSC4(6)

Process in the MSC to handle an incoming (MT) call

Signals to/from the left are to/from the GMSC; signals to/from the right are to/from the process MT_CF_MSC



Process ICH_MSC

ICH_MSC4(13)

Process in the MSC to handle an incoming (MT) call

Signals to/from the left are to/from the GMSC; signals to/from the right are to/from the VLR

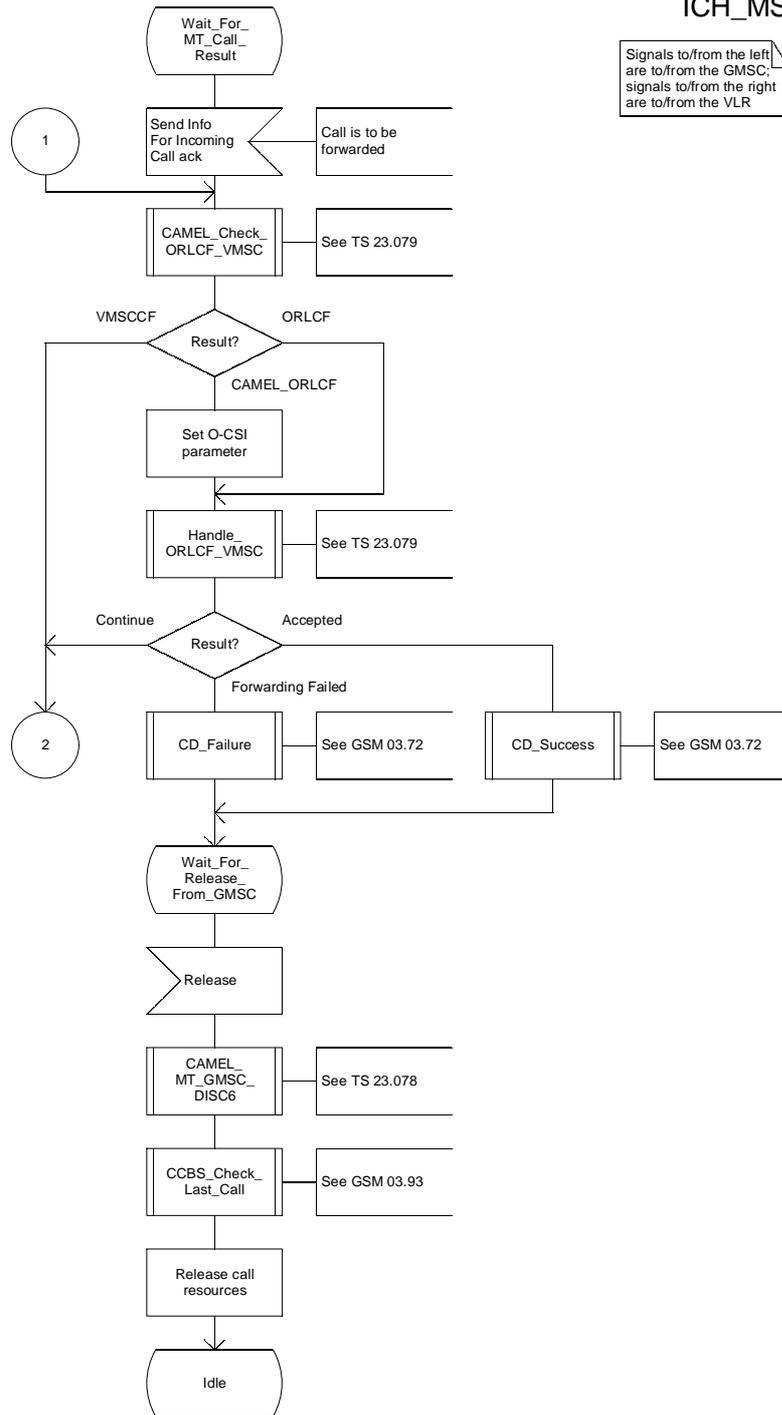


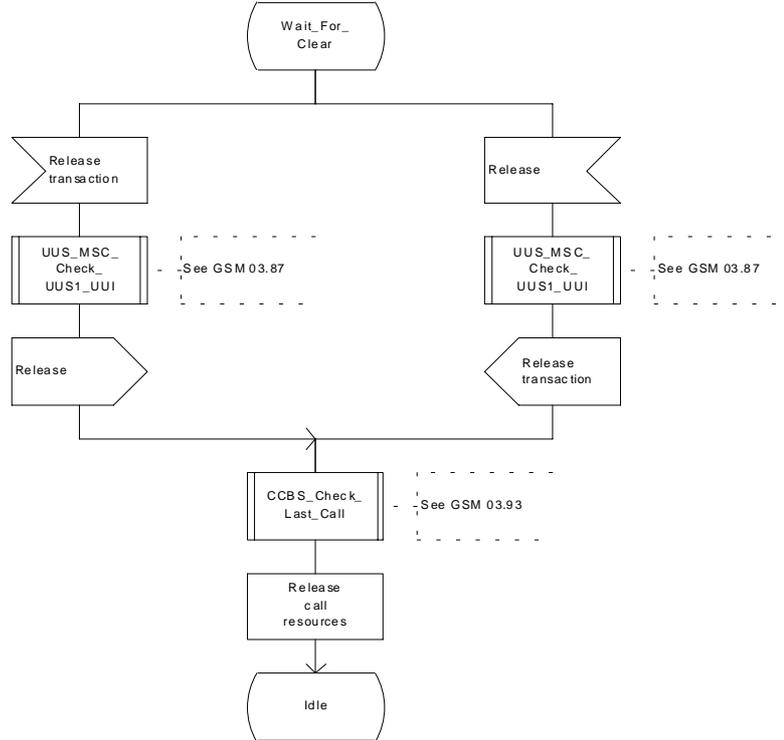
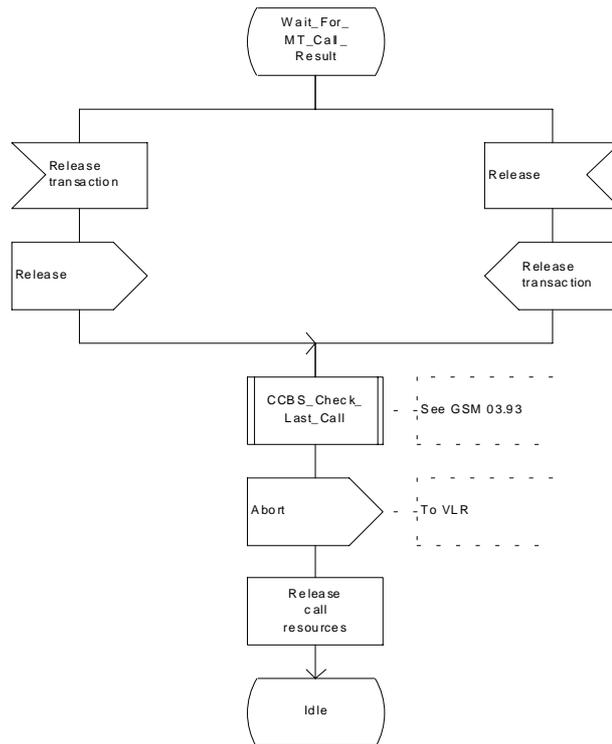
Figure 62d: Process ICH_MSC (sheet 4)

Process ICH_MSC

ICH_MSC5(6)

Process in the MSC
to handle an incoming (MT) call

Signals to/from the left
are to/from the BSS;
signals to/from the right
are to/from the GMS C
unless otherwise indicated



Process ICH_MSC

ICH_MSC5(13)

Process in the MSC to handle an incoming (MT) call

Signals to the right are to the VLR unless marked otherwise

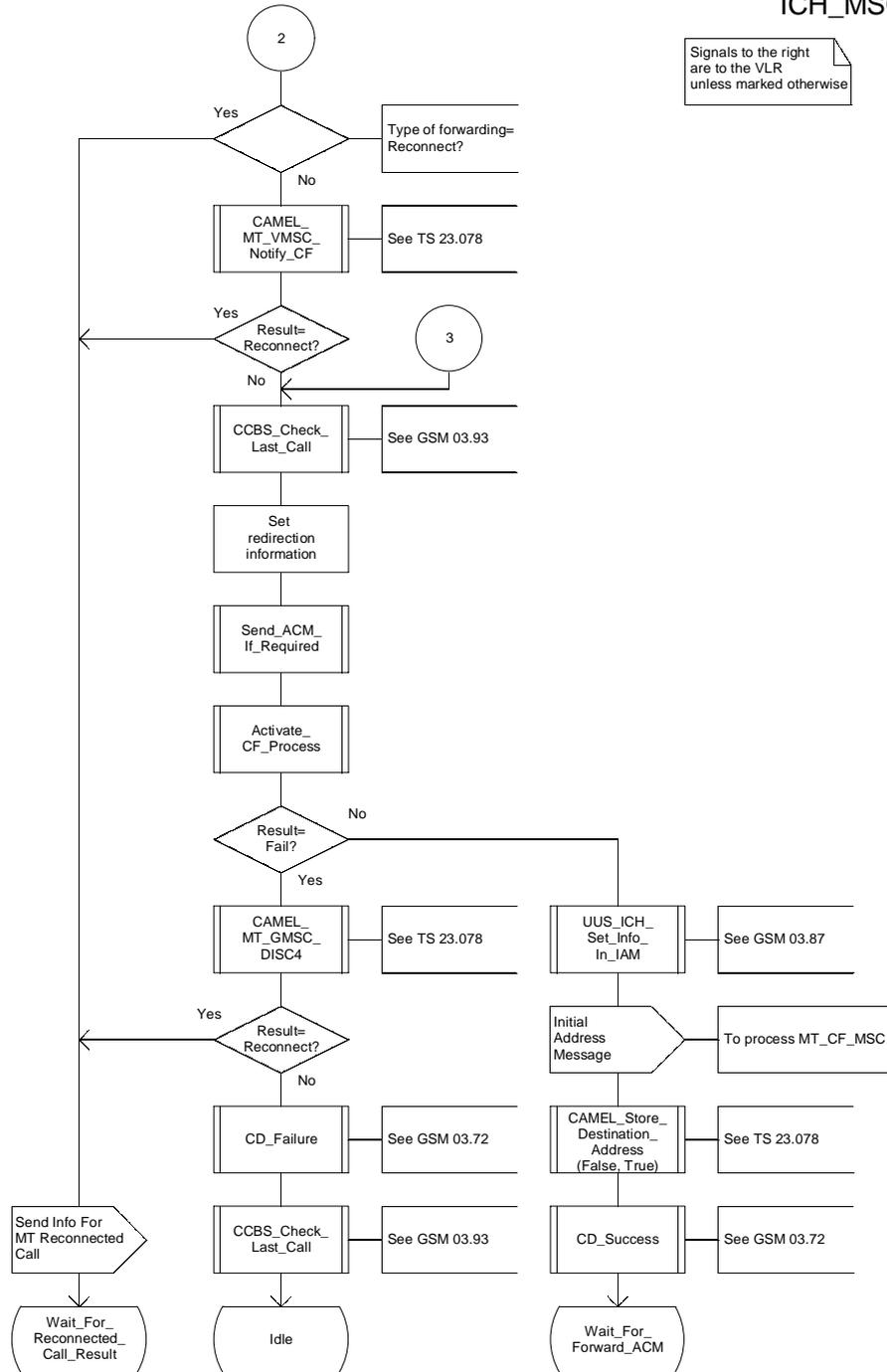


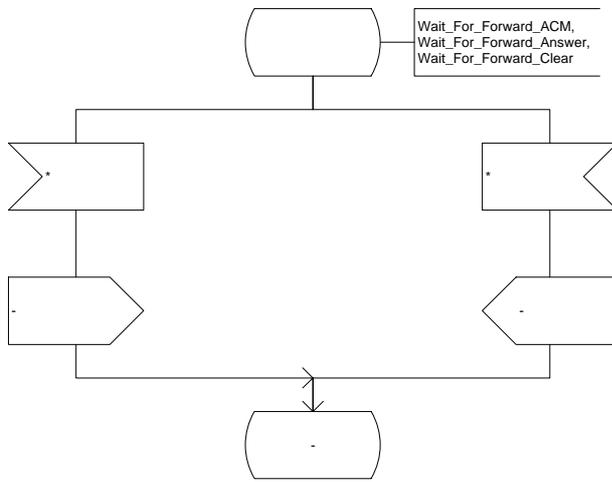
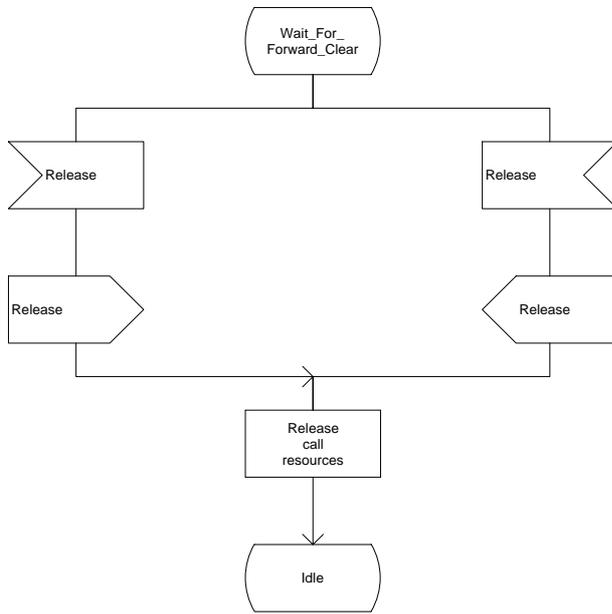
Figure 62e: Process ICH_MSC (sheet 5)

Process ICH_MSC

ICH_MSC6(6)

Process in the MSC to handle an incoming (MT) call

Signals to/from the left are to/from the GMSC; signals to/from the right are to/from the process MT_CF_MSC



Process ICH_MSC

ICH_MSC6(13)

Process in the MSC to handle an incoming (MT) call

Signals to/from the left are to/from the GMSC; signals to/from the right are to/from the VLR unless marked otherwise

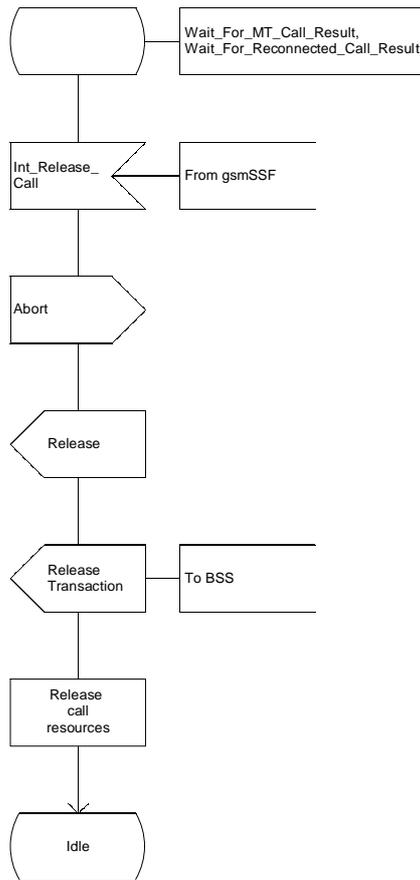


Figure 62f: Process ICH_MSC (sheet 6)

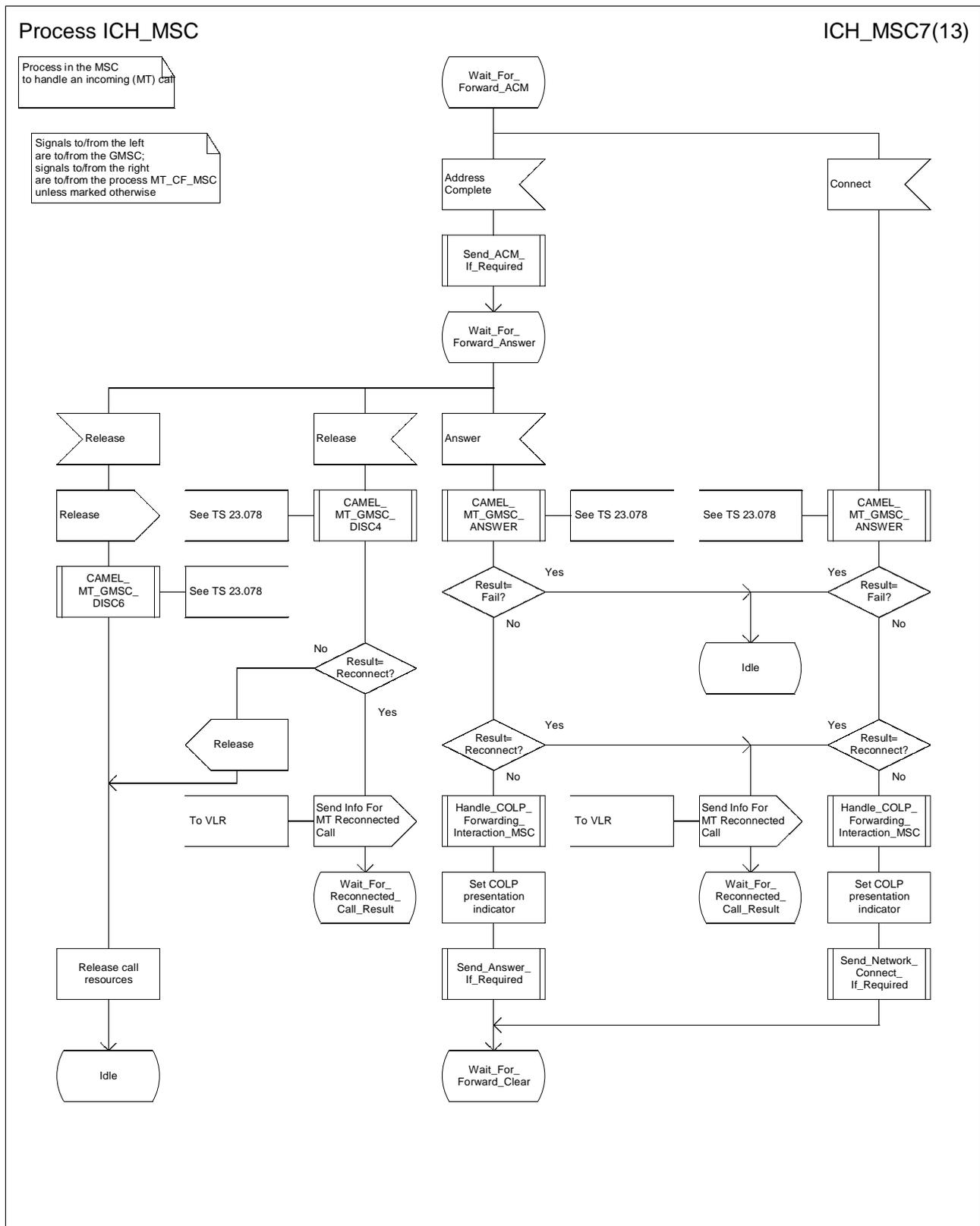


Figure 62g: Process ICH_MSC (sheet 7)

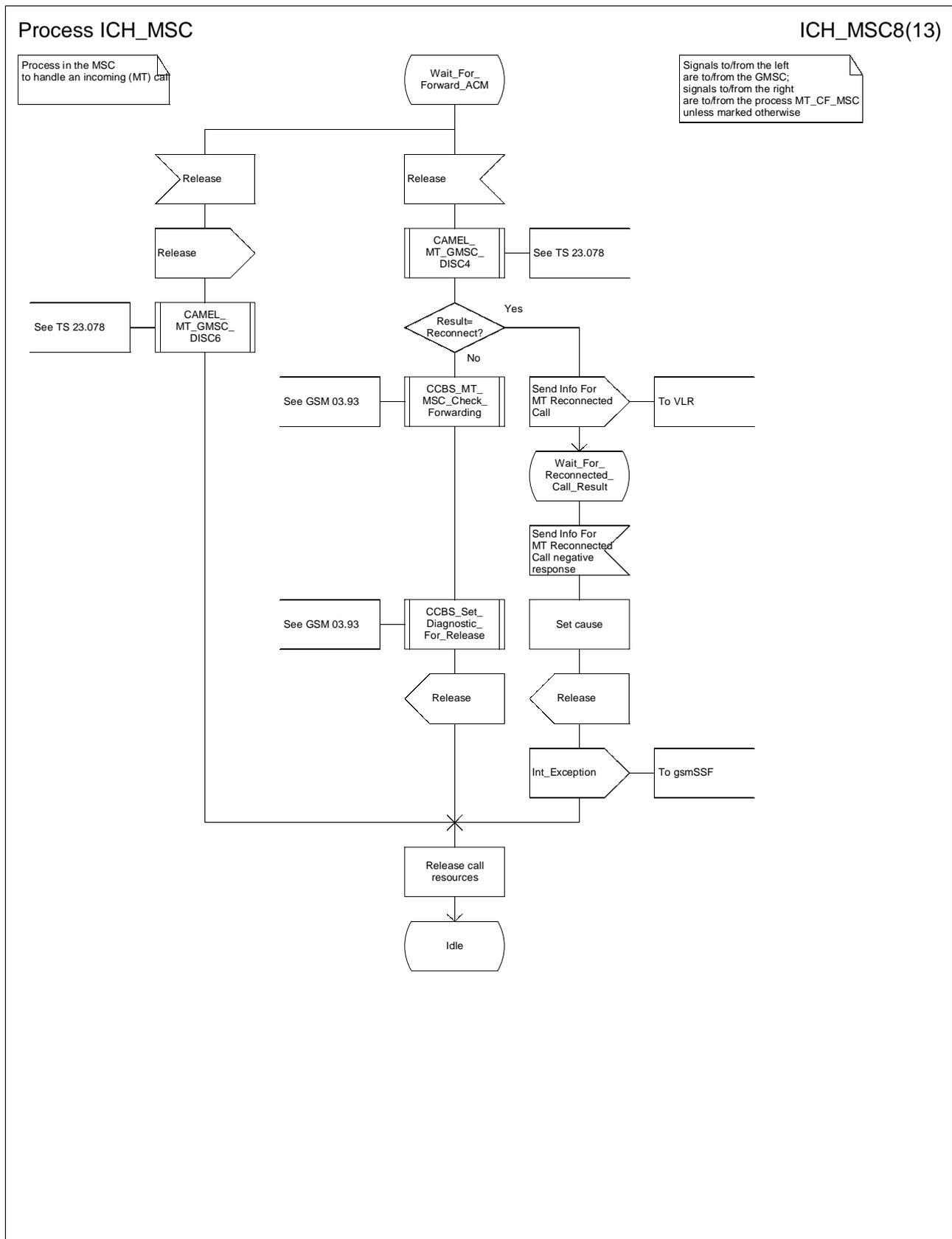


Figure 62h: Process ICH_MSC (sheet 8)

Process ICH_MSC

ICH_MSC9(13)

Process in the MSC to handle an incoming (MT) call

Signals from the left are from the GMSC; signals from the right are from the VLR

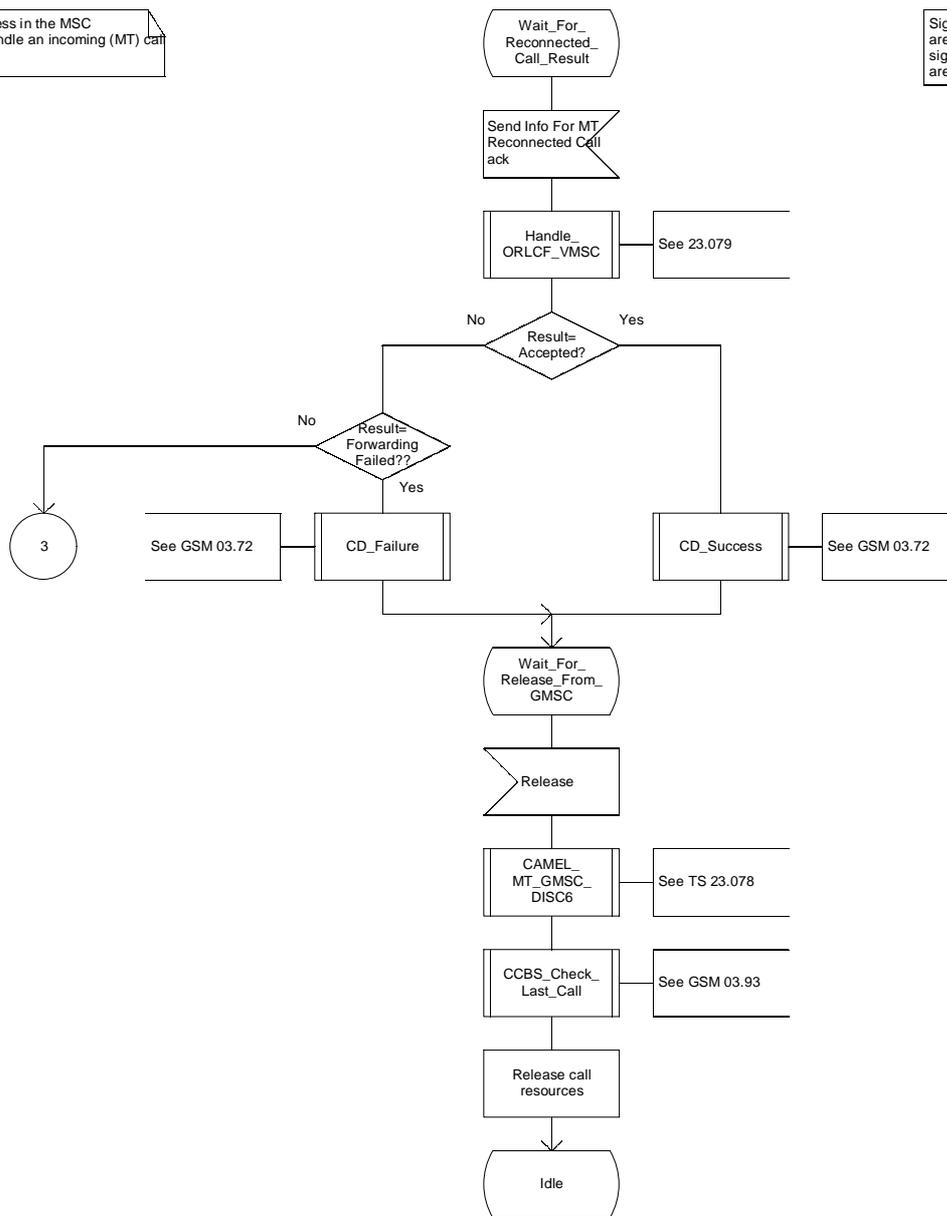


Figure 62i: Process ICH_MSC (sheet 9)

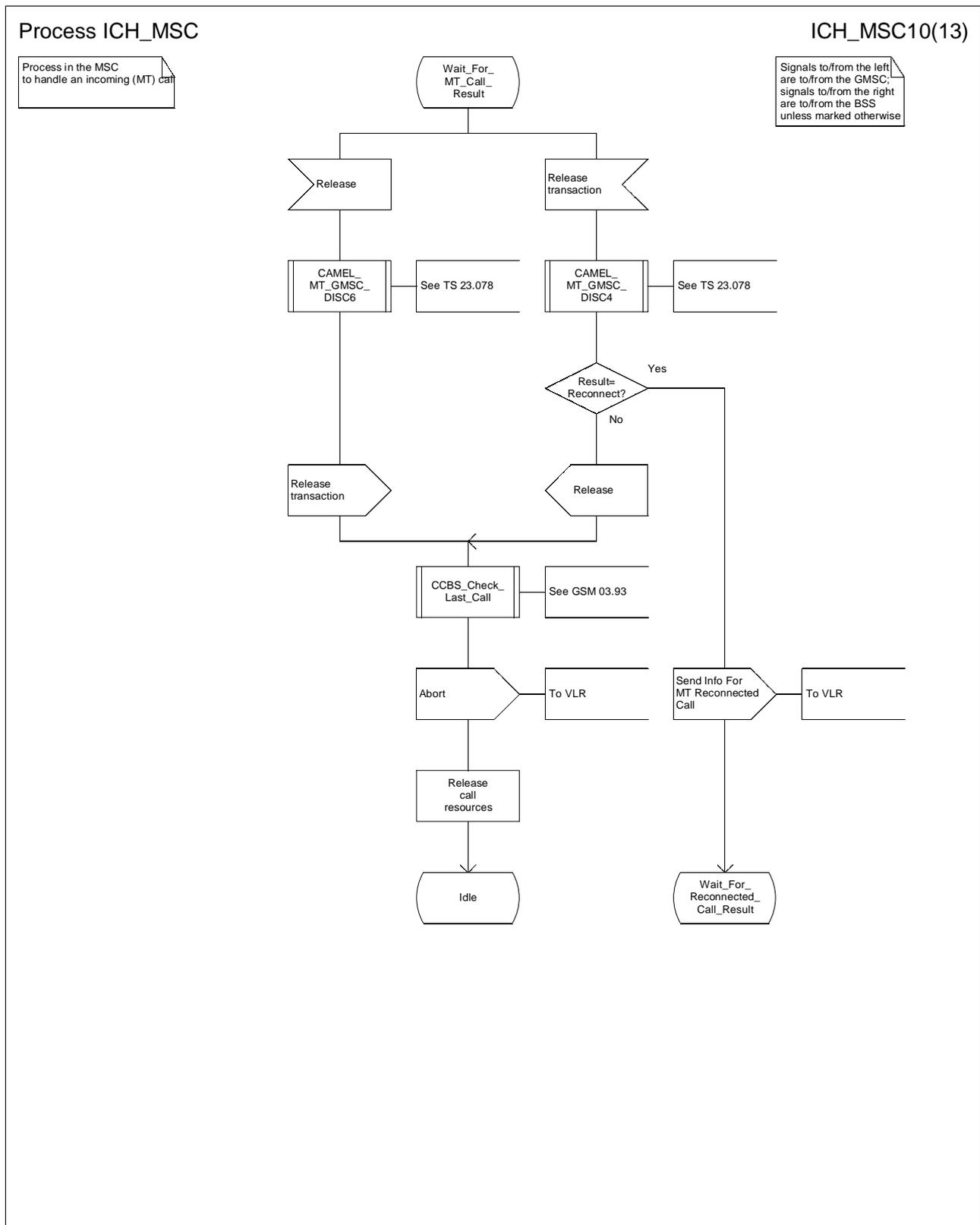


Figure 62j: Process ICH_MSC (sheet 10)

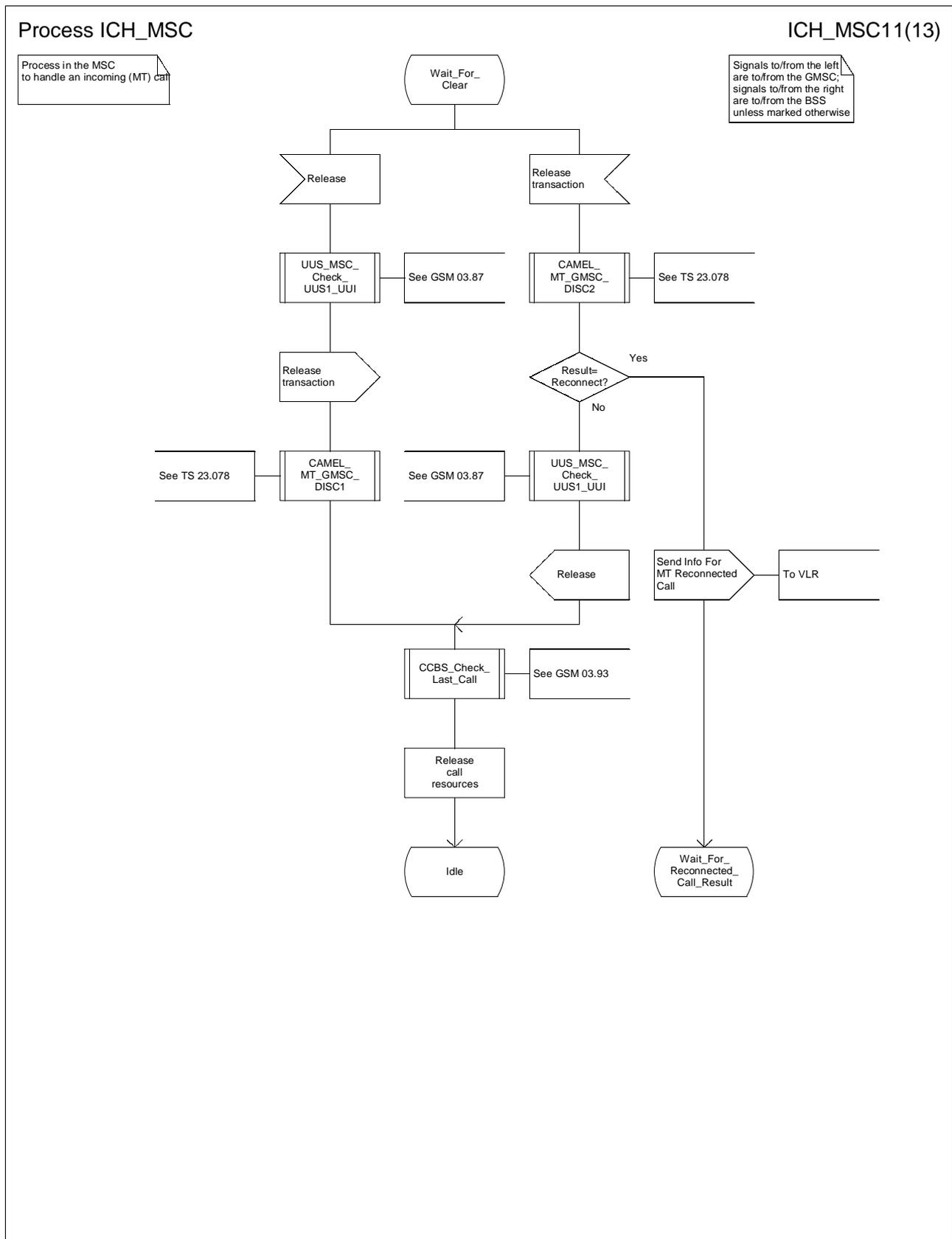


Figure 62k: Process ICH_MSC (sheet 11)

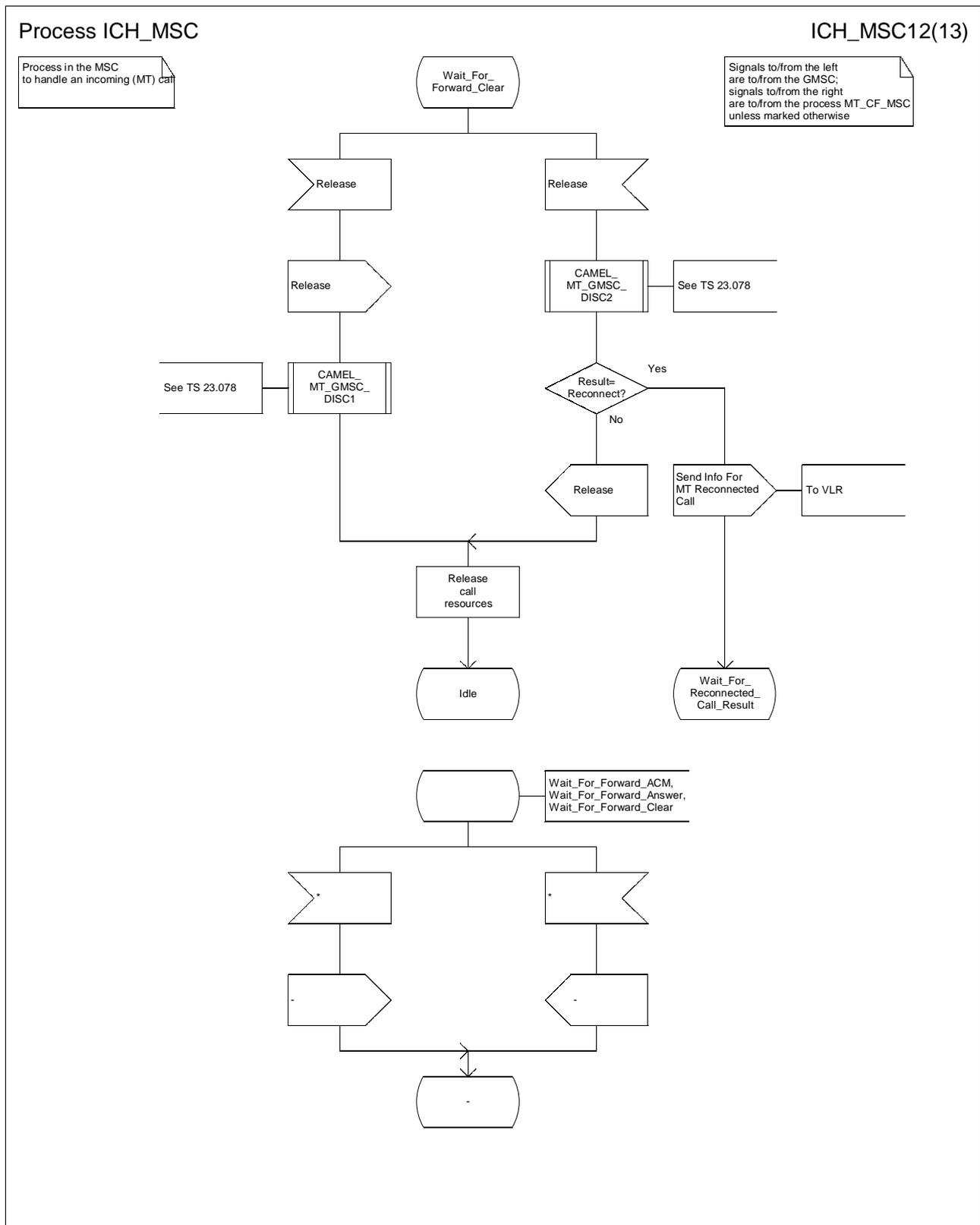


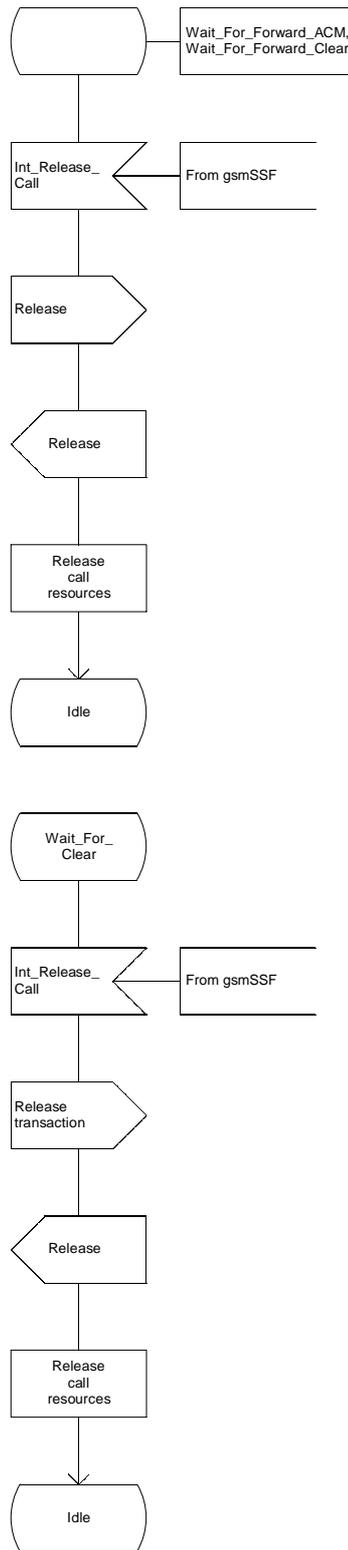
Figure 62!: Process ICH_MSC (sheet 12)

Process ICH_MSC

ICH_MSC13(13)

Process in the MSC to handle an incoming (MT) call

Signals to/from the left are to/from the GMSC; signals to/from the right are to/from the process MT_CF_MSC unless marked otherwise



Signals to/from the left are to/from the GMSC; signals to/from the right are to/from the BSS unless marked otherwise

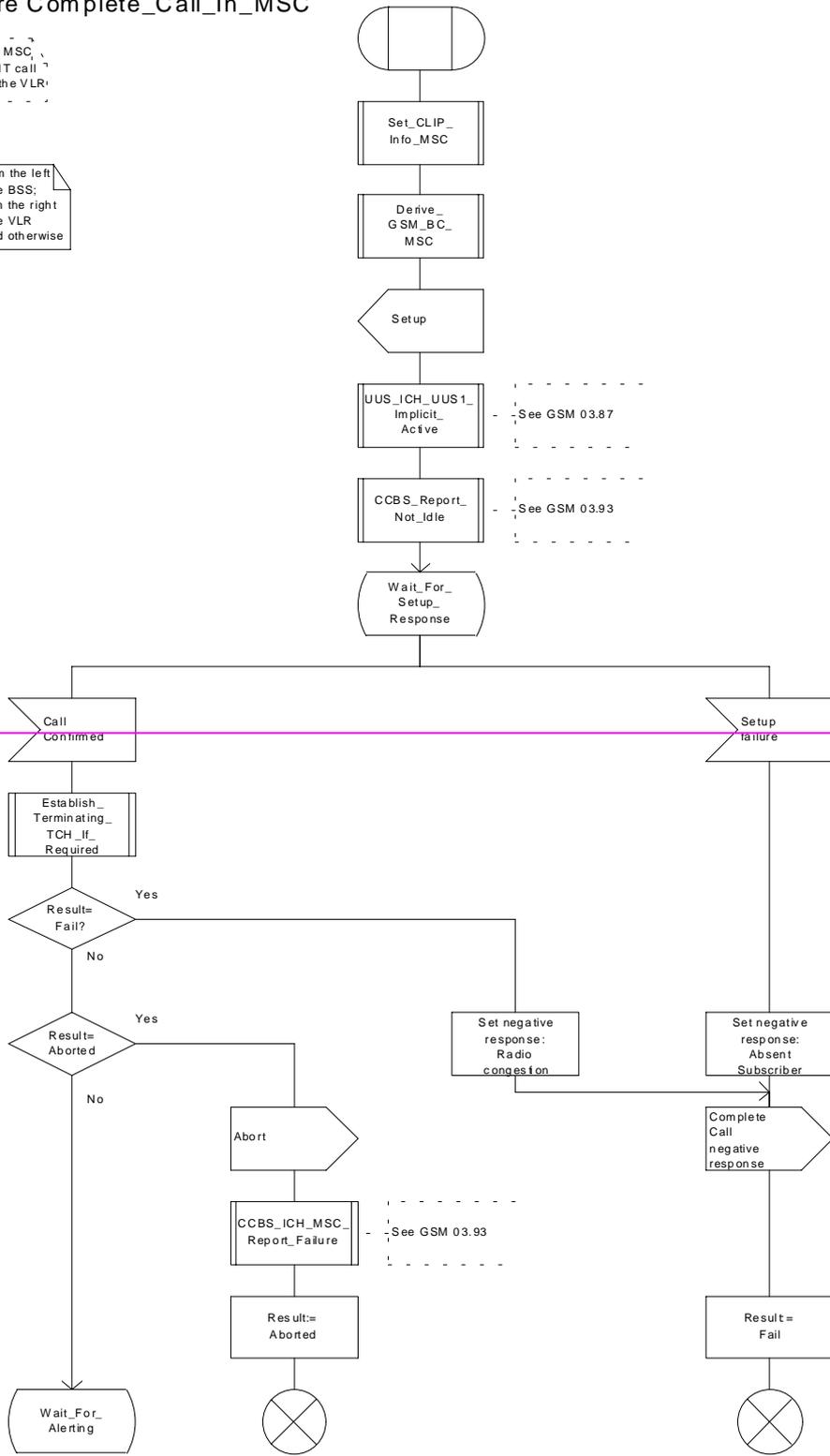
Figure 62m: Process ICH_MSC (sheet 13)

Procedure Complete_Call_In_MSC

CCI_MSC1(5)

Procedure in the MSC to complete an MT call on request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise



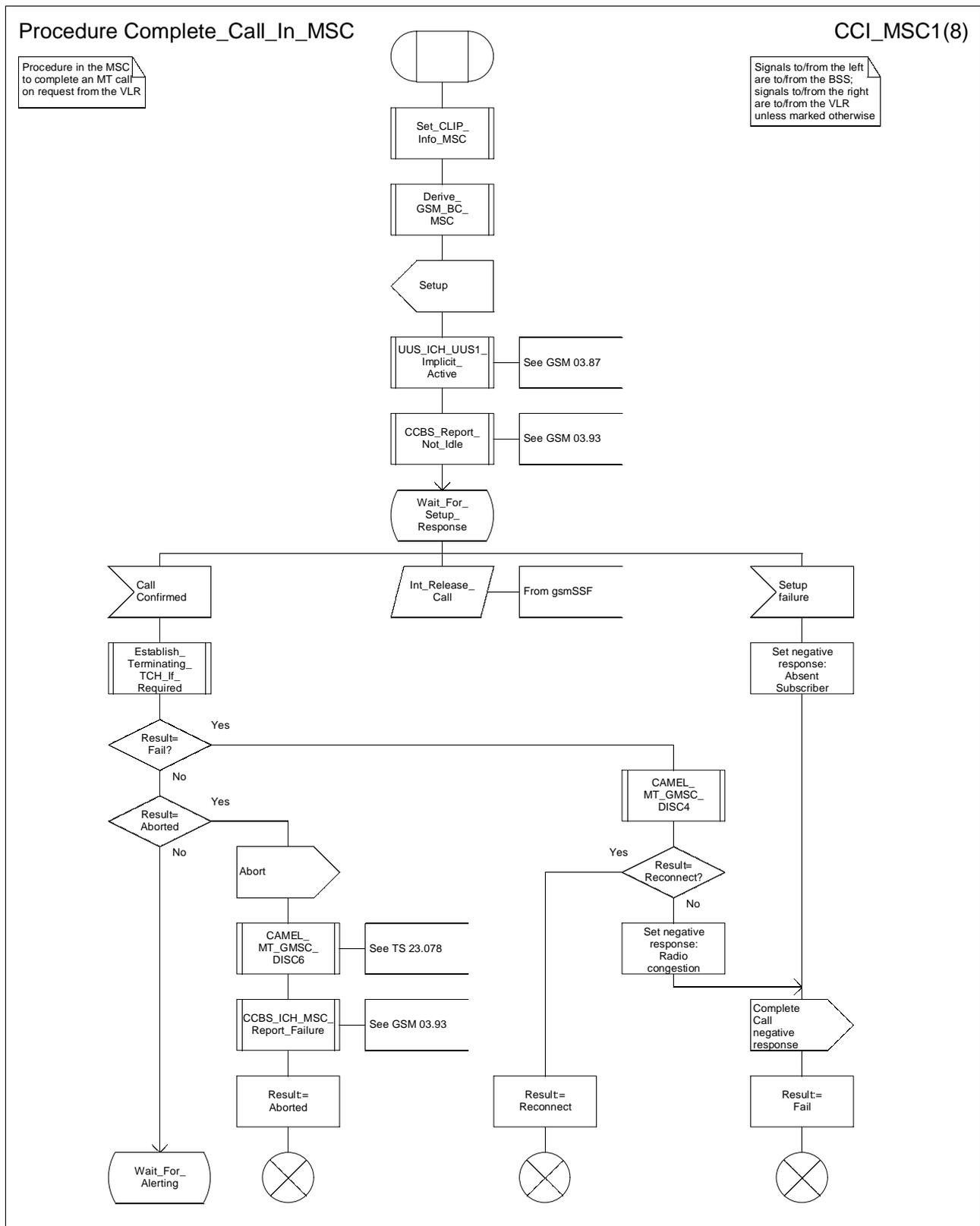


Figure 65a: Procedure Complete_Call_In_MSC (sheet 1)

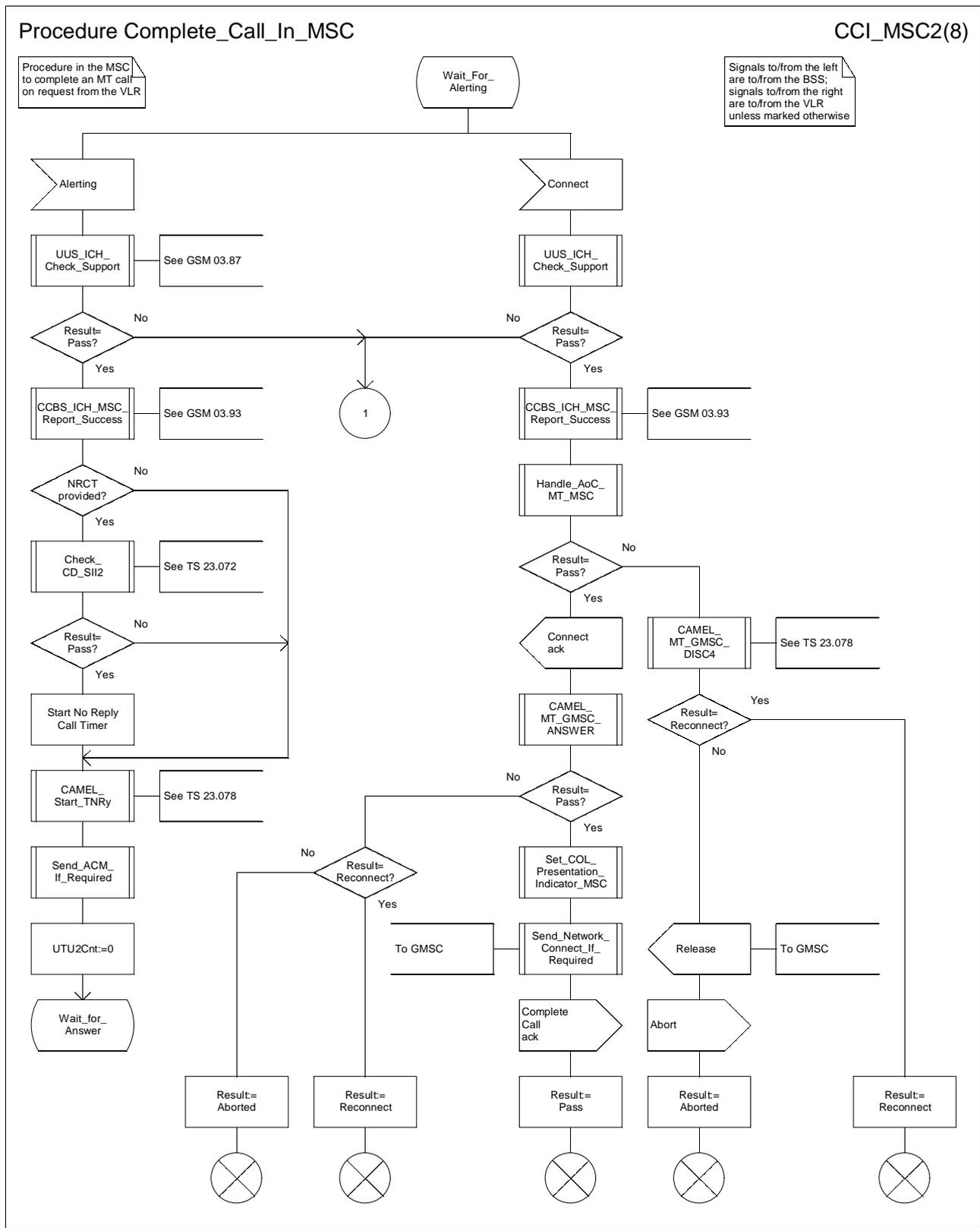


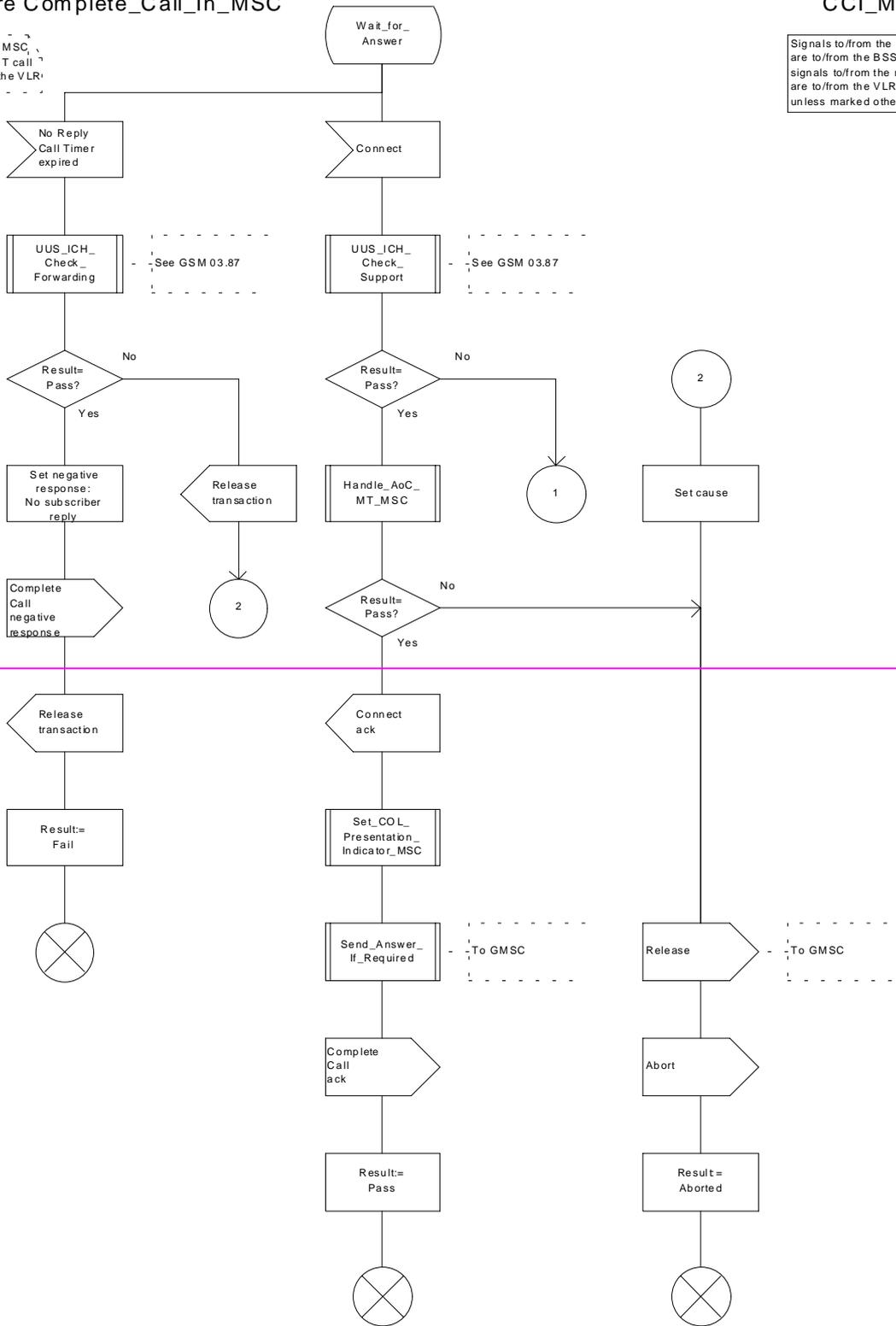
Figure 65b: Procedure Complete_Call_In_MSC (sheet 2)

Procedure Complete_Call_In_MSC

CCI_MSC3(5)

Procedure in the MSC to complete an MT call on request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise



Procedure Complete_Call_In_MSC

CCI_MSC3(8)

Procedure in the MSC to complete an MT call on request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise

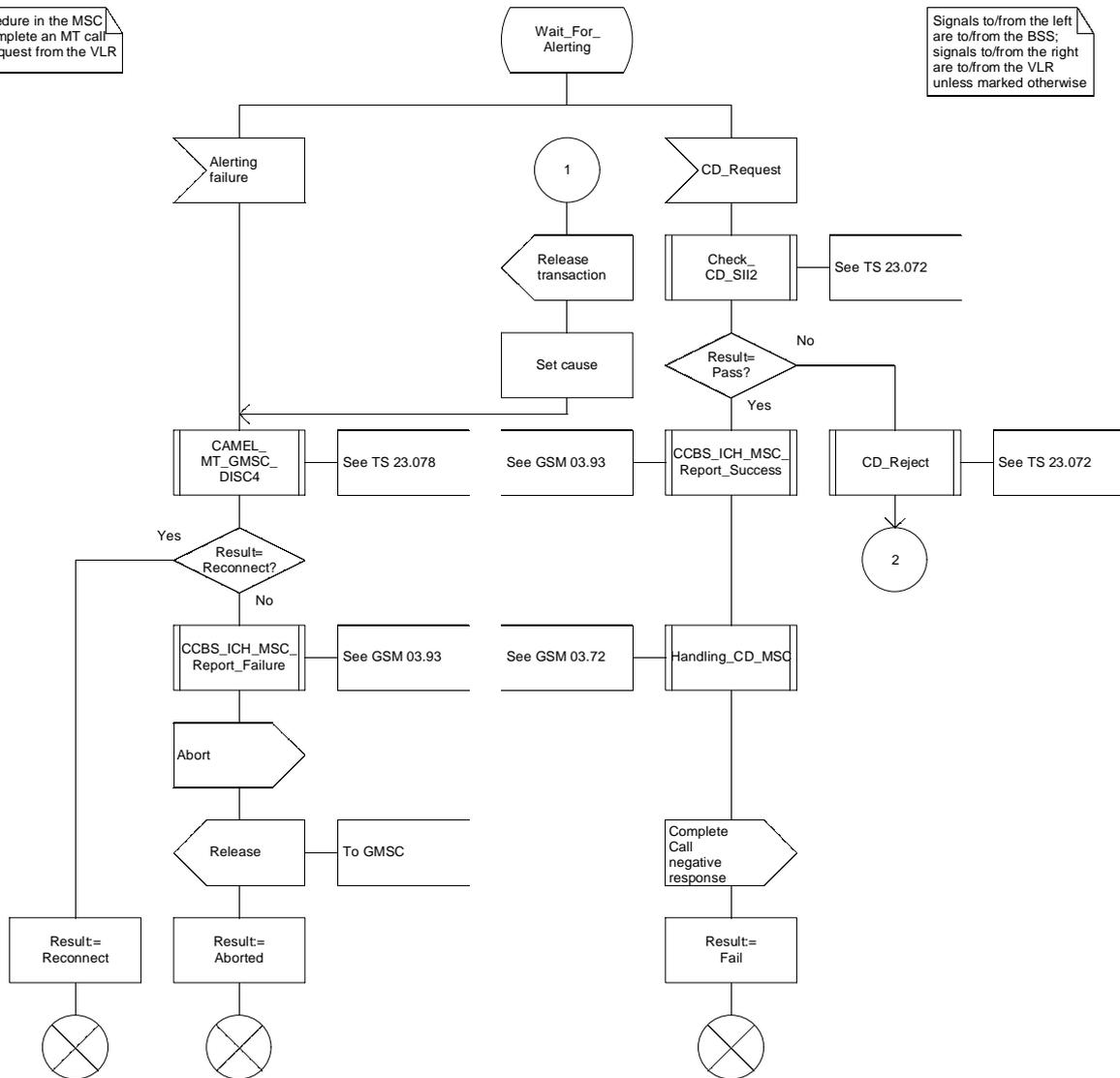


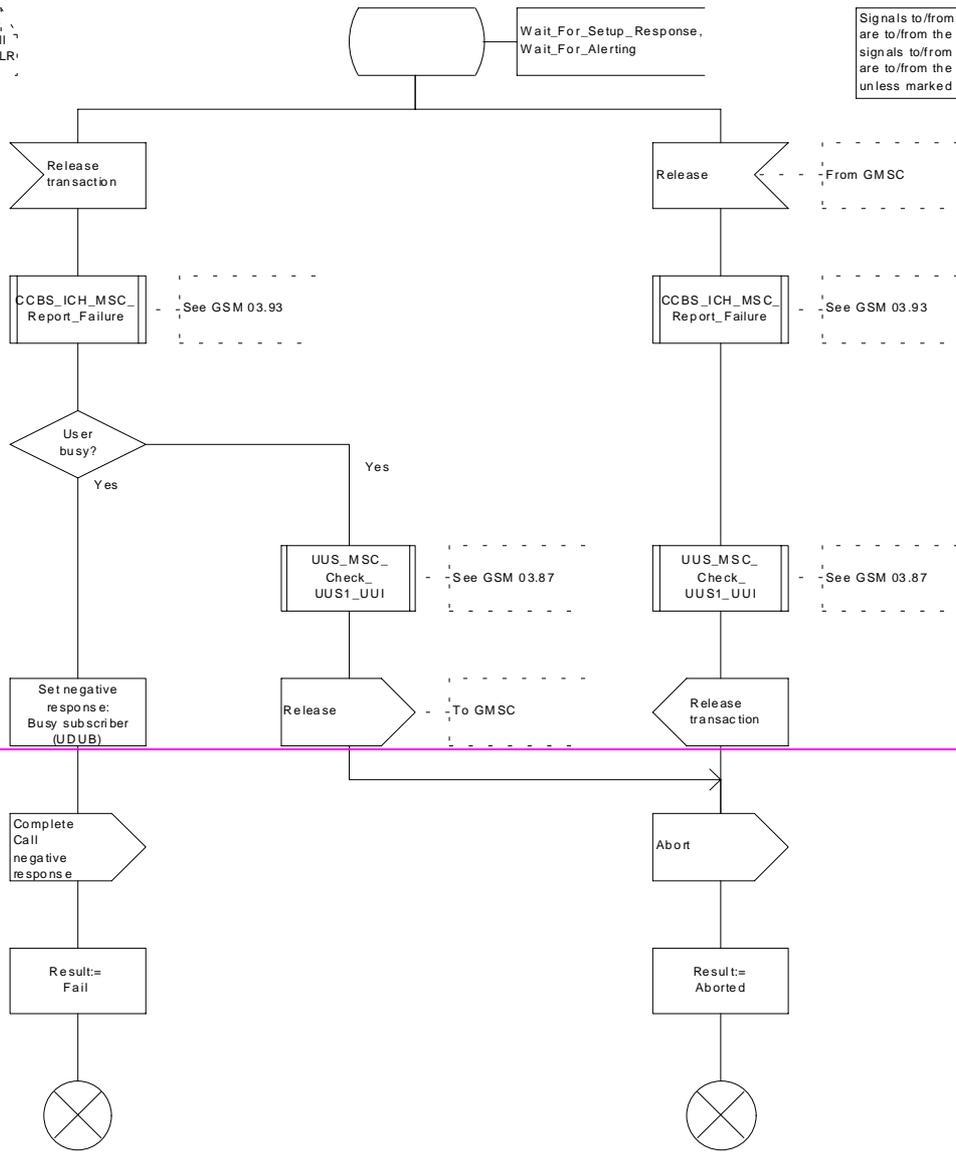
Figure 65c: Procedure Complete_Call_In_MSC (sheet 3)

Procedure Complete_Call_In_MSC

CCI_MSC4(5)

Procedure in the MSC to complete an MT call on request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise



Procedure Complete_Call_In_MSC

CCI_MSC4(8)

Procedure in the MSC to complete an MT call on request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise

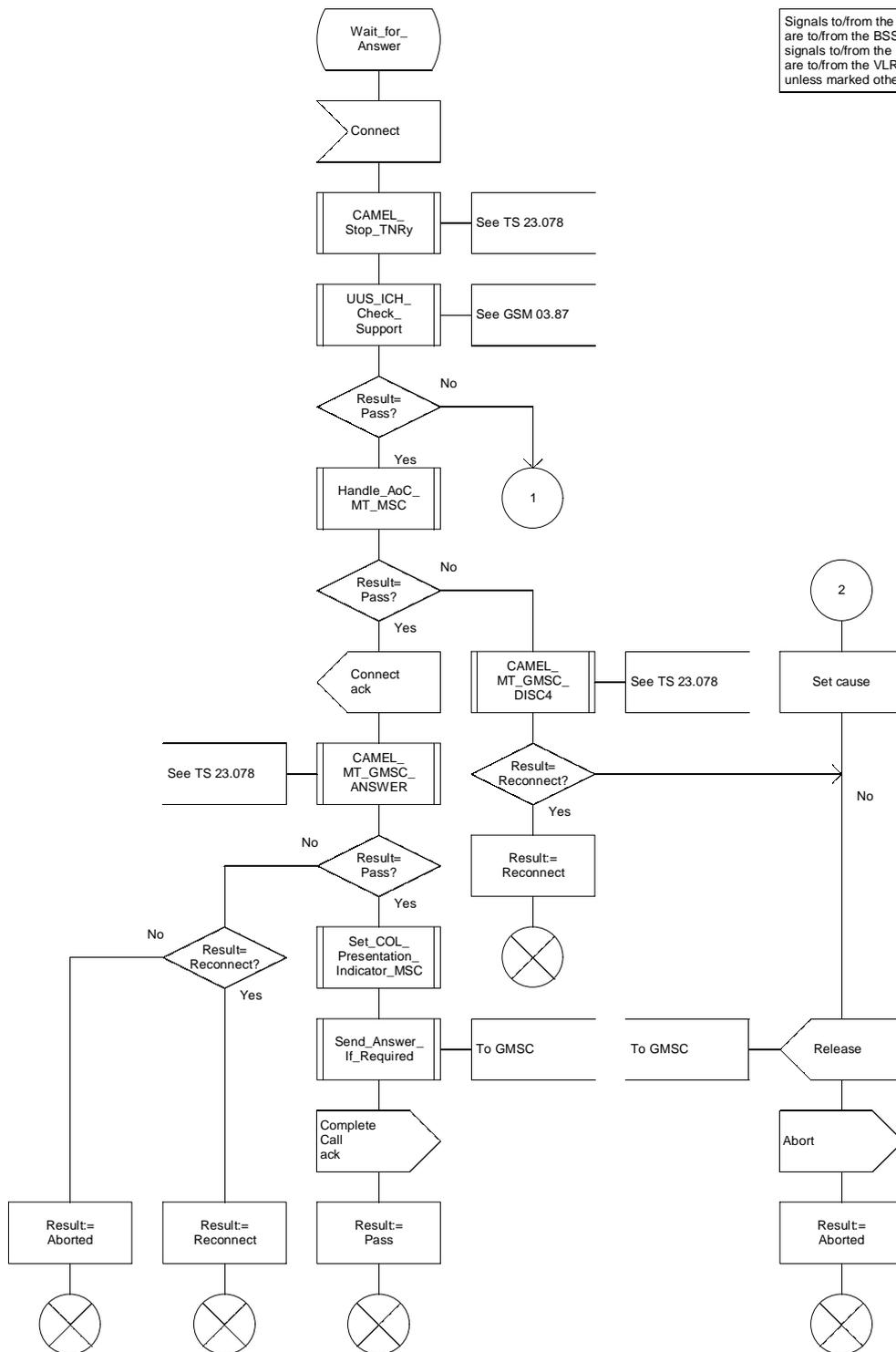


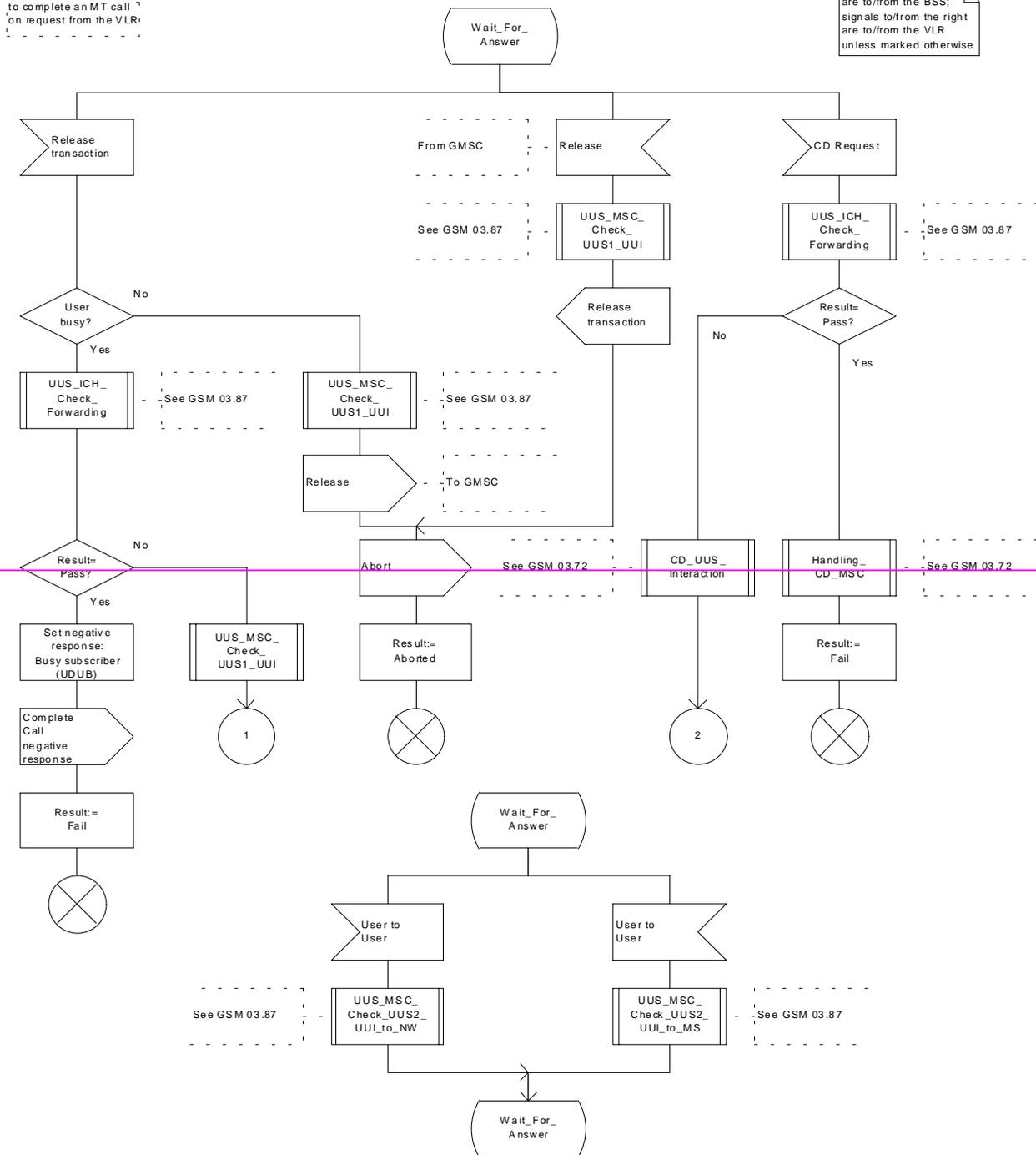
Figure 65d: Procedure Complete_Call_In_MSC (sheet 4)

Procedure Complete_Call_In_MSC

CCI_MSC5(5)

Procedure in the MSC to complete an MT call on request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise



Procedure Complete_Call_In_MSC

CCI_MSC5(8)

Procedure in the MSC to complete an MT call on request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise

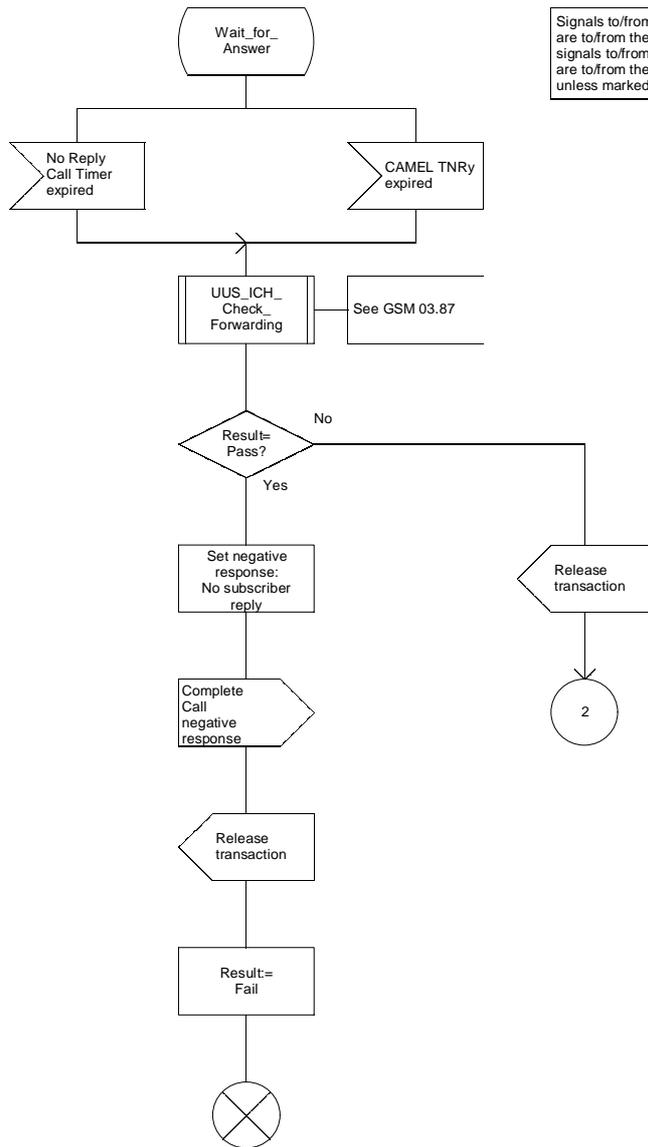


Figure 65e: Procedure Complete_Call_In_MSC (sheet 5)

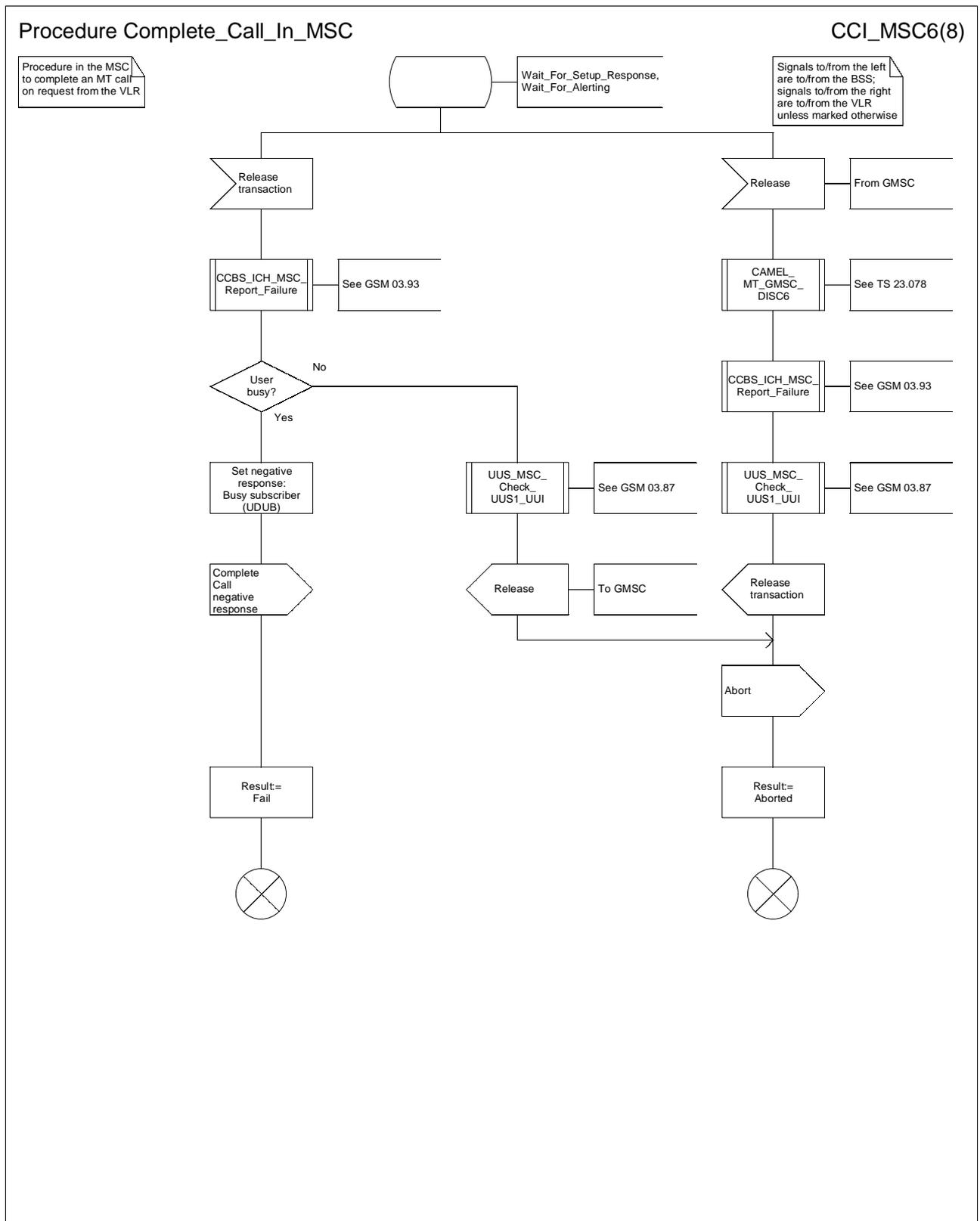


Figure 65f: Procedure Complete_Call_In_MSC (sheet 6)

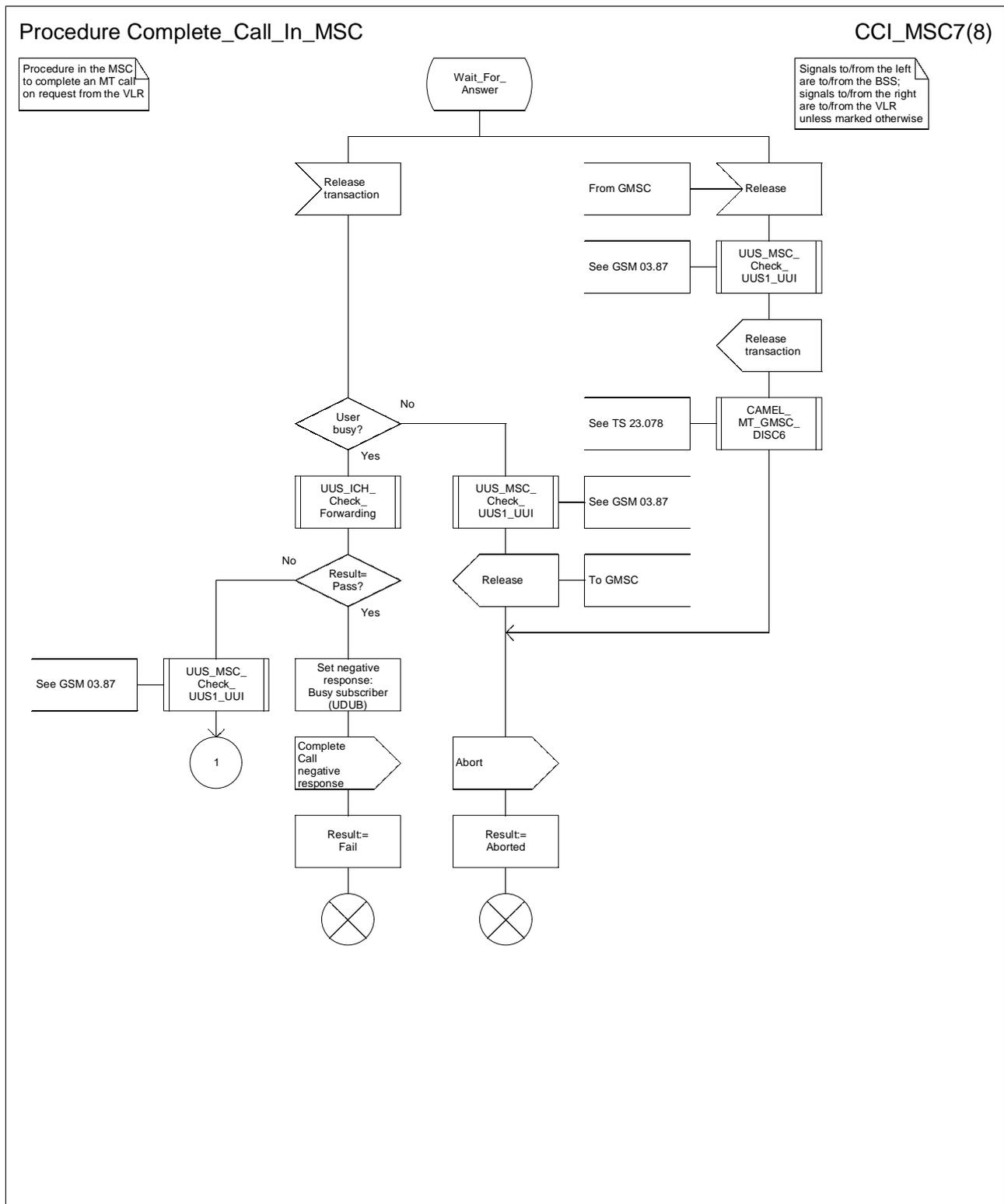


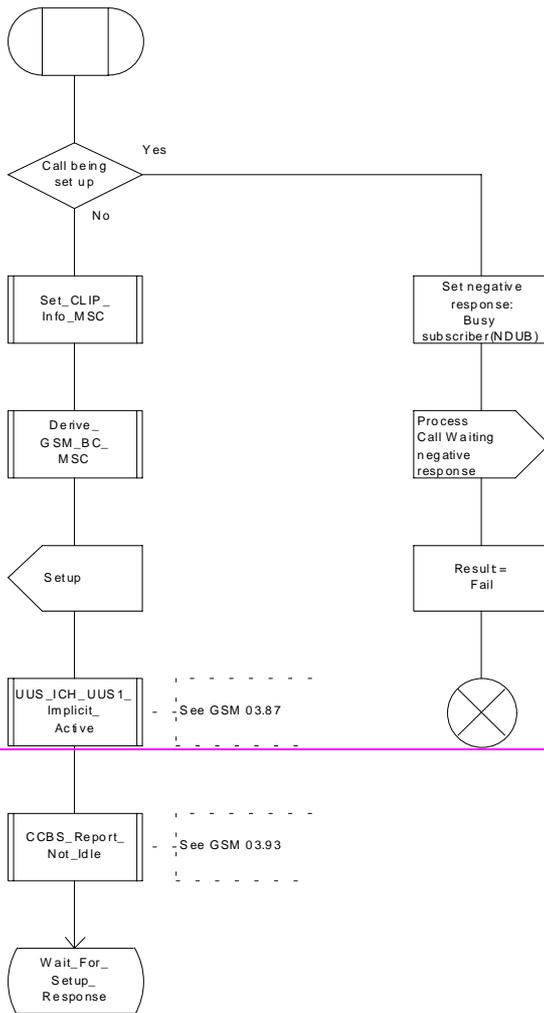
Figure 65g: Procedure Complete Call In MSC (sheet 7)

Procedure Process_Call_Waiting_MSC

PCW_MSC1(5)

Procedure in the MSC to handle a Process Call Waiting request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise



Procedure Process_Call_Waiting_MSC

PCW_MSC1(8)

Procedure in the MSC to handle a Process Call Waiting request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise

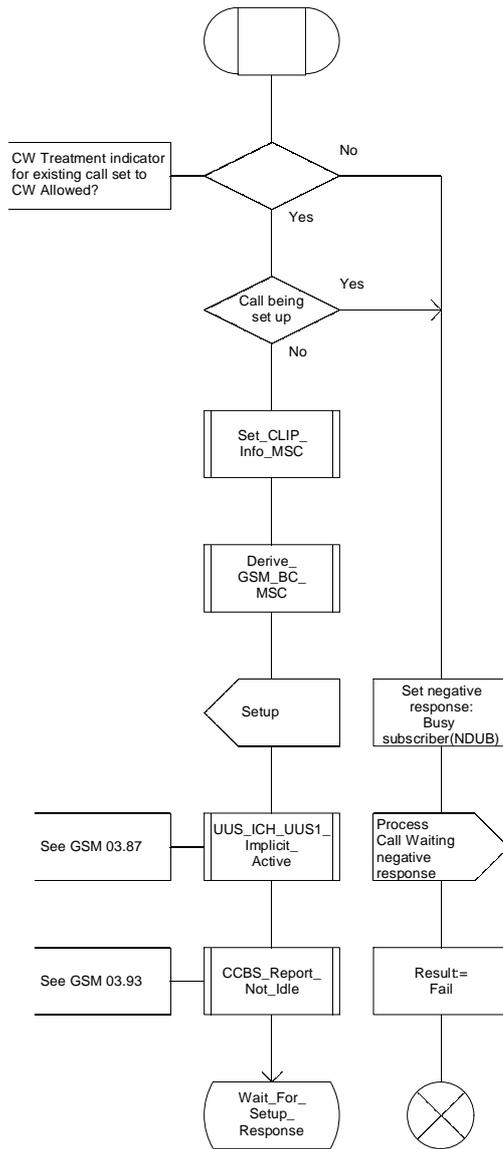


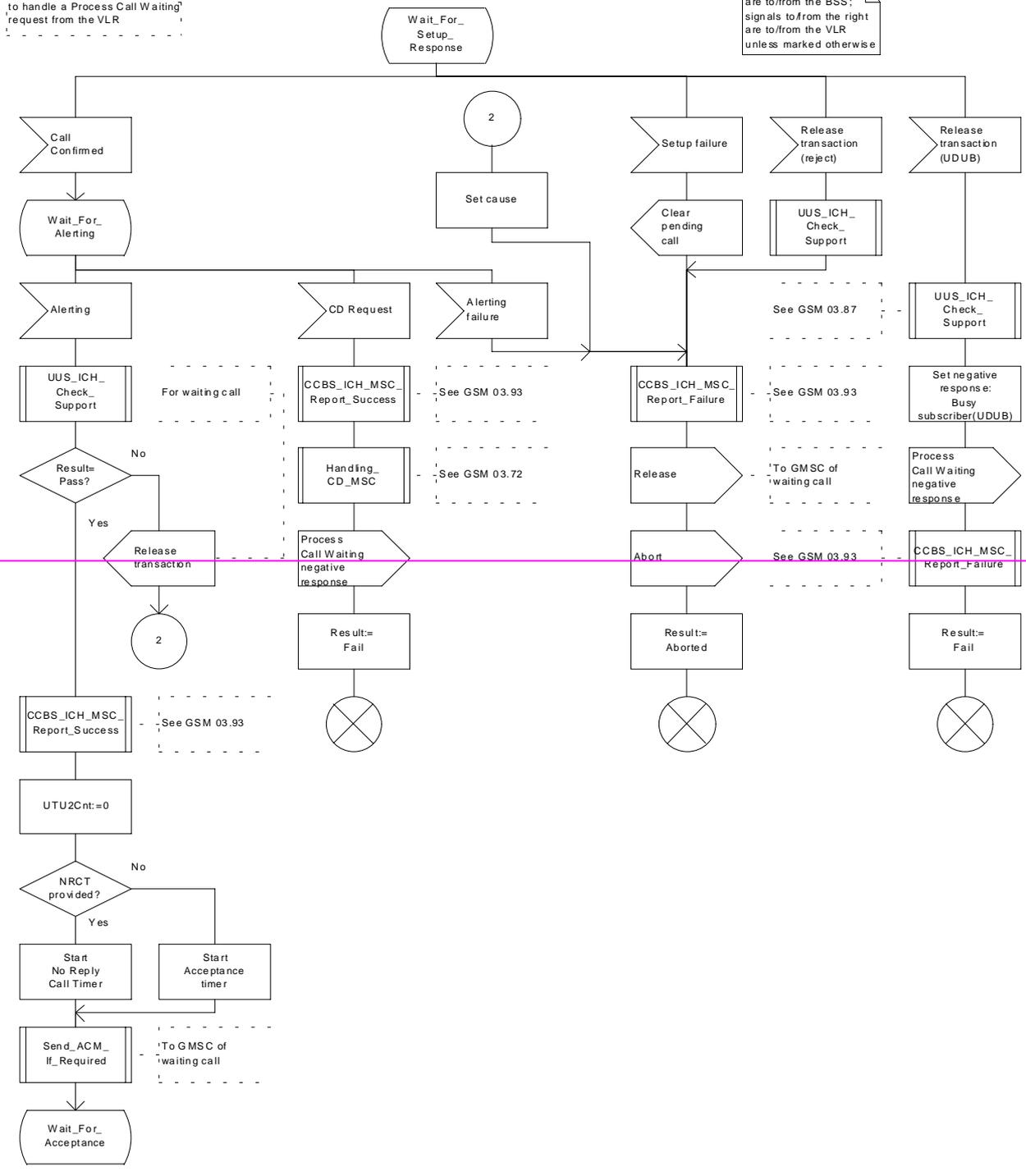
Figure 66a: Procedure Process_Call_Waiting_MSC (sheet 1)

Procedure Process_Call_Waiting_MSC

PCW_MSC2(5)

Procedure in the MSC to handle a Process Call Waiting request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise



Procedure Process_Call_Waiting_MSC

PCW_MSC2(8)

Procedure in the MSC to handle a Process Call Waiting request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise

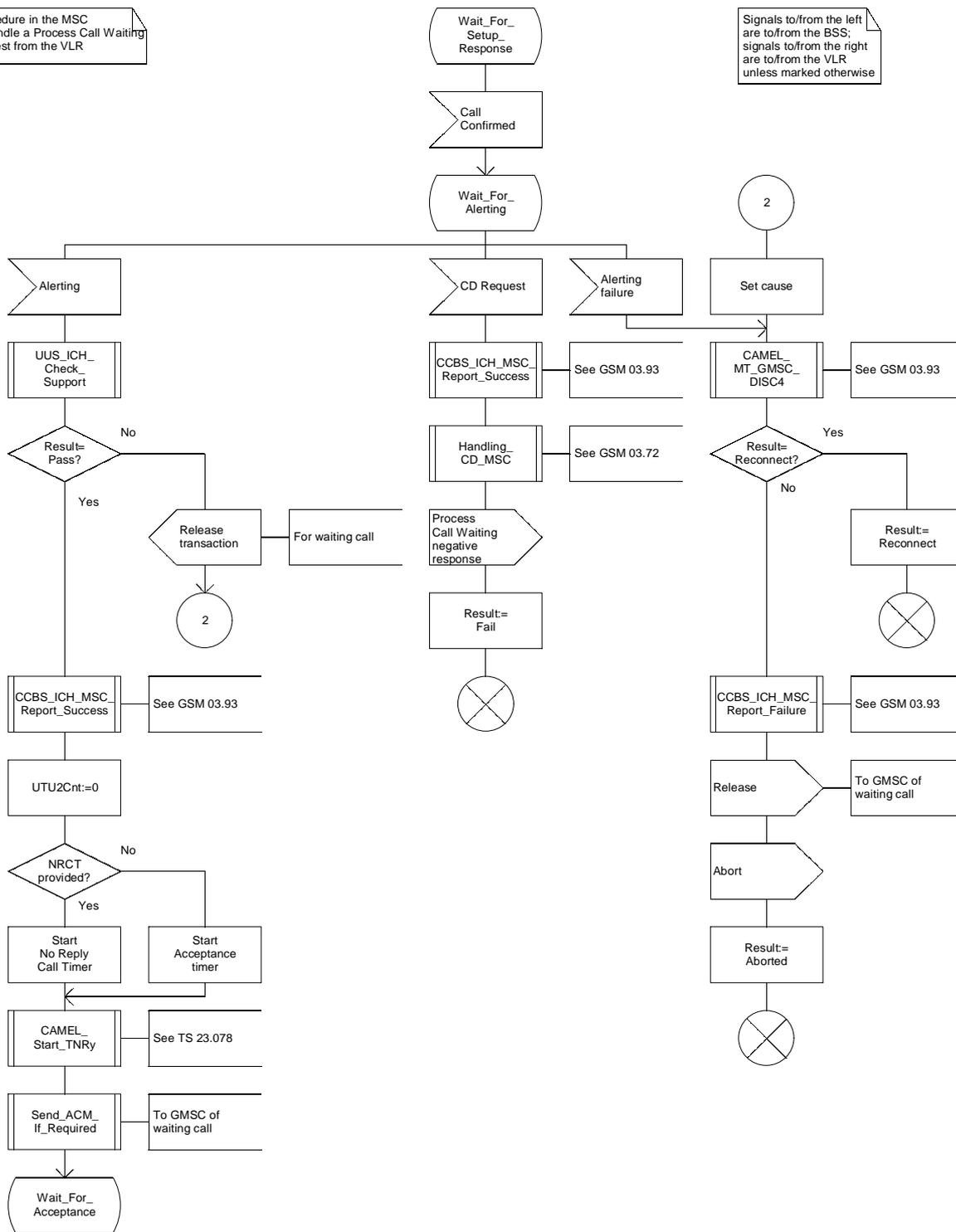


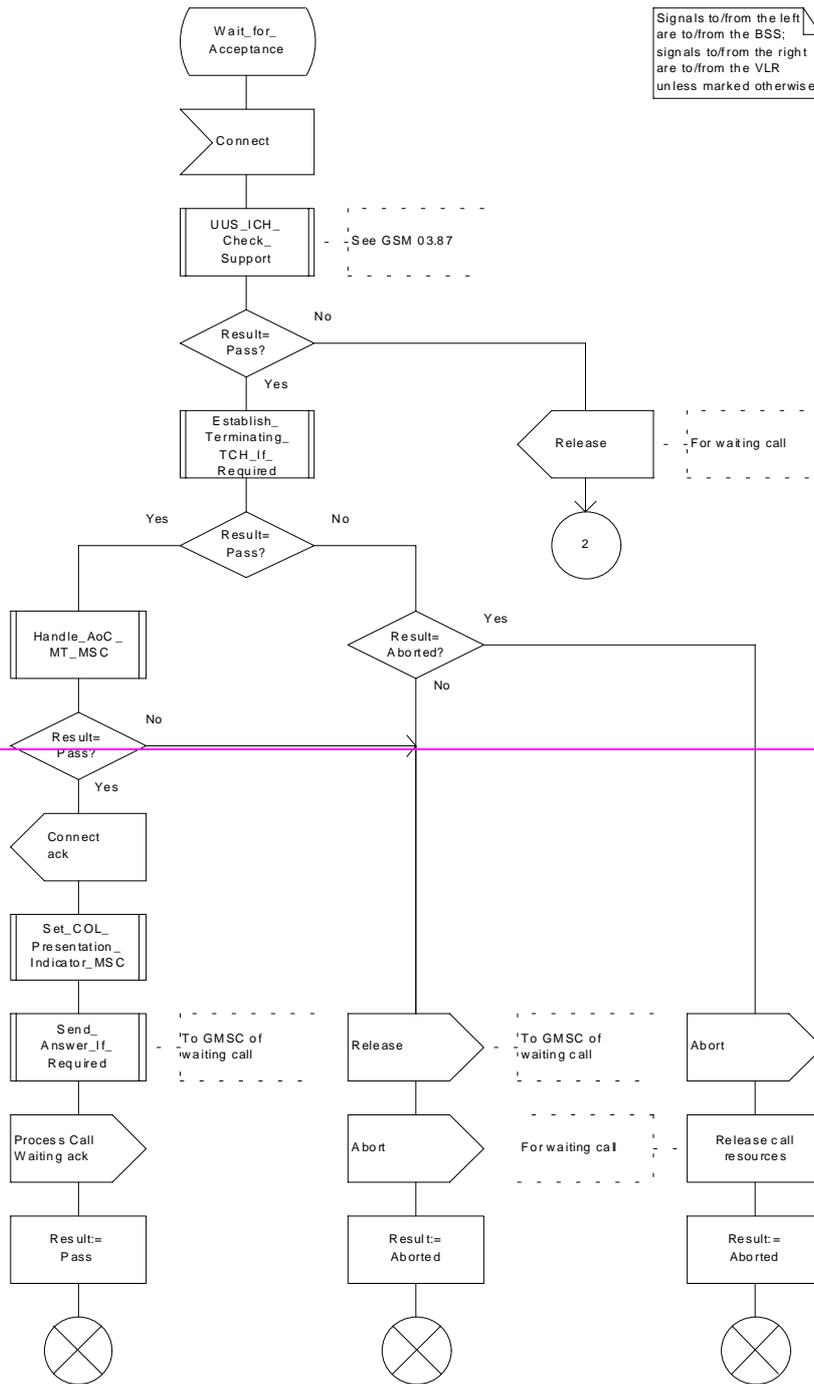
Figure 66b: Procedure Process_Call_Waiting_MSC (sheet 2)

Procedure Process_Call_Waiting_MSC

PCW_MSC3(5)

Procedure in the MSC to handle a Process Call Waiting request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise



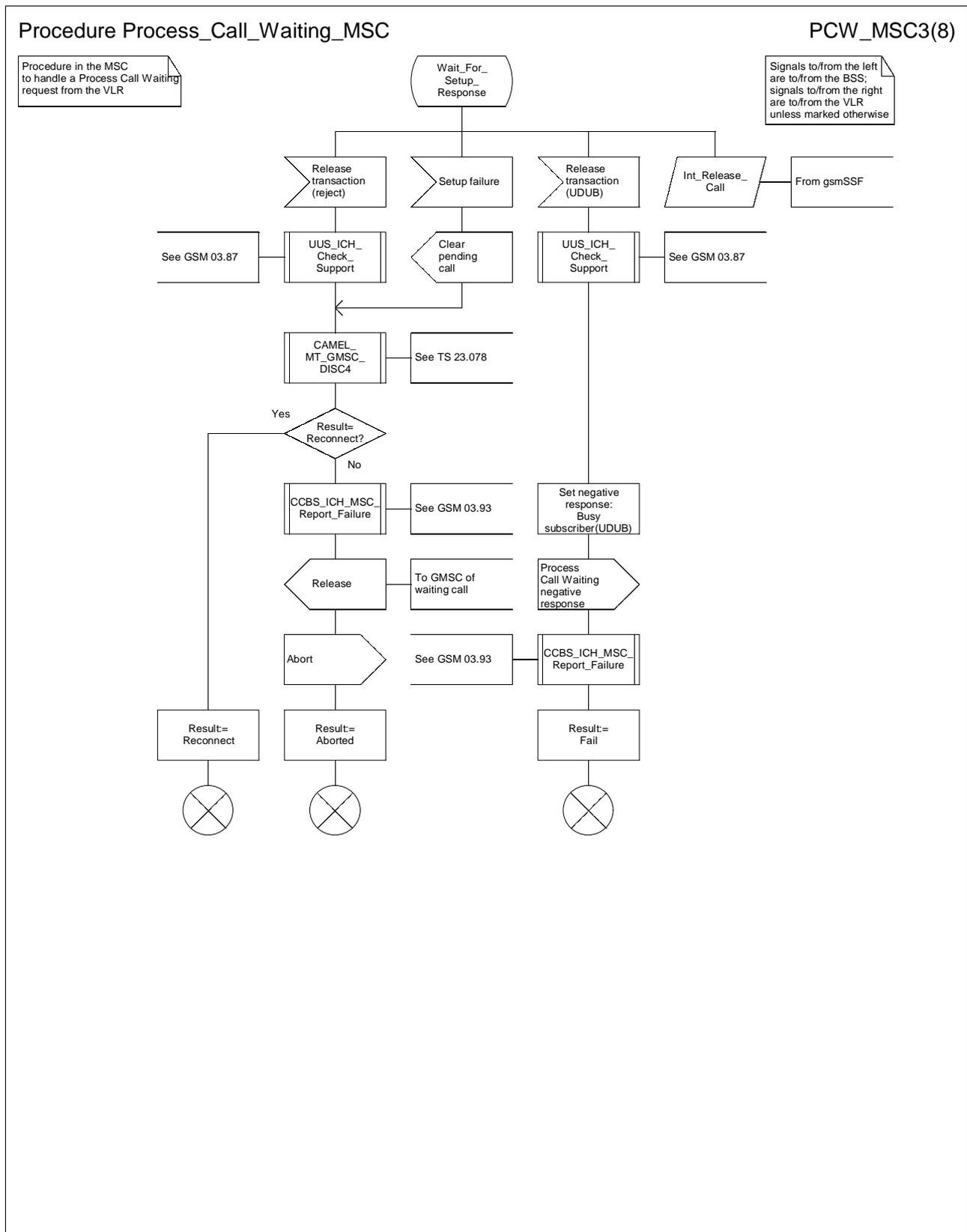


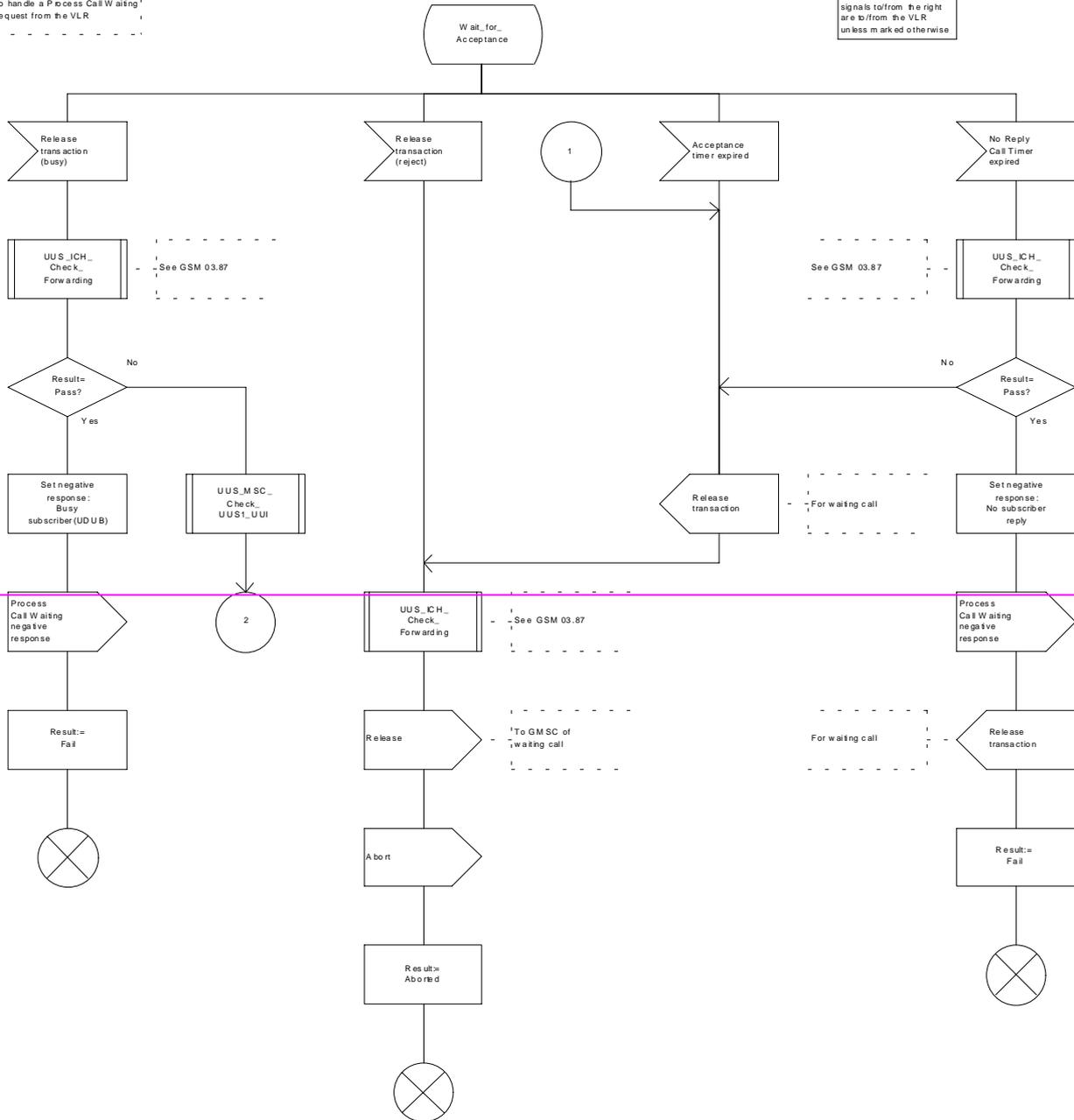
Figure 66c: Procedure Process_Call_Waiting_MSC(sheet 3)

Procedure Process_Call_Waiting_MSC

PCW_MSC4(5)

Procedure in the MSC to handle a Process Call Waiting request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise



Procedure Process_Call_Waiting_MSC

PCW_MSC4(8)

Procedure in the MSC to handle a Process Call Waiting request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise

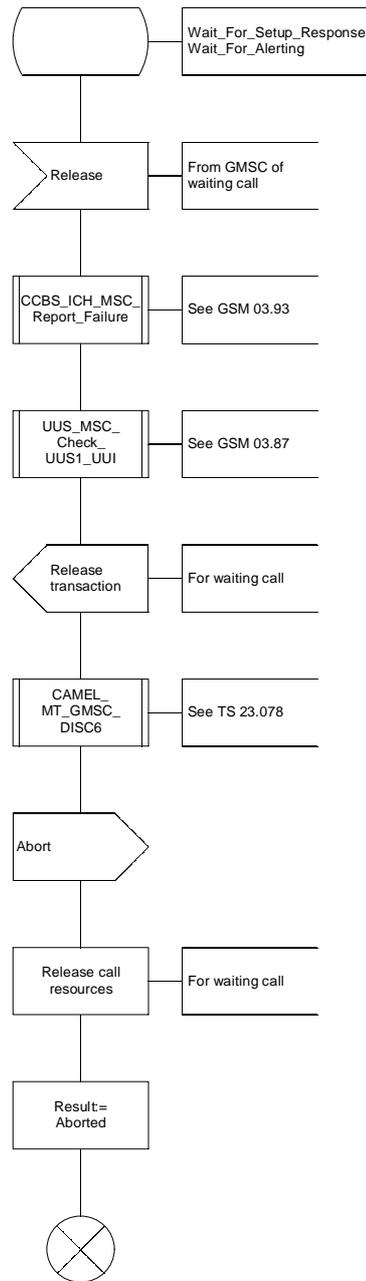


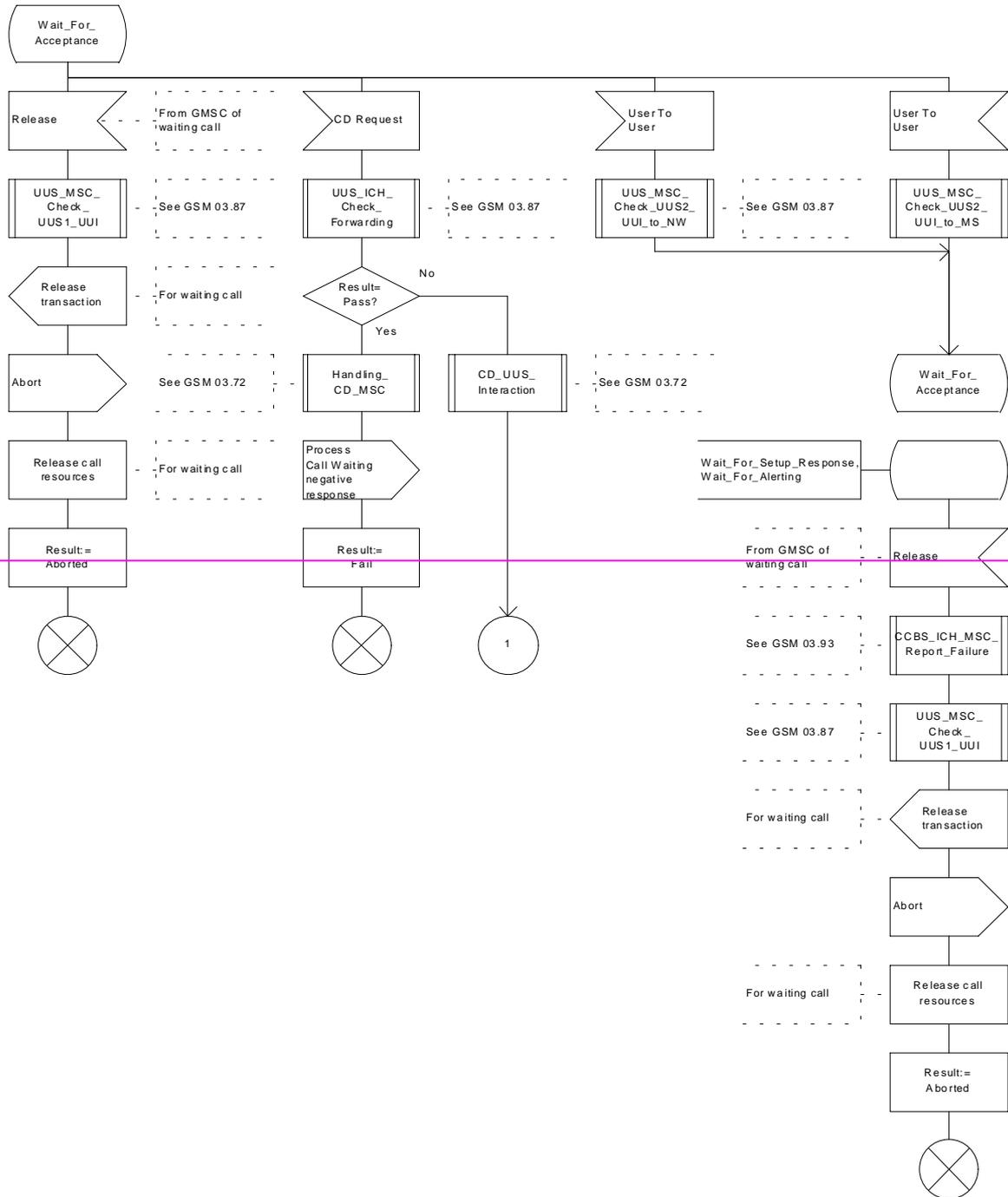
Figure 66d: Procedure Process_Call_Waiting_MSC(sheet 4)

Procedure Process_Call_Waiting_MSC

PCW_MSC5(5)

Procedure in the MSC to handle a Process Call Waiting request from the VLR

Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise



Procedure Process_Call_Waiting_MSC

PCW_MSC6(8)

Procedure in the MSC to handle a Process Call Waiting request from the VLR

Signals to the right are to the VLR

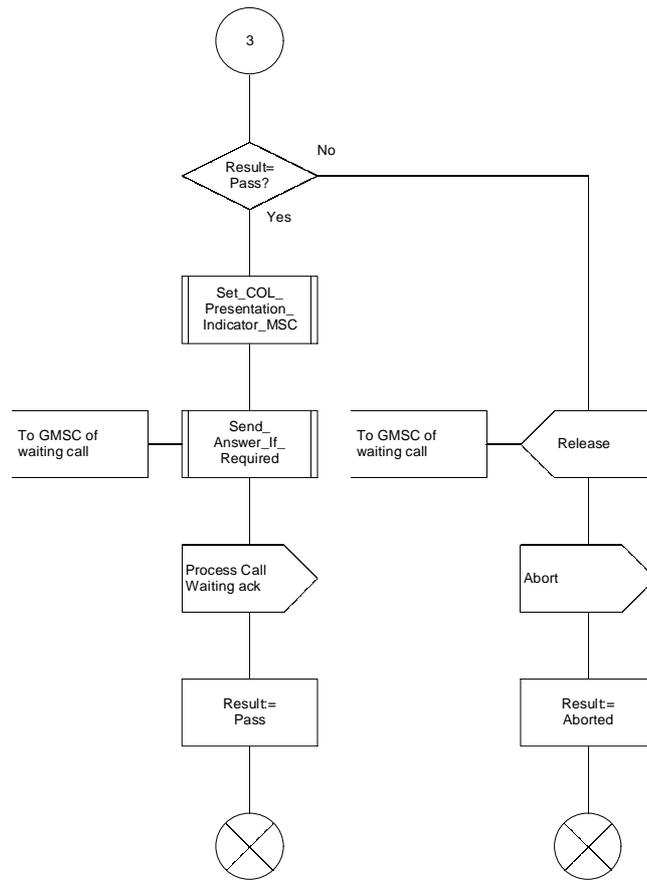


Figure 66f: Procedure Process Call Waiting MSC(sheet 6)

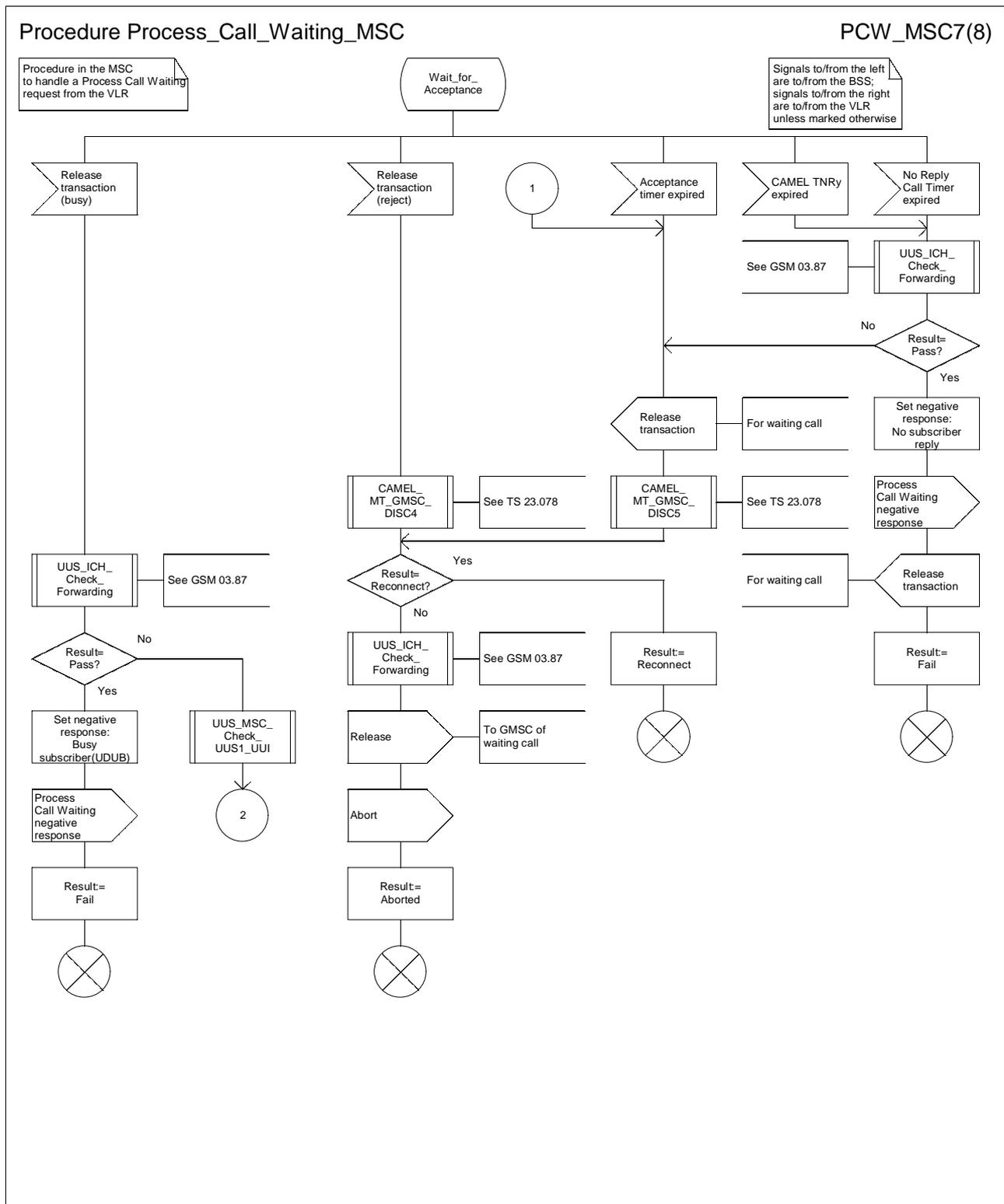


Figure 66g: Procedure Process Call Waiting MSC(sheet 7)

****** Next Modified Section ********7.3.2.1 Process ICH_VLR**

Sheet 1: if the MSRN received in the Send Info For Incoming Call is not allocated or there is no IMSI record for the IMSI identified by the MSRN, this is treated as an unknown MSRN.

Sheet 1: the procedure CAMEL_ICH_VLR is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [28]. If the VLR does not support CAMEL phase 3, processing continues from the "No" exit of the test "Result=CAMEL Active?".

Sheet 1: the procedure CCBS_ICH_Set_CCBS_Call_Indicator is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 1, sheet 2, sheet 4: the procedure CCBS_ICH_VLR_Report_Failure is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 1, sheet 3: the procedure CCBS_ICH_Report_Not_Reachable is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet ~~2~~ 1: this process communicates with the matching instance of the process PRN_VLR, which is linked by the MSRN.

Sheet 2: the test "Paging via SGSN possible" takes the "yes" exit if:

- the Gs interface is implemented; and
- there is an association established for the MS between the MSC/VLR and the SGSN.

Sheet 1, sheet 2, sheet 4: the procedure CCBS_ICH_VLR_Report_Failure is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 1, sheet 3: the procedure CCBS_ICH_Report_Not_Reachable is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 3: the test "NDUB?" takes the "Yes" exit if the Page MS negative response or the Search for MS negative response had the value Busy Subscriber (NDUB).

Sheet 3: the procedure Get_CW_Subscription_Info_VLR is specific to Call Waiting. If the VLR does not support Call Waiting, processing continues from the "No" exit of the test "CW available?".

Sheet 3: the VLR uses the basic service returned in the Page MS negative response or the Search for MS negative response Busy Subscriber (More calls possible) to determine whether call waiting is available.

Sheet 3: the procedure Get_LI_Subscription_Info_MT_VLR is specific to CLIP and COLR. If the VLR supports neither CLIP nor COLR, the procedure call is omitted.

Sheet3: the procedure Get_AoC_Subscription_Info_VLR is specific to AoC; it is specified in subclause 7.1.2.15.

Sheet 3 sheet 5: the procedure CLI_ICH_VLR_Add_CLI is specific to Enhanced CLI Handling. It is specified in GSM 03.81 [11].

Sheet 3: the procedure CCBS_ICH_Handle_NDUB is specific to CCBS; it is specified in GSM 03.93 [19]. If the VLR does not support CCBS, processing continues from the "Forward" exit of the test "Result".

Sheet 3: the procedure Process_Access_Request_VLR is specified in subclause 7.1.2.2.

Sheet 3: the output signal Page MS towards the SGSN includes the Location area identity parameter.

Sheet 3: if the VLR does not support CUG, handling continues from the "No" exit of the test "CUG info present?".

Sheet 4, sheet 5: the procedure CD_Authorization is specific to Call Deflection, it is specified in GSM 03.72 [7]. If the VLR does not support Call Deflection, processing continues from the "Yes" exit of the test "Result=Aborted?".

Sheet 4, sheet 5: the procedure CCBS_ICH_Handle_UDUB is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 5: the test "NDUB?" is executed only if the VLR supports CCBS. If the VLR does not support CCBS, processing continues from connector 5.

Sheet 6: the procedure CCBS_ICH_Set_CCBS_Target is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 6: the procedure Handle_CFNRC is specified in subclause 7.2.2.11.

Sheet 7: the procedure Forward_CUG_Check is specific to CUG; it is specified in subclause 7.2.2.6. If the VLR does not support CUG, processing continues from the "Yes" exit of the test "Result=Call allowed?".

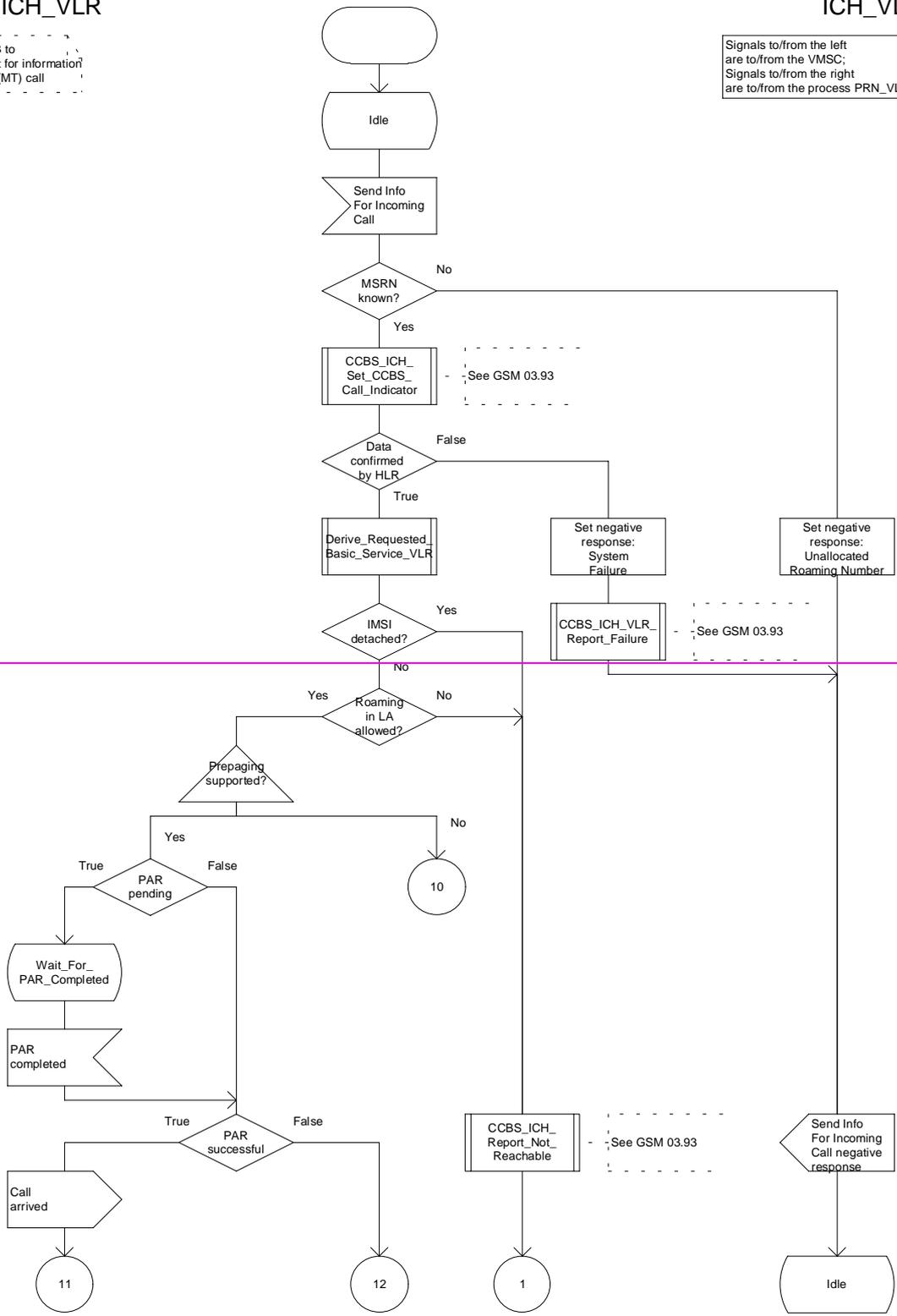
****** Next Modified Section ******

Process ICH_VLR

Process in VLRB to handle a request for information for an incoming (MT) call

ICH_VLR1(7)

Signals to/from the left are to/from the VMSC; Signals to/from the right are to/from the process PRN_VLR.



Process ICH_VLR

ICH_VLR1(7)

Process in VLRB to handle a request for information for an incoming (MT) call

Signals to/from the left are to/from the MSC

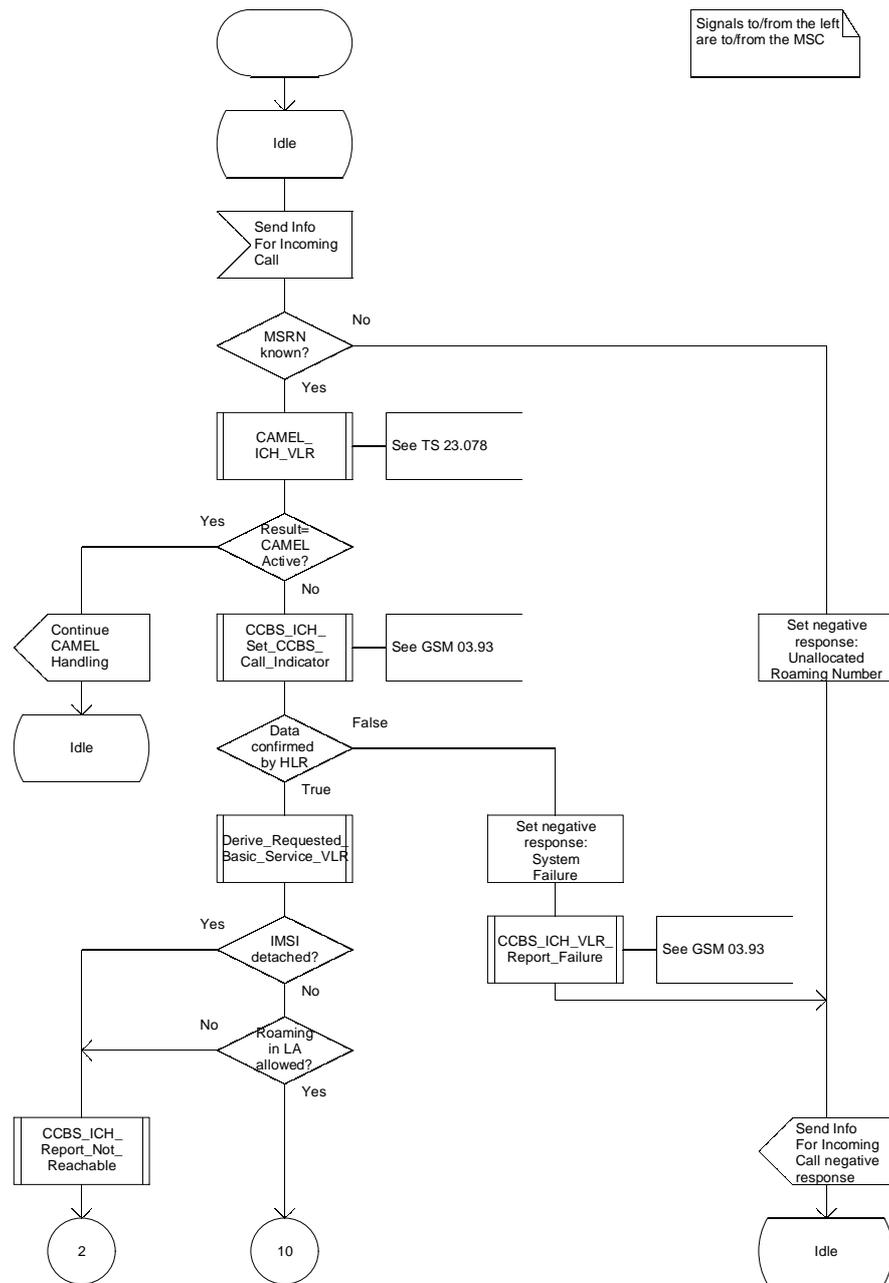


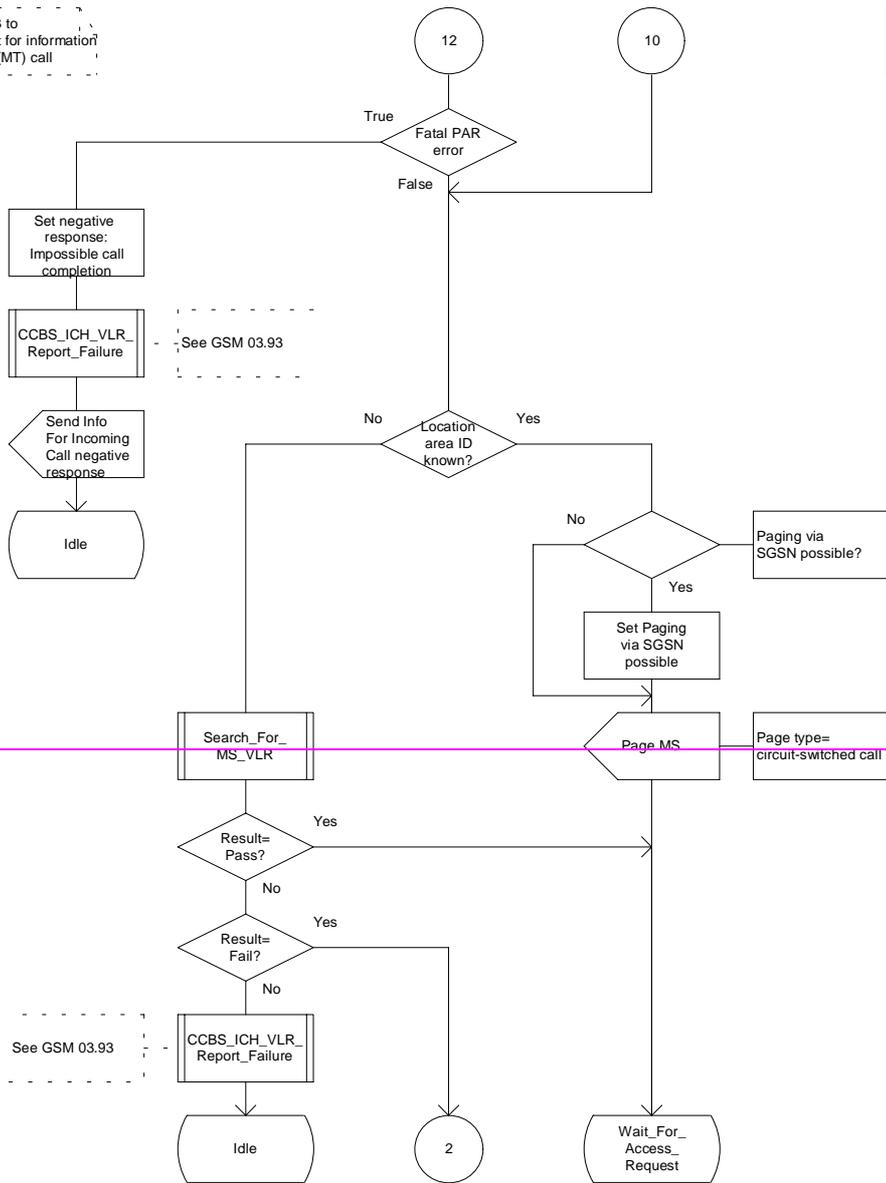
Figure 72a: Process ICH_VLR (sheet 1)

Process ICH_VLR

ICH_VLR2(7)

Process in VLRB to handle a request for information for an incoming (MT) call

Signals to the left are to the MSC



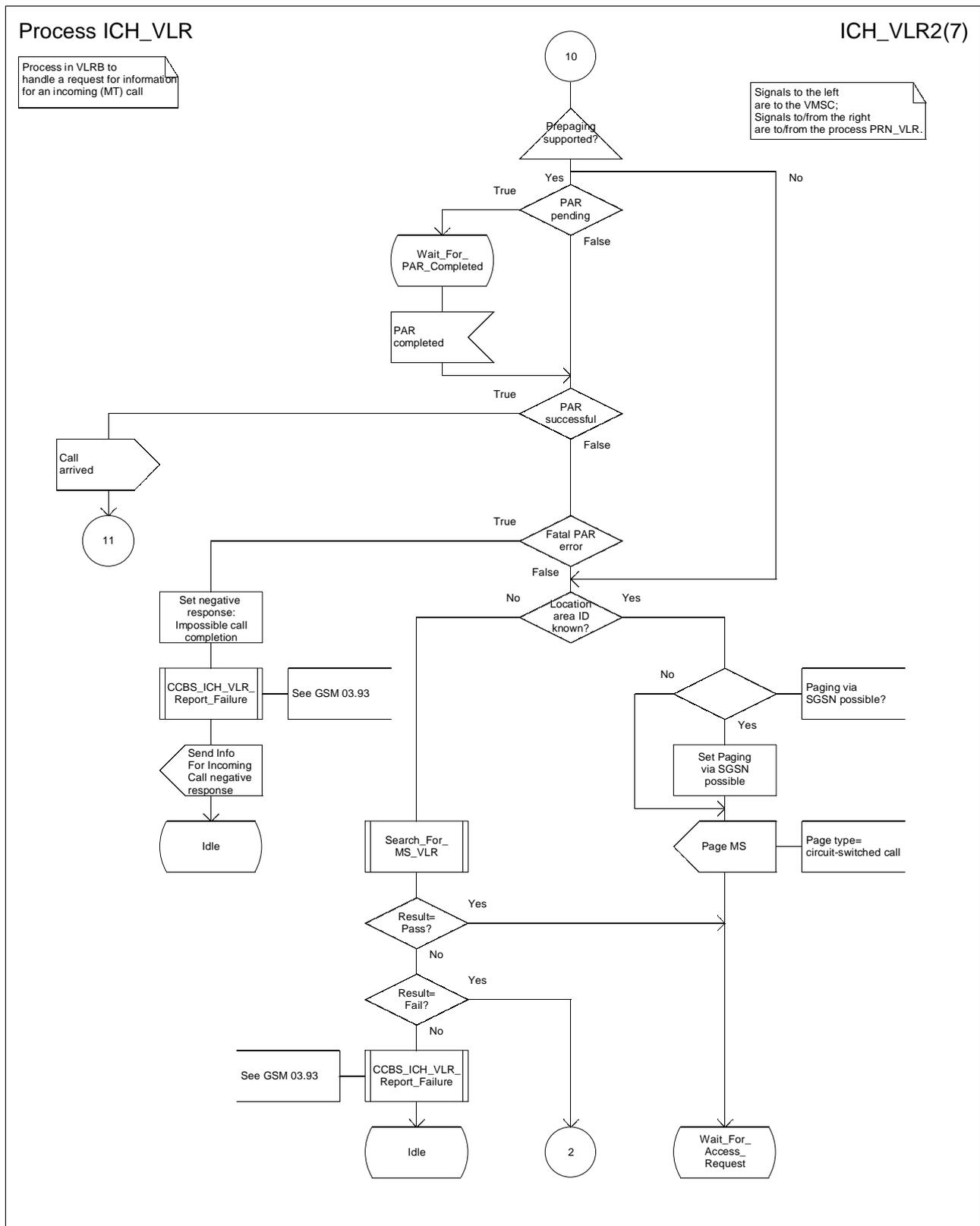


Figure 72b: Process ICH_VLR (sheet 2)

****** Next Modified Section ******

8.3.5.1 Location information

The compound information element Location information consists of the following subordinate information elements:

Information element name	Required	Description
Location number	C	For a definition of this information element, see ETS 300 356-1 [30]. Shall be present if the VLR can derive it from the stored cell global identity or location area identity; otherwise shall be absent. The mapping from cell ID and location area to location number is network-specific and outside the scope of the GSM standard.
Cell ID	C	Cell global identity of the cell in which the MS is currently in radio contact or in which the MS was last in radio contact. Shall be present if the subscriber record is marked as confirmed by radio contact; otherwise shall be absent.
Geographical information	C	For a definition of this information element, see GSM 03.32 (Universal Geographical Area Description). Shall be present if the VLR can derive it from the stored cell global identity or location area identity; otherwise shall be absent.
<u>Geodetic information</u>	<u>C</u>	<u>This information element corresponds to the Calling Geodetic Location defined in ITU-T Q.763 [31]. Shall be present if the VLR can derive it from the stored cell global identity or location area identity; otherwise shall be absent.</u>
VLR number	O	E.164 number which identifies the VLR (see GSM 03.03 [2]). If the HLR receives it from the VLR it shall ignore it.
Age of location information	C	Measured in minutes. Shall be present if available in the MSC/VLR; otherwise shall be absent.

****** Next Modified Section ******

8.5.2 Perform Call Forwarding

Information element name	Required	Description
Forwarded-to number	M	E.164 number of the C subscriber.
<u>OR call</u>	<u>M</u>	<u>Indicates whether the call which is to be forwarded was subject to basic OR as specified in TS 23.079 [29].</u>

3G CHANGE REQUEST

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

23.079 CR 008

Current Version: 3.2.0

3G specification number ↑

↑ CR number as allocated by 3G support team

For submission to TSG CN#06
list TSG meeting no. here ↑

for approval (only one box should
for information be marked with an X)

Form: 3G CR cover sheet, version 1.0 The latest version of this form is available from: <ftp://ftp.3gpp.org/Information/3GCRF-xx.rtf>

Proposed change affects:
(at least one should be marked with an X)

USIM

ME

UTRAN

Core Network

Source: Vodafone Airtouch

Date: 25/11/1999

Subject: Introduction of CAMEL Phase 3

3G Work item: CAMEL Phase 3

Category:

- F Correction
A Corresponds to a correction in a 2G specification
B Addition of feature
C Functional modification of feature
D Editorial modification

(only one category
shall be marked
with an X)

Reason for change:

To allow the transfer of the destination address for a call leg to the gsmSCF. This is necessary for the correct operation of prepayment services.

Clauses affected: 2; 9.4.2; Figures 7a, 7b

Other specs affected:

- Other 3G core specifications → List of CRs:
Other 2G core specifications → List of CRs:
MS test specifications → List of CRs:
BSS test specifications → List of CRs:
O&M specifications → List of CRs:

Other comments:

This CR is an update of the changes in document N2-99808 to base it on 23.079 v3.2.0



help.doc

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

2 Normative references

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

- [1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".
- [2] GSM 02.79: "Digital cellular telecommunications system (Phase 2+); Support of Optimal Routeing (SOR); Service definition (Stage 1)".
- [3] GSM 02.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) Supplementary Services - Stage 1".
- [4] GSM 03.03: "Digital cellular telecommunications system (Phase 2+); Numbering, addressing and identification".
- [5] GSM 03.04: "Digital cellular telecommunications system (Phase 2+); Signalling requirements relating to routeing of calls to mobile subscribers".
- [6] GSM 03.18: "Digital cellular telecommunications system (phase 2+); Basic call handling; Technical realisation".
- [7] GSM 03.78: "Digital cellular telecommunications system (phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL) - Stage 2".
- [8] GSM 03.78: "Digital cellular telecommunications system (Phase 2+); Customized Applications for Mobile network Enhanced Logic (CAMEL) - Phase 2; Stage 2".
- [9] GSM 03.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 2".
- [10] GSM 03.87: "Digital cellular telecommunications system (Phase 2+); User-to-User (UUS) supplementary services - Stage 2 (GSM 03.87)".

[11] [3GPP TS 23.078: "Technical Specification Group Core Network; Customized Applications for Mobile network Enhanced Logic \(CAMEL\) - Phase 3; Stage 2".](#)

**** Next modified section ****

9.4.2 Procedure OR_Handle_RCH

Sheet 1: the procedure Activate_CF_Process is specified in GSM 03.18 [6].

Sheet 1: if the GMSC interrogates the HLR for a Forwarded-to number, the Routeing address is the Forwarded-to number received in the Send Routeing Info ack; otherwise the Routeing address is the Forwarded-to number received in the Resume Call Handling.

Sheet 1: the procedure CAMEL_MT_GMSC_Notify_CF is specific to CAMEL phase 2; it is specified in GSM 03.78 for CAMEL Phase 2 [8]. If the GMSC does not support CAMEL, processing continues from the "Continue" exit of the test "Result".

Sheet 2: the task "Destination address:=FTN" is executed only if the GMSC supports optimal routing of basic mobile-to-mobile calls.

Sheet 2: the process MT_CF_MSC is specified in GSM 03.18 [6].

Sheet 2: the procedure UUS_GMSC_Check_Forwarding is specific to UUS; it is specified in GSM 03.87 [10].

Sheet 2: the procedure CAMEL_Store_Destination_Address is specific to CAMEL phase 3; it is specified in TS 23.078 for CAMEL Phase 3 [11].

Sheet 2: the called party address sent in the IAM to the process MT_CF_MSC is the Forwarded-to number received in the Perform Call Forwarding ack.

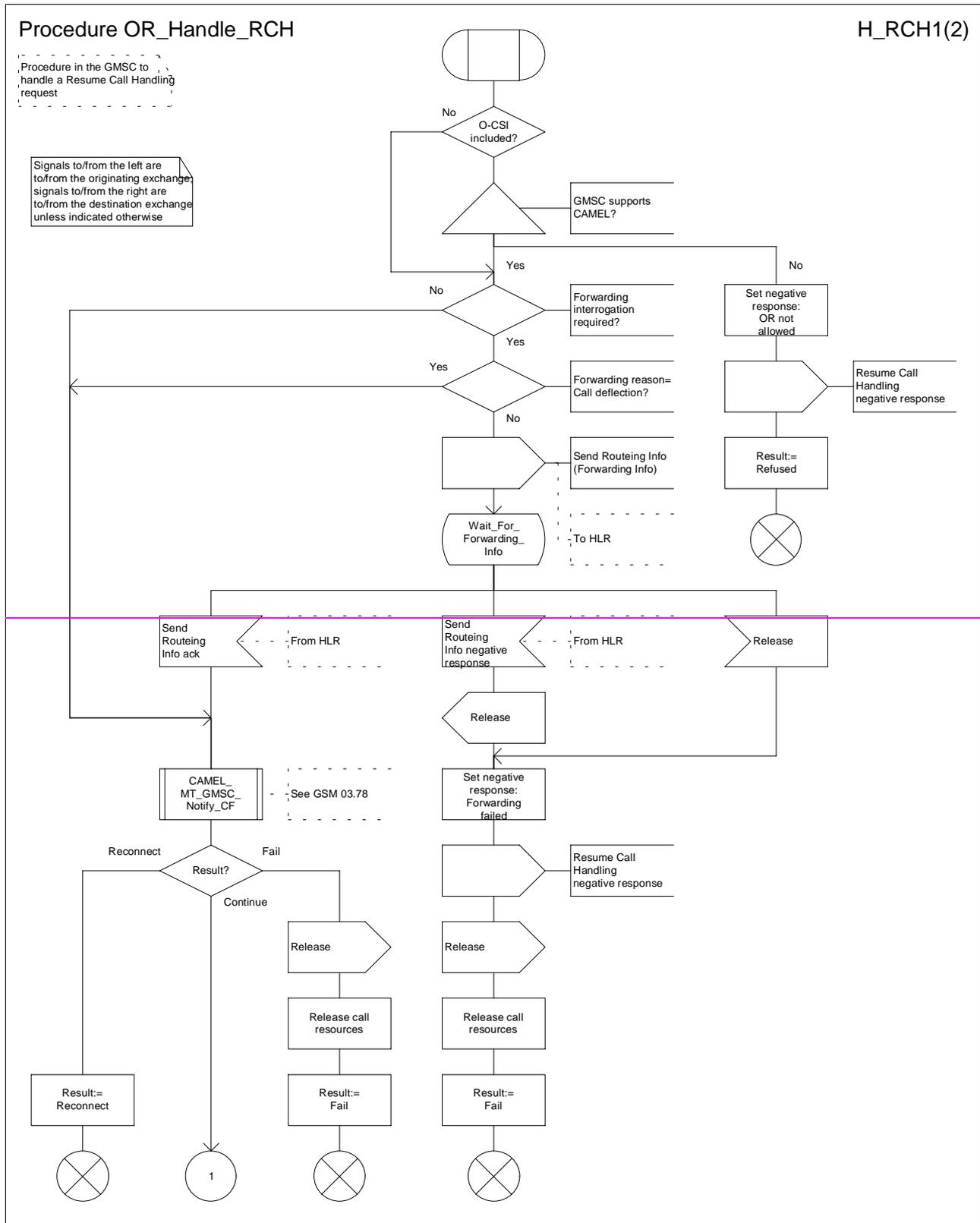
**** Next modified section ****

Procedure OR_Handle_RCH

H_RCH1(2)

Procedure in the GMSC to handle a Resume Call Handling request

Signals to/from the left are to/from the originating exchange signals to/from the right are to/from the destination exchange unless indicated otherwise



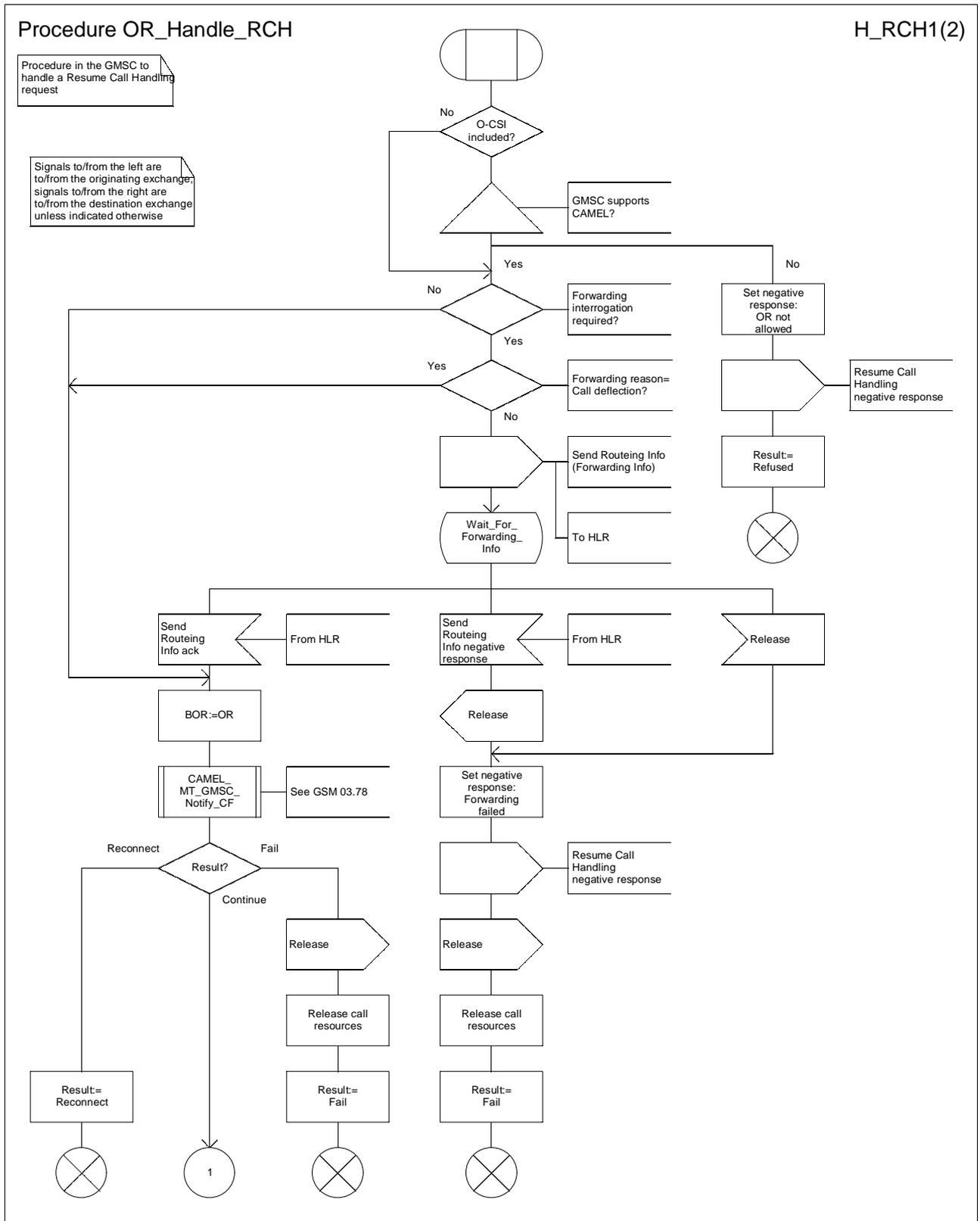


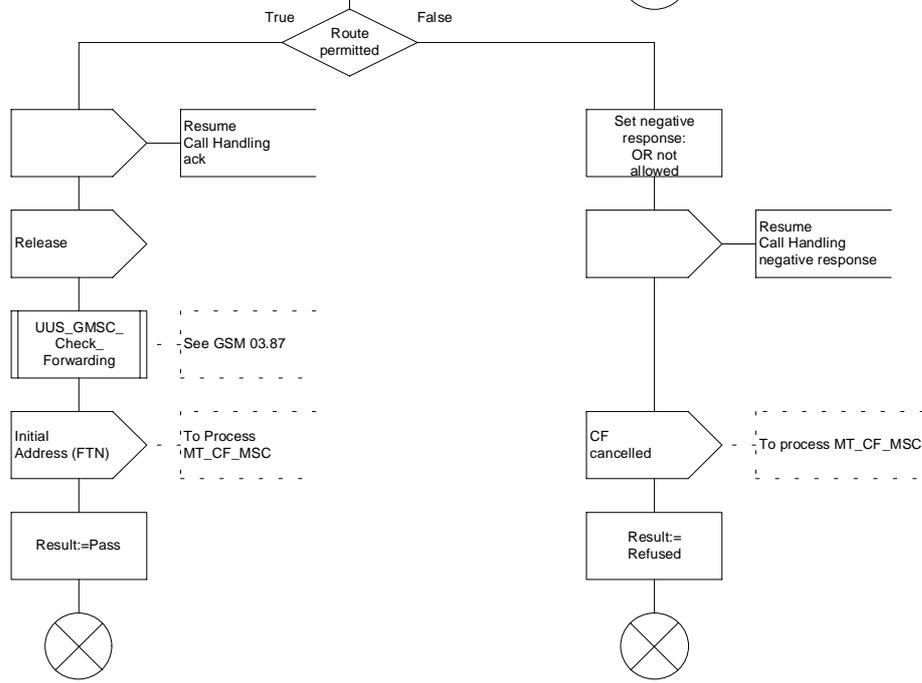
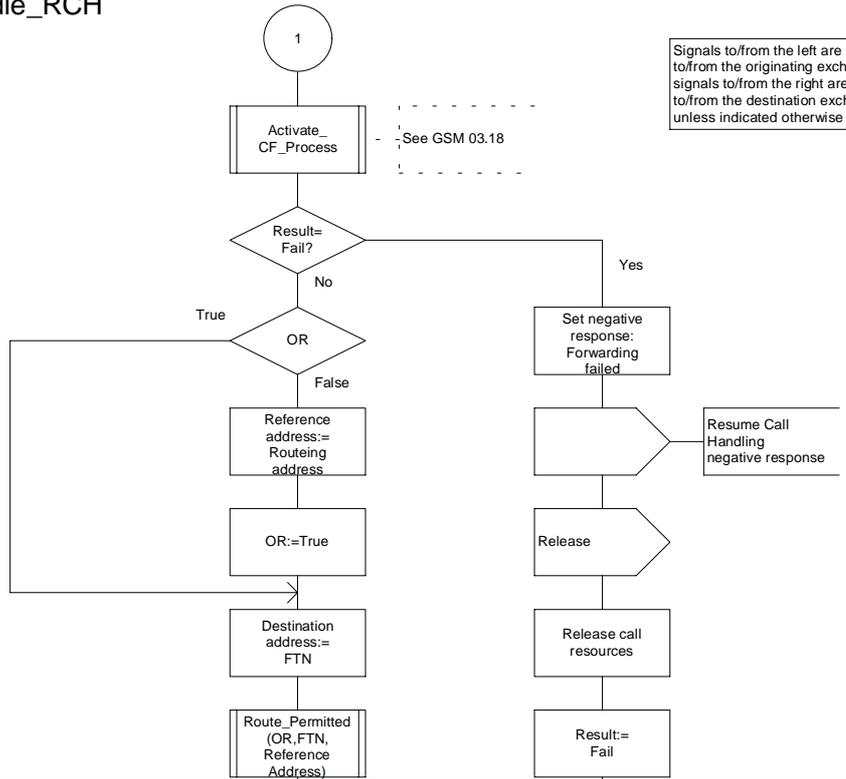
Figure 7a: Procedure OR_Handle_RCH (sheet 1)

Procedure OR_Handle_RCH

H_RCH2(2)

Procedure in the GMSC to handle a Resume Call Handling request

Signals to/from the left are to/from the originating exchange; signals to/from the right are to/from the destination exchange unless indicated otherwise



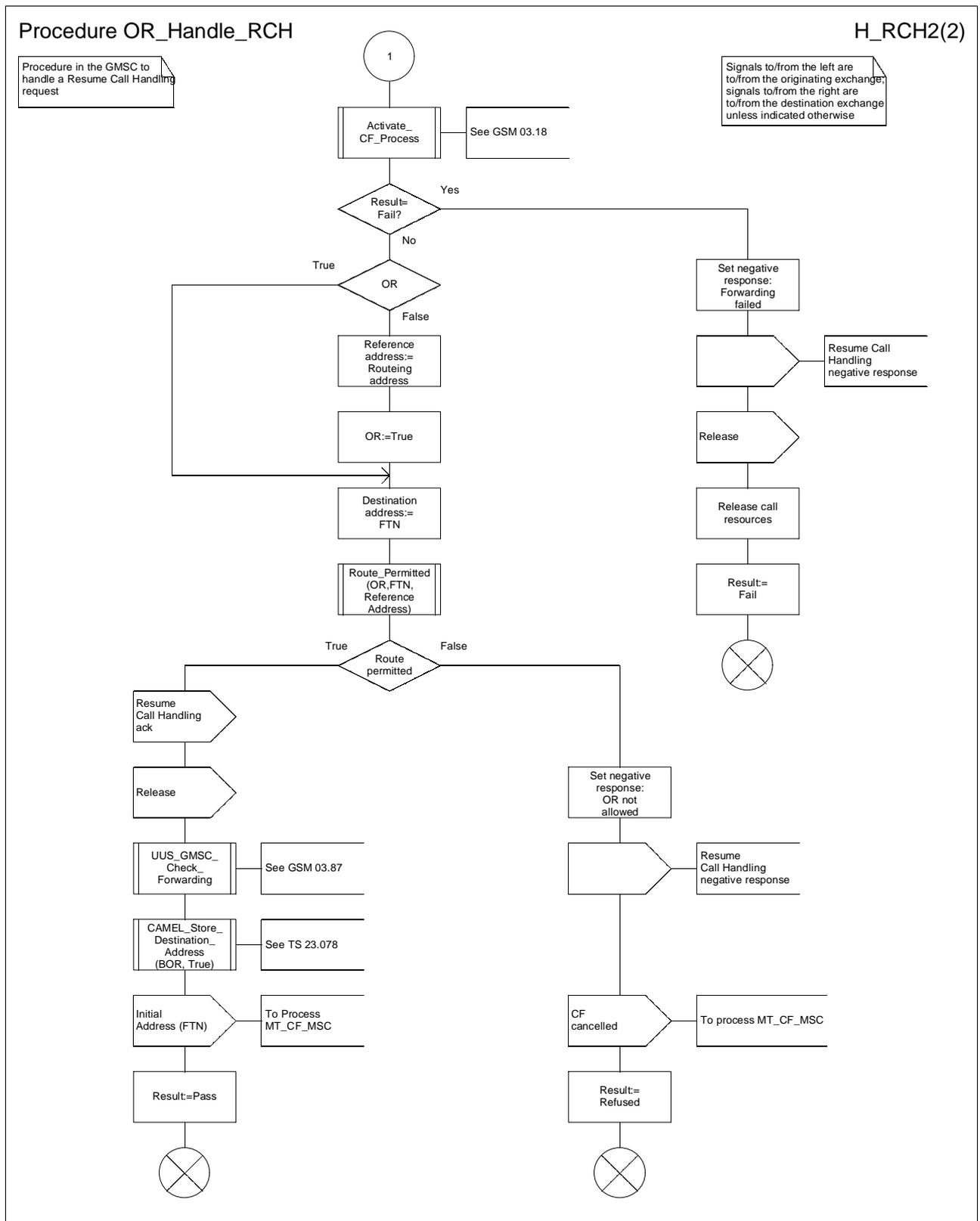


Figure 7b: Procedure OR_Handle_RCH (sheet 2)

3G CHANGE REQUEST

29.002 CR 073r1

Current Version: 3.2.0

For submission to TSG CN#06 for approval
for information

Proposed change affects: USIM ME UTRAN Core Network

Source: TSG CN2 **Date:** 06/12/1999

Subject: Introduction of CAMEL Phase 3 in 3G TS 29.002

3G Work item: CAMEL Phase 3

Category:

F Correction	<input type="checkbox"/>
A Corresponds to a correction in a 2G specification	<input type="checkbox"/>
B Addition of feature	<input type="checkbox"/>
C Functional modification of feature	<input checked="" type="checkbox"/>
D Editorial modification	<input type="checkbox"/>

Reason for change: Inclusion of CAMEL Phase 3 into 3G TS 29.002.

Clauses affected: See attached combined CR

Other specs affected:

Other 3G core specifications	<input type="checkbox"/>	→ List of CRs:	
Other 2G core specifications	<input type="checkbox"/>	→ List of CRs:	
MS test specifications	<input type="checkbox"/>	→ List of CRs:	
BSS test specifications	<input type="checkbox"/>	→ List of CRs:	
O&M specifications	<input type="checkbox"/>	→ List of CRs:	

Other comments: This 'combined CR' contains the approved contributions on CAMEL Phase 3, for 3G TS 29.002.

The contents of the following Tdocs has been included:

- N2-99F66
- N299D63
- N2-99G51
- N2-99H80
- N2-99K36
- N2-99H82
- N2-99H68
- N2-99H00
- N2-99F68
- N2-99K34
- N2-99K42 (with changes that were agreed in the Phoenix meeting)
- N2-99K50 (with changes that were agreed in the Phoenix meeting)
- N2-99F60
- N2-99J21 (with changes that were agreed in the Phoenix meeting)
- N2-99J83
- N2-99J79

Results from the editors meeting in Stuttgart (1 & 2 December 1999) have been included.

Minor editorial corrections have been made to the draft spec.

Figure 25.9/3: The activate trace mode macro in the VLR

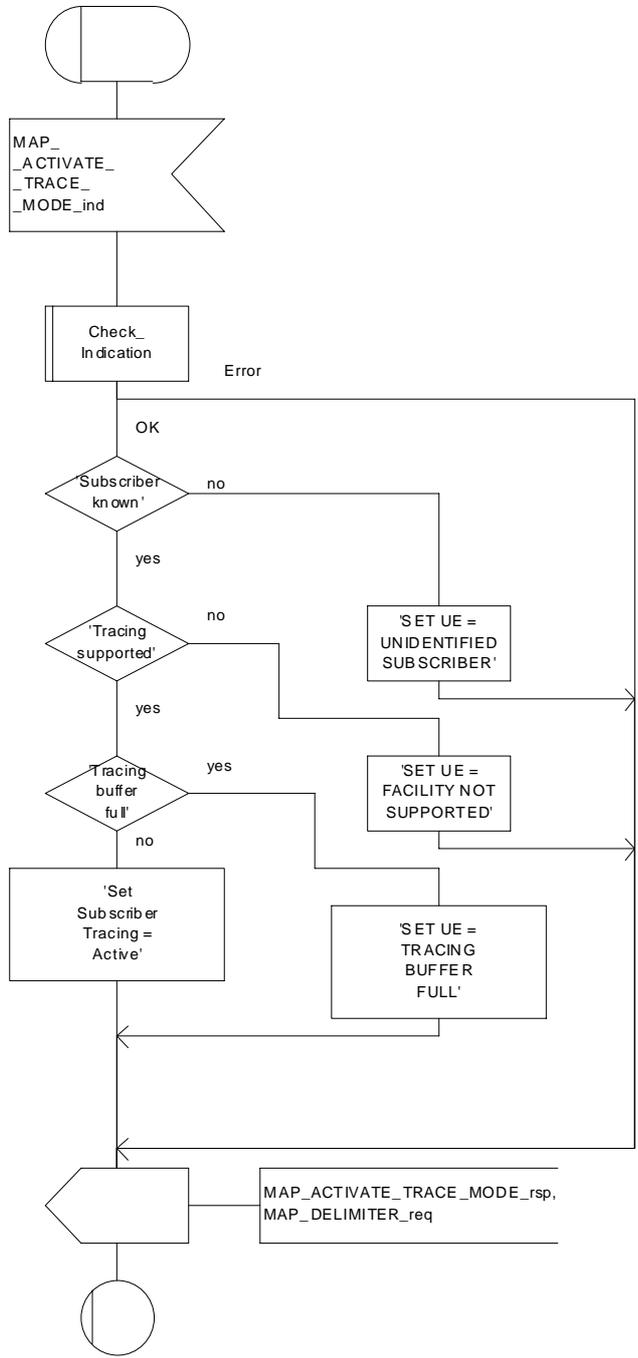


Figure 25.9/3: Macro Activate_Tracing_VLR

25.9.4 Macro Control_Tracing_HLR

The Control_Tracing_HLR macro may be invoked in the HLR, if subscriber related activity is detected. If the tracing is active in the HLR and not active in the VLR or in the SGSN, the MAP_ACTIVATE_TRACE_MODE request is sent to the VLR or to the SGSN.

The MAP_ACTIVATE_TRACE_MODE confirmation from the VLR or from the SGSN is processed as follows:

- if the primitive contains a successful acknowledge, the tracing in VLR or in the SGSN is set active;
- if the primitive contains errors, the tracing in VLR or in SGSN is set deactive.

The Control_Tracing_HLR macro between HLR and VLR is shown in the figure 25.9/4

The Control_Tracing_HLR_with_SGSN macro between HLR and SGSN is shown in the figure 25.9/5

Figure 25.9/4: The subscriber tracing activation macro in the HLR

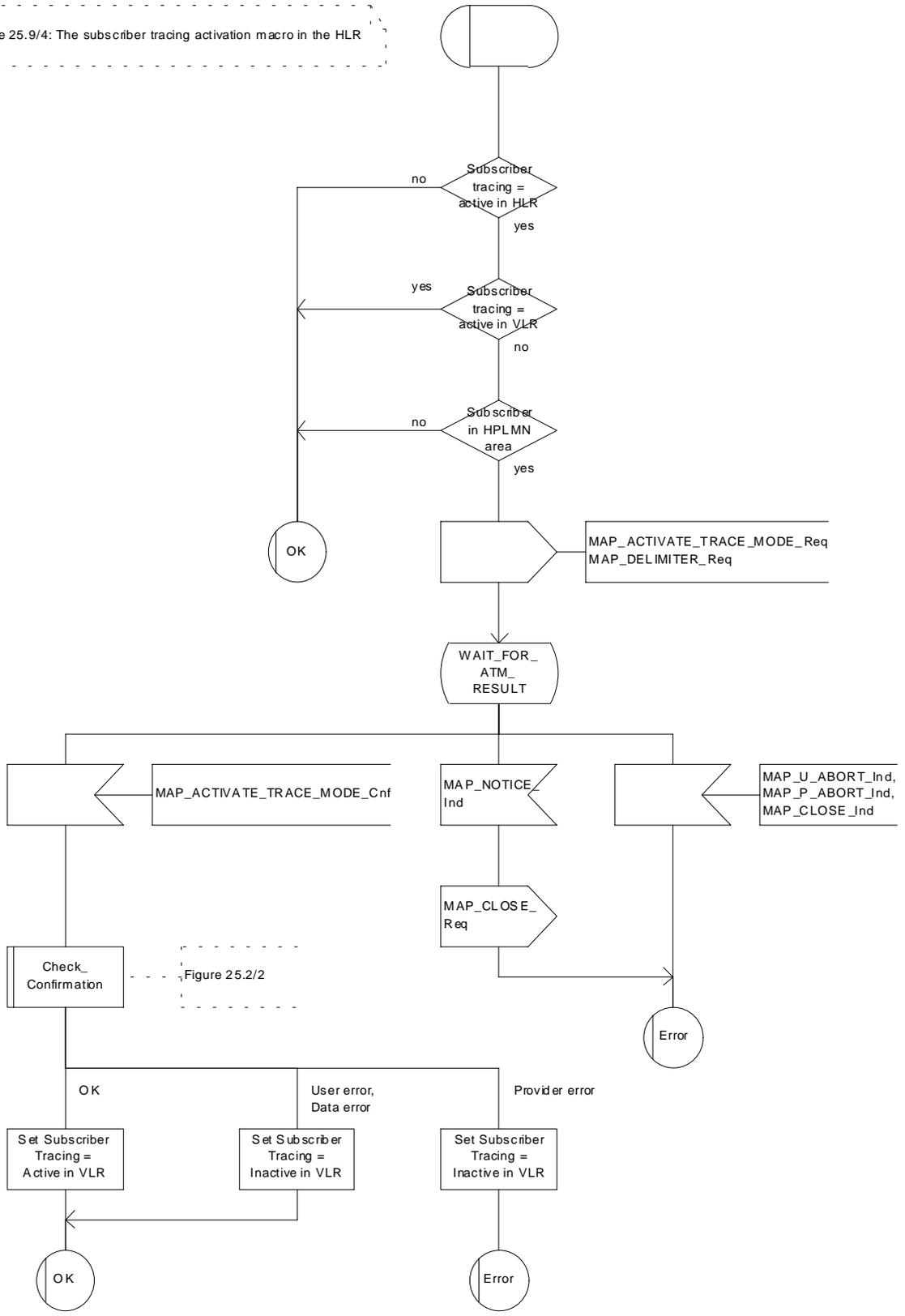


Figure 25.9/4: Macro Control_Tracing_HLR

Figure 25.9/5: The subscriber tracing activation macro in the HLR

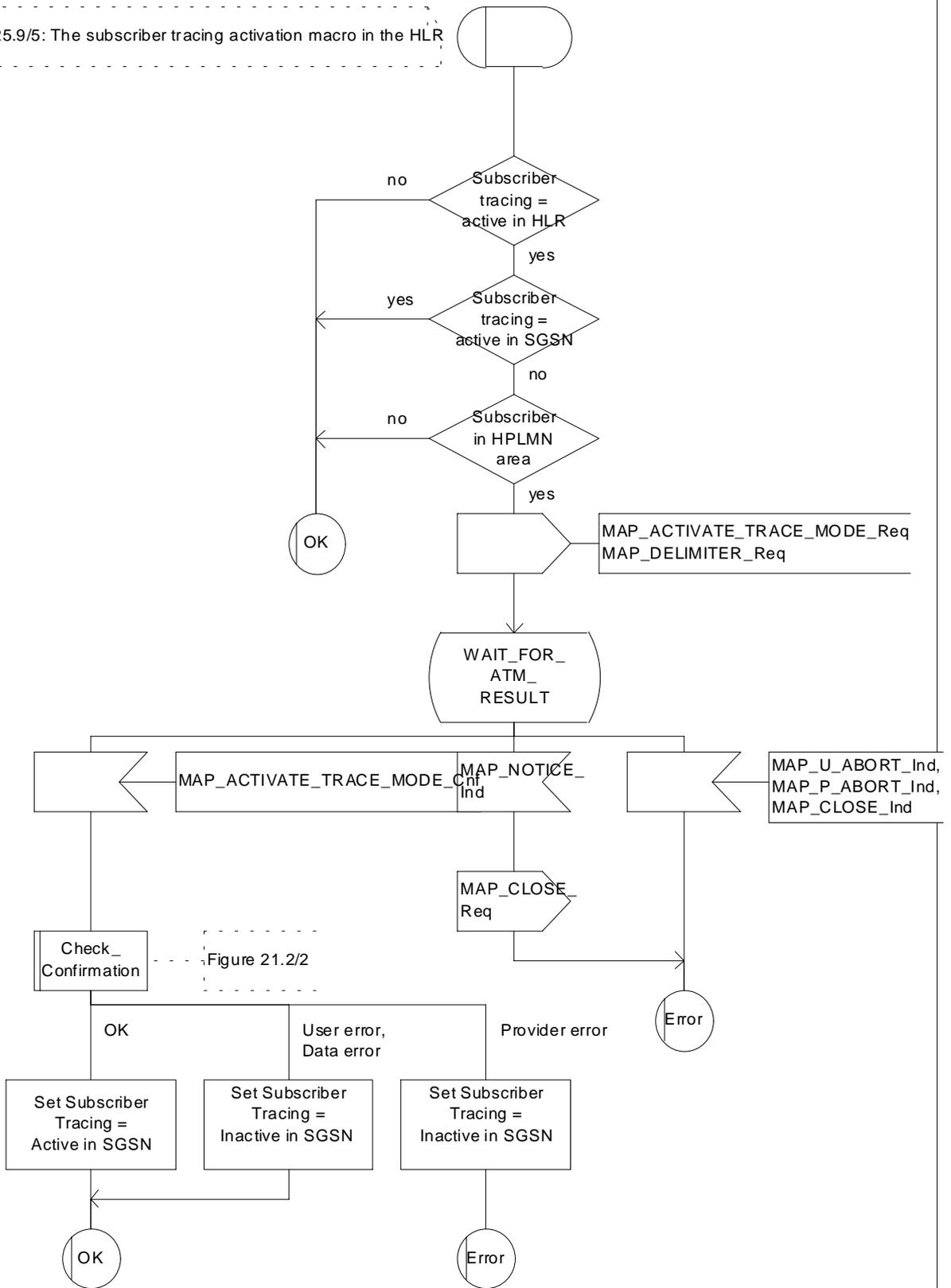


Figure 25.9/5: Macro Control_Tracing_HLR_with_SGSN

25.9.5 Macro Trace_Subscriber_Activity_SGSN

The macro Trace_Subscriber_Activity_SGSN is invoked, if the subscriber activity is detected by the SGSN and the tracing is active.

The Trace_Subscriber_Activity_SGSN macro is shown in the figure 25.9/6.

Figure 25.9/6: The subscriber tracing macro in the SGSN

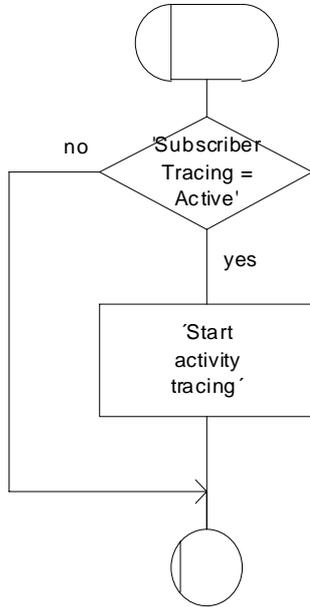


Figure 25.9/6: Macro Trace_Subscriber_Activity_SGSN

25.9.6 Macro Activate_Tracing_SGSN

The Activate_Tracing_SGSN macro is invoked, when the MAP_ACTIVATE_TRACE_MODE indication is received from the HLR. The primitive is processed in the SGSN as follows:

- if the data contains errors, a data missing or unexpected data value indication is returned to the HLR;
- if the tracing is not supported, a facility not supported indication is returned to the HLR;
- if the tracing buffer does not have any space left for the data, a tracing buffer full indication is returned to the HLR;
- if no errors is detected, the tracing is set active and a positive acknowledge is returned to the HLR.

The Activate_Tracing_SGSN macro is described in the figure 25.9/7.

Figure 25.9/7: The activate trace mode macro in the SGSN:

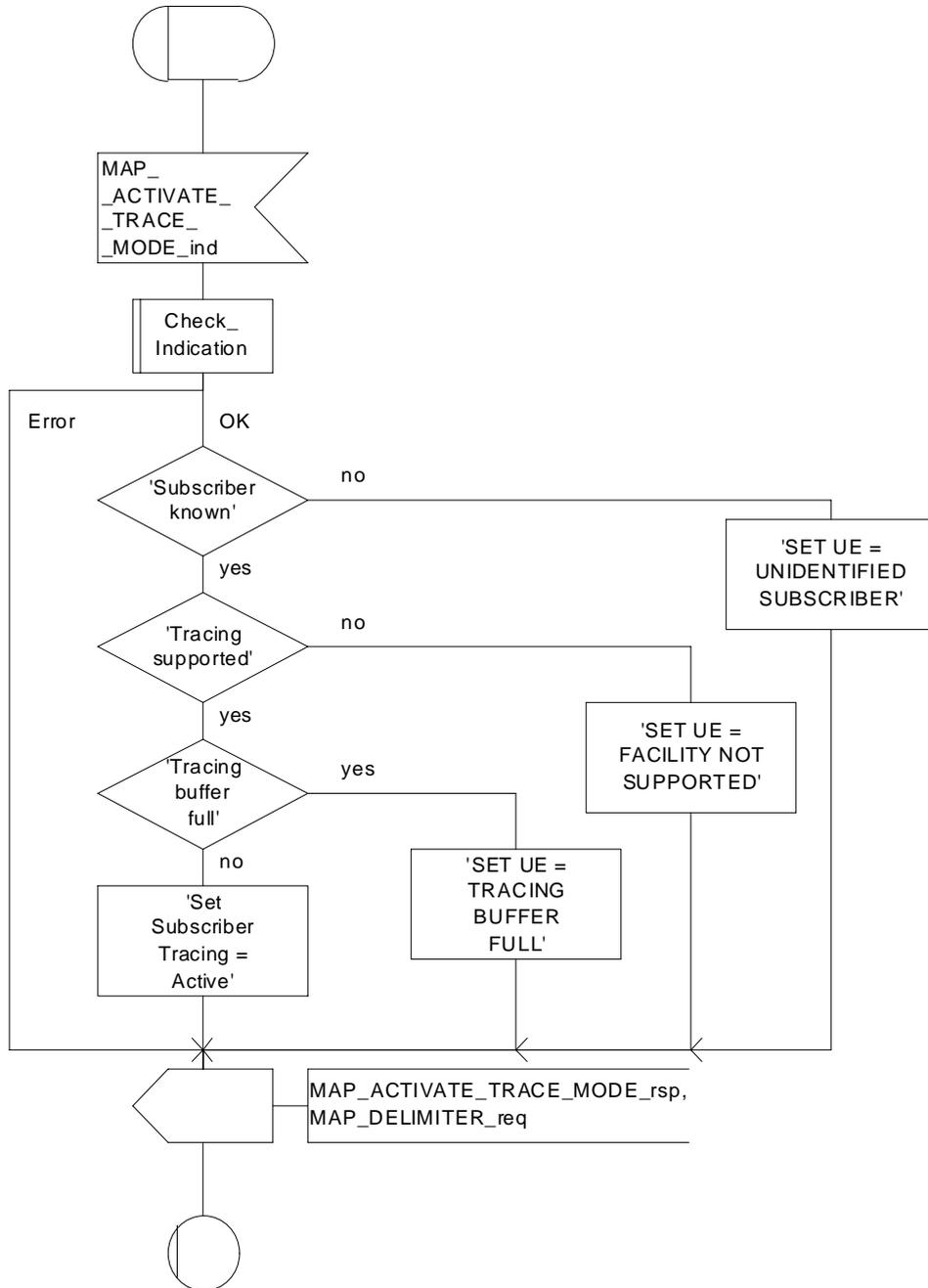


Figure 25.9/7: Macro Activate_Tracing_SGSN

25.10 Short Message Alert procedures

25.10.1 Subscriber_Present_VLR process

The Subscriber_Present_VLR process is invoked by the VLR, when the mobile subscriber becomes active and the MNRF flag is set. The general description of the short message alert procedures is in the subclause 23.4.

The VLR sends the MAP_READY_FOR_SM request to the HLR and waits for the HLR to answer. When receiving the answer, the VLR will act as follows:

- the MNRF flag is cleared if the procedure is successful;
- the MNRF flag is not cleared if the procedure is not successful.

The Subscriber_Present_VLR process is shown in the figure 25.10/1.

Figure 25.10/1: The short message alert process in the VLR for mobile present situation

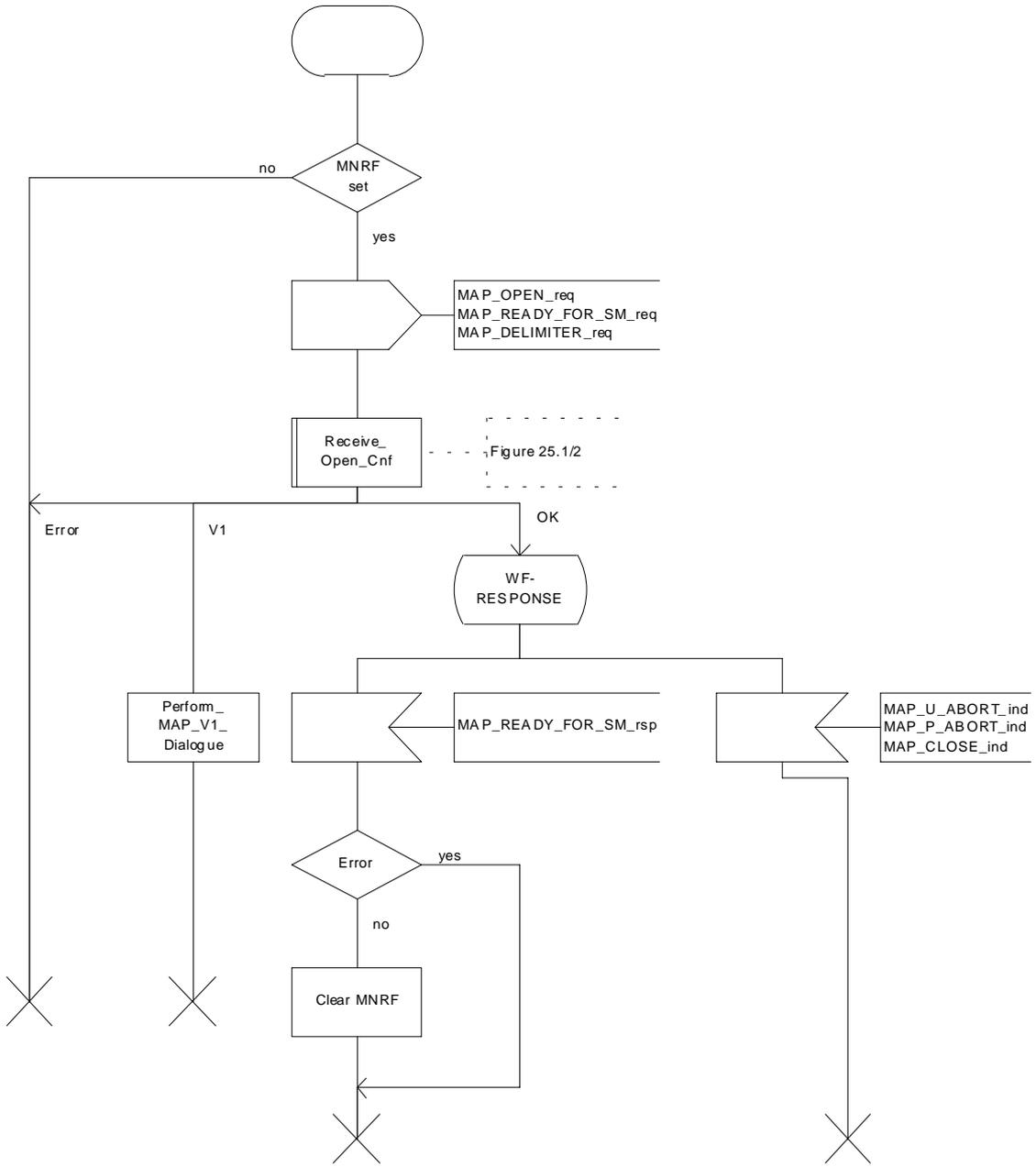


Figure 25.10/1: Process Subscriber_Present_VLR

25.10.2 Macro Alert_Service_Centre_HLR

The Alert_Service_Centre_HLR macro is initiated when the HLR notices that the Service Centre(s) shall be alerted. The macro starts process Alert_Service_Centre_HLR for every SC address in the MWD list.

In the process Alert_Service_Centre_HLR the HLR sends MAP_ALERT_SERVICE_CENTRE request to the appropriate IWMSC. The MWD entry is deleted when the positive acknowledge is received from the IWMSC. The unsuccessful alert may be repeated. The MWD entry should be purged in the unsuccessful case, at least when a suitable time period has expired.

The Alert_Service_Centre_HLR macro is shown in the figure 25.10/2 and the Alert_Service_Centre_HLR process is shown in the figure 25.10/3.

Figure 25.10/2: The short message alert macro in the HLR

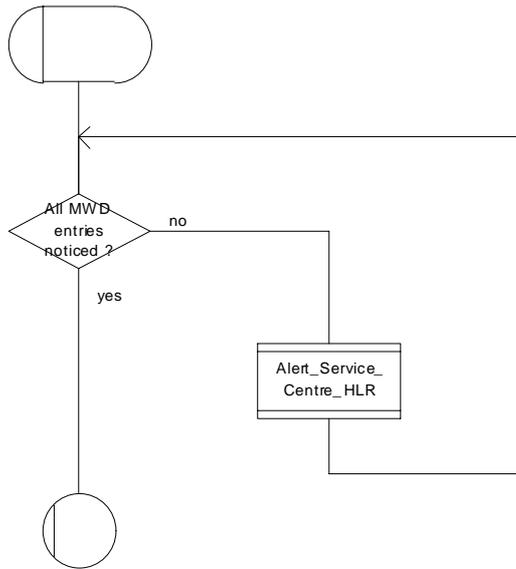


Figure 25.10/2: Macro Alert_Service_Centre_HLR

Figure 25.10/3: The short message alert process in the HLR

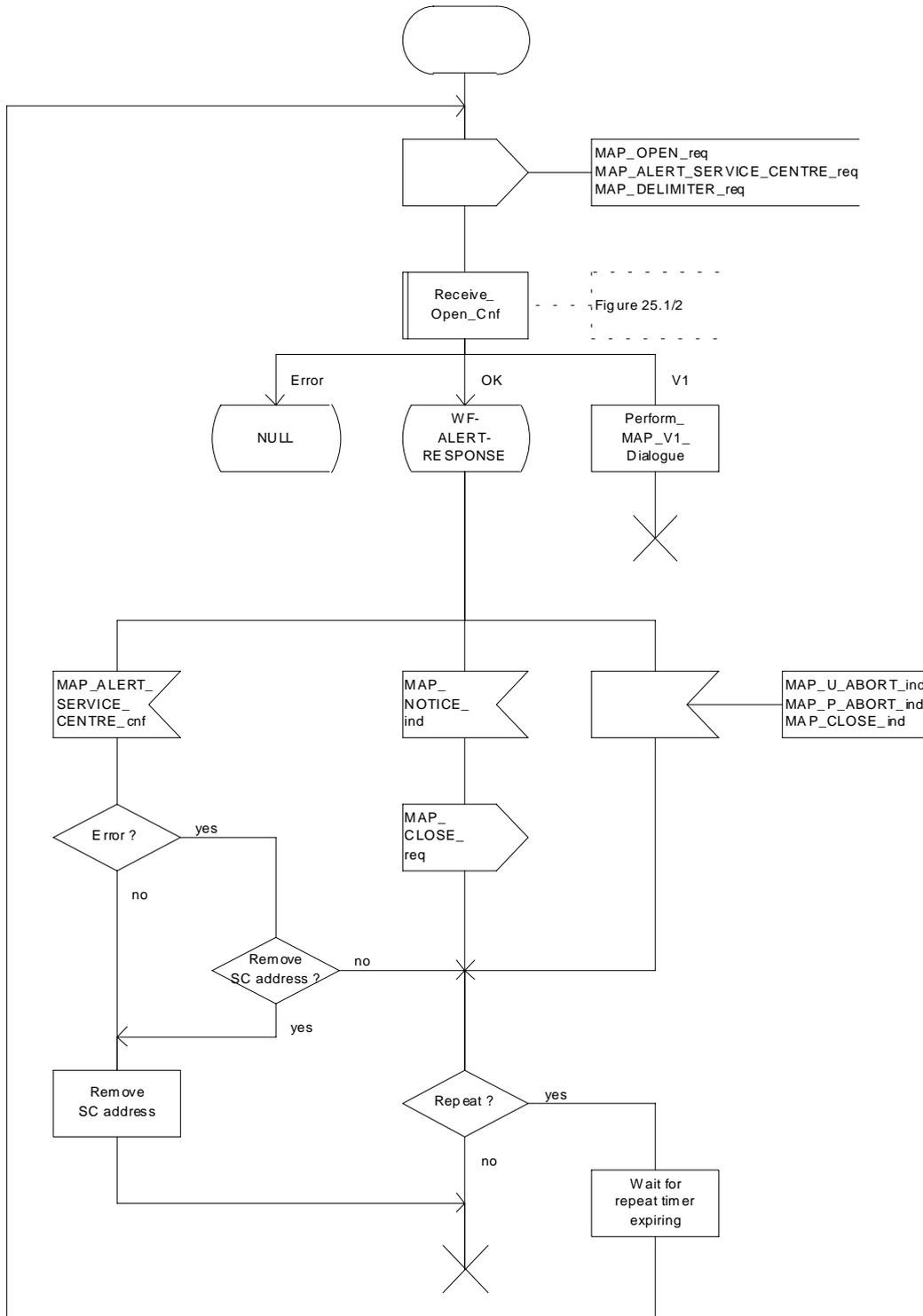


Figure 25.10/3: Process Alert_Service_Centre_HLR

25.10.3 The Mobile Subscriber is present

When receiving Page response, Attach request or Routing area update request messages (TS GSM 04.08), while the MS not reachable for GPRS (MNRG) flag is set, the SGSN will send the MAP_READY_FOR_SM request towards the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for GPRS.

When receiving the answer, the SGSN will act as follows:

- MNRG is cleared if the procedure is successful
- MNRG is not cleared if the procedure is not successful

The Subscriber_Present_SGSN process is shown in the figure 25.10/4.

Figure 25.10/4: The short message alert process in the SGSN for mobile present situation

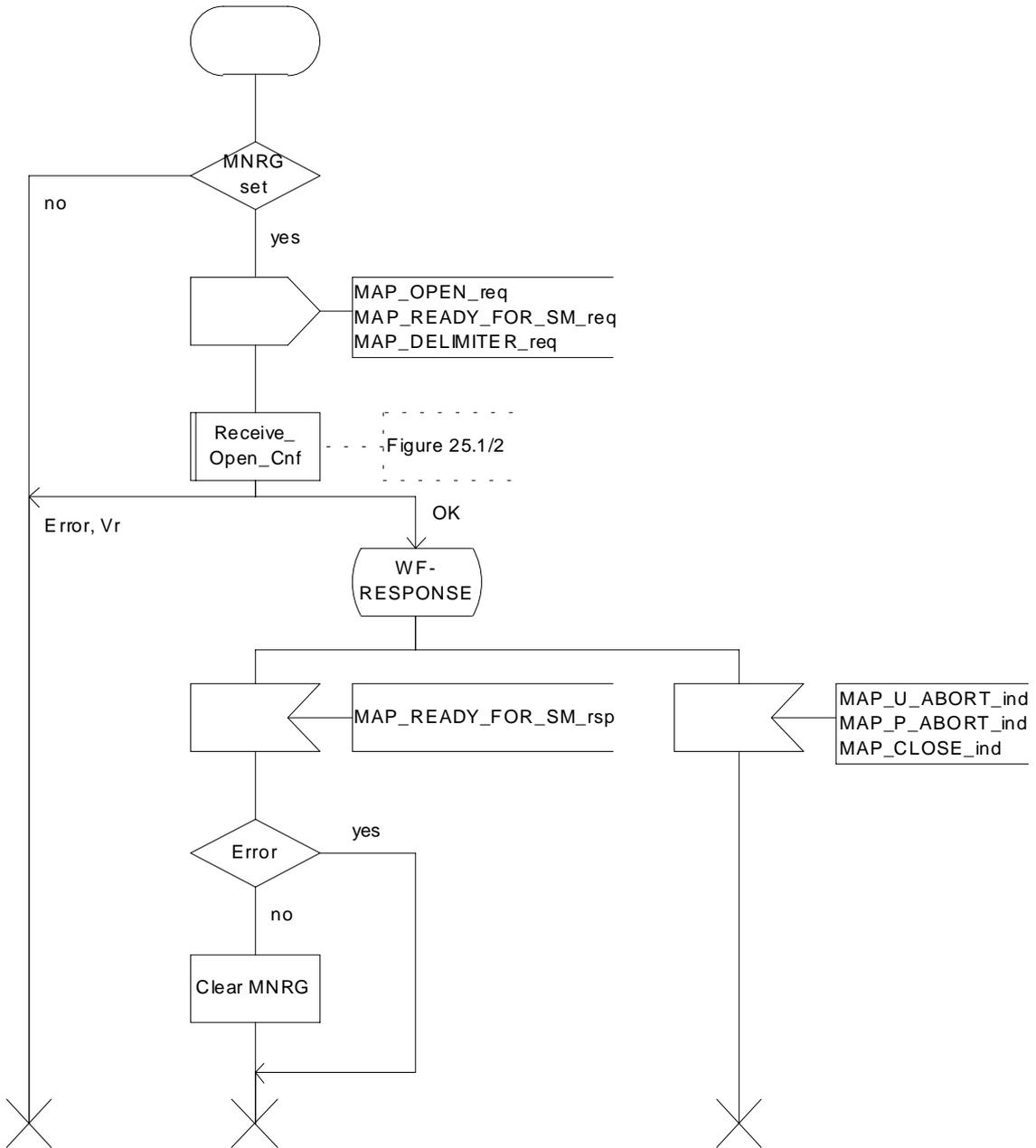


Figure 25.10/4: Process Subscriber_Present_SGSN

History

Document history		
V3.0.0	May 1999	Version 3.0.0 created
V3.1.0	September 1999	TSG#4 approval
V3.2.0	November 1999	
V3.3.0	December 1999	Introduction of CAMEL Phase 3. The following Tdocs have been included: N2-99F66, N299D63, N2-99G51, N2-99H80, N2-99H81, N2-99H82, N2-99H68, N2-99H00, N2-99F68, N2-99K34, N2-99K42 (modified), N2-99K50 (modified), N2-99F60, N2-99J21, N2-99J83, N2-99J79

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

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- [5] GSM 02.04: "Digital cellular telecommunications system (Phase 2+); General on supplementary services".
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- [12] GSM 02.84: "Digital cellular telecommunications system (Phase 2+); Multi Party (MPTY) supplementary services - Stage 1".
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3 Abbreviations

Abbreviations used in the present document are listed in GSM 01.04.

4 Configuration of the mobile network

4.1 The entities of the mobile system

To provide the mobile service as it is defined, it is necessary to introduce some specific functions. These functional entities can be implemented in different equipments or integrated. In any case, exchanges of data occur between these entities.

4.1.1 The Home Location Register (HLR)

This functional entity is a data base in charge of the management of mobile subscribers. A PLMN may contain one or several HLRs; it depends on the number of mobile subscribers, on the capacity of the equipment and on the organization of the network. All subscription data are stored there. The main information stored there concerns the location of each MS in order to be able to route calls to the mobile subscribers managed by each HLR. All management interventions occur on this data base. The HLRs have no direct control of MSCs.

Two numbers attached to each mobile subscription are stored in the HLR:

- IMSI;
- MSISDN.

The data base contains other information such as:

- location information (VLR number);
- basic telecommunication services subscription information;
- service restrictions (e.g. roaming limitation);
- supplementary services; the tables contain the parameters attached to these services.
- GPRS subscription data and routing information.

The organization of the subscriber data is detailed in GSM 03.08.

4.1.2 The Visitor Location Register (VLR)

An MS roaming in an MSC area is controlled by the Visitor Location Register in charge of this area. When an MS appears in a location area it starts a location updating procedure. The MSC in charge of that area notices this registration and transfers to the Visitor Location Register the identity of the location area where the MS is situated. A VLR may be in charge of one or several MSC areas.

The VLR also contains the information needed to handle the calls set up or received by the MSs registered in its data base (in some cases the VLR may have to obtain additional information from the HLR); the following elements can be found in its tables:

- the IMSI;
- the MSISDN;
- the TMSI, if applicable;
- the location area where the MS has been registered. This will be used to call the station;
- supplementary service parameters.

The information is passed between VLR and HLR by the procedures described in GSM 03.12.

The organization of the subscriber data is detailed in GSM 03.08.

4.1.3 The Mobile-services Switching Centre (MSC)

The Mobile-services Switching Centre is an exchange which performs all the switching functions for MSs located in a geographical area designated as the MSC area. The main difference between an MSC and an exchange in a fixed network is that the MSC has to take into account the impact of the allocation of radio resources and the mobile nature of the subscribers and has to perform, for example, the following procedures:

- procedures required for the location registration (see GSM 03.12);
- procedures required for hand-over (see GSM 03.09).

4.1.4 The Base Station System (BSS)

The BSS is the sub-system of Base Station equipment (transceivers, controllers, etc...) which is viewed

- by the MSC through an interface (A-interface) with the functionality described in GSM 08.02;
- by the SGSN through an interface (Gb-interface) with the functionality described in GSM 03.60.

4.1.5 The Gateway MSC (GMSC)

In the case of incoming calls to the PLMN, if the fixed network is unable to interrogate the HLR, the call is routed to an MSC. This MSC will interrogate the appropriate HLR and then route the call to the MSC where the MS is located. The MSC which then performs the routing function to the actual location of the mobile is called the Gateway MSC.

The choice of which MSCs can act as Gateway MSCs is a network operator matter (e.g. all MSCs or some designated MSCs).

If the call is a voice group/broadcast call it is routed directly from the GMSC to the VBS/VGCS Anchor MSC, based on information (VBS/VGCS call reference) contained in the dialled number. See also GTSS 03.68 and 03.69.

See also GSM 03.04.

4.1.6 The SMS Gateway MSC

The SMS GMSC is the interface between the Mobile Network and the network which provides access to the Short Message Service Centre, for short messages to be delivered to MSs.

The choice of which MSCs can act as SMS Gateway MSCs is a network operator matter (e.g. all MSCs or some designated MSCs).

4.1.7 The SMS Interworking MSC

The SMS IWMSC is the interface between the Mobile Network and the network which provides access to the Short Message Service Centre, for short messages submitted by MSs.

The choice of which MSCs can act as SMS Interworking MSCs is a network operator matter (e.g. all MSCs or some designated MSCs).

4.1.8 The VBS/VGCS Anchor MSC

The voice broadcast/group call anchor MSC obtains from the associated GCR all relevant attributes and controls in turn all cells in its area, VBS/VGCS Relay-MSCs and dispatchers belonging to a given group call.

4.1.9 The Equipment Identity Register (EIR)

This functional unit is a data base in charge of the management of the equipment identities of the MSs; see also GSM 02.16.

4.1.10 The GSM Service Control Function (gsmSCF)

This functional entity contains the CAMEL service logic to implement OSS. It interfaces with the gsmSSF, gprsSSF, the HLR, VLR and MSC; see also 3G TS 23.078.

4.1.11 The VBS/VGCS Relay MSC

The voice broadcast/group call relay MSC obtains from the associated anchor MSC all relevant attributes and controls in turn all cells in its area belonging to a given group call.

4.1.12 The Group Call Register (GCR)

This functional unit is a data base in charge of the management of attributes related to the establishment of Voice Broadcast Calls and Voice Group Calls

4.1.13 The Shared InterWorking Function Server (SIWFS)

A Shared Inter Working Function is a network function that may be used by any MSC in the same PLMN to provide interworking for a data/fax call. Whereas an IWF can only be used by its MSC, the SIWF can be used by several other network nodes e.g. any MSC within the same PLMN (the concept is not limited to a certain number of MSCs). SIWF is applied to data services in GSM Phase 2 and GSM Phase 2+ (as defined in GSM 02.02, GSM 02.03 and GSM 02.34).

The usage of an SIWF requires no additional manipulation at the MS.

An IWF provides specific functions associated with the visited MSC for the interworking with other networks. It comprises signalling and traffic channel related functions. The traffic channel related functions are provided by an Inter Working Unit (IWU).

The SIWF concept is that it provides specific functions for the interworking with other networks. It comprises signalling and traffic channel related functions. Whereas the signalling related functions are associated with the visited MSC, the IWU providing the traffic channel related functions has another physical location.

The entity that contains all additional functions needed in the visited MSC to provide the SIWF is called SIWF Controller (SIWFC). The entity where the IWU is located is called SIWF Server (SIWFS). The Interface between a visited MSC and a SIWFS is called the K Interface.

SIWFS can be provided by a MSC (MSC/SIWFS) or by another network entity (stand alone SIWFS).

4.1.14 The Serving GPRS Support Node (SGSN)

This functional unit keeps track of the individual MSS' location and performs security functions and access control; see also GSM 03.60.

4.1.15 The Gateway GPRS Support Node (GGSN)

This functional unit provides interworking with external packet-switched networks, network screens and routing of the Network Requested PDP-context activation; see also GSM 03.60.4.2 "Configuration of a Public Land Mobile Network (PLMN)".

The basic configuration of a Public Land Mobile Network is presented in figure 2.2/1. In this figure the most general solution is described in order to define all the possible interfaces which can be found in any PLMN. The specific implementation in each network may be different: some particular functions may be implemented in the same equipment and then some interfaces may become internal interfaces. In any case the configuration of a PLMN must have no impact on the relationship with the other PLMNs.

In this configuration, all the functions are considered implemented in different equipments. Therefore, all the interfaces are external and need the support of the Mobile Application Part of the Signalling System No. 7 to exchange the data necessary to support the mobile service. From this configuration, all the possible PLMN organizations can be deduced.

4.1.16 The Number Portability Location Register (NPLR)

This functional unit provides routing information necessary in some Mobile Number Portability environments in order to route calls for ported mobile subscribers. For details see also GSM 03.66 [108].

4.1.17 The Serving Mobile Location Center (SMLC)

An SMLC is a database and processing entity that manages the procedures for obtaining the geographic location of a target MS in the coverage area served by the SMLC. In managing the location procedures, the SMLC chooses the positioning method and provides data and instructions to the LMUs or target MS that perform the actual location measurements associated with the chosen method. The SMLC also verifies any location estimate computed by the target MS or computes a location itself from measurements provided to it by the target MS or LMUs.

An SMLC also manages a set of LMUs in its coverage area whose purpose is to provide location measurements and location assistance data to the SMLC to compute, or assist in computing, location estimates for target MSs. Management functions performed by an SMLC on behalf of its LMUs include maintaining the status and current serving MSC of each LMU and supporting O&M procedures,

The database in an SMLC contains data necessary for choosing an appropriate position method and any parameters associated with this method for a target MS in any serving cell, for computing or verifying location estimates and for managing its LMUs.

4.1.18 The Gateway Mobile Location Center (GMLC)

The GMLC provides access to location services (LCS) for LCS clients external to a PLMN. A GMLC may also support access to location services from LCS clients internal to its own PLMN. The GMLC allows an LCS client to issue location requests for certain target MSs; it then conveys these requests to the VMSC currently serving each target MS and passes back the location results to the LCSclient. Any target MS whose location is requested may belong to either the GMLC's own PLMN or another PLMN and may currently be served by either the GMLC's own PLMN or another PLMN.

4.1.19 The Location Measurement Unit (LMU)

The LMU is the logical network entity that performs location measurements in the VPLMN in order to either position a target MS or provide assistance data to be used in conjunction with other location measurements. An LMU is controlled by an SMLC in the VPLMN from which location commands can be received and to which any location measurements are returned.

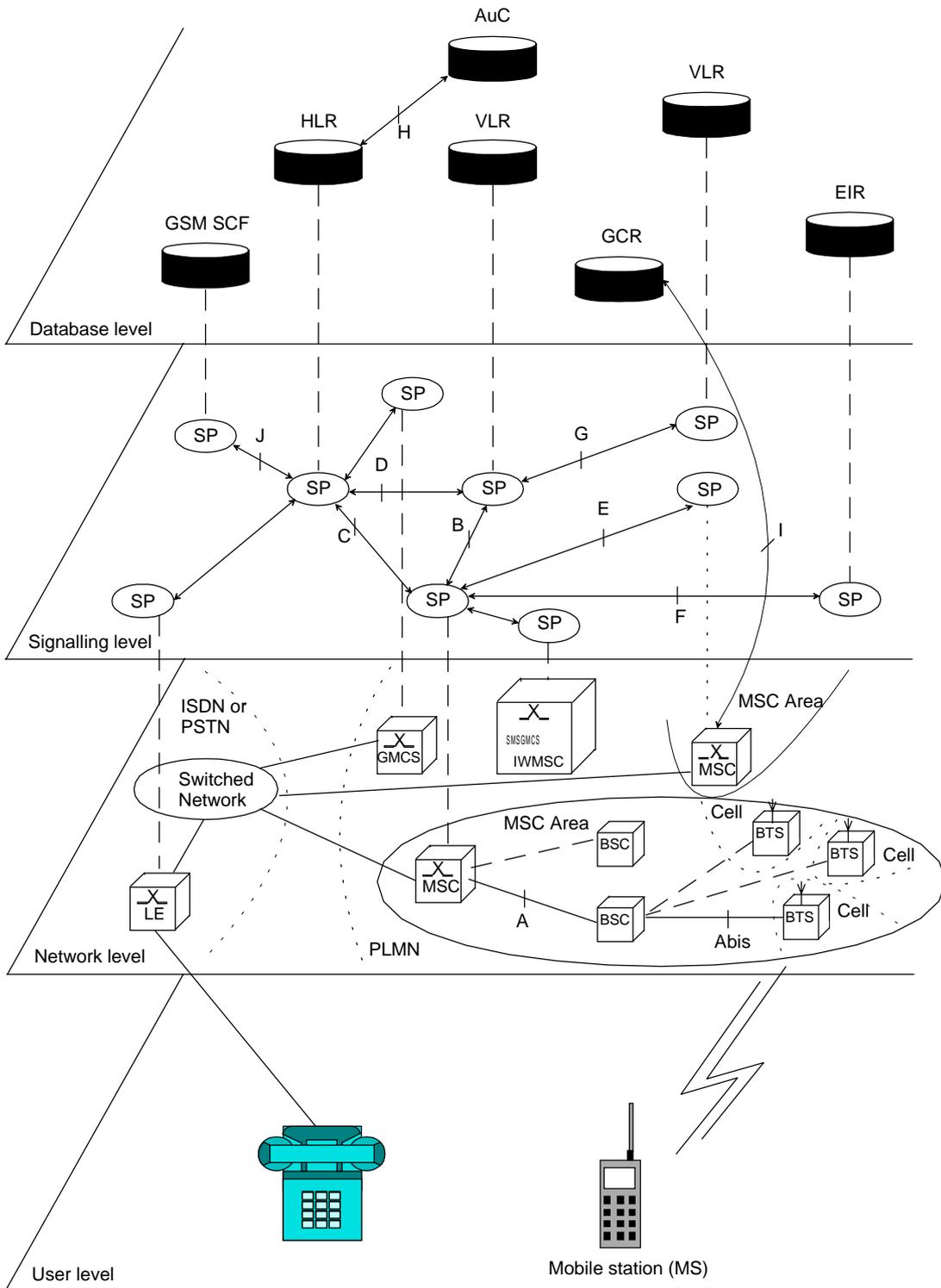


Figure 4.2/1: Configuration of a PLMN

4.3 Interconnection between PLMNs

Since the configuration of a PLMN does not have any impact on other PLMNs, the signalling interfaces specified can be implemented both between the entities within a PLMN and between different PLMNs.

4.4 The interfaces within the mobile service

4.4.1 Interface between the HLR and the VLR (D-interface)

This interface is used to exchange the data related to the location of the MS and to the management of the subscriber. The main service provided to the mobile subscriber is the capability to set up or to receive calls within the whole service area. To support that purpose the location registers have to exchange data. The VLR informs the HLR on the registration of a MS managed by the latter and provides it with the relevant location information. The HLR sends to the VLR all the data needed to support the service to the MS. The HLR then calls the previous VLR to inform it that it can cancel the location registration of this station because of the roaming of the mobile.

Exchanges of data may also occur when the mobile subscriber requires a particular service, when he wants to change some data attached to his subscription or when some parameters of the subscription are modified by administrative means.

4.4.2 Interface between the HLR and the gsmSCF (J-interface)

This interface is used by the gsmSCF to request information from the HLR (via the Any-time Interrogation function) or to allow call independent related network- or user-initiated interaction between an MS and the gsmSCF (via the USSD function). Support of the gsmSCF-HLR interface is a network operator option. As a network operator option, the HLR may refuse to provide the information requested by the gsmSCF.

4.4.3 Interface between the VLR and its associated MSC(s) (B-interface)

The VLR is the location and management data base for the MSs roaming in the area controlled by the associated MSC(s). Whenever the MSC needs data related to a given MS currently located in its area, it interrogates the VLR. When a MS initiates a location updating procedure with an MSC, the MSC informs its VLR which stores the relevant information in its tables. This procedure occurs whenever a mobile roams to another location area. Also, for instance when a subscriber activates a specific supplementary service or modifies some data attached to a service, the MSC transfers (via the VLR) the request to the HLR, which stores these modifications and updates the VLR if required.

However, this interface is not fully operational specified. It is strongly recommended not to implement the B-interface as an external interface.

4.4.4 Interface between VLRs (G-interface)

When an MS initiates a location updating using TMSI, the VLR can fetch the IMSI and authentication set from the previous VLR.

4.4.5 Interface between the HLR and the MSC (C-interface)

When the fixed network is not able to perform the interrogation procedure needed to set up a call to a mobile subscriber, the Gateway MSC has to interrogate the HLR of the called subscriber to obtain the roaming number of the called MS (see GSM 03.04).

To forward a short message to a mobile subscriber, the SMS Gateway MSC has to interrogate the HLR to obtain the MSC number where the MS is located.

4.4.6 Interface between the MSC and the gsmSCF (L-interface)

When one of the following Supplementary Services, CD, ECT or MPTY, is invoked in the MSC a notification shall be sent towards the gsmSCF.

4.4.6A Interface between the VLR and the gsmSCF (?-interface)

This interface is used by the VLR to notify the gsmSCF about the occurrence of a Mobility Management event.

Editor's note: this sentence has been added during drafting 29.002.

4.4.7 Interface between MSCs (E-interface)

When a MS moves from one MSC area to another during a call, a handover procedure has to be performed in order to continue the communication. For that purpose the MSCs involved have to exchange data to initiate and then to realize the operation.

This interface is also used to forward short messages, to perform location for a target MS for which handover has occurred on an established call and to transfer LCS messages to and from an LMU for which handover of a signalling channel has occurred.

This interface is also used to transfer information for inter-MSC VBS/VGCS calls .

4.4.8 Interface between the MSC and Base Station Systems (A-interface)

The description of this interface is contained in the GSM 08-series of MSs.

The BSS-MSC interface carries information concerning:

- BSS management;
- call handling;
- location management.

4.4.9 Interface between MSC and EIR (F-interface)

This interface is used when an MSC wants to check an IMEI.

4.4. 10 Interface between VBS/VGCS Anchor MSC and GCR (I-interface)

This is an internal interface.

4.4.11 Interface between the MSC and the SIWF server (K-interface)

When a MSC detects that it can not provide the requested IW function, resources from an SIWF server can be used. This interface is used to allocate resources in that SIWF server and establish required physical connections to that server.

4.4.12 Interface between SGSN and HLR (Gr-interface)

The description of this interface is contained in the GSM 03.60.

4.4.13 Interface between SGSN and SMS-GMSC or SMS-IWMSC (Gd-interface)

The description of this interface is contained in the GSM 03.60.

4.4.14 Interface between GGSN and HLR (Gc-interface)

The description of this interface is contained in the GSM 03.60.

4.4.15 Interface between SGSN and EIR (Gf-interface)

The description of this interface is contained in the GSM 03.60.

4.4.16 Interface between SGSN and BSC (Gb-interface)

The description of this interface is contained in the GSM 03.60.

4.4.17 Interface between SGSN and MSC/VLR (Gs-interface)

The description of this interface is contained in the GSM 09.18.

4.4.18 Interface between SMLC and MSC (Ls interface)

This interface is used by the MSC to request either the initiation of location procedures or the retrieval of location assistance data for a particular target MS in the coverage area served by the SMLC. The interface is also used to transfer LCS measurement and O&M information between an SMLC and LMU or BSC via the MSC.

4.4.19 Interface between SMLC and VLR (Lv interface)

This interface is used by the VLR to register or deregister an LMU in the SMLC.

4.4.20 Interface between GMLC and HLR (Lh interface)

This interface is used by the GMLC to request the address of the visited MSC for a particular target MS whose location has been requested.

4.4.21 Interface between GMLC and MSC (Lg interface)

This interface is used by the GMLC to convey a location request to the MSC currently serving a particular target MS whose location was requested. The interface is used by the MSC to return location results to the GMLC.

4.4.22 Interface between LCS Client and GMLC (Le interface)

This interface is used by a client of the Location Services (LCS) to request location information from a GMLC for certain target MSs. The interface is used by the GMLC to provide location information to an LCS client. This interface is external to a PLMN and is not defined within GSM.

4.4.23 Interface between the gsmSCF and the GMLC (Lc-interface)

This interface is used by the gsmSCF to request information from the GMLC (via the Any-time Interrogation function).

As a network operator option, the GMLC may refuse to provide the information requested by the gsmSCF.

4.5 Splitting of the data storage

The data attached to each MS management, operation and location are stored in the Location Registers. Some data are duplicated in the HLR and in the VLR, but others may be stored only in one place.

The data associated with any client that uses a particular GMLC to access location services is stored in the GMLC.

A detailed description of the data organization can be found in GSM 03.08.

5 Overload and compatibility overview

5.1 Overload control

There is a requirement for an overload/congestion control for all entities of the Public Land Mobile Network and the underlying Signalling System No. 7.

5.1.1 Overload control for MSC (outside MAP)

For the entity MSC the following two procedures (outside MAP) may be applied to control the processor load:

- ISDN
CCITT Recommendation Q.764 (Automatic Congestion Control), applicable to reduce the mobile terminating traffic;
- BSSAP
GSM 08.08 (A-interface Flow Control), applicable to reduce the mobile originating traffic.

5.1.2 Overload control for MAP entities

For all MAP entities, especially the HLR, the following overload control method is applied:

If overload of a MAP entity is detected requests for certain MAP operations (see tables 5.1/1, 5.1/2, 5.1/3 and 5.1/4) may be ignored by the responder. The decision as to which MAP Operations may be ignored is made by the MAP service provider and is based upon the priority of the application context.

Since most of the affected MAP operations are supervised in the originating entity by TC timers (medium) an additional delay effect is achieved for the incoming traffic.

If overload levels are applicable in the Location Registers the MAP operations should be discarded taking into account the priority of their application context (see table 5.1/1 for HLR, table 5.1/2 for MSC/VLR, table 5.1/3 for the SGSN and table 5.1/4 for the SMLC; the lowest priority is discarded first).

The ranking of priorities given in the tables 5.1/1, 5.1/2, 5.1/3 and 5.1/4 is not normative. The tables can only be seen as a proposal which might be changed due to network operator/implementation matters.

Table 5.1/1: Priorities of Application Contexts for HLR as Responder

Priority high	Responder = HLR	Initiating Entity
	<u>Mobility Management</u>	
	networkLocUp (updateLocation), (restoreData/v2), (sendParameters/v1)	VLR
	gprsLocationUpdate (updateGPRSLocation/v3),	SGSN
	infoRetrieval (sendAuthenticationInfo/v2), (sendParameters/v1)	VLR/SGSN
	istAlerting (istAlert/v3) (purgeMS/v2/v3)	MSC msPurging VLR
	msPurging (purgeMS/v3)	SGSN
	<u>Short Message Service</u>	
	shortMsgGateway (sendRoutingInfoforSM), (reportSM-DeliveryStatus)	GMSC
	mwdMngt VLR/SGSN (readyForSM/v2/v3), (noteSubscriberPresent/v1)	
	<u>Mobile Terminating Traffic</u>	
	locInfoRetrieval (sendRoutingInfo)	GMSC
	anyTimeEnquiry (anyTimeInterrogation)	gsmSCF
	reporting (statusReport)	VLR
	<u>Location Services</u>	
	locationSvcGateway (sendRoutingInfoforLCS/v3)	GMLC
	<u>Subscriber Controlled Inputs (Supplementary Services)</u>	
	networkFunctionalSs (registerSS), (eraseSS), (activateSS), (deactivateSS), (interrogateSS), (registerPassword), (processUnstructuredSS-Data/v1), (beginSubscriberActivity/v1)	VLR
	callCompletion (registerCCEnter), (eraseCCEnter)	VLR
	networkUnstructuredSs (processUnstructuredSS-Request/v2)	VLR
	imsiRetrieval (sendIMSI/v2)	VLR
	gprsLocationInfoRetrieval (sendRoutingInfoForGprs/v3)	GGSN/SGSN
	failureReport (failureReport/v3)	GGSN/SGSN
Priority low		

NOTE: The application context name is the last component but one of the object identifier.
 Operation names are given in brackets for information with "/vn" appended to vn only operations.

Table 5.1/3: Priorities of Application Contexts for SGSN as Responder

Responder = SGSN	Initiating Entity
Priority high	
<u><i>Mobility and Location Register Management</i></u>	
locationCancel (cancelLocation v3)	HLR
reset (reset)	HLR
subscriberDataMngt (insertSubscriberData v3), (deleteSubscriberData v3)	HLR
tracing (activateTraceMode), (deactivateTraceMode)	HLR
<u><i>Short Message Service</i></u>	
shortMsgMT-Relay (MT-ForwardSM v3) (forwardSM v1/v2)	MSC
<u><i>Network-Requested PDP context activation</i></u>	
gprsNotify HLR (noteMsPresentForGprs v3),	
Priority low	

NOTE: The application context name is the last component but one of the object identifier.
 Operation names are given in brackets for information with "/vn" appended to vn.

Table 5.1/2: Priorities of Application Contexts for MSC/VLR as Responder

Responder = MSC/VLR	Initiating Entity
Priority high	
<u>Handover</u>	
handoverControl (prepareHandover/v2), (performHandover/v1)	MSC
<u>Mobility and Location Register Management</u>	
locationCancel (cancelLocation)	HLR
reset (reset)	HLR
immediateTermination (istCommand/v3)	HLR
interVlrInfoRetrieval (sendIdentification/v2), (sendParameters/v1)	VLR
subscriberDataMngt (insertSubscriberData), (deleteSubscriberData)	HLR
tracing (activateTraceMode), (deactivateTraceMode)	HLR
<u>Short Message Service</u>	
shortMsgMO-Relay (MO-ForwardSM v3) (forwardSM v1/v2)	MSC/SGSN
shortMsgMT-Relay (MT-ForwardSM v3) (forwardSM v1/v2)	MSC
shortMsgAlert (alertServiceCentre/v2), (alertServiceCentreWithoutResult/v1)	HLR
<u>Mobile Terminating Traffic</u>	
roamingNbEnquiry (provideRoamingNumber)	HLR
callControlTransfer (resumeCallHandling)	MSC
subscriberInfoEnquiry (provideSubscriberInformation)	HLR
reporting (remoteUserFree) (SetReportingState)	HLR
<u>Location Services</u>	
locationSvcLMUControl (lcsReset v3)	SMLC
locationSvcDataTransfer (lcsInformationRequest v3)	SMLC
locationSvcEnquiry (provideSubscriberLocation v3)	GMLC
<u>Network-Initiated USSD</u>	
networkUnstructuredSs (unstructuredSS-Request/v2), (unstructuredSS-Notify/v2)	HLR
Priority low	

NOTE: The application context name is the last component but one of the object identifier.
Operation names are given in brackets for information with "/vn" appended to vn only operations.

Table 5.1/4: Priorities of Application Contexts for SMLC as Responder

Responder = SMLC	Initiating Entity
Priority high	
<u>Location Services</u>	
locationSvcLMUControl (lcsRegistration v3)	VLR
locationSvcDataTransfer (lcsInformationReport v3)	MSC
locationSvcPositioning (performLocation v3)	MSC
Priority low	

NOTE: The application context name is the last component but one of the object identifier.
Operation names are given in brackets for information with "/vn" appended to vn.

5.1.3 Congestion control for Signalling System No. 7

The requirements of SS7 Congestion control have to be taken into account as far as possible.

Means which could be applied to achieve the required traffic reductions are described in subclauses 5.1.1 and 5.1.2.

5.2 Compatibility

5.2.1 General

The present document of the Mobile Application Part is designed in such a way that an implementation which conforms to it can also conform to the Mobile Application Part operational version 1 specifications, except on the MSC-VLR interface.

A version negotiation mechanism based on the use of an application-context-name is used to negotiate the protocol version used between two entities for supporting a MAP-user signalling procedure.

When starting a signalling procedure, the MAP-user supplies an application-context-name to the MAP-provider. This name refers to the set of application layer communication capabilities required for this dialogue. This refers to the required TC facilities (e.g. version 1 or 2) and the list of operation packages (i.e. set of operations) from which operations can be invoked during the dialogue.

A version one application-context-name may only be transferred to the peer user in a MAP-U-ABORT to an entity of version two or higher (i.e. to trigger a dialogue which involves only communication capabilities defined for MAP operational version 1).

If the proposed application-context-name can be supported by the responding entity the dialogue continues on this basis otherwise the dialogue is refused and the initiating user needs to start a new dialogue, which involves another application-context-name which requires less communication capabilities but provides similar functionalities (if possible).

When a signalling procedure can be supported by several application contexts which differ by their version number, the MAP-User needs to select a name. It can either select the name which corresponds to the highest version it supports or follow a more specific strategy so that the number of protocol fallbacks due to version compatibility problems be minimized.

5.2.2 Strategy for selecting the Application Context (AC) version

A method should be used to minimize the number of protocol fall-backs which would occur sometimes if the highest supported AC-Name were always the one selected by GSM entities when initiating a dialogue. The following method is an example which can be used mainly at transitory phase stage when the network is one of mixed phase entities.

5.2.2.1 Proposed method

A table (table 1) may be set up by administrative action to define the highest application context (AC) version supported by each destination; a destination may be another node within the same or a different PLMN, or another PLMN considered as a single entity. The destination may be defined by an E.164 number or an E.214 number derived from an IMSI or in North America (World Zone 1) by an E.164 number or an IMSI (E.212 number). The table also includes the date when each destination is expected to be able to handle at least one AC of the latest version of the MAP protocol. When this date is reached, the application context supported by the node is marked as "unknown", which will trigger the use of table 2.

A second table (table 2) contains an entry for each destination which has an entry in table 1. For a given entity, the entry in table 2 may be a single application context version or a vector of different versions applying to different application contexts for that entity. Table 2 is managed as described in subclause 5.2.2.2.

The data for each destination will go through the following states:

- a) the version shown in table 1 is "version n-1", where 'n' is the highest version existing in this specification; table 2 is not used;
- b) the version shown in table 1 is "unknown"; table 2 is used, and maintained as described in subclause 5.2.2.2;
- c) when the PLMN operator declares that an entity (single node or entire PLMN) has been upgraded to support all the MAP version n ACs defined for the relevant interface, the version shown in table 1 is set to "version n" by administrative action; table 2 is no longer used, and the storage space may be recovered.

5.2.2.2 Managing the version look-up table

WHEN it receives a MAP-OPEN and the MAP-User determines the originating entity number either using the originating address parameter or the originating reference parameter or retrieving it from the subscriber data using the IMSI or the MSISDN.

IF the entity number is known

THEN

It updates (if required) the associated list of highest supported ACs

ELSE

It creates an entry for this entity and includes the received AC-name in the list of highest supported ACs.

WHEN starting a procedure, the originating MAP-user looks up its version control table.

IF the destination address is known and not timed-out

THEN

It retrieves the appropriate AC-name and uses it

IF the dialogue is accepted by the peer

THEN

It does not modify the version control table

ELSE (this should never occur)

It starts a new dialogue with the common highest version supported (based on information implicitly or explicitly provided by the peer).

It replace the old AC-name by the new one in the list of associated highest AC supported.

ELSE

It uses the AC-name which corresponds to the highest version it supports.

IF the dialogue is accepted by the peer

THEN

It adds the destination node in its version control table and includes the AC-Name in the list of associated highest AC supported.

ELSE

It starts a new dialogue with the common highest version supported (based on information implicitly or explicitly provided by the peer).

IF the destination node was not known

THEN

It adds the destination node in its version control table and includes the new AC-Name in the list of associated highest AC supported.

ELSE

It replaces the old AC-name by the new one in the list of highest supported AC and reset the timer.

5.2.2.3 Optimizing the method

A table look-up may be avoided in some cases if both the HLR and the VLR or both the HLR and the SGSN store for each subscriber the version of the AC-name used at location updating. Then:

- for procedures which make use of the same application-context, the same AC-name (thus the same version) can be selected (without any table look-up) when the procedure is triggered;
- for procedures which make use of a different application-context but which includes one of the packages used by the location updating AC, the same version can be selected (without any table look-up) when the procedure is triggered;

for HLR:

- Subscriber data modification (stand alone);

for VLR:

- Data Restoration.

6 Requirements concerning the use of SCCP and TC

6.1 Use of SCCP

The Mobile Application Part makes use of the services offered by the Signalling Connection Control Part of signalling System No. 7. CCITT Blue Book or ITU-T (03/93) Recommendations Q.711 to Q.716 should be consulted for the full specification of SCCP. In North America (World Zone 1) the national version of SCCP is used as specified in ANSI T1.112. Interworking between a PLMN in North America and a PLMN outside North America will involve an STP to translate between ANSI SCCP and ITU-T/CCITT SCCP.

6.1.1 SCCP Class

MAP will only make use of the connectionless classes (0 or 1) of the SCCP.

6.1.2 Sub-System Number (SSN)

The Application Entities (AEs) defined for MAP consist of several Application Service Elements (ASEs) and are addressed by sub-system numbers (SSNs). The SSN for MAP are specified in GSM 03.03 [17].

6.1.3 SCCP addressing

6.1.3.1 Introduction

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

Only the entities which should be addressed are described below. If the CCITT or ITU-T SCCP is used, the format and coding of address parameters carried by the SCCP for that purpose shall comply with CCITT Recommendation Q.713 with the following restrictions:

1) Intra-PLMN addressing

For communication between entities within the same PLMN, a MAP SSN shall always be included in the called and calling party addresses. All other aspects of SCCP addressing are network specific.

2) Inter-PLMN addressing

a) Called Party Address

- SSN indicator = 1 (MAP SSN always included);
- Global title indicator = 0100 (Global title includes translation type, numbering plan, encoding scheme and nature of address indicator);
- the translation type field will be coded "00000000" (Not used). For call related messages for non-optimal routed calls (as described in GSM 03.66) directed to another PLMN the translation type field may be coded "10000000" (CRMNP);
- Routing indicator = 0 (Routing on global title);

b) Calling Party Address

- SSN indicator = 1 (MAP SSNs always included);
- Point code indicator = 0;
- Global title indicator = 0100 (Global title includes translation type, numbering plan, encoding scheme and nature of address indicator);
- Numbering Plan = 0001 (ISDN Numbering Plan, E.164; In Case of Inter-PLMN Signalling, the dialogue initiating entity and dialogue responding entity shall always include its own E.164 Global Title as Calling Party Address);
- the translation type field will be coded "00000000" (Not used);
- Routing indicator = 0 (Routing on Global Title).

If ANSI T1.112 SCCP is used, the format and coding of address parameters carried by the SCCP for that purpose shall comply with ANSI specification T1.112 with the following restrictions:

1) Intra-PLMN addressing

For communication between entities within the same PLMN, a MAP SSN shall always be included in the called and calling party addresses. All other aspects of SCCP addressing are network specific.

2) Inter-PLMN addressing

a) Called Party Address

- SSN indicator = 1 (MAP SSN always included);
- Global title indicator = 0010 (Global title includes translation type);
- the Translation Type (TT) field will be coded as follows:
 - TT = 9, if IMSI is included,
 - TT = 14, if MSISDN is included,
 - Or TT = 10, if Network Element is included. (If TT=10, then Number Portability GTT is not invoked, if TT=14, then Number Portability GTT may be invoked.)
- Routing indicator = 0 (Routing on global title);

b) Calling Party Address

- SSN indicator = 1 (MAP SSNs always included);
- Point code indicator = 0;
- Global title indicator = 0010 (Global title includes translation type);
 - TT = 9, if IMSI is included,
 - TT = 14, if MSISDN is included,
 - Or TT = 10, if Network Element is included. (If TT=10, then Number Portability GTT is not invoked, if TT=14, then Number Portability GTT may be invoked.)

Routing indicator = 0 (Routing on Global Title).

If a Global Title translation is required for obtaining routing information, one of the numbering plans E.164, E.212 and E.214 is applicable.

- E.212 numbering plan

When CCITT or ITU-T SCCP is used, an E.212 number must not be included as Global Title in an SCCP UNITDATA message. The translation of an E.212 number into a Mobile Global Title is applicable in a dialogue initiating VLR, SGSN or GGSN if the routing information towards the HLR is derived from the subscriber's IMSI. In World Zone 1 when ANSI SCCP is used, the IMSI (E.212 number) is used as a Global Title to address the HLR. When an MS moves from one VLR service area to another, the new VLR may derive the address of the previous VLR from the Location Area Identification provided by the MS in the location registration request. The PLMN where the previous VLR is located is identified by the E.212 numbering plan elements of the Location Area Identification, ie the Mobile Country Code (MCC) and the Mobile Network Code (MNC).

- E.214 and E.164 numbering plans

When CCITT or ITU-T SCCP is used, only address information belonging to either E.214 or E.164 numbering plan is allowed to be included as Global Title in the Called and Calling Party Address. In World Zone 1 when ANSI SCCP is used, the IMSI (E.212 number) is used as a Global Title to address the HLR.

If the Calling Party Address associated with the dialogue initiating message contains a Global Title, the sending network entity shall include its E.164 entity number.

When receiving an SCCP UNITDATA message, SCCP shall accept either of the valid numbering plans in the Called Party Address and in the Calling Party Address.

When CCITT or ITU-T SCCP is used and an N-UNITDATA-REQUEST primitive from TC is received, SCCP shall accept an E.164 number or an E.214 number in the Called Address and in the Calling Address. In World Zone 1 when ANSI SCCP is used, the IMSI (E.212 number) is used instead of E.214 number.

The following subclauses describe the method of SCCP addressing appropriate for each entity both for the simple intra-PLMN case and where an inter-PLMN communication is required. The following entities are considered:

- the Mobile-services Switching Centre (MSC);
- the Home location Register (HLR);
- the Visitor Location Register (VLR);
- the Gateway Mobile-services Switching Centre (GMSC);
- the GSM Service Control Function (gsmSCF);
- the Interworking Mobile-services Switching Centre (IWMSC);
- the Shared Inter Working Function (SIWF);
- the Serving GPRS Support Node (SGSN);
- the Gateway GPRS Support Node (GGSN);
- the Serving Mobile Location Center (SMLC);
- the Gateway Mobile Location Center (GMLC).

6.1.3.2 The Mobile-services Switching Centre (MSC)

There are several cases where it is necessary to address the MSC.

6.1.3.2.1 MSC interaction during handover

The address is derived from the target Cellid.

6.1.3.2.2 MSC for short message routing

When a short message has to be routed to a MS, the GMSC addresses the VMSC by an MSC identity received from the HLR which complies with E.164 rules.

For MS originating short message, the IWMSC address is derived from the Service Centre address.

6.1.3.2.3 MSC for location request routing

When a location request for a particular MS needs to be sent to the MS's VMSC, the GMLC addresses the VMSC using an E.164 address received from the MS's HLR.

6.1.3.2.4 MSC for LMU Control

When a control message has to be routed to an LMU from an SMLC, the SMLC addresses the serving MSC for the LMU using an E.164 address.

6.1.3.3 The Home Location Register (HLR)

There are several cases where the HLR has to be addressed:

6.1.3.3.1 During call set-up

When a call is initiated the HLR of the called mobile subscriber will be interrogated to discover the whereabouts of the MS. The addressing required by the SCCP will be derived from the MSISDN dialled by the calling subscriber. The dialled number will be translated into either an SPC, in the case of communications within a PLMN, or a Global Title if other networks are involved (i.e. if the communication is across a PLMN boundary).

If the calling subscriber is a fixed network subscriber, the interrogation can be initiated from the Gateway MSC of the home PLMN in the general case. If the topology of the network allows it, the interrogation could be initiated from any Signalling Point which has MAP capabilities, e.g. local exchange, outgoing International Switching Centre (ISC), etc.

6.1.3.3.2 Before location updating completion

When a MS registers for the first time in a VLR, the VLR has to initiate the update location dialogue with the MS's HLR and a preceding dialogue for authentication information retrieval if the authentication information must be retrieved from the HLR. When initiating either of these dialogues, the only data for addressing the HLR that the VLR has available is contained in the IMSI, and addressing information for SCCP must be derived from it. When continuing the established update location dialogue (as with any other dialogue), the VLR must derive the routing information towards the HLR from the Calling Party Address received with the first responding CONTINUE message until the dialogue terminating message is received. This means that the VLR must be able to address the HLR based:

- on an E.214 Mobile Global Title originally derived by the VLR from the IMSI (when CCITT or ITU-T SCCP is used), or an E.212 number originally derived from IMSI (when ANSI SCCP is used, an IMSI); or
- on an E.164 HLR address; or
- in the case of intra-PLMN signalling, on an SPC.

When answering with Global Title to the VLR, the HLR shall insert its E.164 address in the Calling Party Address of the SCCP message containing the first responding CONTINUE message.

If the HLR is in the same PLMN as the VLR, local translation tables may exist to derive an SPC. For authentication information retrieval and location updating via the international PSTN/ISDN signalling network that requires the use of CCITT or ITU-T SCCP, the Global title must be derived from the IMSI, using the principles contained in CCITT Recommendation E.214 and the Numbering Plan Indicator (NPI) value referenced by the SCCP Specifications. In World Zone 1 where the ANSI SCCP is used, IMSI (E.212 number) is used as Global Title. A summary of the translation from the IMSI (CCITT Recommendation E.212) to Mobile Global Title (described in CCITT Recommendation E.214) is shown below:

- E.212 Mobile Country Code translates to E.164 Country Code;
- E.212 Mobile Network Code translates to E.164 National Destination Code;
- E.212 Mobile Subscriber Identification Number (MSIN) is carried unchanged if within the E.164 number maximum length (15 digits). If the Mobile Global Title is more than 15 digits the number is truncated to 15 by deleting the least significant digits.

This translation will be done either at the application or at SCCP level in the VLR. The Mobile Global Title thus derived will be used to address the HLR.

If location updating is triggered by an MS that roams from one MSC Area into a different MSC Area served by the same VLR, the VLR shall address the HLR in the same way as if the MS registers for the first time in the VLR.

6.1.3.3.3 After location updating completion

In this case, the subscriber's basic MSISDN has been received from the HLR during the subscriber data retrieval procedure as well as the HLR number constituting a parameter of the MAP message indicating successful completion of the update location dialogue. From either of these E.164 numbers the address information for initiating dialogues with the roaming subscriber's HLR can be derived. Also the subscriber's IMSI may be used for establishing the routing information towards the HLR. This may apply in particular if the dialogue with the HLR is triggered by subscriber controlled input.

Thus the SCCP address of the roaming subscriber's HLR may be an SPC, or it may be a Global title consisting of the E.164 MSISDN or the E.164 number allocated to the HLR or either the E.214 Mobile Global Title derived from the IMSI if CCITT or ITU-T SCCP is used, or the IMSI if ANSI SCCP is used (ANSI SCCP is used in World Zone 1).

6.1.3.3.4 VLR restoration

If a roaming number is requested by the HLR for an IMSI that has no data record in the interrogated VLR, the VLR provides the roaming number in the dialogue terminating message. Subsequently the VLR must retrieve the authentication data from the MS's HLR, if required, and must then trigger the restore data procedure. For this purpose, the VLR has to initiate in succession two independent dialogues with the MS's HLR. The MTP and SCCP address information needed for routing towards the HLR can be derived from the IMSI received as a parameter of the MAP message requesting the roaming number. In this case, the IMSI received from the HLR in the roaming number request shall be processed in the same way as the IMSI that is received from an MS that registers for the first time within a VLR. Alternatively to the IMSI, the Calling Party Address associated with the roaming number request may be used to obtain the routing information towards the HLR.

6.1.3.3.5 During Network-Requested PDP Context Activation

When receiving a PDP PDU the GGSN may interrogate the HLR of the MS for information retrieval. When initiating such a dialogue, the only data for addressing the HLR that the GGSN has available is contained in the IMSI, and addressing information must be derived from it. The IMSI is obtained from the IP address or the X.25 address in the incoming IP message by means of a translation table. This means that the GGSN shall be able to address the HLR based on an E.214, (if CCITT or ITU-T SCCP is used), or E.212 (if ANSI SCCP is used), Mobile Global Title originally derived by the GGSN from the IMSI in the case of inter-PLMN signalling. In the case of intra-PLMN signalling, an SPC may also be used.

If the HLR is in the same PLMN as the GGSN, local translation tables may exist to derive an SPC. For information retrieval via the international PSTN/ISDN signalling network, the Global title must be derived from the IMSI, using the principles contained in CCITT Recommendation E.214 and the Numbering Plan Indicator (NPI) value referenced by the SCCP Specifications. A summary of the translation from the IMSI (CCITT Recommendation E.212) to Mobile Global Title (described in CCITT Recommendation E.214) is shown below:

- E.212 Mobile Country Code translates to E.164 Country Code;
- E.212 Mobile Network Code translates to E.164 National Destination Code;
- E.212 Mobile Subscriber Identification Number (MSIN) is carried unchanged if within the E.164 number maximum length (15 digits). If the Mobile Global Title is more than 15 digits the number is truncated to 15 by deleting the least significant digits.

This translation will be done either at the application or at SCCP level in the GGSN. The Mobile Global Title thus derived will be used to address the HLR.

6.1.3.3.6 Before GPRS location updating completion

When a MS registers for the first time in a SGSN, the SGSN has to initiate the update location dialogue with the MS's HLR and a preceding dialogue for authentication information retrieval if the authentication information must be retrieved from the HLR. When initiating either of these dialogues, the only data for addressing the HLR that the SGSN has available is contained in the IMSI, and addressing information for SCCP must be derived from it. When continuing the established update location dialogue (as with any other dialogue), the SGSN must derive the routing information towards the HLR from the Calling Party Address received with the first responding CONTINUE message until the dialogue terminating message is received. This means that the SGSN must be able to address the HLR based:

- on an E.214 (if CCITT or ITU-T SCCP is used) or E.212 (if ANSI SCCP is used) Mobile Global Title originally derived by the SGSN from the IMSI; or
- on an E.164 HLR address; or
- in the case of intra-PLMN signalling, on an SPC.

If the HLR is in the same PLMN as the SGSN, local translation tables may exist to derive an SPC. For authentication information retrieval and location updating via the international PSTN/ISDN signalling network, the Global title must be derived from the IMSI, using the principles contained in CCITT Recommendation E.214 and the Numbering Plan Indicator (NPI) value referenced by the SCCP Specifications. A summary of the translation from the IMSI (CCITT Recommendation E.212) to Mobile Global Title (described in CCITT Recommendation E.214) is shown below:

- E.212 Mobile Country Code translates to E.164 Country Code;

- E.212 Mobile Network Code translates to E.164 National Destination Code;
- E.212 Mobile Subscriber Identification Number (MSIN) is carried unchanged if within the E.164 number maximum length (15 digits). If the Mobile Global Title is more than 15 digits the number is truncated to 15 by deleting the least significant digits.

This translation will be done either at the application or at SCCP level in the SGSN. The Mobile Global Title thus derived will be used to address the HLR.

6.1.3.3.7 After GPRS location updating completion

In this case, the subscriber's Basic MSISDN has been received from the HLR during the subscriber data retrieval procedure as well as the HLR number constituting a parameter of the MAP message indicating successful completion of the update location dialogue. From either of these E.164 numbers the address information for initiating dialogues with the roaming subscriber's HLR can be derived. Also the subscriber's IMSI may be used for establishing the routing information towards the HLR.

Thus the SCCP address of the roaming subscriber's HLR may be an SPC, or it may be a Global title consisting of the E.164 MSISDN or the E.164 number allocated to the HLR or the E.214 Mobile Global Title derived from the IMSI.

6.1.3.3.8 Query for a Location Request

For a location request from an external client, the GMLC needs to address the home HLR of the target MS to obtain the address of the target MS's serving MSC. The GMLC uses either the international E.164 MSISDN, the international E.214 number (if CCITT or ITU-T SCCP is used) or the international E.212 number (if ANSI SCCP is used) of the MS as means to route a query to the HLR.

6.1.3.4 The Visitor Location Register (VLR)

There are several cases when the VLR needs to be addressed:

6.1.3.4.1 Inter-VLR information retrieval

When an MS moves from one VLR service area to another, the new VLR may request the IMSI and authentication sets from the previous VLR. The new VLR derives the address of the previous VLR from the Location Area Identification provided by the MS in the location registration request.

6.1.3.4.2 HLR request

The HLR will only request information from a VLR if it is aware that one of its subscribers is in the VLR's service area. This means that a location updating dialogue initiated by the VLR has been successfully completed, i.e. the HLR has indicated successful completion of the update location procedure to the VLR.

When initiating dialogues towards the VLR after successful completion of location updating, the routing information used by the HLR is derived from the E.164 VLR number received as a parameter of the MAP message initiating the update location dialogue. If the VLR is in the same PLMN as the HLR, the VLR may be addressed directly by an SPC derived from the E.164 VLR number. For dialogues via the international PSTN/ISDN signalling network, presence of the E.164 VLR number in the Called Party Address is required.

6.1.3.5 The Interworking MSC (IWMSC) for Short Message Service

The IWMSC is the interface between the mobile network and the network to access to the Short Message Service Centre. This exchange has an E.164 address known in the SGSN or in the MSC.

6.1.3.6 The Equipment Identity Register (EIR)

The EIR address is either unique or could be derived from the IMEI. The type of address is not defined.

6.1.3.7 The Shared Inter Working Function (SIWF)

When the Visited MSC detects a data or fax call and the IWF in the V-MSC can not handle the required service an SIWF can be invoked. The SIWF is addressed with an E.164 number.

6.1.3.8 The Serving GPRS Support Node (SGSN)

The HLR will initiate dialogues towards the SGSN if it is aware that one of its subscribers is in the SGSN's serving area. This means that a GPRS location updating has been successfully completed, i.e, the HLR has indicated successful completion of the GPRS location update to the SGSN. The routing information used by the HLR is derived from the E.164 SGSN number received as parameter of the MAP message initiating the GPRS update location procedure. If the SGSN is in the same PLMN as the HLR, the SGSN may be addressed directly by an SPC derived from the E.164 SGSN number. For dialogues via the international PSTN/ISDN signalling network, the presence of the E.164 SGSN number in the Called Party Address is required.

When the GMSC initiates dialogues towards the SGSN the SGSN (MAP) SSN (See GSM 03.03) shall be included in the called party address. The routing information used by the GMSC is derived from the E.164 SGSN number received as a parameter of the MAP message initiating the forward short message procedure. If the GMSC does not support the GPRS functionality the MSC (MAP) SSN value shall be included in the called party address.

Note: Every VMSC and SGSN shall have uniquely identifiable application using E.164 numbers, for the purpose of SMS over GPRS when the GMSC does not support the GPRS functionality.

6.1.3.9 The Gateway GPRS Support Node (GGSN)

The GGSN provides interworking with external packet-switched networks, network screens and routing of the Network-Requested PDP Context activation. If a Network-Requested PDP Context activation fails, the HLR will alert the GGSN when the subscriber becomes reachable. The HLR will use the E.164 GGSN number received as parameter of the MAP message reporting the failure.

6.1.3.10 The Gateway MSC (GMSC) for Short Message Service

The GMSC provides interworking with the network to access the Short Message Service Centre, the mobile network and routing of Send Routing Info For SM. The GMSC has an E.164 address known in the HLR, SGSN or MSC

6.1.3.10A The Serving Mobile Location Center (SMLC)

There are several instances where an SMLC needs to be addressed.

6.1.3.10A.1 Registration (LMU)

When an LMU needs to register with a controlling SMLC, it may derive the identity of the SMLC from pre-administered data. The identity will be represented in this case by an international E.164 address.

6.1.3.10A.2 Instigation of Positioning (MSC)

When an MSC needs to instigate procedures to obtain location information for a target MS, it derives the identity of the SMLC for this MS from the MS's serving cell site. The identity of the SMLC shall be represented by either an SS7 signalling point code or an international E.164 address.

6.1.3.10B The Gateway Mobile Location Center (GMLC)

The GMLC initiates location requests on behalf of external clients. The E.164 address of the GMLC is provided to an HLR when the GMLC requests a serving MSC address from the HLR for a target MS. The E.164 address of the GMLC is also provided to a serving MSC when the GMLC requests the location of a target MS served by this MSC.

6.1.3.11 Summary table

The following tables summarize the SCCP address used for invoke operations. As a principle, within a PLMN either an SPC or a GT may be used (network operation option), whereas when addressing an entity outside the PLMN the GT must be used. The address type mentioned in the table (e.g. MSISDN) is used as GT or to derive the SPC.

For a response, the originating address passed in the invoke is used as SCCP Called Party Address. For extra-PLMN addressing the own E.164 entity address is used as SCCP Calling Party Address; for intra-PLMN addressing an SPC derived from the entity number may be used instead. When using an SPC, the SPC may be taken directly from MTP.

Table 6.1/1

to from	fixed net work	HLR	VLR	MSC	EIR	gsmSCF	SIWF	SGSN	GGSN
fixed network	---	E:GT T:MSISDN	---	---	---	---	---	---	---
home location register	---	---	I:SPC/GT E:GT T:VLR NUMBER	---	---	I:SPC/GT E:GT T:gsmSCF NUMBER	---	I:SPC/GT E:GT T:SGSN NUMBER	I:SPC/GT E:GT T:GGSN NUMBER
visitor location register	---	I:SPC/GT E:GT T:MGT (outside World Zone 1)/MSISDN (World Zone 1)/HLR NUMBER (note)	I:SPC/GT E:GT T:VLR NUMBER	---	---	I:SPC/GT E:GT T:gsmSCF NUMBER	---	---	---
mobile-services switching centre	---	I:SPC/GT E:GT T:MSISDN	I:SPC/GT E:GT T:VLR NUMBER	I:SPC/GT E:GT T:MSC NUMBER	I:SPC/GT E:GT T:EIR NUMBER	I:SPC/GT E:GT T:gsmSCF NUMBER	I:SPC/GT E:GT T:SIWF NUMBER	I:SPC/GT E:GT T:SGSN NUMBER	---
gsm Service Control Function	---	I:SPC/GT E:GT T:MSISDN	---	---	---	---	---	---	---
Shared Inter Working Function	---	---	---	I:SPC/GT E:GT T:MSC NUMBER	---	---	---	---	---
Serving GPRS Support Node	---	I:SPC/GT E:GT T:MGT/ MSISDN/HL R NUMBER	---	I:SPC/GT E:GT T:MSC NUMBER	I:SPC/GT E:GT T:EIR NUMBER	---	---	---	---
Gateway GPRS Support Node	---	I:SPC/GT E:GT T:MGT	---	---	---	---	---	---	---
Serving Mobile Location Centre	---	---	I:SPC/GT (E:GT) T:VLR NUMBER	I:SPC/GT (E:GT) T:MSC NUMBER	---	---	---	---	---
Gateway Mobile Location Center	---	I:SPC/GT E:GT T:MSISDN, MGT (outside World Zone 1) or IMSI (World Zone 1) (note)	---	I:SPC/GT E:GT T:MSC NUMBER	---	---	---	---	---

I: Intra-PLMN E: Extra(Inter)-PLMN T: Address Type

GT: Global Title MGT: E.214 Mobile Global Title SPC: Signalling Point Code

NOTE: For initiating the location updating procedure and an authentication information retrieval from the HLR preceding it, the VLR has to derive the HLR address from the IMSI of the MS. The result can be an SPC or an E.214 Mobile Global Title if CCITT or ITU-T SCCP is used, or IMSI itself if ANSI SCCP is used (ANSI SCCP is used in World Zone 1).. When continuing the established update location dialogue (as with any other dialogue) the VLR must derive the routing information towards the HLR from the Calling Party Address received with the first responding CONTINUE message until the dialogue terminating message is received.

For transactions invoked by the VLR after update location completion, the VLR may derive the information for addressing the HLR from addresses received in the course of the update location procedure (MSISDN or HLR number) or from the IMSI.

When invoking the Restore Data procedure and an authentication information retrieval from the HLR preceding it, the VLR must derive the information for addressing the HLR from the address information received in association with the roaming number request. This may be either the IMSI received as a parameter of the MAP message requesting the Roaming Number or the Calling Party Address associated with the MAP message requesting the Roaming Number.

The gsmSCF shall be addressed using more than one Global Title number. The first Global Title number is used to address a gsmSCF for MAP. The second Global Title number is used to address a gsmSCF for CAP.

For querying the HLR to obtain the VMSC address to support location services, the GMLC has to derive the HLR address from either the MSISDN or IMSI of the target MS. When using the IMSI, the result can be an SPC or an E.214 Mobile Global Title if CCITT or ITU-T SCCP is used, or IMSI itself if ANSI SCCP is used (ANSI SCCP is used in World Zone 1).

Inter-PLMN signalling from an SMLC to MSC is not defined in GSM 03.71; hence, the type of addressing is not significant.

Table 6.1/2

to from	SMLC	GMLC
fixed network	---	---
home location register	---	---
visitor location register	I:SPC/GT (E:GT) T:MLC NUMBER	---
mobile-services switching centre	I:SPC/GT (E:GT) T:MLC NUMBER	---
gsm Service Control Function	---	I:SPC/GT E:GT T:MSISDN
Shared Inter Working Function	---	---
Serving GPRS Support Node	---	---
Gateway GPRS Support Node	---	---
Serving Mobile Location Centre	---	---
Gateway Mobile Location Center	---	

I: Intra-PLMN E: Extra(Inter)-PLMN T: Address Type
 GT: Global Title MGT: E.214 Mobile Global Title SPC: Signalling Point Code

NOTE: Inter-PLMN signalling from an MSC to SMLC is not defined in GSM 03.71; hence, the type of addressing is not significant.

6.2 Use of TC

The Mobile Application part makes use of the services offered by the Transaction Capabilities (TC) of signalling system No. 7. ETS 300 287, which is based on CCITT White Book Recommendations Q.771 to Q.775, should be consulted for the full specification of TC.

The MAP uses all the services provided by TC except the ones related to the unstructured dialogue facility.

From a modelling perspective, the MAP is viewed as a single Application Service Element. Further structuring of it is for further study.

Transaction Capabilities refers to a protocol structure above the network layer interface (i.e. the SCCP service interface) up to the application layer including common application service elements but not the specific application service elements using them.

TC is structured as a Component sub-layer above a Transaction sub-layer.

The Component sub-layer provides two types of application services: services for the control of end-to-end dialogues and services for Remote Operation handling. These services are accessed using the TC-Dialogue handling primitives and TC-Component handling primitives respectively.

Services for dialogue control include the ability to exchange information related to application-context negotiation as well as initialization data.

Services for Remote Operation handling provide for the exchange of protocol data units invoking tasks (operations), and reporting their outcomes (results or errors) plus any non-application-specific protocol errors detected by the component sub-layer. The reporting of application-specific protocol errors by the TC user, as distinct from application process errors, is also provided. The Transaction sub-layer provides a simple end-to-end connection association service over which several related protocol data units (i.e. built by the Component Sub-Layer) can be exchanged. A Transaction termination can be prearranged (no indication provided to the TC user) or basic (indication provided).

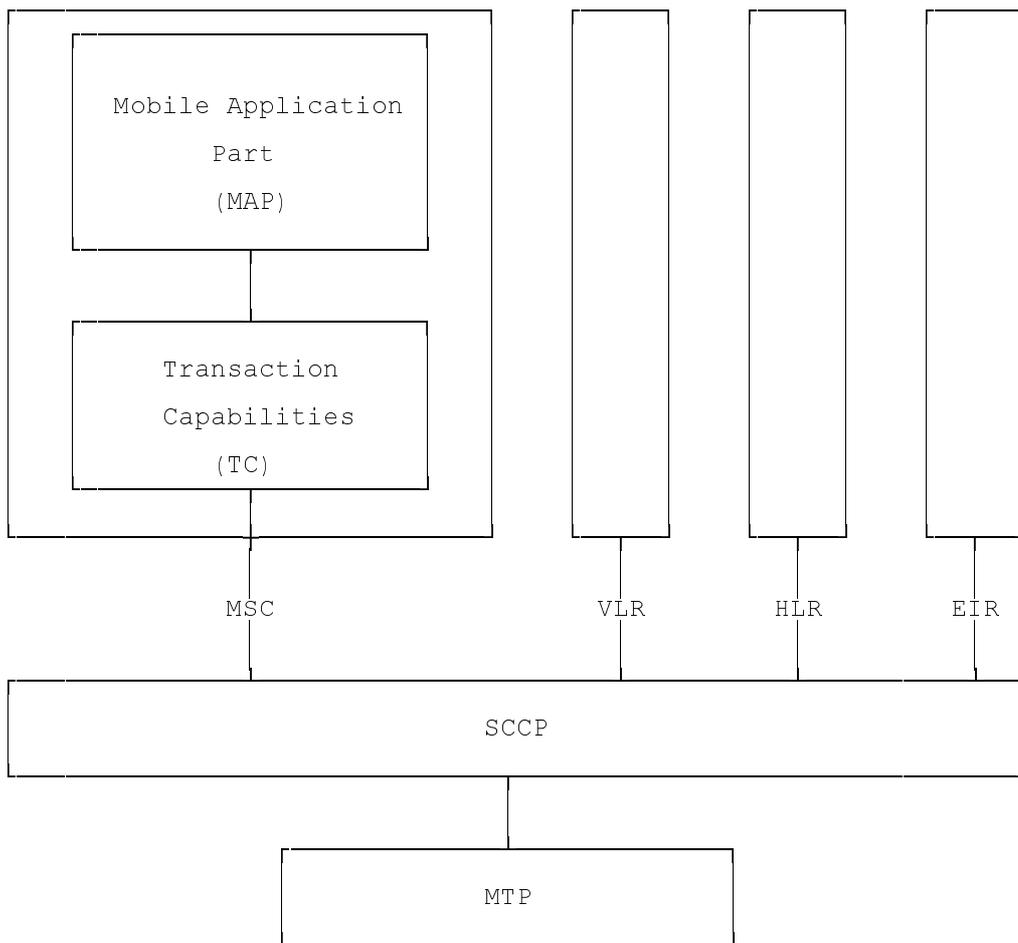


Figure 6.2/1: Facilities for supporting the Mobile Application Part in Signalling System No.7

7 General on MAP services

7.1 Terminology and definitions

The term service is used in clauses 7 to 12 as defined in CCITT Recommendation X.200. The service definition conventions of CCITT Recommendation X.210 are also used.

7.2 Modelling principles

MAP provides its users with a specified set of services and can be viewed by its users as a "black box" or abstract machine representing the MAP service-provider. The service interface can then be depicted as shown in figure 7.2/1.

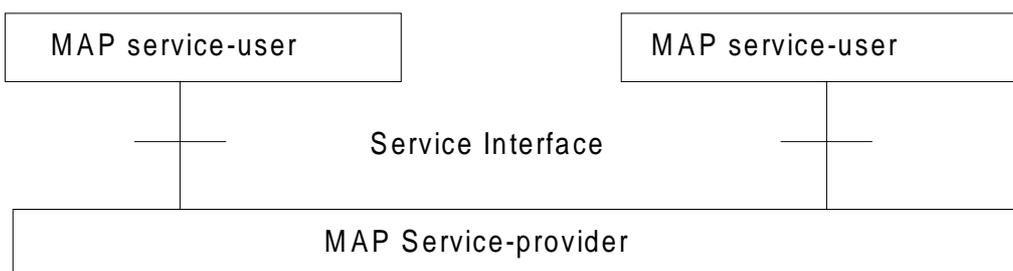


Figure 7.2/1: Modelling principles

The MAP service-users interact with the MAP service-provider by issuing or receiving MAP service-primitives at the service interface.

A MAP service-user may receive services from several instances of the MAP service-provider at the same time. In such cases the overall procedure is synchronised by the service-user.

The MAP service-primitives are named using the following notation:

MAP-ServicePrimitiveName type

where **type** can be any of: request (req), indication (ind), response (rsp) or confirm (cnf) (In the user arrow diagrams type is not indicated in the case of req/ind and indicated as "ack" in the case of rsp/cnf).

The services are further classified as unconfirmed-service, confirmed-service and provider-initiated-service where the first two categories refer to whether or not the service is confirmed by the service-provider. The confirmation may or may not correspond to a response provided by the other service-user.

MAP services are also classified as common MAP services which are available to all MAP service-users, and MAP service-user specific services which are services available to one or several, but not all, MAP service-users.

A MAP dialogue is defined as an exchange of information between two MAP users in order to perform a common task. A MAP dialogue will consist of one or several MAP services.

7.3 Common MAP services

All MAP service-users require access to services for performing basic application layer functions:

- for establishing and clearing MAP dialogues between peer MAP service-users;
- for accessing functions supported by layers below the applications layer;
- for reporting abnormal situations;
- for handling of different MAP versions;
- for testing whether or not a persistent MAP dialogue is still active at each side.

For these purposes the following common services are defined:

- MAP-OPEN service;
- MAP-CLOSE service;
- MAP-DELIMITER service;
- MAP-U-ABORT service;
- MAP-P-ABORT service;
- MAP-NOTICE service.

In defining the service-primitives the following convention is used for categorising parameters:

- M** the inclusion of the parameter is mandatory. The M category can be used for any primitive type and specifies that the corresponding parameter must be present in the indicated primitive type;
- O** the inclusion of the parameter is a service-provider option. The O category can be used in indication and confirm type primitives and is used for parameters that may optionally be included by the service-provider;
- U** the inclusion of the parameter is a service-user option. The U category can be used in request and response type primitives. The inclusion of the corresponding parameter is the choice of the service-user;

- C the inclusion of the parameter is conditional. The C category can be used for the following purposes:
- to indicate that if the parameter is received from another entity it must be included for the service being considered;
 - to indicate that the service user must decide whether to include the parameter, based on the context on which the service is used;
 - to indicate that one of a number of mutually exclusive parameters must be included (e.g. parameters indicating a positive result versus parameters indicating a negative result);
 - to indicate that a service user optional parameter (marked "U") or a conditional parameter (marked "C") presented by the service user in a request or response type primitive is to be presented to the service user in the corresponding indication or confirm type primitive;
- (=) when appended to one of the above, this symbol means that the parameter takes the same value as the parameter appearing immediately to its left;

blank the parameter is not present.

A primitive type may also be without parameters, i.e. no parameter is required with the primitive type; in this case the corresponding column of the table is empty.

7.3.1 MAP-OPEN service

This service is used for establishing a MAP dialogue between two MAP service-users. The service is a confirmed service with service primitives as shown in table 7.3/1.

Table 7.3/1: Service-primitives for the MAP-OPEN service

Parameters	Request	Indication	Response	Confirm
Application context name	M	M(=)	U	C(=)
Destination address	M	M(=)		
Destination reference	U	C(=)		
Originating address	U	O		
Originating reference	U	C(=)		
Specific information	U	C(=)	U	C(=)
Responding address			U	C(=)
Result			M	M(=)
Refuse-reason			C	C(=)
Provider error				O

Application context name:

This parameter identifies the type of application context being established. If the dialogue is accepted the received application context name shall be echoed. In case of refusal of dialogue this parameter shall indicate the highest version supported.

Destination address:

A valid SCCP address identifying the destination peer entity (see also clause 6). As an implementation option, this parameter may also, in the indication, be implicitly associated with the service access point at which the primitive is issued.

Destination-reference:

This parameter is a reference which refines the identification of the called process. It may be identical to Destination address but its value is to be carried at MAP level. Table 7.3/2 describes the MAP services using this parameter. Only these services are allowed to use it.

Table 7.3/2: Use of the destination reference

MAP service	Reference type	Use of the parameter
MAP-REGISTER-SS	IMSI	Subscriber identity
MAP-ERASE-SS	IMSI	Subscriber identity
MAP-ACTIVATE-SS	IMSI	Subscriber identity
MAP-DEACTIVATE-SS	IMSI	Subscriber identity
MAP-INTERROGATE-SS	IMSI	Subscriber identity
MAP-REGISTER-PASSWORD	IMSI	Subscriber identity
MAP-PROCESS-UNSTRUCTURED-SS-REQUEST	IMSI	Subscriber identity
MAP-UNSTRUCTURED-SS-REQUEST	IMSI	Subscriber identity
MAP-UNSTRUCTURED-SS-NOTIFY	IMSI	Subscriber identity
MAP-FORWARD-SHORT-MESSAGE	IMSI (note)	Subscriber identity
MAP-REGISTER-CC-ENTRY	IMSI	Subscriber identity
MAP-ERASE-CC-ENTRY	IMSI	Subscriber identity

NOTE: Only when the IMSI and the LMSI are received together from the HLR in the mobile terminated short message transfer.

Originating address:

A valid SCCP address identifying the requestor of a MAP dialogue (see also clause 6). As an implementation option, this parameter may also, in the request, be implicitly associated with the service access point at which the primitive is issued.

Originating-reference:

This parameter is a reference which refines the identification of the calling process. It may be identical to the Originating address but its value is to be carried at MAP level. Table 7.3/3 describes the MAP services using the parameter. Only these services are allowed to use it. Processing of the Originating-reference shall be performed according to the supplementary service descriptions and other service descriptions, e.g. operator determined barring.

Table 7.3/3: Use of the originating reference

MAP service	Reference type	Use of the parameter
MAP-REGISTER-SS	ISDN-Address-String	Originated entity address
MAP-ERASE-SS	ISDN-Address-String	Originated entity address
MAP-ACTIVATE-SS	ISDN-Address-String	Originated entity address
MAP-DEACTIVATE-SS	ISDN-Address-String	Originated entity address
MAP-INTERROGATE-SS	ISDN-Address-String	Originated entity address
MAP-REGISTER-PASSWORD	ISDN-Address-String	Originated entity address
MAP-PROCESS-UNSTRUCTURED-SS-REQUEST	ISDN-Address-String	Originated entity address
MAP-REGISTER-CC-ENTRY	ISDN-Address-String	Originated entity address
MAP-ERASE-CC-ENTRY	ISDN-Address-String	Originated entity address

Specific information:

This parameter may be used for passing any user specific information. Establishment and processing of the Specific information is not specified by GSM and shall be performed according to operator specific requirements.

Responding address:

An address identifying the responding entity. The responding address is included if required by the context (e.g. if it is different from the destination address).

Result:

This parameter indicates whether the dialogue is accepted by the peer.

Refuse reason:

This parameter is only present if the Result parameter indicates that the dialogue is refused. It takes one of the following values:

- Application-context-not-supported;
- Invalid-destination-reference;
- Invalid-originating-reference;
- No-reason-given;
- Remote node not reachable;
- Potential version incompatibility.

7.3.2 MAP-CLOSE service

This service is used for releasing a previously established MAP dialogue. The service may be invoked by either MAP service-user depending on rules defined within the service-user. The service is an unconfirmed service with parameters as shown in table 7.3/4.

Table 7.3/4: Service-primitives for the MAP-CLOSE service

Parameters	Request	Indication
Release method	M	
Specific Information	U	C(=)

Release method:

This parameter can take the following two values:

- normal release; in this case the primitive is mapped onto the protocol and sent to the peer;
- prearranged end; in this case the primitive is not mapped onto the protocol. Prearranged end is managed independently by the two users, i.e. only the request type primitive is required in this case.

Specific information:

This parameter may be used for passing any user specific information. Establishment and processing of the Specific information is not specified by GSM GSM and shall be performed according to operator specific requirements.

7.3.3 MAP-DELIMITER service

This service is used to explicitly request the transfer of the MAP protocol data units to the peer entities.

See also subclause 7.4 and 7.5 for the detailed use of the MAP-DELIMITER service.

The service is an unconfirmed service with service-primitives as shown in table 7.3/5.

Table 7.3/5: Service-primitives for the MAP-DELIMITER service

Parameters	Request	Indication

7.3.4 MAP-U-ABORT service

This service enables the service-user to request the MAP dialogue to be aborted. The service is an unconfirmed service with service-primitives as shown in table 7.3/6.

Table 7.3/6: Service-primitives for the MAP-U-ABORT service

Parameters	Request	Indication
User reason	M	M(=)
Diagnostic information	U	C(=)
Specific information	U	C(=)

User reason:

This parameter can take the following values:

- resource limitation (congestion);
the requested user resource is unavailable due to congestion;

- resource unavailable;
the requested user resource is unavailable for reasons other than congestion;
- application procedure cancellation;
the procedure is cancelled for reason detailed in the diagnostic information parameter;
- procedure error;
processing of the procedure is terminated for procedural reasons.

Diagnostic information:

This parameter may be used to give additional information for some of the values of the user-reason parameter:

Table 7.3/7: User reason and diagnostic information

User reason	Diagnostic information
Resource limitation (congestion) Resource unavailable Application procedure cancellation	- Short term/long term problem Handover cancellation/ Radio Channel release/ Network path release/ Call release/ Associated procedure failure/ Tandem dialogue released/ Remote operations failure
Procedure error	-

Specific information:

This parameter may be used for passing any user specific information. Establishment and processing of the Specific information is not specified by GSM and shall be performed according to operator specific requirements.

7.3.5 MAP-P-ABORT service

This service enables the MAP service-provider to abort a MAP dialogue. The service is a provider-initiated service with service-primitive as shown in table 7.3/8.

Table 7.3/8: Service-primitive for the MAP-P-ABORT service

Parameters	Indication
Provider reason	M
Source	M

Provider reason:

This parameter indicates the reason for aborting the MAP dialogue:

- provider malfunction;
- supporting dialogue/transaction released;
- resource limitation;
- maintenance activity;
- version incompatibility;
- abnormal MAP dialogue.

Source:

This parameter indicates the source of the abort. For Transaction Capabilities (TC) applications the parameter may take the following values:

- MAP problem;
- TC problem;
- network service problem.

Table 7.3/9: Values of provider reason and source parameters and examples of corresponding events

Provider reason	Source	Corresponding event
Provider malfunction	MAP	Malfunction at MAP level at peer entity
	TC	"Unrecognised message type" or "Badly formatted transaction portion" or "Incorrect transaction portion" received in TC-P-ABORT "Abnormal dialogue"
	Network service	Malfunction at network service level at peer entity
Supporting dialogue/transaction released	TC	"Unrecognised transaction ID" received in TC-ABORT
Resource limitation	MAP	Congestion towards MAP peer service-user
	TC	"Resource limitation" received in TC-P-ABORT
Maintenance activity	MAP	Maintenance at MAP peer service-user
	Network service	Maintenance at network peer service level
Abnormal MAP dialogue	MAP	MAP dialogue is not in accordance with specified application context
Version incompatibility	TC	A Provider Abort indicating "No common dialogue portion" is received in the dialogue initiated state

7.3.6 MAP-NOTICE service

This service is used to notify the MAP service-user about protocol problems related to a MAP dialogue not affecting the state of the protocol machines.

The service is a provider-initiated service with service-primitive as shown in table 7.3/10.

Table 7.3/10: Service-primitive for the MAP-NOTICE service

Parameters	Indication
Problem diagnostic	M

Problem diagnostic:

This parameter can take one of the following values:

- abnormal event detected by the peer;
- response rejected by the peer;
- abnormal event received from the peer
- message cannot be delivered to the peer.

7.4 Sequencing of services

The sequencing of services is shown in figure 7.4/1 and is as follows:

Opening:

The MAP-OPEN service is invoked before any user specific service-primitive is accepted. The sequence may contain none, one or several user specific service-primitives. If no user specific service-primitive is contained between the MAP-OPEN and the MAP-DELIMITER primitives, then this will correspond to sending an empty Begin message in TC. If more than one user specific service-primitive is included, all are to be sent in the same Begin message. The sequence ends with a MAP-DELIMITER primitive.

Continuing:

This sequence may not be present in some MAP dialogues. If it is present, it ends with a MAP-DELIMITER primitive. If more than one user specific service-primitive is included, all are to be included in the same Continue message.

Closing:

The sequence can only appear after an opening sequence or a continuing sequence. The sequence may contain none, one or several user specific service-primitives if the MAP-CLOSE primitive specifies normal release. If no user specific service-primitive is included, then this will correspond to sending an empty End message in TC. If more than one user specific service-primitive is included, all are to be sent in the same End message. If prearranged end is specified, the sequence cannot contain any user specific service-primitive. The MAP-CLOSE primitive must be sent after all user specific service-primitives have been delivered to the MAP service-provider.

Aborting:

A MAP service-user can issue a MAP-U-ABORT primitive at any time after the MAP dialogue has been opened or as a response to an attempt to open a MAP dialogue.

The MAP service-provider may issue at any time a MAP-P-ABORT primitive towards a MAP service-user for which a MAP dialogue exists.

MAP-U-ABORT primitives and MAP-P-ABORT primitives terminate the MAP dialogue.

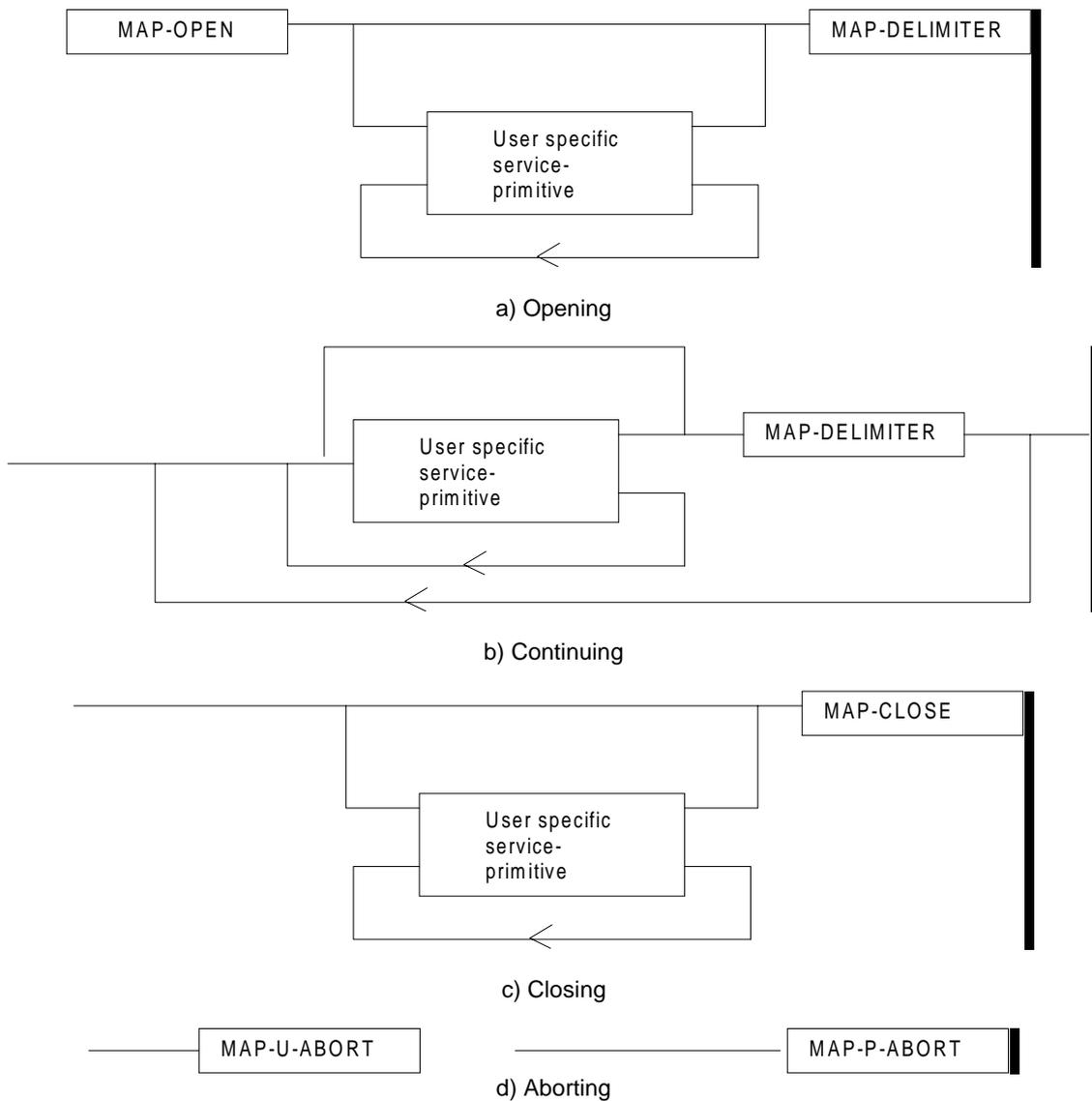


Figure 7.4/1: Sequencing of services

If the reason "resource unavailable (short term problem)" is indicated in the MAP-U-ABORT indication primitive, the MAP service-user may decide to attempt a new MAP dialogue establishment immediately.

Sequencing of user specific service-primitives is done by the MAP service-user and based on rules applicable for each MAP service-user instance.

A MAP-NOTICE indication primitive may be received at any time during the active period of a MAP dialogue.

7.5 General rules for mapping of services onto TC

7.5.1 Mapping of common services

Table 7.5/1 gives an overview of the mapping rules for mapping of common services onto TC-services. Table 7.5/2 gives the mapping rules for mapping of TC-services onto common services.

Protocol machine description is given in clauses 14 to 17.

Table 7.5/1: Mapping of common services on to TC services

MAP service-primitive	TC service-primitive
MAP-OPEN request (+ any user specific service primitives) + MAP-DELIMITER request	TC-BEGIN request (+ component handling primitives)
MAP-OPEN response (+ any user specific service primitives) + MAP-DELIMITER request	TC-CONTINUE request (note) (+ component handling primitives)
(any user specific service primitives) + MAP-DELIMITER request	TC-CONTINUE request (+ component handling primitives)
(any user specific service primitives) + MAP-CLOSE request	TC-END request (+ component handling primitives)
MAP-U-ABORT request	TC-U-ABORT request

NOTE: or TC-END if the MAP-CLOSE request has been received before the MAP-DELIMITER request.

Table 7.5/2: Mapping of TC services on to common service

TC service-primitive	MAP service-primitive
TC-BEGIN indication (+ component handling primitives)	MAP-OPEN indication (+ user specific service primitives) + MAP-DELIMITER indication (note 1)
TC-CONTINUE indication (+ component handling primitives)	First time: MAP-OPEN confirm (+ user specific service primitives) + MAP-DELIMITER indication (note 1) Subsequent times: (user specific service primitives) + MAP-DELIMITER indication (note 1)
TC-END indication (+ component handling primitives)	MAP-OPEN confirm (note 6) (user specific service primitives) + MAP-CLOSE indication
TC-U-ABORT indication	MAP-U-ABORT indication or MAP-P-ABORT indication (note 2) MAP-OPEN confirmation (note 3)
TC-P-ABORT indication	MAP-P-ABORT indication (note 4) MAP-OPEN confirmation (note 5)

NOTE 1: It may not be necessary to present this primitive to the user for MAP version 2 applications.

NOTE 2: The mapping depends on whether the TC-U-ABORT indication primitive contains a MAP-abort-PDU from the remote MAP service-provider or a MAP-user-abort-PDU from the remote MAP service-user.

NOTE 3: Only if the opening sequence is pending and if the "Abort Reason" in the TC-U-ABORT indication is set to "Application Context Not Supported".

NOTE 4: If the "Abort Reason" in the TC-P-ABORT indication is set to a value different from "Incorrect Transaction Portion".

NOTE 5: Only if the opening sequence is pending and if the "Abort Reason" in the TC-P-ABORT indication is set to "Incorrect Transaction Portion".

NOTE 6: Only if opening sequence is pending.

7.5.2 Mapping of user specific services

Table 7.5/3 gives the general mapping rules which apply to mapping of MAP user specific services onto TC services and table 7.5/4 gives the similar rules for mapping of TC services onto MAP user specific services. Detailed mapping is given in clauses 14 to 17.

Table 7.5/3: Mapping of MAP user specific services onto TC services

MAP service-primitive	TC-service-primitive
MAP-xx request	TC-INVOKE request
MAP-xx response (note 1)	TC-RESULT-L request TC-U-ERROR request TC-U-REJECT request TC-INVOKE request (note 2)

Table 7.5/4: Mapping of TC services onto MAP user specific services

TC-service-primitive	MAP service-primitive
TC-INVOKE indication	MAP-xx indication
TC-RESULT-L indication (note 4) TC-U-ERROR indication TC-INVOKE indication (note 2) TC-L-CANCEL indication	MAP-xx confirm
TC-U-REJECT indication TC-L-REJECT indication TC-R-REJECT indication	MAP-xx confirm or MAP-NOTICE indication (note 3)

Notes to tables 7.5/3 and 7.5/4:

NOTE 1: The mapping is determined by parameters contained in the MAP-xx response primitive.

NOTE 2: This applies only to TC class 4 operations where the operation is used to pass a result of another class 2 or class 4 operation.

NOTE 3: The detailed mapping rules are given in clause 16.

NOTE 4: If RESULT-NL components are present they are mapped on to the same MAP-xx confirm.

7.6 Definition of parameters

Following is an alphabetic list of parameters used in the common MAP-services in subclause 7.3:

Application context name	7.3.1	Refuse reason	7.3.1
Destination address	7.3.1	Release method	7.3.2
Destination reference	7.3.1	Responding address	7.3.1
Diagnostic information	7.3.4	Result	7.3.1
Originating address	7.3.1	Source	7.3.5
Originating reference	7.3.1	Specific information	7.3.1/7.3.2/7.3.4
Problem diagnostic	7.3.6	User reason	7.3.4
Provider reason	7.3.5		

Following is an alphabetic list of parameters contained in this clause:

Absent Subscriber Diagnostic SM	7.6.8.9	Invoke Id	7.6.1.1
Access connection status	7.6.9.3	ISDN Bearer Capability	7.6.3.41
		IST Alert Timer	7.6.3.66
		IST Information Withdrawn	7.6.3.68
		IST Support Indicator	7.6.3.69
Access signalling information	7.6.9.5	Kc	7.6.7.4
Additional Absent Subscriber Diagnostic SM	7.6.8.12	Linked Id	7.6.1.2
Additional number	7.6.2.46	LMSI	7.6.2.16
Additional signal info	7.6.9.10	Location Information	7.6.2.30
Additional SM Delivery Outcome	7.6.8.11		
Alert Reason	7.6.8.8	Location update type	7.6.9.6
Alert Reason Indicator	7.6.8.10	Lower Layer Compatibility	7.6.3.42
		LSA Information	7.6.3.56
		LSA Information Withdraw	7.6.3.58
Alerting Pattern	7.6.3.44	Mobile Not Reachable Reason	7.6.3.51
All GPRS Data	7.6.3.53	More Messages To Send	7.6.8.7
All Information Sent	7.6.1.5	MS ISDN	7.6.2.17
APN	7.6.2.42	MSC number	7.6.2.11
Authentication set list	7.6.7.1	MSISdn-Alert	7.6.2.29
B-subscriber Address	7.6.2.36	MWD status	7.6.8.3
B subscriber Number	7.6.2.48	Network Access Mode	7.6.3.50
B subscriber subaddress	7.6.2.49	Network node number	7.6.2.43
Basic Service Group	7.6.4.40	Network resources	7.6.10.1
Bearer service	7.6.4.38	Network signal information	7.6.9.8
BSS-apdu	7.6.9.1	New password	7.6.4.20
Call barring feature	7.6.4.19	No reply condition timer	7.6.4.7
Call barring information	7.6.4.18	North American Equal Access preferred Carrier Id	7.6.2.34
		Number Portability Status	7.6.5.14
Call Direction	7.6.5.8	ODB General Data	7.6.3.9
Call Info	7.6.9.9	ODB HPLMN Specific Data	7.6.3.10
Call reference	7.6.5.1		
Call Termination Indicator	7.6.3.67	OMC Id	7.6.2.18
Called number	7.6.2.24	Originally dialled number	7.6.2.26
Calling number	7.6.2.25		
CAMEL Subscription Info Withdraw	7.6.3.38	Originating entity number	7.6.2.10
Cancellation Type	7.6.3.52	Override Category	7.6.4.4
Category	7.6.3.1	P-TMSI	7.6.2.47
CCBS Feature	7.6.5.8	PDP-Address	7.6.2.45
Channel Type	7.6.5.9	PDP-Context identifier	
Chosen Channel	7.6.5.10	PDP-Type	7.6.2.44
Ciphering mode	7.6.7.7	Pre-paging supported	7.6.5.15
		Previous location area Id	7.6.2.4
Cksn	7.6.7.5	Protocol Id	7.6.9.7
CLI Restriction	7.6.4.5	Provider error	7.6.1.3
CM service type	7.6.9.2		
Complete Data List Included	7.6.3.54	QoS-Subscribed	7.6.3.47
CUG feature	7.6.3.26	Rand	7.6.7.2
CUG index	7.6.3.25	Regional Subscription Data	7.6.3.11
CUG info	7.6.3.22	Regional Subscription Response	7.6.3.12
CUG interlock	7.6.3.24	Requested Info	7.6.3.31
CUG Outgoing Access indicator	7.6.3.8	Roaming number	7.6.2.19
CUG subscription	7.6.3.23	Roaming Restricted In SGSN Due To Unsupported Feature	7.6.3.49
CUG Subscription Flag	7.6.3.37	Roaming Restriction Due To Unsupported Feature	7.6.3.13
		Service centre address	7.6.2.27
Current location area Id	7.6.2.6	SGSN CAMEL Subscription Info	7.6.3.70
		Serving Cell Id	7.6.2.37
Current password	7.6.4.21	SGSN address	7.6.2.39
eMLPP Information	7.6.4.41	SGSN number	7.6.2.38
Equipment status	7.6.3.2	SIWF Number	7.6.2.35
Extensible Basic Service Group	7.6.3.5	SoLSA Support Indicator	7.6.3.57
Extensible Bearer service	7.6.3.3	SM Delivery Outcome	7.6.8.6
Extensible Call barring feature	7.6.3.21	SM-RP-DA	7.6.8.1
		SM-RP-MTI	7.6.8.16
Extensible Call barring information	7.6.3.20	SM-RP-OA	7.6.8.2
Extensible Forwarding feature	7.6.3.16		
Extensible Forwarding info	7.6.3.15		
Extensible Forwarding Options	7.6.3.18		

- mistyped parameter;
- resource limitation;
- initiating release, i.e. the peer has already initiated release of the dialogue and the service has to be released;
- unexpected response from the peer;
- service completion failure;
- no response from the peer;
- invalid response received.

7.6.1.4 User error

This parameter can take values as follows:

NOTE: The values are grouped in order to improve readability; the grouping has no other significance.

a) Generic error:

- system failure, i.e. a task cannot be performed because of a problem in another entity. The type of entity or network resource may be indicated by use of the network resource parameter;
- data missing, i.e. an optional parameter required by the context is missing;
- unexpected data value, i.e. the data type is formally correct but its value or presence is unexpected in the current context;
- resource limitation;
- initiating release, i.e. the receiving entity has started the release procedure;
- facility not supported, i.e. the requested facility is not supported by the PLMN;
- incompatible terminal, i.e. the requested facility is not supported by the terminal.

b) Identification or numbering problem:

- unknown subscriber, i.e. no such subscription exists;
- number changed, i.e. the subscription does not exist for that number any more;
- unknown MSC;
- unidentified subscriber, i.e. if the subscriber is not contained in the database and it has not or cannot be established whether or not a subscription exists;
- unallocated roaming number;
- unknown equipment;
- unknown location area.

c) Subscription problem:

- roaming not allowed, i.e. a location updating attempt is made in an area not covered by the subscription;
- illegal subscriber, i.e. illegality of the access has been established by use of authentication procedure;
- bearer service not provisioned;
- teleservice not provisioned;
- illegal equipment, i.e. the IMEI check procedure has shown that the IMEI is blacklisted or not whitelisted.

d) Handover problem:

- no handover number available;
- subsequent handover failure, i.e. handover to a third MSC failed for some reason.

e) Operation and maintenance problem:

- tracing buffer full, i.e. tracing cannot be performed because the tracing capacity is exceeded.

f) Call set-up problem:

- no roaming number available, i.e. a roaming number cannot be allocated because all available numbers are in use;
- absent subscriber, i.e. the subscriber has activated the detach service or the system detects the absence condition. This error may be qualified to indicate whether the subscriber was IMSI detached, in a restricted area or did not respond to paging;
- busy subscriber. This error may be qualified to indicate that the subscriber was busy due to CCBS and that CCBS is possible;
- no subscriber reply;
- forwarding violation, i.e. the call has already been forwarded the maximum number of times that is allowed;
- CUG reject, i.e. the call does not pass a CUG check; additional information may also be given in order to indicate rejection due to e.g. incoming call barred or non-CUG membership.
- call barred. Optionally, additional information may be included for indicating either that the call meets a barring condition set by the subscriber or that the call is barred for operator reasons. In case of barring of Mobil Terminating Short Message, the additional information may indicate a barring condition due to «unauthorised Message Originator».
- optimal routeing not allowed, i.e. the entity which sends the error does not support optimal routeing, or the HLR will not accept an optimal routeing interrogation from the GMSC, or the call cannot be optimally routed because it would contravene optimal routeing constraints.
- forwarding failed, i.e. the GMSC interrogated the HLR for forwarding information but the HLR returned an error.

g) Supplementary services problem:

- call barred;
- illegal SS operation;
- SS error status;
- SS not available;
- SS subscription violation;
- SS incompatibility;
- negative password check;
- password registration failure;
- Number of Password Attempts;
- USSD Busy;
- Unknown Alphabet.
- short term denial;

- long term denial.

For definition of these errors see GSM 04.80.

h) Short message problem:

- SM delivery failure with detailed reason as follows:
 - memory capacity exceeded;
 - MS protocol error;
 - MS not equipped;
 - unknown service centre (SC);
 - SC congestion;
 - invalid SME address;
 - subscriber is not an SC subscriber;
 - and possibly detailed diagnostic information, coded as specified in TS GSM 03.40, under SMS-SUBMIT-REPORT and SMS-DELIVERY-REPORT. If the SM entity which returns the SM Delivery Failure error includes detailed diagnostic information, it shall be forwarded in the MAP_MO_FORWARD_SHORT_MESSAGE and in the MAP_MT_FORWARD_SHORT_MESSAGE response.
- message waiting list full, i.e. no further SC address can be added to the message waiting list;
- Subscriber busy for MT SMS, i.e. the mobile terminated short message transfer cannot be completed because:
 - another mobile terminated short message transfer is going on and the delivery node does not support message buffering; or
 - another mobile terminated short message transfer is going on and it is not possible to buffer the message for later delivery; or
 - the message was buffered but it is not possible to deliver the message before the expiry of the buffering time defined in GSM 03.40;
- Absent Subscriber SM, i.e. the mobile terminated short message transfer cannot be completed because the network cannot contact the subscriber. Diagnostic information regarding the reason for the subscriber's absence may be included with this error.

i) Location services problem:

- Unauthorized Requesting Network
- Unauthorized LCS Client with detailed reason as follows
- Unauthorized Privacy Class
- Unauthorized Call Unrelated External Client
- Unauthorized Call Related External Client
- Privacy override not applicable
- Position method failure with detailed reason as follows:
 - Congestion
 - Insufficient resources
 - Insufficient Measurement Data
 - Inconsistent Measurement Data
 - Location procedure not completed
 - Location procedure not supported by target MS
 - QoS not attainable
- Position method failure with restart allowed
- LMU Unknown or Offline
- Traffic channel establishment failure
- Unknown or unreachable LCS Client

7.6.1.5 All Information Sent

This parameter indicates to the receiving entity when the sending entity has sent all necessary information.

7.6.2 Numbering and identification parameter

7.6.2.1 IMSI

This parameter is the International Mobile Subscriber Identity defined in GSM 03.03.

7.6.2.2 TMSI

This parameter is the Temporary Mobile Subscriber Identity defined in GSM 03.03.

7.6.2.3 IMEI

This parameter is the International Mobile Equipment Identity defined in GSM 03.03.

7.6.2.4 Previous location area Id

This parameter refers to the identity of the location area from which the subscriber has roamed.

7.6.2.5 Stored location area Id

This parameter refers to the location area where the subscriber is assumed to be located.

7.6.2.6 Current location area Id

This parameter is used to indicate the location area in which the subscriber is currently located.

7.6.2.7 Target location area Id

This parameter refers to the location area into which the subscriber intends to roam.

7.6.2.8 Target cell Id

This parameter refers to the identity of the cell to which a call has to be handed over.

7.6.2.9 [Spare]

7.6.2.10 Originating entity number

This parameter refers to an application layer identification of a system component in terms of its associated ISDN number.

7.6.2.11 MSC number

This parameter refers to the ISDN number of an MSC.

7.6.2.12 Target MSC number

This parameter refers to the ISDN number of an MSC to which a call has to be handed over.

7.6.2.13 HLR number

This parameter refers to the ISDN number of an HLR.

7.6.2.14 VLR number

This parameter refers to the ISDN number of a VLR.

7.6.2.15 HLR Id

This parameter refers to the identity of an HLR derived from the IMSI defined in CCITT Recommendation E.212.

7.6.2.16 LMSI

This parameter refers to a local identity allocated by the VLR to a given subscriber for internal management of data in the VLR. LMSI shall not be sent to the SGSN.

7.6.2.17 MS ISDN

This parameter refers to one of the ISDN numbers assigned to a mobile subscriber in accordance with CCITT Recommendation E.213.

7.6.2.18 OMC Id

This parameter refers to the identity of an operation and maintenance centre.

7.6.2.19 Roaming number

This parameter refers to the roaming number as defined in CCITT Recommendation E.213.

7.6.2.20 [Spare]

7.6.2.21 Handover number

This parameter refers to the number used for routing a call between MSCs during handover.

7.6.2.22 Forwarded-to number

This parameter refers to the address to which a call is to be forwarded. This may include a subaddress. For subscribers having an originating CAMEL Phase 2 or higher subscription, this address need not be in non-E.164 international format.

7.6.2.23 Forwarded-to subaddress

This parameter refers to the sub-address attached to the address to which a call is to be forwarded.

7.6.2.24 Called number

This parameter refers to a called party number as defined in CCITT Recommendation Q.767.

7.6.2.25 Calling number

This parameter refers to a calling party number as defined in CCITT Recommendation Q.767.

7.6.2.26 Originally dialled number

This parameter refers to the number dialled by the calling party in order to reach a mobile subscriber.

7.6.2.27 Service centre address

This parameter represents the address of a Short Message Service Centre.

7.6.2.28 Zone Code

This parameter is used to define location areas into which the subscriber is allowed or not allowed to roam (regional subscription). With a complete list of Zone Codes the VLR or the SGSN is able to determine for all its location areas whether roaming is allowed or not.

7.6.2.29 MSISdn-Alert

This parameter refers to the MSISDN stored in a Message Waiting Data File in the HLR. It is used to alert the Service Centre when the MS is again attainable.

7.6.2.30 Location Information

This parameter indicates the location of the served subscriber as defined in GSM 03.18.

7.6.2.31 GMSC Address

This parameter refers to the E.164 address of a GMSC.

7.6.2.32 VMSC Address

This parameter refers to the E.164 address of a VMSC.

7.6.2.33 Group Id

This parameter is used to describe groups a subscriber can be member of. A subscriber can partake in all group calls (VBS/VGCS) where he subscribed to the respective groups.

7.6.2.34 North American Equal Access preferred Carrier Id

This parameter refers to the carrier identity preferred by the subscriber for calls requiring routing via an interexchange carrier. This identity is used at:

- outgoing calls: when the subscriber does not specify at call setup a carrier identity;
- forwarded calls: when a call is forwarded by the subscriber;
- incoming calls: applicable to the roaming leg of the call.

7.6.2.35 SIWFS Number

This parameter refers to the number used for routing a call between the MSC and the SIWFS (used by ISUP).

7.6.2.36 B-subscriber address

This parameter refers to the address used by the SIWFS to route the outgoing call from the SIWFS to either the B-subscriber in case the non-loop method or back to the VMSC in case of the loop method.

7.6.2.37 Serving cell Id

This parameter indicates the cell currently being used by the served subscriber.

7.6.2.38 SGSN number

This parameter refers to the ISDN number of a SGSN.

7.6.2.39 SGSN address

This parameter refers to the IP-address of a SGSN. This parameter is defined in GSM 03.03.

7.6.2.40 GGSN address

This parameter refers to the IP-address of a GGSN. This parameter is defined in GSM 03.03.

7.6.2.41 GGSN number

This parameter refers to the ISDN number of a GGSN or the ISDN number of the protocol-converter if a protocol-converting GSN is used between the GGSN and the HLR..

7.6.2.42 APN

This parameter refers to the DNS name of a GGSN. This parameter is defined in GSM 03.60.

7.6.2.43 Network Node number

This parameter refers either to the ISDN number of SGSN or to the ISDN number of MSC.

7.6.2.44 PDP-Type

This parameter indicates which type of protocol is used by the MS as defined in GSM 03.60.

7.6.2.45 PDP-Address

This parameter indicates the address of the data protocol as defined in GSM 03.60.

7.6.2.46 Additional number

This parameter can refer either to the SGSN number or to the MSC number.

7.6.2.47 P-TMSI

This parameter is the Packet Temporary Mobile Subscriber Identity defined in GSM 03.03.

7.6.2.48 B-subscriber number

This parameter refers to the number of the destination B dialled by the A user. This may include a subaddress.

7.6.2.49 B-subscriber subaddress

This parameter refers to the sub-address attached to the destination B dialled by the A user.

7.6.2.50 LMU Number

This parameter refers to a local number assigned to an LMU by an SMLC.

7.6.2.51 MLC Number

This parameter refers to the ISDN (E.164) number of an MLC.

7.6.3 Subscriber management parameters

7.6.3.1 Category

This parameter refers to the calling party category as defined in CCITT Recommendation Q.767.

7.6.3.2 Equipment status

This parameter refers to the status of the mobile equipment as defined in GSM 02.16.

7.6.3.3 Extensible Bearer service

This parameter may refer to a single bearer service, a set of bearer services or to all bearer services as defined in TS GSM 02.02. This parameter is used only for subscriber profile management. Extensible Bearer service values include all values defined for a Bearer service parameter (7.6.4.38).

7.6.3.4 Extensible Teleservice

This parameter may refer to a single teleservice, a set of teleservices or to all teleservices as defined in TS GSM 02.03. This parameter is used only for subscriber profile management. Extensible Teleservice values include all values defined for a Teleservice parameter (7.6.4.39).

7.6.3.5 Extensible Basic Service Group

This parameter refers to the Basic Service Group either as an extensible bearer service (see subclause 7.6.3.3) or an extensible teleservice (see subclause 7.6.3.4). This parameter is used only for subscriber profile management. The null value (i.e. neither extensible bearer service nor extensible teleservice) is used to denote the group containing all extensible bearer services and all extensible teleservices.

7.6.3.6 GSM bearer capability

This parameter refers to the GSM bearer capability information element defined in GSM 04.08.

7.6.3.7 Subscriber Status

This parameter refers to the barring status of the subscriber:

- service granted;
- Operator Determined Barring.

7.6.3.8 CUG Outgoing Access indicator

This parameter represents the Outgoing Access as defined in ETS 300 136.

7.6.3.9 Operator Determined Barring General Data

This parameter refers to the set of subscribers features that the network operator or the service provider can regulate. This set only includes those limitations that can be controlled in the VLR or in the SGSN:

- All outgoing calls barred; (*)
- International outgoing calls barred; (*)
- International outgoing calls except those to the home PLMN country barred; (*)
- Interzonal outgoing calls barred; (*)
- Interzonal outgoing calls except those to the home PLMN country barred; (*)
- Interzonal outgoing calls AND international outgoing calls except those directed to the home PLMN country barred; (*)
- Premium rate (information) outgoing calls barred;
- Premium rate (entertainment) outgoing calls barred;
- Supplementary service access barred;
- Invocation of call transfer barred;
- Invocation of chargeable call transfer barred;
- Invocation of internationally chargeable call transfer barred;
- Invocation of interzonally chargeable call transfer barred;
- Invocation of call transfer where both legs are chargeable barred.

(*) Only these ODBs are supported by the SGSN. The SGSN applies them only for short message transfer.

7.6.3.10 ODB HPLMN Specific Data

This parameter refers to the set of subscribers features that the network operator or the service provider can regulate only when the subscriber is registered in the HPLMN. This set only includes those limitations that can be controlled in the VLR or in the SGSN:

- Operator Determined Barring Type 1;
- Operator Determined Barring Type 2;
- Operator Determined Barring Type 3;

- Operator Determined Barring Type 4.

7.6.3.11 Regional Subscription Data

This parameter defines the regional subscription area in which the subscriber is allowed to roam. It consists of a list of Zone Codes (see subclause 7.6.2.28).

7.6.3.12 Regional Subscription Response

This parameter indicates either that the regional subscription data cannot be handled or that the current MSC or SGSN area is entirely restricted because of regional subscription.

7.6.3.13 Roaming Restriction Due To Unsupported Feature

This parameter defines that a subscriber is not allowed to roam in the current MSC area. It may be used by the HLR if a feature or service is indicated as unsupported by the VLR.

7.6.3.14 Extensible SS-Info

This parameter refers to all the information related to a supplementary service and is a choice between:

- extensible forwarding information (see subclause 7.6.3.15);
- extensible call barring information (see subclause 7.6.3.20);
- CUG info (see subclause 7.6.3.22);
- extensible SS-Data (see subclause 7.6.3.29).

7.6.3.15 Extensible Forwarding information

This parameter represents the information related to each call forwarding service:

- the SS-Code of the relevant call forwarding service (see subclause 7.6.4.1);
- if required, a list of extensible forwarding feature parameters (see subclause 7.6.3.16).

The list may contain one item per Basic Service Group.

7.6.3.16 Extensible Forwarding feature

This parameter applies to each combination of call forwarding service and Basic Service Group and contains the following information, as required:

- extensible Basic Service Group (see subclause 7.6.3.5);
- extensible SS-Status (see subclause 7.6.3.17);
- forwarded-to number (see subclause 7.6.2.22);
- forwarded-to subaddress (see subclause 7.6.2.23);
- extensible forwarding options (see subclause 7.6.3.18);
- extensible no reply condition timer (see subclause 7.6.4.19).

7.6.3.17 Extensible SS-Status

This parameter refers to the state information of individual supplementary services as defined in TS GSM 03.11.

7.6.3.18 Extensible Forwarding Options

This parameter refers to a set of forwarding options attached to a supplementary service. It contains the following informations:

- notification to forwarding party (see TS GSM 02.82 for the meaning of this parameter);
- redirection notification to the forwarded-to party (see TS GSM 02.82 for the meaning of this parameter);
- notification to calling party (see TS GSM 02.82 for the meaning of this parameter);
- redirecting presentation (see TS GSM 02.82 for the meaning of this parameter);
- Forwarding reason (see TS GSM 02.82 for the meaning of this parameter).

7.6.3.19 Extensible No reply condition timer

This parameter refers to the extensible no reply condition timer for call forwarding on no reply.

7.6.3.20 Extensible Call barring information

This parameter contains for each call barring service:

- SS-Code (see subclause 7.6.4.1);
- a list of extensible call barring feature parameters (see subclause 7.6.3.21).

The list may contain one item per Basic Service Group.

7.6.3.21 Extensible Call barring feature

This parameter gives the status of call barring services as applicable to each Basic Service Group. The parameter contains the following information:

- Extensible Basic Service Group (see subclause 7.6.3.5);
- provisioned SS-Status (see subclause 7.6.3.17).

7.6.3.22 CUG info

This parameter refers to the overall information required for operation for each CUG:

- CUG subscriptionList;
- CUG featureList.

7.6.3.23 CUG subscription

This parameter refers to the set of basic information for each CUG defined in that subscription. The following information is stored:

- CUG index;
- CUG interlock;
- Intra CUG restrictions;
- Basic Service Group List.

7.6.3.24 CUG interlock

This parameter represents the CUG interlock code defined in ETS 300 138.

7.6.3.25 CUG index

This parameter represents the CUG index defined in ETS 300 138.

7.6.3.26 CUG feature

This parameter contains two parameters which are associated with the Basic Service Group. If the Basic Service Group Code is not present the feature applies to all Basic Services. The following parameters are included:

- Preferential CUG indicator:
indicates which CUG index is to be used at outgoing call set-up using the associated Basic Service Group;
- Inter CUG Option:
describes whether it for the associated Basic Service Group is allowed to make calls outside the CUG and whether incoming calls are allowed;
- Basic Service Group.

See TS GSM 02.85 for meaning of this parameter.

7.6.3.27 Inter CUG options

This parameter indicates the subscribers ability to make and receive calls outside a specific closed user group. It takes any of the following values:

- CUG only facility (only calls within CUG are allowed);
- CUG with outgoing access (calls outside CUG allowed);
- CUG with incoming access (calls from outside CUG into CUG allowed);
- CUG with both incoming and outgoing access (all calls allowed).

7.6.3.28 Intra CUG restrictions

This parameter describes whether or not the subscriber is allowed to originate calls to or to receive calls from within the CUG. It can take any of the following values:

- no CUG restrictions;
- CUG incoming calls barred;
- CUG outgoing calls barred.

7.6.3.29 Extensible SS-Data

This parameter refers to the necessary set of information required in order to characterise one supplementary service:

- SS-Code (see subclause 7.6.4.1);
- Extensible SS-Status (if applicable) (see subclause 7.6.3.17);
- Extensible Override subscription option (if applicable) (see subclause 7.6.3.30);
- Extensible CLI Restriction (if applicable) (see subclause 7.6.3.31);
- Extensible Basic Service Group Code (see subclause 7.6.3.5).

7.6.3.30 Subscriber State

This parameter indicates the state of the MS as defined in GSM 03.18.

7.6.3.31 Requested Info

This parameter indicates the subscriber information being requested as defined in GSM 03.18.

7.6.3.32 Suppression of Announcement

This parameter indicates if the announcement or tones shall be suppressed as defined in 3G TS 23.078.

7.6.3.33 Suppress T-CSI

This parameter is used to suppress the invocation of terminating CAMEL services.

7.6.3.34 GMSC CAMEL Subscription Info

This parameter contains CAMEL subscription information, i.e.O-CSI and/or D-CSI and/or T-CSI, which indicates to the GMSC that originating and/or terminating CAMEL services shall be invoked for the incoming call.

7.6.3.35 VLR CAMEL Subscription Info

This parameter identifies the subscriber as having CAMEL services which are invoked in the MSC or VLR. (added during drafting 29.002).

7.6.3.36 Supported CAMEL Phases in the VLR

This parameter indicates which phases of CAMEL are supported in the VLR.

7.6.3.xx Supported CAMEL Phases in the SGSN

This parameter indicates which phases of CAMEL are supported in the SGSN.

7.6.3.37 CUG Subscription Flag

This parameter indicates a that a subscriber with a T-CSI also has a CUG subscription. It is defined in TS 3G TS 23.078.

7.6.3.38 CAMEL Subscription Info Withdraw

This parameter indicates that CAMEL Subscription Info shall be deleted from the VLR or SGSN.

7.6.3.39 Voice Group Call Service (VGCS) Data

This parameter refers to one or more groups a subscriber may be member of for voice group calls.

7.6.3.40 Voice Broadcast Service (VBS) Data

This parameter refers to one or more groups a subscriber may be member of for the voice broadcast service. Per group it is further indicated whether the subscriber is only allowed to listen to respective group calls or whether he is in addition entitled to initiate respective voice broadcast calls.

7.6.3.41 ISDN bearer capability

This parameter refers to the ISDN bearer capability information element defined in GSM 09.07.

7.6.3.42 Lower layer Compatibility

This parameter refers to the lower layer compatibility information element defined in GSM 04.08.

7.6.3.43 High Layer Compatibility

This parameter refers to the high layer compatibility information element defined in GSM 04.08.

7.6.3.44 Alerting Pattern

This parameter is an indication that can be used by the MS to alert the user in a specific manner in case of mobile terminating traffic (switched call or USSD). That indication can be an alerting level or an alerting category.

7.6.3.45 GPRS Subscription Data Withdraw

This parameter indicates that GPRS Subscription Data shall be deleted from the SGSN.

7.6.3.46 GPRS Subscription Data

This parameter refers to the list of PDP-Contexts that subscriber has subscribed to.

7.6.3.47 QoS-Subscribed

This parameter indicates the quality of service subscribed for a certain service. It is defined in GSM 03.60.

7.6.3.48 VPLMN address allowed

This parameter specifies whether the MS is allowed to use a dynamic address allocated in the VPLMN. It is defined in GSM 03.60.

7.6.3.49 Roaming Restricted In SGSN Due To Unsupported Feature

This parameter defines that a subscriber is not allowed to roam in the current SGSN area. It may be used by the HLR if a feature or service is indicated as unsupported by the SGSN.

7.6.3.50 Network Access Mode

This parameter is defined in GSM 03.08.

7.6.3.51 Mobile Not Reachable Reason

This parameter stores the reason for the MS being absent when an attempt to deliver a short message to an MS fails at the MSC, SGSN or both. It is defined in TS GSM 03.40.

7.6.3.52 Cancellation Type

This parameter indicates the reason of location cancellation. It is defined in TS GSM 03.60.

7.6.3.53 All GPRS Data

This parameter indicates to the SGSN that all GPRS Subscription Data shall be deleted for the subscriber.

7.6.3.54 Complete Data List Included

This parameter indicates to the SGSN that the complete GPRS Subscription Data stored for the Subscriber shall be replaced with the GPRS Subscription Data received.

7.6.3.55 PDP Context Identifier

This parameter is used to identify a PDP context for the subscriber.

7.6.3.56 LSA Information

This parameter refers to one or more localised service areas a subscriber may be a member of, together with the priority of each localised service area. The access right outside these localised service areas is also indicated.

7.6.3.57 SoLSA support indicator

This parameter indicates that the VLR or the SGSN supports SoLSA subscription.

7.6.3.58 LSA Information Withdraw

This parameter indicates that LSA information shall be deleted from the VLR or the SGSN.

7.6.3.59 LMU Indicator

This parameter indicates the presence of an LMU.

7.6.3.60 LCS Information

This parameter defines the LCS related information for an MS subscriber and contains the following components:

- HPLMN GMLC List (see subclause 7.6.3.61)
- LCS Privacy Exception List (see subclause 7.6.3.62)

7.6.3.61 HPLMN GMLC List

This parameter contains the addresses of all GMLCs in the MS subscriber's HPLMN that are permitted to issue a non-call related MT-LR location request for this MS. Usage of this parameter is defined in GSM 03.71.

7.6.3.62 LCS Privacy Exception List

This parameter defines the classes of LCS Client that are allowed to locate any target MS. For each class, the following information is provided:

- SS-Code (see subclause 7.6.4.1);
- a list of LCS privacy exception parameters (see subclause 7.6.3.63).

7.6.3.63 LCS Privacy Exception Parameters

This parameter gives the status of each LCS privacy exception class and any additional parameters relevant to this class. The parameter contains the following information:

- provisioned SS-Status (see subclause 7.6.3.17);
- external client List (see subclause 7.6.3.64);
- internal client List (see subclause 7.6.3.65)

7.6.3.64 External Client List

This parameter gives the identities of the external clients that are allowed to locate a target MS for a non-call related MT-LR. Each identity is an international (e.g.E.164) address. Usage of this parameter is defined in GSM 03.71.

7.6.3.65 Internal Client List

This parameter gives the identities of the internal PLMN operator clients that are allowed to locate a target MS for an NI-LR or MT-LR. Usage of this parameter is defined in GSM 03.71.

7.6.3.66 IST Alert Timer

This parameter indicates the IST Alert Timer value that must be used in the MSC to inform the HLR about the call activities that the subscriber performs. Units are minutes.

7.6.3.67 Call Termination Indicator

This parameter indicates whether the MSC shall terminate a specific ongoing call, or all the call activities related to a specified subscriber.

7.6.3.68 IST Information Withdraw

This parameter indicates that IST information shall be deleted from the VMSC.

7.6.3.69 IST Support Indicator

This parameter indicates the degree of IST functionality supported by the MSC (Visited MSC or Gateway MSC). It can take one of the following values:

- Basic IST functionality
- IST command service (in addition to the basic IST functionality and including the ability to terminate all calls being carried for the identified subscriber).

7.6.3.70 SGSN Camel Subscription Info

This parameter identifies the subscriber as having CAMEL services which are invoked in the SGSN.

7.6.3.71 SMS-CSI

This parameter identifies the subscriber as having SMS CAMEL services as defined in 3G TS 23.078

7.6.3.72 GPRS-CSI

This parameter identifies the subscriber as having GPRS CAMEL services as defined in 3G TS 23.078

7.6.3.73 CAMEL subscription info

This parameter indicates the CSI that can be controlled by CSE.

7.6.3.74 Extensible Call barring information for CSE

This parameter contains for each call barring service for CSE:

- SS-Code;
- a list of extensible call barring feature parameters.
The list may contain one item per Basic Service Group.
- password.
- wrong password attempt counter.
- notification-to-CSE flag.

7.6.3.75 Extensible Forwarding information for CSE

This parameter represents the information for CSE related to each call forwarding service:

- the SS-Code of the relevant call forwarding service;
- if required, a list of extensible forwarding feature parameters.

The list may contain one item per Basic Service Group.

- notification-to-CSE flag.

7.6.3.76 Modification Request for CSI

This parameter indicates the CAMEL subscription information to be modified by CSE.

7.6.3.77 Modification Request for SS Information

This parameter indicates the call forwarding and call barring supplementary service data to be modified by CSE.

7.6.3.78 Call Barring Data

This parameter contains the extensible call barring feature list (see subclause 7.6.3.21) and Notification to CSE flag.

7.6.3.79 Call Forwarding Data

This parameter contains the extensible call forwarding feature list (see subclause 7.6.3.16) and Notification to CSE flag.

7.6.3.80 ODB Data

This parameter contains the ODB general data, ODB HPLMN specific data and Notification to CSE flag.

7.6.3.81 Requested Subscription Info

This parameter indicates the subscription information being requested.

7.6.4 Supplementary services parameters

7.6.4.1 SS-Code

This parameter may refer to one supplementary service or a set of supplementary services as defined in TS GSM 02.04. For MAP Release '97 this includes:

- Calling Line Identification Presentation service (CLIP);
- Calling Line Identification Restriction service (CLIR);
- Connected Line Identification Presentation service (COLP);
- Connected Line Identification Restriction service (COLR);
- Calling Name Presentation (CNAP)
- All Call Forwarding services;
- Call Waiting (CW);
- Call Hold (HOLD);
- Multi-Party service (MPTY);
- Closed User Group (CUG);

- All Charging services;
- All Call Restriction services;
- Explicit Call Transfer service (ECT);
- enhanced Multi-Level Precedence and Pre-emption service (eMLPP);
- Completion of Calls to Busy Subscriber, originating side (CCBS-A);
- Completion of Calls to Busy Subscriber, destination side (CCBS-B).
- All LCS privacy exceptions (see subclause 7.6.4.44).

7.6.4.2 SS-Status

This parameter refers to the state information of individual supplementary services as defined in GSM 03.11.

7.6.4.3 SS-Data

This parameter refers to the necessary set of information required in order to characterise one supplementary service:

- SS-Code (see subclause 7.6.4.1);
- SS-Status (if applicable) (see subclause 7.6.4.2);
- Override subscription option (see subclause 7.6.4.4);
- CLI Restriction (see subclause 7.6.4.5);
- Basic Service Group Code (see subclause 7.6.4.40).

7.6.4.4 Override Category

This parameter refers to the subscription option Override Category attached to a supplementary service. It can take the following two values:

- Enabled;
- Disabled.

7.6.4.5 CLI Restriction Option

This parameter refers to the subscription option Restriction mode attached to the CLIR supplementary service. It can take the following three values:

- Permanent;
- Temporary (Default Restricted);
- Temporary (Default Allowed).

7.6.4.6 Forwarding Options

This parameter refers to a forwarding option attached to a supplementary service. It can take one of the following values:

- notification to forwarding party (see GSM 02.82 for the meaning of this parameter);
- notification to calling party (see GSM 02.82 for the meaning of this parameter);
- redirecting presentation (see GSM 02.82 for the meaning of this parameter);
- Forwarding reason (see GSM 02.82 for the meaning of this parameter).

7.6.4.7 No reply condition timer

This parameter refers to the no reply condition timer for call forwarding on no reply.

7.6.4.8 - 7.6.4.14 [spare]

7.6.4.15 Forwarding information

This parameter represents the information related to each call forwarding service:

- the SS-Code of the relevant call forwarding service (see subclause 7.6.4.1);
- if required, a list of forwarding feature parameters (see subclause 7.6.4.16).

The list may contain one item per Basic Service Group.

7.6.4.16 Forwarding feature

This parameter applies to each combination of call forwarding service and Basic Service Group and contains the following information, as required:

- Basic Service Group (see subclause 7.6.4.40);
- SS-Status (see subclause 7.6.4.2);
- forwarded-to number (see subclause 7.6.2.22);
- forwarded-to subaddress (see subclause 7.6.2.23);
- forwarding options (see subclause 7.6.4.6);
- no reply condition timer (see subclause 7.6.4.7).

7.6.4.17 [spare]

7.6.4.18 Call barring information

This parameter contains for each call barring service:

- SS-Code (see subclause 7.6.4.1);
- a list of call barring feature parameters (see subclause 7.6.4.19).

The list may contain one item per Basic Service Group.

7.6.4.19 Call barring feature

This parameter gives the status of call barring services as applicable to each Basic Service Group. The parameter contains the following information:

- Basic Service Group (see subclause 7.6.4.40);
- SS-Status (see subclause 7.6.4.2).

7.6.4.20 New password

This parameter refers to the password which the subscriber just registered in the network.

This parameter refers to a password used by the subscriber for supplementary service control.

7.6.4.21 Current password

This parameter refers to a password used by the subscriber for supplementary service control.

7.6.4.22 Guidance information

This parameter refers to guidance information given to a subscriber who is requested to provide a password. One of the following information may be given:

- "enter password";

This information is used for checking of the old password.

- "enter new password";

This information is used during password registration for the request of the first new password.

- "enter new password again";

This information is used during password registration for the request of the new password again for verification.

7.6.4.23 [spare]

7.6.4.24 SS-Info

This parameter refers to all the information related to a supplementary service and is a choice between:

- forwarding information (see subclause 7.6.4.15);
- call barring information (see subclause 7.6.4.18);
- CUG info (see subclause 7.6.4.8);
- SS-Data (see subclause 7.6.4.3).
- eMLPP information (see subclause 7.6.4.41).

7.6.4.25-7.6.4.35 [spare]

7.6.4.36 USSD Data Coding Scheme

This parameter contains the information of the alphabet and the language used for the unstructured information in an Unstructured Supplementary Service Data operation. The coding of this parameter is according to the Cell Broadcast Data Coding Scheme as specified in GSM 03.38.

7.6.4.37 USSD String

This parameter contains a string of unstructured information in an Unstructured Supplementary Service Data operation. The string is sent either by the mobile user or the network. The contents of a string sent by the MS are interpreted by the network as specified in GSM 02.90.

7.6.4.38 Bearer service

This parameter may refer to a single bearer service, a set of bearer services or to all bearer services as defined in TS GSM 02.02. This parameter is used only for supplementary service management.

7.6.4.39 Teleservice

This parameter may refer to a single teleservice, a set of teleservices or to all teleservices as defined in TS GSM 02.03. This parameter is used only for supplementary service management.

7.6.4.40 Basic Service Group

This parameter refers to the Basic Service Group either as a bearer service (see subclause 7.6.4.38) or a teleservice (see subclause 7.6.4.39). This parameter is used only for supplementary service management. The null value (i.e. neither bearer service nor teleservice) is used to denote the group containing all bearer services and all teleservices.

7.6.4.41 eMLPP information

This parameter contains two parameters which are associated with the eMLPP service. The following two parameters are included:

- maximum entitled priority:
indicates the highest priority level the subscriber is allowed to apply for an outgoing call set-up;
- default priority:
defines the priority level which shall be assigned to a call if no explicit priority is indicated during call set-up.

7.6.4.42 SS-event

This parameter indicates the Supplementary Service for which an invocation notification is sent towards the gsmSCF. It can indicate one of the following services:

- Explicit Call Transfer (ECT)
- Call Deflection (CD)
- Multi-Party call (MPTY)
- Completion of Calls to Busy Subscriber (CCBS)

7.6.4.43 SS-event data

This parameter contains additional information related to Supplementary Service invocation. Depending on the service invoked it can contain the following information:

ECT A list with all Called Party Numbers involved.

CDThe called Party number involved.

7.6.4.44 LCS Privacy Exceptions

Distinct SS codes are assigned to the following classes of LCS client in a target MS subscriber's privacy exception list.

- Universal Class
- Call related value added class
- Non-Call related value added class
- PLMN operator class

7.6.5 Call parameters

7.6.5.1 Call reference number

This parameter refers to a call reference number allocated by a call control MSC.

7.6.5.2 Interrogation type

This parameter refers to the type of interrogation for routing information which is sent from a GMSC to an HLR. It can take either of two values:

- basic call (for information to route a call before the call has been extended to the VMSC of the called party);
- forwarding (for information to route the call to the forwarded-to destination after the VMSC of the forwarding party has requested the GMSC to resume handling of the call).

7.6.5.3 OR interrogation

This parameter indicates that the GMSC which interrogated the HLR for routing information is not in the same PLMN as the HLR, and therefore that the call will potentially be optimally routed.

7.6.5.4 OR capability

This parameter indicates the phase of OR which the GMSC supports.

7.6.5.5 Forwarding reason

This parameter indicates the reason for which the call is to be forwarded. It can take one of three values:

- busy subscriber;
- mobile subscriber not reachable;
- no subscriber reply.

7.6.5.6 Forwarding interrogation required

This parameter indicates that if the VMSC of the forwarding subscriber requests the GMSC to resume handling of the call the GMSC shall interrogate the HLR for forwarding information.

7.6.5.7 O-CSI

This parameter identifies the subscriber as having originating CAMEL services as defined in TS 3G TS 23.078.

7.6.5.x D-CSI

This parameter identifies the subscriber as having originating CAMEL dialled services as defined in TS 3G TS 23.078.

7.6.5.x T-CSI

This parameter identifies the subscriber as having terminating CAMEL services in the GMSC, as defined in TS 3G TS 23.078.

7.6.5.x VT-CSI

This parameter identifies the subscriber as having terminating CAMEL services in the VMSC, as defined in TS 3G TS 23.078.

7.6.5.8 Call Direction

This parameter is used to indicate the direction of the call.

7.6.5.9 Channel Type

This parameter is the result of a Channel Mode Modification for TS61/62. It contains the changed Air Interface User Rate. The information is sent from the SIWFS to the MSC to assign the correct radio resource. This parameter is defined in GSM 08.08.

7.6.5.10 Chosen Channel

This parameter is sent from the MSC to the SIWFS to adjust the interworking unit to the assigned radio resources. This parameter is defined in GSM 08.08.

7.6.5.11 CCBS Feature

This parameter corresponds to the 'CCBS Description' parameter in GSM 03.93. It refers to the necessary set of information required in order to characterise a certain CCBS request. The parameter may contain the following information:

- CCBS Index (see GSM 03.93 for the use of this parameter);
- B-subscriber number (see subclause 7.6.2.48);
- B-subscriber subaddress (see subclause 7.6.2.49);
- Basic Service Group Code (see subclause 7.6.4.40).

7.6.5.12 UU Data

This parameter includes User-To-User Data. It is defined in GSM 03.87.

7.6.5.13 UUS CF Interaction

This parameter indicates if the call forwarding or call deflection has been activated after UUS1 request has been accepted. It is defined in GSM 03.87.

7.6.5.14 Number Portability Status

This parameter indicates the number portability status of subscriber. See GSM 03.66.

7.6.5.15 Pre-paging supported

This parameter indicates that the entity which sent it supports pre-paging.

7.6.6 Radio parameters

7.6.6.1-7.6.6.6 [spare]

7.6.6.7 HO-Number Not Required

This parameter indicates that no handover number allocation is necessary.

7.6.7 Authentication parameters

7.6.7.1 Authentication set list

This parameter represents a list of sets of authentication parameters for a given subscriber:

- Rand;
- Sres;
- Kc.

7.6.7.2 Rand

This parameter represents a random number used for authentication.

7.6.7.3 Sres

This parameter represents the response to an authentication request.

7.6.7.4 Kc

This parameter refers to a key used for ciphering purposes.

7.6.7.5 [spare]

7.6.7.6 Cksn

This parameter refers to a ciphering key sequence number.

7.6.7.7 Ciphering mode

This parameter refers to the ciphering mode which is associated with a radio channel. It may take values as follows:

- no encryption;
- identification of specific ciphering algorithm.

7.6.8 Short message parameters

7.6.8.1 SM-RP-DA

This parameter represents the destination address used by the short message service relay sub-layer protocol. It can be either of the following:

- IMSI (see subclause 7.6.2.1);
- LMSI (see subclause 7.6.2.16);
- MS-ISDN (see subclause 7.6.2.17);
- roaming number (see subclause 7.6.2.19);
- service centre address (see subclause 7.6.2.27).

7.6.8.2 SM-RP-OA

This parameter refers to the originating address used by the short message service relay sub-layer protocol. It can be either of the following:

- MS-ISDN (see subclause 7.6.2.17);
- service centre address (see subclause 7.6.2.27).

7.6.8.3 MWD status

This parameter indicates whether or not the address of the originator service centre is already contained in the Message Waiting Data file. In addition, it contains the status of the Memory Capacity Exceeded Flag (MCEF), the status of the Mobile subscriber Not Reachable Flag (MNRF) and the status of the Mobile station Not Reachable for GPRS flag (MNRG).

7.6.8.4 SM-RP-UI

This parameter represents the user data field carried by the short message service relay sub-layer protocol.

7.6.8.5 SM-RP-PRI

This parameter is used to indicate whether or not delivery of the short message shall be attempted when a service centre address is already contained in the Message Waiting Data file.

7.6.8.6 SM Delivery Outcome

This parameter indicates the cause for setting the message waiting data. It can take one of the following values:

- Absent subscriber;
- MS memory capacity exceeded;
- Successful transfer.

7.6.8.7 More Messages To Send

This parameter is used to indicate whether or not the service centre has more short messages to send.

7.6.8.8 Alert Reason

This parameter is used to indicate the reason why the service centre is alerted. It can take one of the following values:

- MS present;
- Memory Available.

7.6.8.9 Absent Subscriber Diagnostic SM

This parameter is used to indicate the reason why the subscriber is absent. For the values for this parameter see TS GSM 03.40.

7.6.8.10 Alert Reason Indicator

This parameter indicates that the alert reason is sent to the HLR due to GPRS activity.

7.6.8.11 Additional SM Delivery Outcome

This parameter is used to indicate the GPRS delivery outcome in case a combination between delivery outcome for GPRS and non-GPRS are sent to the HLR.

7.6.8.12 Additional Absent Subscriber Diagnostic SM

This parameter indicates the reason of the additional SM Delivery Outcome.

7.6.8.13 Delivery Outcome Indicator

This parameter indicates that the delivery outcome sent to the HLR is for GPRS.

7.6.8.14 GPRS Node Indicator

This parameter indicates that the Network Node Number sent by the HLR is the SGSN number.

7.6.8.15 GPRS Support Indicator

This parameter indicates that the SMS-GMSC supports GPRS specific procedure of combine delivery of Short Message via MSC and/or via the SGSN.

7.6.8.16 SM-RP-MTI

This parameter represents the RP-Message Type Indicator of the Short Message. It is used to distinguish a SM sent to the mobile station in order to acknowledge an MO-SM initiated by the mobile from a normal MT-SM. This parameter is formatted according to the formatting rules of address fields as described in GSM 03.40.

7.6.8.17 SM-RP-SMEA

This parameter represents the RP-Originating SME-address of the Short Message Entity that has originated the SM. This parameter is used by the short message service relay sub-layer protocol and is formatted according to the formatting rules of address fields as described in GSM 03.40.

7.6.9 Access and signalling system related parameters

7.6.9.1 BSS-apdu

This parameter includes one or two concatenated complete 08.06 messages, as described in GSM 03.09 and GSM 09.10. The Protocol ID indicates that the message or messages are according to GSM 08.06. For the coding of the messages see GSM 08.06 and GSM 08.08.

7.6.9.2 CM service type

This parameter identifies the service category being requested by the subscriber:

- mobile originating call;
- emergency call establishment;
- short message service;
- mobile originating call re-establishment;
- mobile terminating call;
- SS request;
- Voice group call setup;
- Voice broadcast setup.

7.6.9.3 Access connection status

This parameter represents the following access connection status information:

- RR-connection status (established/not established);
- ciphering mode (on/off);
- authentication status (authenticated/not authenticated).

7.6.9.4 External Signal Information

This parameter contains concatenated information elements (including tag and length) which are defined by a common protocol version, preceded by the associated protocol ID. It is used to transport information of the indicated protocol via MAP interfaces.

7.6.9.5 Access signalling information

This parameter refers to any set of information elements imported from GSM 04.08.

7.6.9.6 Location update type

This parameter refers to the location update type (normal, periodic or IMSI attach) contained in the GSM 04.08 LOCATION REGISTRATION REQUEST message.

7.6.9.7 Protocol ID

This parameter refers to the protocol to which the coding of the content of the associated External Signal Information conforms.

The following values are defined:

- 04.08;
- 08.06;
- ETS 300 102-1.

This value indicates the protocol defined by ETS 300 102-1 (EDSS1).

7.6.9.8 Network signal information

This parameter is transported as external signal information. The protocol ID shall be set to "ETS 300 102-1".

The network signal information may include the following information elements as defined in GSM 09.07:

- ISDN BC; the tag and length are defined by ETS 300 102-1.
For the content, see GSM 09.07.
- HLC; the tag and length are defined by ETS 300 102-1.
For the content, see GSM 09.07.
- LLC; the tag and length are defined by ETS 300 102-1.
For the content, see GSM 09.07.

They are contained in the Signal Information parameter according to figure 7.6/1 (irrespective of the order):

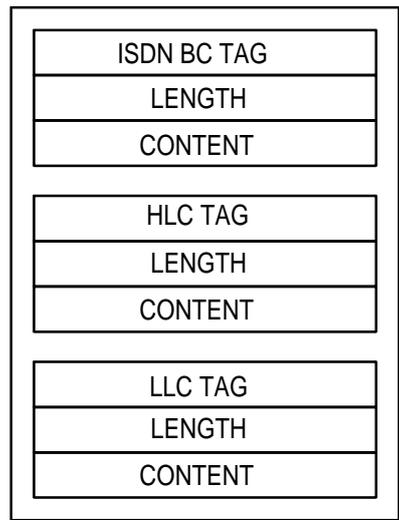


Figure 7.6/1: Network signal information parameter

7.6.9.9 Call Info

This parameter is transported as external signal information. The protocol ID shall be set to "GSM 04.08".

The Call Info includes the set of information elements from the original SETUP message and is imported from GSM 04.08.

7.6.9.10 Additional signal info

This parameter is transported as ext-external signal information. The protocol ID shall be set to "ETS 300 356".

The additional signal information may include the following information elements:

- Calling Party Number as defined by ETS 300 356.
- Generic Number as defined by ETS 300 356.

They are contained in the Signal Information parameter according to figure 7.6/2 (irrespective of the order):

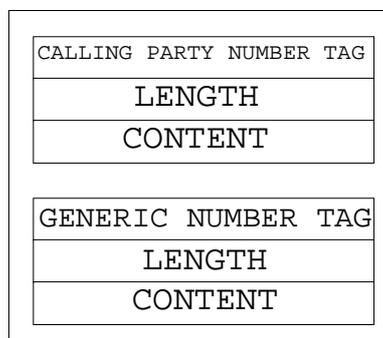


Figure 7.6/2: Additional signal information parameter

7.6.10 System operations parameters

7.6.10.1 Network resources

This parameter refers to a class or type of network resource:

- PLMN;
- HLR;
- VLR (current or previous);
- MSC (controlling or current);
- EIR;
- radio sub-system.

7.6.10.2 Trace reference

This parameter represents a reference associated with a tracing request. The parameter is managed by OMC.

7.6.10.3 Trace type

This parameter identifies the type of trace. Trace types are fully defined in GSM 12.08.

7.6.11 Location Service Parameters

7.6.11.1 Age of Location Estimate

This parameter indicates how long ago the location estimate was obtained.

7.6.11.2 Report Error Indication

If present, this parameter requests an LCS Information Report error message from a serving MSC when an LCS Information message from an SMLC cannot be transferred to a target LMU.

7.6.11.3 LCS Cause

This parameter contains the reason why LCS data could not be transferred to an LMU.

7.6.11.4 LCS Client ID

This parameter provides information related to the identity of an LCS client.

7.6.11.5 LCS Event

This parameter identifies an event associated with the triggering of a location estimate.

7.6.11.6 LCS MLC Data

This parameter provides the identities of any home GMLCs for a target MS. Only these GMLCs are allowed to send a location request for an external client when location requests are restricted to the home PLMN.

7.6.11.7 LCS Priority

This parameter gives the priority of the location request.

7.6.11.8 LCS QoS

This parameter defines the Quality of Service (QoS) for any location request. It is composed of the following elements.

1) Response Time

Indicates the category of response time – “no delay”, “low delay” or “delay tolerant”

2) Accuracy

Indicates the required accuracy of the location estimate.

7.6.11.9 LCS APDU

This parameter carries LCS related data between an SMLC and a BSC or LMU. For data transfer to or from an LMU, it is identical to the Facility Information Element defined in GSM 04.71. For data transfer to or from a BSC, it is identical to the LCS Information parameter defined in GSM 08.71.

7.6.11.10 LMU List

This parameter defines a list of LMUs sharing the same SMLC.

7.6.11.11 Location Estimate

This parameter gives an estimate of the location of an MS in universal coordinates and the accuracy of the estimate.

7.6.11.12 Location Type

This parameter indicates the type of location required by the LCS client. Possible types include:

- current location
- current or last known location
- initial location for an emergency services call

7.6.11.13 NA-ESRD

This parameter only applies to location for an emergency services call in North America and gives the North American Emergency Services Routing Digits.

7.6.11.14 NA-ESRK

This parameter only applies to location for an emergency services call in North America and gives the North American Emergency Services Routing Key.

7.6.11.15 Positioning Data

This parameter provides data on the positioning process for possible use in billing in location method evaluation. The data includes the following for each position method attempt:

- positioning method
- positioning result (success, failure)
- positioning duration
- resources used

7.6.11.16 Privacy Override

This parameter indicates if MS privacy is overridden by the LCS client when the GMLC and VMSC for an MR-LR are in the same country.

7.6.11.17 Radio Channel Type

This parameter identifies the type of radio channel currently assigned to or to be assigned to the target MS.

7.6.11.18 Registration Type

This parameter distinguishes LMU registration in an SMLC from LMU deregistration.

7.6.11.19 Release Forbidden

This parameter indicates if an LMU is forbidden to release a signaling channel to the serving MSC.

7.7 Representation of a list of a basic parameter in service-primitives

In some service-primitives several instances of a basic parameter of subclause 7.6 are required. In the service descriptions such cases will be represented as



in the tables where ParameterName refers to one of the parameters defined in subclause 7.6. This corresponds to the following construction rule:

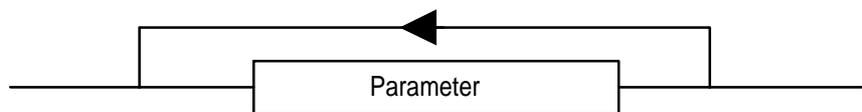


Figure 7.7/1: Construction of Lists

8 Mobility services

8.1 Location management services

8.1.1 MAP_UPDATE_LOCATION_AREA service

8.1.1.1 Definition

This service is used between MSC and VLR to update location information in the network. It is initiated by an MS when changing the location area or at first registration. The detailed conditions are given in GSM 03.12.

The MAP_UPDATE_LOCATION_AREA service is a confirmed service using the primitives from table 8.1/1.

8.1.1.2 Service primitives

Table 8.1/1: MAP_UPDATE_LOCATION_AREA

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Target location area Id	M	M(=)		
Serving cell Id	M	M(=)		
Location update type	M	M(=)		
IMSI	C	C(=)		
TMSI	C	C(=)		
Previous location area Id	C	C(=)		
CKSN	C	C(=)		
User error			C	C(=)
Provider error				O

8.1.1.3 parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

Target location area Id

See definition in subclause 7.6.2.

Serving cell Id

See definition in subclause 7.6.2.

Location update type

See definition in subclause 7.6.9.

IMSI

See definition in subclause 7.6.2. It is up to the MS to provide either IMSI or TMSI, but one shall be present.

TMSI

See definition in subclause 7.6.2. It is up to the MS to provide either IMSI or TMSI, but one shall be present.

Previous location area Id

See definition in subclause 7.6.2. This parameter is provided if the updating is not a first registration.

CKSN

See definition in subclause 7.6.7. The CKSN is given if TMSI is used.

User error

One of the following error causes defined in subclause 7.6.1 is sent by the user in case of location area updating failures, depending on the failure reason:

- unknown subscriber;

This cause is used if the subscriber is not known in the VLR and even a correlated request to the subscriber's HLR gives a negative result (i.e. the IMSI is not allocated to a subscriber).

- unknown location area;

This cause is used if the target location area identity given is not known in the VLR.

- roaming not allowed;

This cause is used if the MS is not allowed to roam into the target location area indicated in the MAP_UPDATE_LOCATION_AREA Req. The cause will be qualified according to the roaming restriction reason, i.e. one of "National Roaming Not Allowed", "PLMN Not Allowed", "Location Area Not Allowed", or "Operator Determined Barring".

- illegal subscriber;

This error is sent if a correlated authentication procedure has not authenticated the subscriber.

- illegal equipment;

This error is sent if an IMEI check failed, i.e. the IMEI is blacklisted or not white-listed.

- system failure;
- unexpected data value.

Provider error

For definition of provider errors see subclause 7.6.1.

8.1.2 MAP_UPDATE_LOCATION service

8.1.2.1 Definition

This service is used by the VLR to update the location information stored in the HLR.

The MAP_UPDATE_LOCATION service is a confirmed service using the service primitives given in table 6.1/2.

8.1.2.2 Service primitives

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
MSC Address	M	M(=)		
VLR number	M	M(=)		
LMSI	U	C(=)		
Supported CAMEL Phases	C	C(=)		
SoLSA Support Indicator	C	C(=)		
IST Support Indicator	C	C(=)	C	C(=)
HLR number				
User error			C	C(=)
Provider error				O

Table 8.1/2: MAP_UPDATE_LOCATION

8.1.2.3 Parameter definitions and use

Invoke Id

See definition in subclause 5.6.1.

IMSI

See definition in subclause 5.6.2.

MSC Address

See definition in subclause 5.6.2. The MSC address is used for short message delivery only and for each incoming call set-up attempt the MSRN will be requested from the VLR.

VLR number

See definition in subclause 5.6.2.

LMSI

See definition in subclause 5.6.2. It is an operator option to provide the LMSI from the VLR; it is mandatory for the HLR to support the LMSI handling procedures.

Supported CAMEL Phases

This parameter indicates which phases of CAMEL are supported. Must be present if a CAMEL phase different from phase 1 is supported. Otherwise may be absent.

HLR number

See definition in subclause 5.6.2. The presence of this parameter is mandatory in case of successful HLR updating.

SoLSA Support Indicator

This parameter is used by the VLR to indicate to the HLR in the Update Location indication that SoLSA is supported. If this parameter is not included in the Update Location indication and the Subscriber is marked as only allowed to roam in Subscribed LSAs, then the HLR shall reject the roaming and indicate to the VLR that roaming is not allowed to that Subscriber in the VLR.

This SoLSA Support Indicator shall be stored by the HLR per VLR where there are Subscribers roaming. If a Subscriber is marked as only allowed to roam in Subscribed LSAs while roaming in a VLR and no SoLSA Support indicator is stored for that VLR, the location status of that Subscriber shall be set to Restricted.

IST Support Indicator

This parameter is used to indicate to the HLR that the VMSC supports basic IST functionality, that is, the VMSC is able to terminate the Subscriber Call Activity that originated the IST Alert when it receives the IST alert response indicating that the call(s) shall be terminated. If this parameter is not included in the Update Location indication and the Subscriber is marked as an IST Subscriber, then the HLR may limit the service for the subscriber (by inducing an Operator Determined barring of Roaming, Incoming or Outgoing calls), or allow service assuming the associated risk of not having the basic IST mechanism available.

This parameter can also indicate that the VMSC supports the IST Command service, including the ability to terminate all calls being carried for the identified subscriber by using the IMSI as a key. If this additional capability is not included in the Update Location indication and the HLR supports the IST Command capability, then the HLR may limit the service for the subscriber (by inducing an Operator Determined barring of Roaming, Incoming or Outgoing calls), or allow service assuming the associated risk of not having the IST Command mechanism available.

User error

In case of unsuccessful updating, an error cause shall be returned by the HLR. The following error causes defined in subclause 5.6.1 may be used, depending on the nature of the fault:

- unknown subscriber;
- roaming not allowed;

This cause will be sent if the MS is not allowed to roam into the PLMN indicated by the VLR number. The cause is qualified by the roaming restriction reason "PLMN Not Allowed" or "Operator Determined Barring". If no qualification is received (HLR with MAP Version 1), "PLMN Not Allowed" is taken as default.

- system failure;
- unexpected data value.

Provider error

For definition of provider errors see subclause 5.6.1.

8.1.3 MAP_CANCEL_LOCATION service

8.1.3.1 Definition

This service is used between HLR and VLR to delete a subscriber record from the VLR. It may be invoked automatically when an MS moves from one VLR area to another, to remove the subscriber record from the old VLR, or by the HLR operator to enforce a location updating from the VLR to the HLR, e.g. on withdrawal of a subscription.

Also this service is used between HLR and SGSN to delete a subscriber record from the SGSN. It may be invoked automatically when an MS moves from one SGSN area to another, to remove the subscriber record from the old SGSN, or by the HLR operator to enforce a location updating from the SGSN to the HLR.

The MAP_CANCEL_LOCATION service is a confirmed service using the primitives defined in table 8.1/3.

8.1.3.2 Service primitives

Table 8.1/3: MAP_CANCEL_LOCATION

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
LMSI	C	C(=)		
Cancellation Type	C	C(=)		
User error			C	C(=)
Provider error				O

8.1.3.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2.

LMSI

See definition in subclause 7.6.2. The LMSI shall be included if it has been received from VLR. LMSI is not applicable between SGSN and HLR.

Value 0000 0000 can be used to indicate that the LMSI is not in use.

Cancellation Type

See definition in subclause 5.6.3. The presence of this parameter is mandatory when the Cancel Location is sent to the SGSN. If the VLR receives this parameter and do not understand it the VLR shall ignore it.

User error

If the cancellation fails, an error cause is to be returned by the VLR or by the SGSN. The one of the following error causes defined in subclause 5.6.1 shall be used:

- unexpected data value;
- data missing.

Provider error

For definition of provider errors see subclause 7.6.1.

8.1.4 MAP_SEND_IDENTIFICATION service

8.1.4.1 Definition

The MAP_SEND_IDENTIFICATION service is used between a VLR and a previous VLR to retrieve IMSI and authentication sets for a subscriber registering afresh in that VLR.

The MAP_SEND_IDENTIFICATION service is a confirmed service using the service primitives defined in table 8.1/4.

8.1.4.2 Service primitives

Table 8.1/4: MAP_SEND_IDENTIFICATION

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
TMSI	M	M(=)		
IMSI			C	C(=)
Authentication set			U	C(=)
User error			C	C(=)
Provider error				O

8.1.4.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

TMSI

See definition in subclause 7.6.2.

IMSI

See definition in subclause 7.6.2. The IMSI is to be returned if the service succeeds.

Authentication set

See definition in subclause 7.6.7. If the service succeeds a list of up to five authentication sets is returned, if there are any available.

User error

This parameter is mandatory if the service fails. The following error cause defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- unidentified subscriber.

Provider error

For definition of provider errors see subclause 7.6.1.

8.1.5 MAP_DETACH_IMSI service

8.1.5.1 Definition

The MAP_DETACH_IMSI service is used by the MSC to indicate to the VLR that an MS is no longer reachable. The network needs this information e.g. to reject an incoming call without initiating paging on the radio path.

The MAP_DETACH_IMSI service is a non-confirmed service using the service primitives defined in table 8.1/5.

8.1.5.2 Service primitives

Table 8.1/5: MAP_DETACH_IMSI

Parameter name	Request	Indication
Invoke Id	M	M(=)
Serving cell id	M	M(=)
IMSI	C	C(=)
TMSI	C	C(=)

8.1.5.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

Serving cell id

See definition in subclause 7.6.2.

IMSI

See definition in subclause 7.6.2. It is up to the MS to provide either IMSI or TMSI as subscriber identity, but one shall be present.

TMSI

See definition in subclause 7.6.2. It is up to the MS to provide either IMSI or TMSI as subscriber identity, but one shall be present.

8.1.6 MAP_PURGE_MS service

8.1.6.1 Definition

This service is used between the VLR and the HLR to cause the HLR to mark its data for an MS so that any request for routing information for a mobile terminated call or a mobile terminated short message will be treated as if the MS is not reachable. It is invoked when the subscriber record for the MS is to be deleted in the VLR, either by MMI interaction or automatically, e.g. because the MS has been inactive for several days.

Also this service is used between the SGSN and the HLR to cause the HLR to mark its data for an MS so that any request for routing information for a mobile terminated short message or a network requested PDP-context activation will be treated as if the MS is not reachable. It is invoked when the subscriber record for the MS is to be deleted in the SGSN, either by MMI interaction or automatically, e.g. because the MS has been inactive for several days.

The MAP_PURGE_MS service is a confirmed service using the primitives defined in table 8.1/6.

8.1.6.2 Service primitives

Table 8.1/6: MAP_PURGE_MS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
VLR number	C	C(=)		
Freeze TMSI			C	C(=)
Freeze P-TMSI			C	C(=)
SGSN number	C	C(=)		
User error			C	C(=)
Provider error				O

8.1.6.3 Parameter definitions and use

Invoke ID

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2.

VLR number

Shall be present if the sender is VLR. See definition in subclause 7.6.2.

SGSN number

Shall be present if the sender is SGSN. See definition in subclause 7.6.2

Freeze TMSI

This parameter is sent to the VLR to indicate that the TMSI has to be frozen. It shall be present if the received VLR number matches the stored VLR number.

Freeze P-TMSI

This parameter is sent to the SGSN to indicate that the P-TMSI has to be frozen. It shall be present if the received SGSN number matches the stored SGSN number.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Data Missing;
- Unexpected Data Value;
- UnknownSubscriber.

Provider error

See definition of provider errors in subclause 7.6.1.

8.1.7 MAP_UPDATE_GPRS_LOCATION service

8.1.7.1 Definition

This service is used by the SGSN to update the location information stored in the HLR.

The MAP_UPDATE_GPRS_LOCATION service is a confirmed service using the service primitives given in table 8.1/7.

8.1.7.2 Service primitives

Table 8.1/7: MAP_UPDATE_GPRS_LOCATION

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
SGSN number	M	M(=)		
SGSN address	M	M(=)		
Supported CAMEL Phases	C	C(=)		
SoLSA Support Indicator	C	C(=)		
HLR number			C	C(=)
User error			C	C(=)
Provider error				O

8.1.7.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2.

SGSN number

See definition in subclause 7.6.2.

SGSN address

See definition in subclause 7.6.2.

SoLSA Support Indicator

This parameter is used by the SGSN to indicate to the HLR in the Update GPRS Location indication that SoLSA is supported. If this parameter is not included in the Update GPRS Location indication and the Subscriber is marked as only allowed to roam in Subscribed LSAs, then the HLR shall reject the roaming and indicate to the SGSN that roaming is not allowed to that Subscriber in the SGSN.

This SoLSA Support Indicator shall be stored by the HLR per SGSN where there are Subscribers roaming. If a Subscriber is marked as only allowed to roam in Subscribed LSAs while roaming in a SGSN and no SoLSA Support indicator is stored for that SGSN, the location status of that Subscriber has to be set to Restricted.

Supported CAMEL Phases

This parameter indicates which phases of CAMEL are supported. The SGSN can only support CAMEL phase 3 or greater.

HLR number

See definition in subclause 7.6.2. The presence of this parameter is mandatory in case of successful HLR updating.

User error

In case of unsuccessful updating, an error cause shall be returned by the HLR. The following error causes defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- unknown subscriber;
- roaming not allowed;

This cause will be sent if the MS is not allowed to roam into the PLMN indicated by the SGSN number. The cause is qualified by the roaming restriction reason "PLMN Not Allowed" or "Operator Determined Barring".

- system failure;
- unexpected data value.

The diagnostic in the Unknown Subscriber may indicate “Imsi Unknown” or “Gprs Subscription Unknown”.

Provider error

For definition of provider errors see subclause 7.6.1.

8.1.8 MAP-NOTE-MM-EVENT

8.1.8.1 Definition

This service is used between the VLR and the gsmSCF when for a subscriber a mobility management event has been processed successfully, that subscriber is provisioned with M-CSI and the relevant mobility management event is marked for reporting.

8.1.8.2 Service primitives

The service primitives are shown in table 8.1/8.

Table 8.1/8: MAP_NOTE_MM_EVENT parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Event Met	M	M(=)		
Service Key	M	M(=)		
IMSI	M	M(=)		
Basic MSISDN	M	M(=)		
Location Information	C	C(=)		
LSA Identity	C	C(=)		
Supported CAMEL Phases	M	M(=)		
User error			C	C(=)
Provider error				O

8.1.8.3 Parameter use

Event Met

This parameter indicates the mobility management event that has lead to the notification. It shall have one of the following values:

- Location update in the same VLR service area
- Location update to ananother VLR service area
- IMSI attach
- MS initiated IMSI detach (explicit detach)
- Network initiated IMSI detach (implicit detach)

Service Key

See subclause 7.6.x.

IMSI

See subclause 7.6.x.

Basic MSISDN

See subclause 7.6.x.

Location Information

See subclause 7.6.x. This information shall be sent, if available.

LSA Identity

See subclause 7.6.x. This information shall be sent, if available.

Supported CAMEL Phases

See subclause 7.6.x. This information shall always be sent.

User error

This parameter is sent by the receiving entity when an error is detected. It shall have one of the following values:

- Data Missing;
- Unexpected Data Value;
- Unknown Subscriber;
- MM-EventNotSupported;

Provider error

This is defined in subclause 7.6.1.

8.2 Paging and search

8.2.1 MAP_PAGE service

8.2.1.1 Definition

This service is used between VLR and MSC to initiate paging of an MS for mobile terminated call set-up, mobile terminated short message or unstructured SS notification.

The MAP_PAGE service is a confirmed service using the primitives from table 8.2/1.

8.2.1.2 Service primitives

Table 8.2/1: MAP_PAGE

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Stored location area Id	M	M(=)		
TMSI	U	C(=)		
User error			C	C(=)
Provider error				O

8.2.1.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2. The IMSI is used to define the paging subgroup. If the TMSI is not supplied, paging on the radio path uses the IMSI as an identifier.

Stored location area Id

See definition in subclause 7.6.2.

TMSI

See definition in subclause 7.6.2. The TMSI is included if paging on the radio channel is to use the TMSI as an identifier.

User error

The following error causes defined in subclause 7.6.1 may be sent by the user in case of a paging error, depending on the failure reason:

- absent subscriber;
- unknown location area;
- busy subscriber;
- system failure;

This corresponds to the case where there is no call associated with the MAP_PAGE service, i.e. if the call has been released but the dialogue to the VLR has not been aborted.

- unexpected data value.

Provider error

See definition in subclause 7.6.1.

8.2.2 MAP_SEARCH_FOR_MS service

8.2.2.1 Definition

This service is used between VLR and MSC to initiate paging of an MS in all location areas of that VLR. It is used if the VLR does not hold location area information confirmed by radio contact.

The MAP_SEARCH_FOR_MS service is a confirmed service using the primitives from table 8.2/2.

8.2.2.2 Service primitives

Table 8.2/2: MAP_SEARCH_FOR_MS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Current location area Id			C	C(=)
User error			C	C(=)
Provider error				O

8.2.2.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2. The IMSI is used to identify the subscriber when paging on the radio path.

Current location area Id

See definition in subclause 7.6.2. In case of successful outcome of the service, i.e. if the MS responds to paging, the Location Area Id of the area in which the MS responded is given in the response.

User error

The following error causes defined in subclause 7.6.1 shall be sent by the user if the search procedure fails, depending on the failure reason:

- absent subscriber;

This error cause is returned by the MSC if the MS does not respond to the paging request.

- system failure;

This corresponds to the case where there is no call associated with the MAP_SEARCH_FOR_MS service, i.e. if the call has been released but the dialogue to the VLR has not been aborted.

- busy subscriber;
- unexpected data value.

Provider error

See definition in subclause 7.6.1.

8.3 Access management services

8.3.1 MAP_PROCESS_ACCESS_REQUEST service

8.3.1.1 Definition

This service is used between MSC and VLR to initiate processing of an MS access to the network, e.g. in case of mobile originated call set-up or after being paged by the network.

The MAP_PROCESS_ACCESS_REQUEST service is a confirmed service using the primitives from table 8.3/1.

8.3.1.2 Service primitives

Table 8.3/1: MAP_PROCESS_ACCESS_REQUEST

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
CM service type	M	M(=)		
Access connection status	M	M(=)		
Current Location Area Id	M	M(=)		
Serving cell id	M	M(=)		
TMSI	C	C(=)		
Cksn	C	C(=)		
IMSI	C	C(=)	C	C(=)
IMEI	C	C(=)	C	C(=)
MSISDN			U	C(=)
User error			C	C(=)
Provider error				O

8.3.1.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

CM service type

See definition in subclause 7.6.9.

Access connection status

See definition in subclause 7.6.9.

Current Location Area Id

See definition in subclause 7.6.2. This parameter is used to update the VLR in case of previous VLR failure.

Serving cell id

See definition in subclause 7.6.2.

TMSI

See definition in subclause 7.6.2. Either TMSI or IMSI as received from the MS are included in the Request/Indication, but one shall be present. In case of CM Service Type "Emergency Call Establishment", the IMEI may replace IMSI/TMSI.

Cksn

See definition in subclause 7.6.7. In case of access with TMSI, the Cksn shall be present.

IMSI

See definition in subclause 7.6.2. Either TMSI or IMSI as received from the MS are included in the Request/Indication, but one shall be present. In case of CM Service Type "Emergency Call Establishment", the IMEI may replace IMSI/TMSI.

In the Response/Confirmation, the IMSI is to be sent in case of successful outcome of the service. In case of CM Service Type "Emergency Call Establishment", IMEI may replace IMSI.

IMEI

See definition in subclause 7.6.2. The IMEI may replace IMSI/TMSI in the Request/Indication and IMSI in the Response/Confirmation only in case the CM Service Type indicates "Emergency Call Establishment".

MSISDN

See definition in subclause 7.6.2. The MSISDN is included in case of successful outcome of the service as an operator option, e.g. if it is needed at the MSC for charging purposes in case of call forwarding.

User error

One of the following error causes defined in subclause 7.6.1 shall be sent by the user if the access request fails, depending on the failure reason:

- unidentified subscriber;
- illegal subscriber;

This error is sent if a correlated authentication procedure has not authenticated the subscriber.

- illegal equipment;

This error is sent if an IMEI check failed, i.e. the IMEI is blacklisted or not white-listed.

- roaming not allowed;

This cause is used after VLR restart if the subscriber has no subscription for the current location area, e.g. due to regional subscription. The cause will be qualified by "location area not allowed" or "national roaming not allowed", respectively.

- unknown location area;
- system failure;
- unexpected data value.

Provider error

For definition of provider errors see subclause 7.6.1.

8.4 Handover services

8.4.1 MAP_PREPARE_HANOVER service

8.4.1.1 Definition

This service is used between MSC-A and MSC-B (E-interface) when a call is to be handed over from MSC-A to MSC-B.

The MAP_PREPARE_HANOVER service is a confirmed service using the primitives from table 8.4/1.

8.4.1.2 Service primitives

Table 8.4/1: MAP_PREPARE_HANOVER

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Target Cell Id	C	C(=)		
HO-NumberNotRequired	C	C(=)		
BSS-APDU	C	C(=)	C	C(=)
Handover Number			C	C(=)
User error			C	C(=)
Provider error				O

8.4.1.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

Target Cell Id

For definition of this parameter see subclause 7.6.2. This parameter is only included if the service is not in an ongoing transaction.

HO-Number Not Required

For definition of this parameter see subclause 7.6.6.

BSS-APDU

For definition of this parameter see subclause 7.6.9.

Handover Number

For definition of this parameter see subclause 7.6.2. This parameter shall be returned, unless the parameter HO-NumberNotRequired is sent.

User error

For definition of this parameter see subclause 7.6.1. The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- No handover number available;
- System failure;
- Unexpected data value;
- DataMissing.

Provider error

See definition of provider errors in subclause 7.6.1.

8.4.2 MAP_SEND_END_SIGNAL service

8.4.2.1 Definition

This service is used between MSC-B and MSC-A (E-interface) indicating that the radio path has been established by MSC-B to the MS. MSC-A retains then the main control of the call until it clears.

The response is used by MSC-A to inform MSC-B that all resources for the call can be released in MSC-B, either because the call has been released in MSC-A or because the call has been successfully handed over from MSC-B to another MSC.

The MAP_SEND_END_SIGNAL service is a confirmed service using the primitives from table 8.4/2.

8.4.2.2 Service primitives

Table 8.4/2: MAP_SEND_END_SIGNAL

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
BSS-APDU	M	M(=)		
Provider error				O

8.4.2.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

BSS-APDU

For definition of this parameter see subclause 7.6.9.

Provider error

For definition of this parameter see subclause 7.6.1.

8.4.3 MAP_PROCESS_ACCESS_SIGNALLING service

8.4.3.1 Definition

This service is used between MSC-B and MSC-A (E-interface) to pass information received on the A-interface in MSC-B to MSC-A.

The MAP_PROCESS_ACCESS_SIGNALLING service is a non-confirmed service using the primitives from table 8.4/3.

8.4.3.2 Service primitives

Table 8.4/3: MAP_PROCESS_ACCESS_SIGNALLING

Parameter name	Request	Indication
Invoke Id	M	M(=)
BSS-APDU	M	M(=)

8.4.3.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

BSS-APDU

For definition of this parameter see subclause 7.6.9.

8.4.4 MAP_FORWARD_ACCESS_SIGNALLING service

8.4.4.1 Definition

This service is used between MSC-A and MSC-B (E-interface) to pass information to be forwarded to the A-interface of MSC-B.

The MAP_FORWARD_ACCESS_SIGNALLING service is a non-confirmed service using the primitives from table 8.4/4.

8.4.4.2 Service primitives

Table 8.4/4: MAP_FORWARD_ACCESS_SIGNALLING

Parameter name	Request	Indication
Invoke Id	M	M(=)
BSS-APDU	M	M(=)

8.4.4.3 Parameter use

For the definition and use of all parameters and errors, see subclause 7.6.1

Invoke Id

For definition of this parameter see subclause 7.6.1.

BSS-APDU

For definition of this parameter see subclause 7.6.9.

8.4.5 MAP_PREPARE_SUBSEQUENT_HANOVER service

8.4.5.1 Definition

This service is used between MSC-B and MSC-A (E-interface) to inform MSC-A that it has been decided that a handover to either MSC-A or a third MSC (MSC-B') is required.

The MAP_PREPARE_SUBSEQUENT_HANOVER service is a confirmed service using the primitives from table 8.4/5.

8.4.5.2 Service primitives

Table 8.4/5: MAP_PREPARE_SUBSEQUENT_HANOVER

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Target Cell Id	M	M(=)		
Target MSC Number	M	M(=)		
BSS-APDU	M	M(=)	C	C(=)
User error			C	C(=)
Provider error				O

8.4.5.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

Target Cell Id

For definition of this parameter see subclause 7.6.2.

Target MSC Number

For definition of this parameter see subclause 7.6.2.

BSS-APDU

For definition of this parameter see subclause 7.6.9.

User error

For definition of this parameter see subclause 7.6.1. The following error causes defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown MSC;
- Subsequent handover failure;
- Unexpected data value;
- Data Missing.

Provider error

For definition of this parameter see subclause 7.6.1.

8.4.6 MAP_ALLOCATE_HANOVER_NUMBER service

8.4.6.1 Definition

This service is used between MSC and VLR (B-interface) to request a handover number.

The MAP_ALLOCATE_HANOVER_NUMBER service is a confirmed service using the primitives from table 8.4/6.

8.4.6.2 Service primitives

Table 8.4/6: MAP_ALLOCATE_HANOVER_NUMBER

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
User error			C	C(=)
Provider error				O

8.4.6.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

User error

For definition of this parameter see subclause 7.6.1. The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- No handover number available.

Provider error

For definition of this parameter see subclause 7.6.1.

8.4.7 MAP_SEND_HANOVER_REPORT service

8.4.7.1 Definition

This service is used between VLR and MSC-B (B-interface) to transfer the handover number to be forwarded to and used by MSC-A.

The MAP_SEND_HANOVER_REPORT service is a confirmed service using the primitives from table 8.4/7.

8.4.7.2 Service primitives

Table 8.4/7: MAP_SEND_HANOVER_REPORT

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Handover Number	M	M(=)		Linked Id
M	M(=)	O	Provider error	

8.4.7.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

Handover Number

For definition of this parameter see subclause 7.6.2.

Linked Id

For definition of this parameter see subclause 7.6.1. This service is linked with MAP_ALLOCATE_HANOVER_NUMBER.

Provider error

For definition of this parameter see subclause 7.6.1.

8.5 Authentication management services

8.5.1 MAP_AUTHENTICATE service

8.5.1.1 Definition

This service is used between the VLR and the MSC when the VLR receives a MAP service indication from the MSC concerning a location registration, call set-up, operation on a supplementary service or a request from the MSC to initiate authentication.

The service is a confirmed service and consists of four service primitives.

8.5.1.2 Service primitives

The service primitives are shown in table 8.5/1

Table 8.5/1: MAP_AUTHENTICATE parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
RAND	M	M(=)		
CKSN	M	M(=)		
SRES			M	M(=)
Provider error				O

8.5.1.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

RAND

See subclause 7.6.7 for the use of this parameter.

CKSN

See subclause 7.6.7 for the use of this parameter.

SRES

See subclause 7.6.7 for the use of this parameter.

Provider error

See subclause 7.6.1 for the use of this parameter.

8.5.2 MAP_SEND_AUTHENTICATION_INFO service

8.5.2.1 Definition

This service is used between the VLR and the HLR for the VLR to retrieve authentication information from the HLR. The VLR requests some sets of RAND/SRES/Kc vectors.

Also this service is used between the SGSN and the HLR for the SGSN to retrieve authentication information from the HLR. The SGSN requests some sets of RAND/SRES/Kc vectors.

If the HLR cannot provide the VLR or the SGSN with triplets, an empty response is returned. The VLR or the SGSN may then re-use old authentication triplets, except where this is forbidden under the conditions specified in GSM 03.20 [24].

If the VLR or SGSN receives a MAP-Send_AUTHENTICATION_INFO response containing a User Error parameter as part of the handling of an authentication procedure, the authentication procedure in the VLR or SGSN shall fail.

Security related network functions are further described in GSM 03.20.

The service is a confirmed service and consists of four service primitives.

8.5.2.2 Service primitives

The service primitives are shown in table 8.5/2.

Table 8.5/2: MAP_SEND_AUTHENTICATION_PARAMETERS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
AuthenticationSetList			C	C(=)
User error			C	C(=)
Provider error				O

8.5.2.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

IMSI

See subclause 7.6.2 for the use of this parameter.

AuthenticationSetList

A set of one to five authentication vectors are transferred from the HLR to the VLR or from the HLR to the SGSN, if the outcome of the service was successful.

User error

One of the following error causes defined in subclause 7.6.1 shall be sent by the user in case of unsuccessful outcome of the service, depending on the respective failure reason:

- unknown subscriber;
- unexpected data value;
- system failure;
- data missing.

Provider error

See subclause 7.6.1 for the use of this parameter.

8.6 Security management services

8.6.1 MAP_SET_CIPHERING_MODE service

8.6.1.1 Definitions

This service is used between the VLR and the MSC to set the ciphering mode and to start ciphering if applicable. It is called when another service requires that information is to be sent on the radio path in encrypted form.

The service is a non-confirmed service and consists of two service primitives.

8.6.1.2 Service primitives

The service primitives are shown in table 8.6/1

Table 8.6/1: MAP_SET_CIPHERING_MODE parameters

Parameter name	Request	Indication
Invoke id	M	M(=)
Ciphering mode	M	M(=)
Kc	C	C(=)

8.6.1.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

Ciphering mode

See subclause 7.6.7 for the use of this parameter.

Kc

The Kc parameter should be included when the ciphering mode parameter indicates that ciphering must be performed.

8.7 International mobile equipment identities management services

8.7.1 MAP_CHECK_IMEI service

8.7.1.1 Definition

This service is used between the VLR and the MSC and between the MSC and the EIR and between the SGSN and EIR to request check of IMEI. If the IMEI is not available in the MSC or in the SGSN, it is requested from the MS and transferred to the EIR in the service request.

The service is a confirmed service and consists of four service primitives.

8.7.1.2 Service primitives

The service primitives are shown in table 8.7/1.

Table 8.7/1: MAP_CHECK_IMEI parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMEI	C	C(=)	C	C(=)
Equipment status			C	C(=)
User error			C	C(=)
Provider error				O

8.7.1.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

IMEI

See subclause 7.6.2 for the use of this parameter. The parameter shall not be included in the service request between the VLR and the MSC, but is mandatory in the service request from the MSC to the EIR and from the SGSN to the EIR. It is not included in the service response from the EIR to the MSC or to the SGSN, but is mandatory in the service response from the MSC to the VLR on successful outcome.

Equipment status

See subclause 7.6.4 for the use of this parameter. This parameter is sent by the responder in case of successful outcome of the service.

User error

One of the following error causes defined in subclause 7.6.1 shall be sent by the user in case of unsuccessful outcome of the service, depending on the respective failure reason:

- unknown equipment;

This error is returned by the responder when the IMEI is not known in the EIR.

- system failure;
- unexpected data value.

Provider error

See subclause 7.6.1 for the use of this parameter.

8.7.2 MAP_OBTAIN_IMEI service

8.7.2.1 Definition

This service is used between the VLR and the MSC to request the IMEI. If the IMEI is not available in the MSC, it is requested from the MS.

The service is a confirmed service and consists of four service primitives.

8.7.2.2 Service primitives

The service primitives are shown in table 8.7/2.

Table 8.7/2: MAP_OBTAIN_IMEI parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMEI			C	C(=)
User error			C	C(=)
Provider error				O

8.7.2.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

IMEI

See subclause 7.6.2 for the use of this parameter. The parameter IS included in the service response from the MSC to the VLR on successful outcome of the service.

User error

If the service fails, the VLR sends the user error System Failure (see subclause 7.6.1) to the MSC.

Provider error

See subclause 7.6.1 for the use of this parameter.

8.8 Subscriber management services

8.8.1 MAP-INSERT-SUBSCRIBER-DATA service

8.8.1.1 Definition

This service is used by an HLR to update a VLR with certain subscriber data in the following occasions:

- the operator has changed the subscription of one or more supplementary services, basic services or data of a subscriber. Note that in case of withdrawal of a Basic or Supplementary service this primitive shall not be used;
- the operator has applied, changed or removed Operator Determined Barring;
- the subscriber has changed data concerning one or more supplementary services by using a subscriber procedure;
- the HLR provides the VLR with subscriber parameters at location updating of a subscriber or at restoration. In this case, this service is used to indicate explicitly that a supplementary service is not provisioned, if the supplementary service specification requires it. The only supplementary services which have this requirement are the CLIR and COLR services. Network access mode is provided only in restoration.

Also this service is used by an HLR to update a SGSN with certain subscriber data in the following occasions:

- if the GPRS subscription has changed;
- if the network access mode is changed;
- the operator has applied, changed or removed Operator Determined Barring;
- the HLR provides the SGSN with subscriber parameters at GPRS location updating of a subscriber.

It is a confirmed service and consists of the primitives shown in table 6.8/1.

8.8.1.2 Service primitives

Table 8.8/1: MAP-INSERT-SUBSCRIBER-DATA

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
MSISDN	C	C(=)		
Category	C	C(=)		
Subscriber Status	C	C(=)		
Bearer service List	C	C(=)	C	C(=)
Teleservice List	C	C(=)	C	C(=)
Forwarding information List	C	C(=)		
Call barring information List	C	C(=)		
CUG information List	C	C(=)		
SS-Data List	C	C(=)		
eMLPP Subscription Data	C	C(=)		
Operator Determined Barring General data	C	C(=)	C	C(=)
Operator Determined Barring HPLMN data	C	C(=)		
Roaming Restriction Due To Unsupported Feature	C	C(=)		
Regional Subscription Data	C	C(=)		
VLR CAMEL Subscription Info	C	C(=)		
Voice Broadcast Data	C	C(=)		
Voice Group Call Data	C	C(=)		
Network access mode	C	C(=)		
GPRS Subscription Data	C	C(=)		
Roaming Restricted In SGSN Due To Unsupported Feature	C	C(=)		
North American Equal Access preferred Carrier Id List	U	C(=)		
SGSN Camel Subscription Info	C	C(=)		
LSA Information	C	C(=)		
IST Alert Timer	C	C(=)		
SS-Code List			C	C(=)
LMU Identifier	C	C(=)		
LCS Information	C	C(=)		
Regional Subscription Response			C	C(=)
Supported CAMEL Phases			C	C(=)
User error			U	C(=)
Provider error				O

8.8.1.3 Parameter use

Network access mode

This parameter defines if the subscriber has access to MSC/VLR and/or to SGSN. This parameter is used by SGSN and MSC/VLR. In VLR, the parameter is used only as part of Restore Data Procedure and the parameter is not stored in the VLR.

All parameters are described in subclause 7.6. The following clarifications are applicable:

IMSI

It is only included if the service is not used in an ongoing transaction (e.g. location updating). This parameter is used by the VLR and the SGSN.

MSISDN

It is included either at location updating or when it is changed. The MSISDN sent shall be the basic MSISDN. This parameter is used by the VLR and the SGSN.

Category

It is included either at location updating or when it is changed. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Subscriber Status

It is included either at location updating or when it is changed.

To apply, remove or update Operator Determined Barring Categories the Subscriber Status is set to Operator Determined Barring. In this case ODB General Data shall also be present. If the Operator Determined Barring applies and the subscriber is registered in the HPLMN and HPLMN specific Operator Determined Barring applies then ODB HPLMN Specific Data shall also be present.

To remove all Operator Determined Barring Categories the Subscriber Status shall be set to "Service Granted". This parameter is used by the VLR and the SGSN.

Bearer service List

A list of Extensible Bearer service parameters (Extensible Bearer service is defined in subclause 7.6). An Extensible Bearer service parameter must be the code for an individual Bearer service, except in the cases described below.

The codes for the Bearer service groups "allAlternateSpeech-DataCDA" and "allAlternateSpeech-DataCDS" shall, if applicable, be sent from the HLR to the VLR as a pair. The codes for the Bearer service groups "allSpeechFollowedByDataCDA" and "allSpeechFollowedByDataCDS" shall, if applicable, be sent from the HLR to the VLR as a pair.

If it is included in the Request/Indication, it includes either all Extensible Bearer services subscribed (at location updating or at restoration) or only the ones added (at subscriber data modification).

If the VLR receives an Indication containing any Extensible Bearer service parameters which it does not support/allocate it returns them in the response to the HLR and discards the unsupported Extensible Bearer services (no error is sent back), except in the cases described below.

If the VLR receives the codes for the Bearer service groups "allSpeechFollowedByDataCDA" and "allSpeechFollowedByDataCDS" and supports one or more of the circuit-switched synchronous or asynchronous data rates specified for simple data bearer services, it shall accept the bearer service codes, and not return them in the response to the HLR. If the VLR does not support any of the circuit-switched synchronous or asynchronous data rates specified for simple data bearer services, and receives the pair of codes for "allAlternateSpeech-DataCDA" and "allAlternateSpeech-DataCDS" or the pair of codes for "allSpeechFollowedByDataCDA" and "allSpeechFollowedByDataCDS", it shall reject the pair of codes by returning them in the response to the HLR. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Teleservice List

A list of Extensible Teleservice parameters (Extensible Teleservice is defined in subclause 7.6). An Extensible Teleservice parameter must be the code for an individual Teleservice.

If it is included in the Request/Indication, it contains either all Extensible Teleservices subscribed (at location updating or at restoration) or the ones added (at subscriber data modification). Only the Extensible Teleservices that are relevant to the node at which the message is received should be included in the Teleservice List.

If the VLR or the SGSN receives an Indication containing any Extensible Teleservice parameters which it does not support/allocate it returns them in the response to the HLR and discards the unsupported Extensible Teleservices (no error is sent back). This parameter is used by the VLR and the SGSN.

Forwarding information List

A list of Extensible Forwarding information parameters (Extensible Forwarding information is defined in subclause 7.6). It includes Call Forwarding services either at location updating or at restoration or when they are changed. Each Extensible Forwarding information parameter shall be treated independently of all other parameters in the primitive.

The Extensible Forwarding information shall include the SS-Code for an individual call forwarding supplementary service. The Extensible Forwarding information shall contain one or more Extensible Forwarding Features (Extensible Forwarding Feature is defined in subclause 7.6).

The Extensible Forwarding Feature may include an Extensible Basic Service Group. This shall be interpreted according to the rules in subclause 8.8.1.4.

The Extensible Forwarding Feature shall contain an Extensible SS-Status parameter.

If the Extensible SS-Status indicates that call forwarding is registered then (except for call forwarding unconditional) the Extensible Forwarding Feature shall contain a forwarded-to number and, if available, the forwarded-to subaddress. In other states the forwarded-to number and, if applicable, the forwarded-to subaddress shall not be included. For call forwarding unconditional the forwarded-to number and, if applicable, the forwarded-to subaddress shall not be included. If the VLR does not receive a forwarded-to subaddress then it shall assume that a forwarded-to subaddress has not been registered.

The Extensible Forwarding Feature shall contain the extensible forwarding options (except for call forwarding unconditional where the extensible forwarding options shall not be included). Bits 3 and 4 of the extensible forwarding options shall be ignored by the VLR, and may be set to any value by the HLR.

For call forwarding on no reply: If the extensible SS-Status indicates that call forwarding is registered then the Extensible Forwarding Feature shall contain an extensible no reply condition timer. In other states the no reply condition timer shall not be included.

For call forwarding services other than call forwarding on no reply: The Extensible Forwarding Feature shall not contain a no reply condition timer.

If the VLR receives an Indication containing any Call Forwarding service codes which it does not support/allocate it returns them to the HLR in the parameter SS-Code List and discards the unsupported Call Forwarding service codes (no error is sent back). This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Call barring information List

A list of Extensible Call barring information parameters (Extensible Call barring information is defined in subclause 7.6). It includes Call Barring services either at location updating or at restoration or when they are changed. Each Extensible Call barring information parameter shall be treated independently of all other parameters in the primitive.

The Extensible Call barring information shall include the SS-Code for an individual call barring supplementary service. The Extensible Call barring information shall contain one or more Extensible Call Barring Features (Extensible Call Barring Feature is defined in subclause 7.6).

The Extensible Call Barring Feature may include an Extensible Basic Service Group. This shall be interpreted according to the rules in subclause 8.8.1.4.

The Extensible Call Barring Feature shall contain an extensible SS-Status parameter.

If the VLR receives an Indication containing any Extensible Call Barring service codes which it does not support/allocate it returns them to the HLR in the parameter SS-Code List and discards the unsupported Extensible Call Barring service codes (no error is sent back). This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

CUG information List

A list of CUG information list parameters (CUG information is defined in subclause 7.6). It includes CUG information either at location updating or at restoration or when it is changed.

At location updating, restoration or when there is a change in CUG data, the HLR shall include the complete CUG-SubscriptionList and, if there are options per basic group, it shall also include the complete CUG-FeatureList. If there are not options per extensible basic service group the CUG-FeatureList shall not be included.

In any dialogue, the first insertSubscriberData message which contains CUG information shall include a non-empty CUG-SubscriptionList.

When the VLR receives CUG data it shall replace the stored CUG data with the received data set.

If CUG-FeatureList is omitted in the Insert Subscriber Data operation VLR shall interpret that no options per extensible basic service group exist, and then it shall apply the default values i.e. no outgoing access, no incoming access, no preferential CUG exists.

If CUG-Feature is received without preferential CUG, the VLR shall interpret that no preferential CUG applies.

If the VLR detects that there is overlapping in the information received within a dialogue, it shall send the error Unexpected Data Value.

Note that data consistency between CUG subscription data and CUG feature data is the responsibility of the HLR.

If the VLR does not support the CUG service it returns its code to the HLR in the parameter SS-Code List and discards the received information (no error is sent back). This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

SS-Data List

A list of Extensible SS-Data parameters (Extensible SS-Data is defined in subclause 7.6). It is sent for any other supplementary service than Call Forwarding, Call Barring, CUG and eMLPP either at location updating or at restoration or when they are changed. Each SS-Data parameter shall be treated independently of all other parameters in the primitive.

The Extensible SS-Data shall include the SS-Code for an individual supplementary service.

The Extensible SS-Data shall contain an Extensible SS-Status parameter and any subscription options that are applicable to the service defined by the SS-Code.

The SS-Data may include a Basic Service Group List. This shall be interpreted according to the rules in subclause 8.8.1.4.

If the VLR receives an Indication containing any supplementary service codes which it does not support/allocate it returns them to the HLR in the parameter SS-Code List and therefore discards the unsupported service codes received (no error is sent back). This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Operator Determined Barring General data

If it is included in a Request/Indication, it includes all the Operator Determined Barring categories that may be applied to a subscriber registered in any PLMN. This parameter is only included in a Request/Indication when the parameter Subscriber Status is set to the value Operator Determined Barring. Note that all General Operator Determined Barring Categories shall be set to their actual status.

If the VLR or the SGSN receives an Indication containing Operator Determined Barring General Data which shows that the subscriber is subject to barring not supported / not allocated by the VLR or by the SGSN, it returns Operator Determined Barring General Data in the response to the HLR to show the barring categories which are not supported / not allocated by the VLR or by the SGSN. This parameter is used by the VLR and the SGSN.

Operator Determined Barring HPLMN data

It includes all the Operator Determined Barring categories that may be applied only to a subscriber registered in the HPLMN. Therefore, it shall only be transferred to the VLR or to the SGSN when the subscriber is roaming into the HPLMN and when the parameter Subscriber Status is set to the value Operator Determined Barring. Note that all HPLMN Operator Determined Barring Categories shall be set to their actual status.

If Subscriber Status is set to the value Operator Determined Barring and no Operator Determined Barring HPLMN data is present then the VLR or the SGSN shall not apply any HPLMN specific ODB services to the subscriber. This parameter is used by the VLR and the SGSN.

eMLPP Subscription Data

If included in the Insert Subscriber Data request this parameter defines the priorities the subscriber might apply for a call (as defined in subclause 7.6). It contains both subparameters of eMLPP.

If the VLR does not support the eMLPP service it returns its code to the HLR in the parameter SS-Code List and therefore discards the received information (no error is sent back).

eMLPP subscription data that have been stored previously in a subscriber data record in the VLR are completely replaced by the new eMLPP subscription data received in a MAP_INSERT_SUBSCRIBER_DATA during either an Update Location or Restore Data procedure or a stand alone Insert Subscriber data procedure. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Roaming Restriction Due To Unsupported Feature

The HLR may decide to include this parameter in the request if certain services or features are indicated as not supported by the MSC/VLR (e.g. Advice of Charge Charging Level).

If this parameter is sent to the VLR the MSC area is restricted by the HLR and the VLR. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Regional Subscription Data

If included in the Insert Subscriber Data request this parameter defines the subscriber's subscription area for the addressed VLR or for the addressed SGSN (as defined in subclause 7.6). It contains the complete list of up to 10 Zone Codes that apply to a subscriber in the currently visited PLMN. The HLR shall send only those Zone Codes which are stored against the CC and NDC of the VLR or the CC and NDC of the SGSN to be updated.

NOTE: Support of this parameter is a network operator option and it will not be sent to networks which do not support Regional Subscription.

Regional subscription data that have been stored previously in a subscriber data record in the VLR or in the SGSN are completely replaced by the regional subscription data received in an Insert Subscriber Data indication during either an Update Location or Restore Data procedure or a stand alone Insert Subscriber data procedure.

After the regional subscription data are inserted the VLR or the SGSN shall derive whether its location areas are allowed or not. If the whole MSC or SGSN area is restricted it will be reported to HLR by returning the Regional Subscription Response.

The VLR or the SGSN returns a Regional Subscription Response indicating that a problem with the Zone Code has been detected in one of the following cases:

- Too Many Zone Codes: more than 10 Zone Codes are to be stored in the VLR or in the SGSN;
- Regional Subscription Not Supported by the VLR or the SGSN;
- Zone Codes Conflict: the VLR or the SGSN detects that the zone codes indicate conflicting service permission for a location area.

Zone codes which have no mapping to location areas shall be ignored.

If a sequence of MAP_INSERT_SUBSCRIBER_DATA services is used during a dialogue, Regional Subscription Data shall be accepted only in one service. Regional Subscription Data received in a subsequent service shall be rejected with the error Unexpected Data Value.

If Regional Subscription Data are not included in any MAP_INSERT_SUBSCRIBER_DATA service, there is no restriction of roaming due to Regional Subscription. This parameter is used by the VLR and the SGSN.

Voice Broadcast Data

This parameter contains a list of group id's a user might have subscribed to; (VBS-Data is defined in subclause 7.6). It includes VBS information either at location updating or at restoration or when it is changed.

At location updating, restoration or when there is a change in VBS data, the HLR shall include the complete VBS-Data.

When the VLR receives VBS-Data within a dialogue it shall replace the stored VBS-data with the received data set. All subsequent VBS-dta received within this dialogue shall be interpreted as add-on data.

If VBS-data is omitted in the Insert Subscriber Data operation the VLR shall keep the previously stored VBS data.

If the VLR detects that there is overlapping in the information received within a dialogue, it shall send the error Unexpected Data Value. . This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Voice Group Call Data

This parameter contains a list of group id's a user might have subscribed to; see subclause 7.6.

At location updating, restoration or when there is a change in VGCS data, the HLR shall include the complete VGCS-Data.

When the VLR receives VGCS-Data within a dialogue it shall replace the stored VGCS-Data with the received data set. All VGCS-Data received within this dialogue shall be interpreted as add-on data.

If VBCS-Data is omitted in the Insert Subscriber Data operation the VLR shall keep the previously stored VGCS-Data.

If the VLR detects that there is overlapping in the information received within a dialogue, it shall send the error Unexpected Data Value. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

North American Equal Access preferred Carrier Id List

A list of the preferred carrier identity codes that are subscribed to.

When the VLR receives this parameter from the HLR, it shall replace the previously stored preferred carrier identity codes with the received ones. It is not possible to delete all the preferred carrier identity codes from the VLR using this service. To delete all the preferred carrier identity codes from the VLR, the HLR shall use the MAP_CANCEL_LOCATION service.

LSA Information

If included in the ISD request, this parameter contains a list of localised service area identities a user might have subscribed to together with the priority of each localised service area; see subclause 7.6. The access right outside these localised service areas is also indicated. In all cases mentioned below, the LSA information shall only include LSA Data applicable to the VPLMN where the Subscriber is located. The VLR number, received in the MAP-UPDATE_LOCATION primitive, or the SGSN number, received in the MAP_UPDATE_GPRS_LOCATION primitive, can be used, alongside data stored in the HLR, to determine the LSA Data applicable to the VPLMN.

At restoration, location updating or GPRS location updating the HLR shall include the complete set of applicable LSA Information.

When there is a change in LSA data the HLR shall include at least the new and/or modified LSA data.

When there is a change in the access right outside the localised service areas the HLR shall include the LSA only access indicator.

When the SGSN or the VLR receives LSA information within a dialogue it shall check if the received data has to be considered as the entire LSA information. If so, it shall replace the stored LSA information with the received data set, otherwise it shall replace the data only for the modified LSA data (if any) and/or access right, and add the new LSA data (if any) to the stored LSA Information.

If the entire LSA information is received, it shall always include the LSA only access indicator value together with the LSA data applicable for the PLMN (if any).

If LSA Information is omitted in the Insert Subscriber Data operation the SGSN or the VLR shall keep the previously stored LSA Information.

If the SGSN or the VLR detects that there is overlapping in the information received within a dialogue, it shall send the error Unexpected Data Value. This parameter is used by the VLR and the SGSN.

IST Alert Timer

This parameter contains the IST Alert timer value that must be used to inform the HLR about the call activities that the subscriber performs.

At Location Updating, restoration, or when there is a change in the IST data defined for the Subscriber, the HLR shall include the IST Alert timer.

LMU Identifier

This parameter indicates the presence of an LMU.

LCS Information

This parameter provides the following LCS related information for an MS subscriber:

- list of GMLCs in the HPLMN
- privacy exception list

SS-Code List

The list of SS-Code parameters that are provided to a subscriber but are not supported/allocated by the VLR (SS-Code is defined in subclause 7.6). The list can only include individual SS-Codes that were sent in the service request. This parameter is used only by the VLR.

Regional Subscription Response

If included in the response this parameter indicates one of:

- MSC Area Restricted entirely because of regional subscription;
- SGSN Area Restricted entirely because of regional subscription;
- Too Many Zone Codes to be inserted;
- Zone Codes Conflict;
- Regional Subscription not Supported by the VLR or by the SGSN.

If the VLR determines after insertion of Regional Subscription Data that the entire MSC area is restricted, the VLR shall respond with a Regional Subscription Response indicating MSC Area Restricted. Otherwise MSC Area Restricted is not sent. The HLR shall check whether the current MSC area is no longer restricted.

If the SGSN determines after insertion of Regional Subscription Data that the entire SGSN area is restricted, the SGSN shall respond with a Regional Subscription Response indicating SGSN Area Restricted. Otherwise SGSN Area Restricted is not sent. The HLR shall check whether the current SGSN area is no longer restricted. This parameter is used by the VLR and by the SGSN.

VLR CAMEL Subscription Info

This parameter is sent for subscribers who have CAMEL services which are invoked in the MSC. In CAMEL phase 1, this parameter contains only the O-CSI. In CAMEL Phase 2, this parameter may contain OCSI and SS-CSI. In CAMEL Phase 3, this parameter may contain O-CSI, D-CSI, SS-CSI, VT-CSI, SMS-CSI and M-CSI. If an O-CSI and/or VT-CSI is contained, TDP-Criteria may also be present in CAMEL Phase 2 or 3. The VLR CAMEL Subscription Info is sent at location updating or when any information in the applicable CAMEL Subscription Info in the HLR has been changed. The entire set of CAMEL Subscription Info is sent within one dialogue. If a set of CAMEL Subscription Info is already

stored in the VLR it is replaced by the received data. If the VLR CAMEL Subscription Info is omitted in the Insert Subscriber Data operation the VLR shall keep the previously stored VLR CAMEL Subscription Info. Within one dialogue subsequent received data are interpreted as add-on data. If the VLR detects that there is overlapping in the information received within a dialogue, it shall send the error Unexpected Data Value. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

The VLR CAMEL Subscription Info may contain the TIF-CSI (Translation Information Flag) for CAMEL Phase 2 and 3. See 3G TS 23.072 for the use of this parameter and the conditions for its presence.

Supported CAMEL Phases

The use of this parameter and the requirements for its presence are specified in 3G TS 23.078. This parameter is used by the VLR and SGSN.

A VLR or SGSN not supporting any CAMEL Phase may omit this parameter.

GPRS Subscription Data

This parameter contains a list of PDP-contexts a user has subscribed to; see subclause 7.6

At GPRS location updating the HLR shall include the complete GPRS Subscription Data.

When there is a change in GPRS subscriber data the HLR shall include only the new and/or modified PDP contexts.

When the SGSN receives GPRS Subscription Data within a dialogue it shall check if the received data has to be considered as the entire GPRS subscription data. If so, it shall replace the stored GPRS Subscription Data with the received data set, otherwise it shall replace the data only for the modified PDP contexts (if any) and add the new PDP contexts (if any) to the stored GPRS Subscription Data.

If GPRS Subscription Data is omitted in the Insert Subscriber Data operation the SGSN shall keep the previously stored GPRS Subscription Data.

If the SGSN detects that there is overlapping in the information received within a dialogue, it shall send the error Unexpected Data Value. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

SGSN CAMEL Subscription Info

The SGSN CAMEL Subscription Info is sent at GPRS location updating or when any information in the applicable SGSN CAMEL Subscription Info in the HLR has been changed. In CAMEL Phase 3, this parameter may contain GPRS-CSI or/and SMS-CSI. The entire set of SGSN CAMEL Subscription Info is sent. If a set of SGSN CAMEL Subscription Info is already stored in the SGSN it is replaced by the received data. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

Roaming Restricted In SGSN Due To Unsupported Feature

The HLR may decide to include this parameter in the request if certain services or features are indicated as not supported by the SGSN. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

User error

Only one of the following values is applicable:

- Unidentified subscriber;
- Data missing;
- Unexpected data value.

8.8.1.4 Basic service information related to supplementary services

A number of parameters that relate to supplementary services can be qualified by a Basic Service Group (or a Basic Service Group List). This subclause explains how this information is to be interpreted. Supplementary service parameters to which this subclause is applicable only apply to the basic service groups described in this subclause, and only those basic service groups shall be overwritten at the VLR.

The Basic Service Group (or Basic Service Group List) is optional.

If present the Basic Service Group (or the elements of the Basic Service Group List) shall be one of:

- an Elementary Basic Service Group for which the supplementary service is applicable to at least one basic service in the group; and to which the subscriber has a subscription to at least one basic service in the group;
- the group "All Teleservices" provided that the service is applicable to at least one teleservice and that the subscriber has a subscription to at least one teleservice that is in the same Elementary Basic Service Group as a teleservice to which the service is applicable;
- the group "All Bearer Services" provided that the service is applicable to at least one bearer service and that the subscriber has a subscription to at least one bearer service that is in the same Elementary Basic Service Group as a basic service to which the service is applicable.

If the Basic Service Group (or Basic Service Group List) is not present then the parameter shall apply to all Basic Service Groups.

If the basic service information is not a single Elementary Basic Service Group then the parameter shall be taken as applying individually to all the Elementary Basic Service Groups for which:

- the supplementary service is applicable to at least one basic service in the Basic Service Group; and
- the subscriber has a subscription to at least one basic service in the Basic Service Group.

The VLR is not required to store supplementary services data for Basic Service Groups that are not supported at the VLR.

8.8.2 MAP-DELETE-SUBSCRIBER-DATA service

8.8.2.1 Definition

This service is used by an HLR to remove certain subscriber data from a VLR if the subscription of one or more supplementary services or basic services is withdrawn. Note that this service is not used in case of erasure or deactivation of supplementary services.

Also this service is used by an HLR to remove GPRS subscription data from a SGSN.

It is a confirmed service and consists of the primitives shown in table 8.8/2.

8.8.2.2 Service primitives

Table 8.8/2: MAP-DELETE-SUBSCRIBER-DATA

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Basic service List	C	C(=)		
SS-Code List	C	C(=)		
Roaming Restriction Due To Unsupported Feature	C	C(=)		
Camel Subscription Info Withdraw	C	C(=)		
Regional Subscription Data	C	C(=)		
VBS Group Indication	C	C(=)		
VGCS Group Indication	C	C(=)		
GPRS Subscription Data Withdraw	C	C(=)		
Roaming Restricted In SGSN Due To Unsupported Feature	C	C(=)		
LSA Information Withdraw	C	C(=)		
IST Information Withdraw	C	C(=)		
Regional Subscription Response			C	C(=)
User error			C	C(=)
Provider error				O

8.8.2.3 Parameter use

All parameters are described in subclause 7.6. The following clarifications are applicable:

Basic service List

A list of Extensible Basic service parameters (Extensible Basic service is defined in subclause 7.6). It is used when one, several or all basic services are to be withdrawn from the subscriber. If the VLR or the SGSN receives a value for an Extensible Basic Service which it does not support, it shall ignore that value. This parameter is used by the VLR and by the SGSN.

SS-Code List

A list of SS-Code parameters (SS-Code is defined in subclause 7.6). It is used when several or all supplementary services are to be withdrawn from the subscriber.

There are three possible options:

- deletion of basic service(s);
The parameter Basic service List is only included.
- deletion of supplementary service(s);
The parameter SS-Code List is only included.
- deletion of basic and supplementary services;
Both Basic service List and SS-Code List are included.

This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Roaming Restriction Due To Unsupported Feature

This parameter is used if Roaming Restriction Due To Unsupported Feature is deleted from the subscriber data. This may occur if unsupported features or services are removed from the subscriber data in the HLR.

If this parameter is sent the VLR shall check if the current Location Area is possibly allowed now. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

CAMEL Subscription Info Withdraw

This parameter is used to indicate that CAMEL Subscription Info shall be deleted from the VLR or from the SGSN. All CAMEL Subscription Info for the subscriber shall be deleted. This parameter is used by the VLR and by the SGSN.

Regional Subscription Identifier

Contains one single Zone Code (as defined subclause 7.6) and is used if all Zone Codes shall be deleted from the subscriber data. When all the Zone Codes are deleted, the VLR or the SGSN shall check for its location areas whether they are allowed or not. If the whole MSC area is restricted, VLR will report it to HLR by returning the Regional Subscription Response "MSC Area Restricted". If the whole SGSN area is restricted, SGSN will report it to HLR by returning the Regional Subscription Response "SGSN Area Restricted".

The binary coding of the Zone Code value received in a Delete Subscriber Data request shall not be checked by the VLR or by the SGSN.

Note that support of this parameter is a network operator option and it shall not be sent to networks which do not support Regional Subscription.

If Regional Subscription is not supported by the VLR or by the SGSN, the request for deletion of Zone Codes is refused by sending the Regional Subscription Response "Regional Subscription Not Supported" to the HLR.

If no Zone Codes are stored in the respective subscriber data record, the request for deleting all Zone Code information shall be ignored and no Regional Subscription Response shall be returned. This parameter is used by the VLR and by the SGSN.

VBS Group Indication

Contains an indication (flag) which is used if all Group Id's shall be deleted from the subscriber data for the Voice Broadcast teleservice.

If VBS is not supported in the VLR or no Group Ids are stored for VBS in the respective subscriber record, the request for deletion of all Group Ids shall be ignored. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

VGCS Group Indication

Contains an indication (flag) which is used if all Group Id's shall be deleted from the subscriber data for the Voice Group Call teleservice. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

If VGCS is not supported in the VLR or no Group Ids are stored for VGCS in the respective subscriber record, the request for deletion of all Group Ids shall be ignored.

GPRS Subscription Data Withdraw

This parameter is used to indicate whether all GPRS Subscription Data for the subscriber shall be deleted or if only a subset of the stored GPRS Subscription Data for the subscriber shall be deleted. In the latter case only those PDP context whose identifiers are included in the subsequent identifier list will be deleted. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

Roaming Restricted In SGSN Due To Unsupported Feature

This parameter is used if Roaming Restricted In SGSN Due To Unsupported Feature is deleted from the GPRS subscriber data. This may occur if unsupported features or services are removed from the GPRS subscriber data in the HLR.

If this parameter is sent the SGSN shall check if the current Location Area is possibly allowed now. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

LSA Information Withdraw

This parameter is used to indicate whether all LSA Information for the subscriber shall be deleted or if only a subset of the stored LSA Information for the subscriber shall be deleted. In the latter case only the LSA data whose LSA identities are included in the subsequent LSA data list will be deleted. This parameter is used by the VLR and the SGSN.

IST Information Withdraw

This parameter is used to indicate that the IST condition has been removed for the subscriber. See GSM 03.35 for the use of this parameter.

Regional Subscription Response

If included in the Delete Subscriber Data response this parameter indicates one of:

- MSC Area Restricted
- SGSN Area Restricted;
- Regional Subscription Not Supported.

This parameter is used by the VLR and by the SGSN.

User error

Only one of the following values is applicable:

- Unidentified subscriber;
- Data missing;
- Unexpected data value.

8.9 Identity management services

8.9.1 MAP-PROVIDE-IMSI service

8.9.1.1 Definition

This service is used by a VLR in order to get, via the MSC, the IMSI of a subscriber (e.g. when a subscriber has identified itself with a TMSI not allocated to any subscriber in the VLR).

It is a confirmed service and consists of the primitives shown in table 8.9/1.

8.9.1.2 Service primitives

Table 8.9/1: MAP-PROVIDE-IMSI

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI			C	C(=)
User error			C	C(=)
Provider error				O

8.9.1.3 Parameter use

All parameters are described in subclause 7.6. The following clarifications are applicable:

IMSI

This parameter is received when the request is successfully carried out. It contains the requested IMSI.

User error

Only one of the following values is applicable:

- Absent subscriber.

8.9.2 MAP-FORWARD-NEW-TMSI service

8.9.2.1 Definition

This service is used by a VLR to allocate, via MSC, a new TMSI to a subscriber during an ongoing transaction (e.g. call set-up, location updating or supplementary services operation).

It is a confirmed service and consists of the primitives shown in table 8.9/2.

8.9.2.2 Service primitives

Table 8.9/2: MAP-FORWARD-NEW-TMSI

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
TMSI	M	M(=) O	Provider error	

8.9.2.3 Parameter use

The parameter TMSI is described in subclause 7.6.

8.10 Fault recovery services

8.10.1 MAP_RESET service

8.10.1.1 Definition

This service is used by the HLR, after a restart, to indicate to a list of VLRs or SGSNs that a failure occurred.

The MAP_RESET service is a non-confirmed service using the service primitives defined in table 8.10/1

8.10.1.2 Service primitives

Table 8.10/1: MAP_RESET

Parameter name	Request	Indication
Invoke Id	M	M(=)
HLR number	M	M(=)
HLR Id LIST	U	C(=)

8.10.1.3 Parameter definition and use

Invoke Id

See definition in subclause 7.6.1.

HLR number

See definition in subclause 7.6.2.

HLR Id LIST

The HLR Id List is a list of HLR Id. If the parameter is present in the indication, the VLR or SGSN may base the retrieval of subscribers to be restored on their IMSI: the subscribers affected by the reset are those whose IMSI leading digits are equal to one of these numbers. If the parameter is absent, subscribers to be restored are those for which the OriginatingEntityNumber received at location updating time matches the equivalent parameter of the Reset Indication.

8.10.2 MAP_FORWARD_CHECK_SS_INDICATION service

8.10.2.1 Definition

This service may be used by an HLR as an implementation option, to indicate to a mobile subscriber that supplementary services parameters may have been altered, e.g. due to a restart. If received from the HLR, the VLR shall forward this indication to the MSC, which in turn forwards it to the MS. The HLR only sends this indication after successful completion of the subscriber data retrieval from HLR to VLR that ran embedded in a MAP_UPDATE_LOCATION procedure.

The MAP_FORWARD_CHECK_SS_INDICATION service is a non-confirmed service using the service primitives defined in table 8.10/2.

8.10.2.2 Service primitives

Table 8.10/2: MAP_FORWARD_CHECK_SS_INDICATION

Parameter name	Request	Indication
Invoke Id	M	M(=)

8.10.2.3 Parameter definition and use

Invoke Id

See definition in subclause 7.6.1.

8.10.3 MAP_RESTORE_DATA service

8.10.3.1 Definition

This service is invoked by the VLR on receipt of a MAP_PROVIDE_ROAMING_NUMBER indication for an unknown IMSI, or for a known IMSI with the indicator "Confirmed by HLR" set to "Not confirmed". The service is used to update the LMSI in the HLR, if provided, and to request the HLR to send all data to the VLR that are to be stored in the subscriber's IMSI record.

The MAP_RESTORE_DATA service is a confirmed service using the service primitives defined in table 6.10/3.

8.10.3.2 Service primitives

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
LMSI	U	C(=)		
Supported CAMEL phases	C	C(=)		
HLR number			C	C(=)
MS Not Reachable Flag			C	C(=)
User error			C	C(=)
Provider error				O

Table 8.10/3: MAP_RESTORE_DATA

8.10.3.3 Parameter definitions and use

Invoke Id

See definition in subclause 5.6.1.

IMSI

See definition in subclause 5.6.2.

LMSI

See definition in subclause 5.6.2. It is an operator option to provide the LMSI from the VLR; it is mandatory for the HLR to support the LMSI handling procedures.

Supported CAMEL Phases

This parameter indicates which phases of CAMEL are supported. Must be present if a CAMEL phase different from phase 1 is supported. Otherwise may be absent.

HLR number

See definition in subclause 5.6.2. The presence of this parameter is mandatory in case of successful outcome of the service.

MS Not Reachable Flag

See definition in subclause 5.6.8. This parameter shall be present in case of successful outcome of the service, if the "MS Not Reachable flag" was set in the HLR.

User error

In case of unsuccessful outcome of the service, an error cause shall be returned by the HLR. The following error causes defined in subclause 5.6.1 may be used, depending on the nature of the fault:

- unknown subscriber;
- system failure;
- unexpected data value;
- data missing.

Provider error

For definition of provider errors see subclause 5.6.1.

8.11 Subscriber Information services

8.11.1 MAP-ANY-TIME-INTERROGATION service

8.11.1.1 Definition

This service is used by the gsmSCF, to request information (e.g. subscriber state and location) from the HLR or the GMLC at any time.

When this service is used to the HLR, the subscriber state or location may be requested.
When this service is used to the GMLC, only the location may be requested.

8.11.1.2 Service primitives

Table 8.11/1: Any_Time_Interrogation

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Requested Info	M	M(=)		
gsmSCF-Address	M	M(=)		
IMSI	C	C(=)		
MSISDN	C	C(=)		
Location Information			C	C(=)
Subscriber State			C	C(=)
User error			C	C(=)
Provider error				O

8.11.1.3 Parameter definition and use

All parameters are described in subclause 7.6.

The HLR or GMLC may be able to use the value of the parameter gsmSCF-address to screen a MAP_Any_Time_Interrogation indication.

The use of the parameters and the requirements for their presence are specified in 3G TS 23.078.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- System Failure;
- Any Time Interrogation Not Allowed;
- Data Missing;
- Unexpected Data Value;
- Unknown Subscriber.

Provider error

These are defined in subclause 7.6.1.

8.11.2 MAP-PROVIDE-SUBSCRIBER-Info service

8.11.2.1 Definition

This service is used to request information (e.g. subscriber state and location) from the VLR at any time.

8.11.2.2 Service primitives

Table 8.11/2: Provide_Subscriber_Information

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Requested Info	M	M(=)		
IMSI	M	M(=)		
LMSI	U	O		
Location Information			C	C(=)
Subscriber State			C	C(=)
User error			C	C(=)
Provider error				O

8.11.2.3 Parameter definition and use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.18

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Data Missing;
- Unexpected Data Value.

Provider error

These are defined in subclause 7.6.1.

8.11.3 MAP-ANY-TIME-SUBSCRIPTION-INTERROGATION service

8.11.3.1 Definition

This service is used by the gsmSCF, to request subscription information (e.g. call forwarding supplementary service data or CSI) from the HLR at any time.

8.11.3.2 Service primitives

Table 8.11/3: Any_Time_Subscription_Interrogation

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Requested Subscription Info	M	M(=)		
GsmSCF-Address	M	M(=)		
IMSI	C	C(=)		
MSISDN	C	C(=)		
Call Forwarding Data			C	C(=)
Call Barring Data			C	C(=)
ODB Data			C	C(=)
CAMEL Subscription Info			C	C(=)
Supported CAMEL phases in VLR			C	C(=)
Supported CAMEL phases in SGSN			C	C(=)
User error			C	C(=)
Provider error				O

8.11.3.3 Parameter definition and use

All parameters are described in subclause 7.6.

The HLR may be able to use the value of the parameter gsmSCF-address to screen a MAP_Any_Time_Subscription_Interrogation indication.

The use of the parameters and the requirements for their presence are specified in 3G TS 23.078.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Unexpected Data Value;
- Unknown Subscriber;
- BearerServiceNotProvisioned;
- TeleserviceNotProvisioned;
- CallBarred;
- IllegalSS-Operation;
- SS-NotAvailable;
- InformationNotAvailable
- Any Time Subscription Interrogation Not Allowed;
- Data Missing;

Provider error

These are defined in subclause 7.6.1.

8.11.4 MAP-ANY-TIME-MODIFICATION service

8.11.4.1 Definition

This service is used by the gsmSCF, to modify information of the HLR at any time.

8.11.4.2 Service primitives

Table 8.11/4: Any_Time_Modification

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
gsmSCF-Address	M	M(=)		
IMSI	C	C(=)		
MSISDN	C	C(=)		
Modification request for SS information	C	C(=)		
Modification request for CSI	C	C(=)		
Ext Forwarding information-for-CSE			C	C(=)
Ext Call barring information-for-CSE			C	C(=)
CAMEL subscription info			C	C(=)
User error			C	C(=)
Provider error				O

8.11.4.3 Parameter definition and use

All parameters are described in subclause 7.6.

The HLR may be able to use the value of the parameter gsmSCF-address to screen an MAP_Any_Time_Modification indication.

The use of these parameters and the requirements for their presence are specified in 3G TS 23.078.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Any Time Modification Not Allowed;
- Data Missing;
- Unexpected Data Value;
- Unknown Subscriber;
- Bearer service not provisioned;

This error is returned only if not even a subset of the requested bearer service group has been subscribed to.

- Teleservice not provisioned;

This error is returned only if not even a subset of the requested teleservice group has been subscribed to.

- Call Barred;
- Illegal SS operation;
- SS error status;

- SS incompatibility;
- SS subscription violation;
- Information Not Available.

Provider error

These are defined in subclause 7.6.1.

8.11.5 MAP-NOTE-SUBSCRIBER-DATA-MODIFIED service

8.11.5.1 Definition

This service is used by the HLR to inform the gsmSCF that subscriber data have been modified.

8.11.5.2 Service primitives

Table 8.11/5: Note_Subscriber_Data_Modified

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
MSISDN	M	M(=)		
Type of Modification	M	M(=)		
User error			C	C(=)
Provider error				O

8.11.5.3 Parameter definition and use

Invoke id

See subclause 7.6.1 for the use of this parameter.

IMSI

See subclause 7.6.2 for the use of this parameter.

MSISDN

See subclause 7.6.2 for the use of this parameter.

Type of Modification

This parameter indicates which subscriber data have been modified

It takes one of the following values:

- Call Forwarding SS Data modified;
- Call Barring SS Data modified;
- Operator Determined Barring Data modified;
- CAMEL Subscription Information modified.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Unexpected Data Value;
- Unknown Subscriber.

Provider error

These are defined in subclause 7.6.1.

The use of the parameters and the requirements for their presence are specified in 3G TS 23.078.

9 Operation and maintenance services

9.1 Subscriber tracing services

9.1.1 MAP-ACTIVATE-TRACE-MODE service

9.1.1.1 Definition

This service is used between the HLR and the VLR to activate subscriber tracing in the VLR.

Also this service is used between the HLR and the SGSN to activate subscriber tracing in the SGSN.

The MAP-ACTIVATE-TRACE-MODE service is a confirmed service using the primitives from table 9.1/1.

9.1.1.2 Service primitives

Table 9.1/1: MAP-ACTIVATE-TRACE-MODE

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
Trace reference	M	M(=)		
Trace type	M	M(=)		
OMC Id	U	C(=)		
User error			C	C(=)
Provider error				O

9.1.1.3 Parameter use

Invoke id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2. The IMSI is a mandatory parameter in a stand-alone operation.

Trace reference

See definition in subclause 7.6.10.

Trace type

See definition in subclause 7.6.10.

OMC Id

See definition in subclause 7.6.2. The use of this parameter is an operator option.

User error

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unidentified Subscriber;
- Facility Not Supported;
- Tracing Buffer Full;

- System Failure;
- Unexpected Data Value;
- Data missing.

Provider error

For definition of provider errors see subclause 7.6.1.

9.1.2 MAP-DEACTIVATE-TRACE-MODE service

9.1.2.1 Definition

This service is used between the VLR and the HLR for deactivating subscriber tracing in the VLR.

Also this service is used between the SGSN and the HLR for deactivating subscriber tracing in the SGSN.

The MAP-DEACTIVATE-TRACE-MODE service is a confirmed service using the primitives from table 9.1/2.

9.1.2.2 Service primitives

Table 9.1/2: MAP-DEACTIVATE-TRACE-MODE

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
Trace reference	M	M(=)		
User error			C	C(=)
Provider error				O

9.1.2.3 Parameter use

Invoke id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2. The IMSI is a mandatory parameter in a stand-alone operation.

Trace reference

See definition in subclause 7.6.10.

User error

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unidentified Subscriber;
- Facility Not Supported;
- System Failure;
- Unexpected Data Value;
- Data missing.

Provider error

For definition of provider errors see subclause 7.6.1.

9.1.3 MAP-TRACE-SUBSCRIBER-ACTIVITY service

9.1.3.1 Definition

This service is used between the VLR and the MSC to activate the subscriber tracing in the MSC.

The MAP-TRACE-SUBSCRIBER-ACTIVITY service is a non-confirmed service using the primitives from table 9.1/3.

9.1.3.2 Service primitives

Table 9.1/3: MAP-TRACE-SUBSCRIBER-ACTIVITY

Parameter name	Request	Indication
Invoke id	M	M(=)
IMSI	C	C(=)
Trace reference	M	M(=)
Trace type	M	M(=)
OMC Id	U	C(=)

9.1.3.3 Parameter use

Invoke id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2. The controlling MSC shall provide either the IMSI or the IMEI to the servicing MSC.

Trace reference

See definition in subclause 7.6.10.

Trace type

See definition in subclause 7.6.10.

OMC Id

See definition in subclause 7.6.2. The use of this parameter is an operator option.

9.2 Other operation and maintenance services

9.2.1 MAP-SEND-IMSI service

9.2.1.1 Definition

This service is used by a VLR in order to fetch the IMSI of a subscriber in case of some Operation & Maintenance procedure where subscriber data are needed in the Visited PLMN and MSISDN is the only subscriber's identity known.

It is a confirmed service and consists of the primitive shown in figure 9.2/1.

9.2.1.2 Service primitives

Table 9.2/1: MAP-SEND-IMSI

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
MSISDN	M	M(=)		
IMSI			C	C(=)
User error			C	C(=)
Provider error				O

9.2.1.3 Parameter use

All parameters are described in subclause 7.6. The following clarifications are applicable:

User error

Only one of the following values is applicable:

- Unknown subscriber;
- Unexpected data value;
- Data missing.

10 Call handling services

10.1 MAP_SEND_ROUTING_INFORMATION service

10.1.1 Definition

This service is used between the Gateway MSC and the HLR. The service is invoked by the Gateway MSC to perform the interrogation of the HLR in order to route a call towards the called MS.

This is a confirmed service using the primitives listed in table 10.1/1.

This service is also used between the GMSC and the NPLR.

10.1.2 Service primitives

Table 10.1/1: MAP_SEND_ROUTING_INFORMATION parameters

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Interrogation Type	M	M(=)		
GMSC Address	M	M(=)		
MSISDN	M	M(=)	C	C(=)
OR Interrogation	C	C(=)		
OR Capability	C	C(=)		
CUG Interlock	C	C(=)	C	C(=)
CUG Outgoing Access	C	C(=)	C	C(=)
Number of Forwarding	C	C(=)		
Network Signal Info	C	C(=)		
Supported CAMEL Phases	C	C(=)		
Suppress T-CSI	C	C(=)		
Suppression of Announcement	C	C(=)		
Call Reference Number	C	C(=)		
Forwarding Reason	C	C(=)		
Basic Service Group	C	C(=)		
Alerting Pattern	C	C(=)		
CCBS Call	C	C(=)		
Supported CCBS Phase	C	C(=)		
Additional Signal Info	C	C(=)		
IST Support Indicator	C	C(=)		
Pre-paging supported	C	C(=)		
Call Diversion Treatment Indicator	C	C(=)		
IMSI			C	C(=)
MSRN			C	C(=)
Forwarding Data			C	C(=)
Forwarding Interrogation Required			C	C(=)
VMSC address			C	C(=)
GMSC Camel Subscription Info			C	C(=)
Location Information			C	C(=)
Subscriber State			C	C(=)
Basic Service Code			C	C(=)
CUG Subscription Flag			C	C(=)
North American Equal Access preferred			U	C(=)
Carrier Id				
User error			C	C(=)
SS-List			U	C(=)
CCBS Target			C	C(=)
Keep CCBS Call Indicator			C	C(=)
IST Alert Timer			C	C(=)
Number Portability Status			U	C(=)
Provider error				O

10.1.3 Parameter use

See subclause 7.6 for a definition of the parameters used in addition to the following. Note that:

- a conditional parameter whose use is defined only in 3G TS 23.078 shall be absent if the sending entity does not support CAMEL;
- a conditional parameter whose use is defined only in GSM 03.79 shall be absent if the sending entity does not support optimal routing;
- a conditional parameter whose use is defined only in 3G TS 23.078 & GSM 03.79 shall be absent if the sending entity supports neither CAMEL nor optimal routing.

Interrogation Type

See GSM 03.79 [99] for the use of this parameter.

GMSC address

The E.164 address of the GMSC.

MSISDN

This is the Mobile Subscriber ISDN number assigned to the called subscriber. In the Request & Indication it is the number received by the GMSC in the IAM. If the call is to be forwarded and the HLR supports determination of the redirecting number, the HLR inserts the basic MSISDN in the Response.

See GSM 03.66 [108] for the use of this parameter and the conditions for its presence in the response.

OR Interrogation

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

OR Capability

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

CUG Interlock

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

CUG Outgoing Access

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

Number of Forwarding

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

Network Signal Info

See GSM 03.18 [97] for the conditions for the presence of the components of this parameter.

Supported CAMEL Phases

The use of this parameter and the requirements for its presence are specified in 3G TS 23.078

T-CSI Suppression

The use of this parameter and the requirements for its presence are specified in 3G TS 23.078

Suppression Of Announcement

The use of this parameter and the requirements for its presence are specified in 3G TS 23.078

Call Reference Number

The use of this parameter and the conditions for its presence are specified in 3G TS 23.078 [98] and GSM 03.79 [99].

Forwarding Reason

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

Basic Service Group

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

Alerting Pattern

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

CCBS Call

See GSM 03.93 [107] for the use of this parameter and the conditions for its presence.

Supported CCBS Phase

Additional Signal Info

See GSM 03.81 [27] for the conditions for the presence of the components of this parameter.

This parameter indicates by its presence that CCBS is supported and the phase of CCBS which is supported.

IST Support Indicator

This parameter is used to indicate to the HLR that the GMSC supports basic IST functionality, that is, the GMSC is able to terminate the subscriber call activity that originated the IST Alert when it receives the IST Alert response indicating that the call(s) shall be terminated. If this parameter is not included in the Send Routing Information indication and the subscriber is marked as an IST subscriber, then the HLR may limit the service for the call (by barring the incoming call if it is not subject to forwarding, or suppressing Call Forwarding from the GMSC), or allow the call assuming the associated risk of not having the basic IST mechanism available.

This parameter can also indicate that the GMSC supports the IST Command, including the ability to terminate all calls being carried for the identified subscriber by using the IMSI as a key. If this additional capability is not included in the Send Routing Information indication and the subscriber is marked as an IST subscriber, then the HLR may limit the service for the subscriber (by barring the incoming calls if they are not subject to forwarding, or suppressing Call Forwarding from the GMSC), or allow the incoming calls assuming the associated risk of not having the IST Command mechanism available.

Pre-paging supported

See 3G 23.018 for the use of this parameter and the conditions for its presence.

Call Diversion Treatment Indicator

This parameter indicates whether or not call diversion is allowed.

IMSI

See GSM 03.18 [97] and GSM 03.66 [108] for the use of this parameter and the conditions for its presence.

MSRN

See GSM 03.18 [97], GSM 03.66 [108] and GSM 03.79 [99] for the use of this parameter and the conditions for its presence. If the NPLR returns only the MSISDN-number without Routeing Number to the GMSC, the MSISDN-number shall be returned as MSRN.

Forwarding Data

This parameter includes the forwarded-to number, the forwarding reason and the forwarding options Notification to calling party and Redirecting presentation, and can include the forwarded-to subaddress. See GSM 03.18 [97] and GSM 03.79 [99] for the conditions for the presence of its components.

Forwarding Interrogation Required

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

VMSC address

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

GMSC CAMEL Subscription Info

The use of this parameter and the requirements for its presence are specified in 3G TS 23.078

Location Information

The use of this parameter and the requirements for its presence are specified in 3G TS 23.078

Subscriber State

The use of this parameter and the requirements for its presence are specified in 3G TS 23.078

CUG Subscription Flag

The use of this parameter and the requirements for its presence are specified in 3G TS 23.078.

North American Equal Access preferred Carrier Id

This parameter is returned to indicate the preferred carrier identity to be used to setup the call (i.e. forwarding the call or establishing the roaming leg).

SS-List

This parameter includes SS-codes and will be returned as an operator option. The HLR shall not send PLMN-specific SS-codes across PLMN boundaries. However if the GMSC receives PLMN-specific SS-codes from a foreign PLMN's HLR the GMSC may ignore it. If the GMSC attempts to process the PLMN specific SS codes, this may lead to unpredictable behaviour but the GMSC shall continue call processing.

Basic Service Code

The use of this parameter and the requirements for its presence are specified in 3G TS 23.078.

If the CAMEL service is not involved, this parameter includes the basic service code and will be returned as an operator option. The HLR shall not send a PLMN-specific Basic Service Code across PLMN boundaries. However if the GMSC receives a PLMN-specific Basic Service Code from a foreign PLMN's HLR the GMSC may ignore it. If the GMSC attempts to process the PLMN specific Basic Service codes, this may lead to unpredictable behaviour but the GMSC shall continue call processing.

CCBS Target

See GSM 03.93 for the use of this parameter and the conditions for its presence.

Keep CCBS Call Indicator

See GSM 03.93 for the use of this parameter and the conditions for its presence.

IST Alert Timer

It includes the IST Alert timer value that must be used to inform the HLR about the call activities that the subscriber performs. This parameter is only sent to the GMSC in response to a Send Routing Information request which indicates the the GMSC supports IST.

Number Portability Status

This parameter indicates the number portability status of the subscriber. This parameter may be present if the sender of SRlack is NPLR.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Unknown Subscriber;
- Number changed;
- Call Barred;

This error will indicate that either incoming calls are barred for this MS or that calls are barred due to Operator Determined Barring (see GSM 02.41 for a definition of this network feature).

- CUG Reject;

The value of this error cause will indicate the reason for CUG Reject.

- Bearer Service Not Provisioned;
- Teleservice Not Provisioned;

A subscription check has been performed and the call has not passed the check due to incompatibility with regard to the requested service. Depending on the nature of the incompatibility, either of these messages will be returned.

- Facility Not Supported;
- Absent Subscriber;

This indicates that the location of the MS is not known (either the station is not registered and there is no location information available or the Provide Roaming Number procedure fails due to IMSI detached flag being set), or the GMSC requested forwarding information with a forwarding reason of not reachable, and the call forwarding on MS not reachable service is not active.

- Busy Subscriber;

This indicates that Call Forwarding on Busy was not active for the specified basic service group when the GMSC requested forwarding information with a forwarding reason of busy.

The error may also indicate that the subscriber is busy due to an outstanding CCBS recall. In the error data it may then be specified that CCBS is possible for the busy encountered call.

- No Subscriber Reply;

This indicates that Call Forwarding on No Reply was not active for the specified basic service group when the GMSC requested forwarding information with a forwarding reason of no reply.

- OR Not Allowed;

This indicates that the HLR is not prepared to accept an OR interrogation from the GMSC, or that calls to the specified subscriber are not allowed to be optimally routed.

- Forwarding Violation;
- System Failure;
- Data Missing;
- Unexpected Data Value.

See subclause 7.6 for a definition of these errors.

Provider error

These are defined in subclause 7.6.

10.2 MAP_PROVIDE_ROAMING_NUMBER service

10.2.1 Definition

This service is used between the HLR and VLR. The service is invoked by the HLR to request a VLR to send back a roaming number to enable the HLR to instruct the GMSC to route an incoming call to the called MS.

This is a confirmed service which uses the Primitives described in table 10.2/1.

10.2.2 Service primitives

Table 10.2/1: MAP_PROVIDE_ROAMING_NUMBER parameters

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
MSC Number	M	M(=)		
MSISDN	U	C(=)		
LMSI	C	C(=)		
GSM Bearer Capability	C	C(=)		
Network Signal Info	C	C(=)		
Suppression Of Announcement	C	C(=)		
Call Reference Number	C	C(=)		
GMSC Address	C	C(=)		
OR Interrogation	C	C(=)		
OR Not Supported in GMSC	C	C(=)		
Alerting Pattern	C	C(=)		
CCBS Call	C	C(=)		
Supported CAMEL Phases in GMSC	C	C(=)		
Additional Signal Info	C	C(=)		
Pre-paging supported	C	C(=)		
Roaming Number			C	C(=)
User error			C	C(=)
Provider error				O

10.2.3 Parameter use

See subclause 7.6 for a definition of the parameters used, in addition to the following. Note that:

- a conditional parameter whose use is defined only in 3G TS 23.078 shall be absent if the sending entity does not support CAMEL;
- a conditional parameter whose use is defined only in GSM 03.79 shall be absent if the sending entity does not support optimal routing;
- a conditional parameter whose use is defined only in 3G TS 23.078 & GSM 03.79 shall be absent if the sending entity supports neither CAMEL nor optimal routing.

IMSI

This is the IMSI of the called Subscriber.

MSC Number

This is the ISDN number assigned to the MSC currently serving the MS. The MSC number will have been stored in the HLR as provided at location updating.

MSISDN

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

LMSI

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

GSM Bearer Capability

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

This information is passed according to the rules specified in TS GSM 09.07.

There may be two GSM Bearer Capabilities supplied.

Network Signal Info

See GSM 03.18 [97] for the conditions for the presence of the components of this parameter.

Suppression Of Announcement

The use of this parameter and the requirements for its presence are specified in 3G TS 23.078.

Call Reference Number

The use of this parameter and the conditions for its presence are specified in 3G TS 23.078 [98] and GSM 03.79 [99].

GMSC Address

The use of this parameter and the conditions for its presence are specified in 3G TS 23.078 [98] and GSM 03.79 [99].

OR Interrogation

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

OR Not Supported in GMSC

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

Supported CAMEL Phases in GMSC

See 3G TS 23.078 [98] for the use of this parameter and the conditions for its presence.

Alerting Pattern

See 3G TS 23.078 [98] for the use of this parameter and the conditions for its presence.

CCBS Call

See GSM 03.93 [xx] for the use of this parameter and the conditions for its presence.

Additional Signal Info

See GSM 03.81 [xx] for the conditions for the presence of the components of this parameter.

Pre-paging supported

See 3G 23.018 for the use of this parameter and the conditions for its presence.

Roaming Number

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Absent Subscriber;

This error will be returned if the IMSI detach flag is set.

- No Roaming Number Available;
- OR Not Allowed;

This indicates that the MAP_PROVIDE_ROAMING_NUMBER indication included the OR interrogation indicator, but the VLR does not support optimal routing.

- Facility Not Supported;
- System Failure;
- Data Missing;

- Unexpected Data Value.

See subclause 7.6 for a definition of these reasons.

Provider error

These are defined in subclause 7.6.

10.3 MAP_RESUME_CALL_HANDLING service

10.3.1 Definition

This service is used between the terminating VMSC and the GMSC. The service is invoked by the terminating VMSC to request the GMSC to resume handling the call and forward it to the specified destination.

This is a confirmed service which uses the Primitives listed in table 10.3/1.

10.3.2 Service primitives

Table 10.3/1: MAP_RESUME_CALL_HANDLING parameters

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Call Reference Number	C	C(=)		
Basic Service Group	C	C(=)		
IMSI	C	C(=)		
Forwarding Data	C	C(=)		
CUG Interlock	C	C(=)		
CUG Outgoing Access	C	C(=)		
O-CSI	C	C(=)		
D-CSI	C	C(=)		
CCBS Target	C	C(=)		
UU Data	C	C(=)		
UUS CF Interaction	C	C(=)		
All Information Sent	C	C(=)		
MSISDN	C	C(=)		
User error			C	C(=)
Provider error				O

10.3.3 Parameter use

Information received in subsequent segment of a segmented dialogue shall not overwrite information received in an earlier segment.

See subclause 7.6 for a definition of the parameters used, in addition to the following.

Call Reference Number

See GSM 03.79 [99] for the use of this parameter. This parameter shall be present in a first segment of the dialogue

Basic Service Group

See GSM 03.79 [99] for the use of this parameter. This parameter shall be present in a first segment of the dialogue

IMSI

This is the IMSI of the forwarding Subscriber. This parameter shall be present in a first segment of the dialogue

Forwarding Data

This parameter includes the forwarded-to number, the forwarding reason and the forwarding options Notification to calling party and Redirecting presentation, and can include the forwarded-to subaddress. See GSM 03.79 [99] for the conditions for the presence of its components. This parameter shall be present in a first segment of the dialogue

CUG Interlock

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

CUG Outgoing Access

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

O-CSI

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

For CAMEL phases 1 & 2, the O-CSI shall contain only one set of O-BCSM TDP data.

THE ABOVE STATEMENT NEEDS TO BE VERIFIED.

D-CSI

The Dialed Services-CSI.

See 3G TS 23.078 for the use of this parameter and the conditions for its presence.

Q1. Shouldn't the above reference read '23.079' instead of 23.078?

Q2. Has anybody written the corresponding CR to 23.079 to mention the transport of D-CSI in RCH?

CCBS Target

See GSM 03.93 [107] for the use of this parameter and the conditions for its presence.

UU Data

See GSM 03.87 for the use of this parameter and the conditions for its presence.

UUS CF Interaction

See GSM 03.87 for the use of this parameter and the conditions for its presence.

All Information Sent

This parameter is set when the VMSC has sent all information to GMSC.

MSISDN

This parameter is the basic MSISDN of the forwarding subscriber. It shall be present if the VMSC supports determination of the redirecting number.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Optimal Routeing not allowed;
- Forwarding failed;

- Unexpected Data Value;
- Data Missing.

Provider error

These are defined in subclause 7.6.

10.4 MAP_PREPARE_GROUP_CALL service

10.4.1 Definition

This service is used by the Anchor_MSC to inform the Relay_MSC about a group call setup.

The MAP_PREPARE_GROUP_CALL service is a confirmed service using the service primitives given in table 10.4

10.4.2 Service primitives

Table 10.4/1: MAP_PREPARE_GROUP_CALL service

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Teleservice	M	M(=)		
ASCI Call Reference	M	M(=)		
Ciphering Algorithm	M	M(=)		
Group Key Number	C	C(=)		
Group Key	C	C(=)		
Priority	C	C(=)		
CODEC-Information	M	M(=)		
Uplink Free Indicator	M	M(=)		
Group Call Number			M	M(=)
User Error			C	C(=)
Provider Error				O

10.4.3 Parameter definitions and use

Invoke Id

See definition in section 7.6.1

Teleservice

Voice Broadcast Service or Voice Group Call Service

ASCI Call Reference

Broadcast call reference or group call reference. This item is used to access the VBS-GCR or VGCS-GCR within the Relay_MSC.

Ciphering Algorithm

The ciphering algorithm to be used for the group call.

Group Key Number

This number has to be broadcasted and is used by the mobile station to select the chosen group key.

Shall be present if the ciphering applies.

Group Key

This key is used for ciphering on the radio interface.

Shall be present if the ciphering applies.

Priority

Default priority level related to the call if eMLPP applies.

CODEC-Information

Information on the codecs allowed for this call.

Uplink Free Indicator

A flag indicating whether the call is initiated from a dispatcher.

Group Call Number

This temporary allocated E.164 number is used for routing the call from the Anchor MSC to the Relay MSC.

User Error

For definition of this parameter see section 7.6.1 The following errors defined in section 7.6.1 may be used, depending on the nature of the fault:

- No Group Call Number available
- System Failure
- Unexpected Data Value

Provider Error

See definition of provider error in section 7.6.1.

10.5 MAP_PROCESS_GROUP_CALL_SIGNALLING service

10.5.1 Definitions

This service is used between Relay MSC and Anchor MSC for transmission of Group Call notifications.

The MAP_PROCESS_GROUP_CALL_SIGNALLING service is a non-confirmed service using the service primitives given in table 10.5

10.5.2 Service primitives

Table 10.5/1: MAP_PROCESS_GROUP_CALL_SIGNALLING service

Parameter name	Request	Indication
Invoke Id	M	M(=)
Uplink Request	C	C(=)
Uplink Release Indication	C	C(=)
Release Group Call	C	C(=)

10.5.3 Parameter definitions and use

Invoke Id

See definition in section 7.6.1

Uplink Request

This information element indicates to the anchor MSC that a service subscriber roaming in the relay MSC area requests access to the uplink.

Uplink Release Indication

This information element if included by the Relay MSC indicates to the Anchor MSC that the uplink has become free.

Release Group Call

This information element if included by the Relay MSC indicates to the Anchor MSC that the service subscriber who has initiated the call and who currently has access to the uplink terminates the call.

10.6 MAP_FORWARD_GROUP_CALL_SIGNALLING service

10.6.1 Definitions

This service is used between Anchor MSC and Relay MSC for transmission of Group Call notifications.

The MAP_FORWARD_GROUP_CALL_SIGNALLING service is a non-confirmed service using the service primitives given in table 10.6

10.6.2 Service primitives

Table 10.6: MAP_FORWARD_GROUP_CALL_SIGNALLING service

Parameter name	Request	Indication
Invoke Id	M	M(=)
IMSI	C	C(=)
Uplink Request Acknowledgement	C	C(=)
Uplink Release Indication	C	C(=)
Uplink Reject Command	C	C(=)
Uplink Seized Command	C	C(=)
Uplink Release Command	C	C(=)

10.6.3 Parameter definitions and use

IMSI

Identity of the service subscriber who has established the call and who is allowed to terminate the call.

Invoke Id

See definition in section 7.6.1

Uplink Request Acknowledgement

This information element is used for positive acknowledgement of an uplink request

Uplink Release Indication

This information element if included by the Anchor MSC indicates to the Relay MSC that the uplink has become free.

Uplink Reject Command

This information element is used for negative acknowledgement of an uplink request

Uplink Seized Command

This information element if included by the Anchor MSC indicates to the Relay MSC that the uplink is no longer free.

Uplink Release Command

This information element if included by the Anchor MSC indicates to the Relay MSC that the uplink which is granted to a MS in the relay MSC area shall be released.

10.7 MAP_SEND_GROUP_CALL_END_SIGNAL service

10.7.1 Definitions

This service is used between the Relay MSC and the Anchor MSC indicating that VGCS / VBS channels have been established in the Relay MSC area. The response is used by the Anchor MSC to inform Relay MSC that all resources for the call can be released in Relay MSC because the call has been released in the Anchor MSC.

The MAP_SEND_GROUP_CALL_END_SIGNAL service is a confirmed service using the service primitives given in table 10.7

10.7.2 Service primitives

Table 10.7: MAP_SEND_GROUP_CALL_END_SIGNAL service

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
Provider Error				O

10.7.3 Parameter definitions and use

IMSI

Identity of the service subscriber who has established the call and who is allowed to terminate the call.

Shall be present if the call was established by a service subscriber roaming in the relay MSC area.

Invoke Id

See definition in section 7.6.1

Provider Error

See definition of provider error in section 7.6.1.

10.8 MAP_Provide_SIWFS_Number

10.8.1 Definition

This service is used between an MSC and SIWFS. It is invoked by an MSC receiving an incoming call (call to or from MS) to request the SIWFS to allocate IWU resources. The service is defined in GSM 03.54.

This is a confirmed service using the primitives described in table 10.8.

10.8.2 Service primitive

Table 10.8: MAP_Provide_SIWFS_Number service

Parameter name	Request	Indication	Response	Confirm
Invoke ID	M	M(=)	M(=)	M(=)
GSM Bearer Capability	M	M(=)		
ISDN Bearer Capability	M	M(=)		
Call Direction	M	M(=)		
B-subscriber address	M	M(=)		
Chosen Channel	M	M(=)		
Lower Layer Compatibility	C	C(=)		
High Layer Compatibility	C	C(=)		
SIWFS number			C	C(=)
User error			C	C(=)
Provider error				O

10.8.3 Parameter use

See subclause 7.6 for a definition of the parameter used, in addition to the following.

GSM Bearer Capability

This information is the result from the negotiation with the mobile station. The information is sent from the MSC to the SIWFS to allocate the correct IWU.

ISDN Bearer Capability

This parameter refers to the ISDN Bearer Capability information element. For the MTC this parameter is received in the ISUP User Service Information parameter. For the MOC call this parameter is mapped from the GSM BC parameter according to GSM 09.07. The parameter is used by the SIWFS to route the call and to allocate the outgoing circuit.

Call Direction

This parameter indicates the direction of the call (mobile originated or mobile terminated) at call set-up.

B-subscriber address

This parameter is sent from the MSC to the SIWFS to inform the SIWFS where to route the call i.e. where to send the IAM. If the loop method is used this parameter will indicate the address to the VMSC. This address is allocated by the VMSC in the same way as a MSRN and is used to correlate the incoming IAM to the corresponding MAP dialogue. If the non-loop method is used this parameter will indicate the address to the B-subscriber.

Chosen Channel

This parameter is sent from the MSC to the SIWFS to adjust the interworking unit to the assigned radio resources. This parameter is defined in GSM 08.08.

Lower Layer Compatibility

This parameter is sent from the MSC to the SIWF to allow the interworking unit to perform a compatibility check. This parameter is handled as specified in GSM 09.07. This parameter is defined in GSM 04.08.

High Layer Compatibility

This parameter is sent from the MSC to the SIWF to allow the interworking unit to perform a compatibility check. This parameter is handled as specified in GSM 09.07. This parameter is defined in GSM 04.08.

SIWFS number

This parameter is sent from the SIWFS to the MSC. This address is used by the visited MSC to route the call, i.e. the IAM to the SIWFS (similar to MSRN) and will be used by the SIWFS to correlate the incoming IAM to the corresponding MAP message. This parameter must always be sent from the SIWFS when a successful allocation of SIWFS resources has been made.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Resource limitation;
- Facility Not Supported;
- Unexpected Data Value;
- System Failure.

See subclause 7.6 for a definition of these reasons.

Provider error

These are defined in subclause 7.6.

10.9 MAP_SIWFS_Signalling_Modify

10.9.1 Definition

This service is used to transport signalling information between an MSC and an SIWFS in the case of a request to modify the configuration (e.g. HSCSD). It is invoked either by an MSC or by the SIWFS. The service is defined in GSM 03.54.

This is a confirmed service using the primitives described in table 10.9.

10.9.2 Service primitive

Table 10.9: MAP_SIWFS_Signalling_Modify service

Parameter name	Request	Indication	Response	Confirm
Invoke ID	M	M(=)	M(=)	M(=)
Channel Type	C	C(=)		
Chosen Channel	C	C(=)	C(=)	C(=)
User error			C	C(=)
Provider error				O

10.9.3 Parameter use

See subclause 7.6 for a definition of the parameter used, in addition to the following.

Channel Type

This parameter is the result of a Channel Mode Modification for TS61/62. It contains the changed Air Interface User Rate. The information is sent from the SIWFS to the MSC to assign the correct radio resource. This parameter is defined in GSM 08.08.

Chosen Channel

This parameter is sent from the MSC to the SIWFS to adjust the interworking unit to the assigned radio resources. This parameter is defined in GSM 08.08.

User error

This parameter is sent by the responder when an error is detected and if present , takes one of the following values:

- Resource limitation;
- Facility Not Supported;
- Data Missing;
- Unexpected Data Value;
- System Failure.

See subclause 7.6 for a definition of these reasons.

Provider error

These are defined in subclause 7.6.

10.10 MAP_SET_REPORTING_STATE service

10.10.1 Definition

This service is used between the HLR and the VLR to set the reporting state for a requested service. It is a confirmed service using the service primitives shown in table 10.10/1.

10.10.2 Service primitives

The service primitives are shown in table 10.10/1.

Table 10.10/1: MAP_SET_REPORTING_STATE parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
LMSI	C	C(=)		
CCBS Monitoring	C	C(=)		
CCBS Subscriber Status			C	C(=)
User error			C	C(=)
Provider error				O

10.10.3 Parameter use

See subclause 7.6 for a definition of the parameters used, in addition to the following.

IMSI

The IMSI is a mandatory parameter if the service is used as the only one in a dialogue.

CCBS Monitoring

This parameter indicates whether monitoring for CCBS shall be started or stopped. If it indicates that monitoring shall be started this service corresponds to the message 'Start Reporting' in GSM 03.93; if it indicates that monitoring shall be stopped this service corresponds to the message 'Stop Reporting' in GSM 03.93.

CCBS Subscriber Status

See GSM 03.93 for the use of this parameter and the conditions for its presence.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- System Failure;
- Unidentified Subscriber;
- Unexpected Data Value;
- Data Missing;
- Resource Limitation;
- Facility Not Supported.

NOTE: This error is reserved for future use.

Provider error

These are defined in subclause 7.6.

10.11 MAP_STATUS_REPORT service

10.11.1 Definition

This service is used by the VLR to report an event or call outcome to the HLR. It is a confirmed service using the service primitives shown in table 10.11/1.

10.11.2 Service primitives

The service primitives are shown in table 10.11/1.

Table 10.11/1: MAP_STATUS_REPORT parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
CCBS Subscriber Status	C	C(=)		
Monitoring Mode	C	C(=)		
Call Outcome	C	C(=)		
User error			C	C(=)
Provider error				O

10.11.3 Parameter use

See subclause 7.6 for a definition of the parameters used, in addition to the following.

CCBS Subscriber Status

If this parameter is present without Monitoring Mode and Call Outcome this service corresponds to the message 'Event Report' in GSM 03.93 [107]. See GSM 03.93 [107] for the use of this parameter and the conditions for its presence.

Monitoring Mode

If this parameter is present with CCBS Call Outcome this service corresponds to the message 'CCBS Call Report' in GSM 03.93. See GSM 03.93 for the use of this parameter and the conditions for its presence.

Call Outcome

See GSM 03.93 for the use of this parameter and the conditions for its presence.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- Unknown Subscriber ;
- System Failure;
- Unexpected Data Value;
- Data Missing.

Provider error

These are defined in subclause 7.6.

10.12 MAP_REMOTE_USER_FREE service

10.12.1 Definition

This service is used between the HLR and the VLR to report that the B subscriber is now idle and that the A subscriber can be notified. It is a confirmed service using the service primitives shown in table 10.12/1.

10.12.2 Service primitives

The service primitives are shown in table 10.12/1.

Table 10.12/1: MAP_REMOTE_USER_FREE parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Call Info	M	M(=)		
CCBS Feature	M	M(=)		
Translated B Number	M	M(=)		
Replace B Number	C	C(=)		
Alerting Pattern	C	C(=)		
RUF Outcome			C	C(=)
User error			C	C(=)
Provider error				O

10.12.3 Parameter use

See subclause 7.6 for a definition of the parameters used, in addition to the following.

Call Info

See GSM 03.93 for the use of this parameter.

CCBS Feature

See GSM 03.93 for the conditions for the presence of the parameters included in the CCBS feature.

Translated B Number

See GSM 03.93 for the use of this parameter.

Replace B Number

See GSM 03.93 for the use of this parameter and the conditions for its presence.

Alerting Pattern

See GSM 03.93 for the use of this parameter and the conditions for its presence.

RUF Outcome

See GSM 03.93 for the use of this parameter and the conditions for its presence.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- Unexpected Data Value;
- Data Missing;
- Incompatible Terminal;

This error is returned by the responder when the terminal used for CCBS activation is not compatible with the terminal used for the CCBS recall. For details refer to GSM 04.08.

- Absent Subscriber (IMSI Detach; Restricted Area; No Page Response);
- System Failure;
- Busy Subscriber (CCBS Busy).

Provider error

These are defined in subclause 7.6.

10.13 MAP_IST_ALERT service

10.13.1 Definition

This service is used between the MSC (Visited MSC or Gateway MSC) and the HLR, to report that the IST timer running for a call for the Subscriber has expired. It is a confirmed service using the service primitives shown in table 10.13/1.

10.13.2 Service primitives

The service primitives are shown in table 10.13/1.

Table 10.13/1: MAP_IST_ALERT parameters

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
IST Alert Timer			C	C(=)
IST Information Withdraw			C	C(=)
Call termination Indicator			C	C(=)
User error			C	C(=)
Provider error				O

10.13.3 Parameter use

All parameters are described in subclause 7.6. The following clarifications are applicable:

IST Alert Timer

If included in the IST Alert response, it includes the new IST Alert timer value that must be used to inform the HLR about the call activities that the subscriber performs.

IST Information Withdraw

If included in the IST Alert response, this parameter is used to indicate that the IST condition has been removed for the subscriber. When the MSC receives this parameter, IST control for that call shall be terminated.

Call termination Indicator

If included in the IST Alert response, this parameter is used to indicate whether the MSC shall terminate the call activity that had previously triggered the IST Alert procedure, or it shall also release all other call activities for the specified subscriber (outgoing call activities if the IST Alert is initiated by the VMSC, or incoming call activities if the IST Alert is initiated by the GMSC). Release of all other call activities is possible only if the MSC has the capability to link the call activities for the Subscriber by using the IMSI as key.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- System Failure;
- Unexpected Data Value;
- Resource Limitation;
- Facility Not Supported;
- Unknown Subscriber.

10.14 MAP_IST_COMMAND service

10.14.1 Definition

This service is used by the HLR to instruct the MSC (Visited MSC or Gateway MSC) to terminate ongoing call activities for a specific subscriber. It is a confirmed service using the service primitives shown in table 10.14/1.

10.14.2 Service primitives

The service primitives are shown in table 10.14/1.

Table 10.14/1: MAP_IST_COMMAND parameters

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
User error			C	C(=)
Provider error				O

10.14.3 Parameter use

All parameters are described in subclause 7.6. The following clarifications are applicable:

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- System Failure;
- Unexpected Data Value;
- Resource Limitation;
- Facility Not Supported;
- Unknown Subscriber.

11 Supplementary services related services

11.1 MAP_REGISTER_SS service

11.1.1 Definition

This service is used between the MSC and the VLR and between the VLR and the HLR to register data related to a supplementary service. The VLR will relay the message to the HLR.

The service is a confirmed service and consists of four service primitives.

11.1.2 Service primitives

The service primitives are shown in table 11.1/1.

Table 11.1/1: MAP_REGISTER_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Basic service	C	C(=)		
Forwarded-to number with subaddress	C	C(=)		
No reply condition time	C	C(=)		
EMLPP default priority	C	C(=)	C	C(=)
Forwarding information			C	C(=)
User error			C	C(=)
Provider error				O

11.1.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

This parameter indicates the supplementary service which the mobile subscriber wants to register.

Basic service

This parameter indicates for which basic service group the supplementary service is to be registered. If it is not included, the registration request applies to all basic services.

Forwarded-to number with subaddress

This parameter is obligatory if the registration applies to one or more call forwarding supplementary services. It can optionally include a sub-address.

No reply condition time

This parameter is included if the registration applies to the Call Forwarding on No Reply supplementary service (or a superset of this service) and the mobile subscriber supplies a value for this time.

EMLPP default priority

This parameter is sent by the initiator to register the eMLPP default priority level and is returned by the responder at successful outcome of the service.

Forwarding information

This parameter is returned by the responder at successful outcome of the service, if the registration request concerned one or a group of Call Forwarding supplementary services.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- System failure;
- Data missing;
- Unexpected data value;
- Call Barred;
- Bearer service not provisioned;

This error is returned only if not even a subset of the requested bearer service group has been subscribed to.

- Teleservice not provisioned;

This error is returned only if not even a subset of the requested teleservice group has been subscribed to.

- Illegal SS operation;
- SS error status;
- SS incompatibility.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.2 MAP_ERASE_SS service

11.2.1 Definition

This service is used between the MSC and the VLR and between the VLR and the HLR to erase data related to a supplementary service. The VLR will relay the message to the HLR.

The service is a confirmed service and consists of four service primitives.

11.2.2 Service primitives

The service primitives are shown in table 11.2/1.

Table 11.2/1: MAP_ERASE_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Basic service	C	C(=)		
Forwarding information			C	C(=)
User error			C	C(=)
Provider error				O

11.2.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

This parameter indicates the supplementary service which the mobile subscriber wants to erase.

Basic service

This parameter indicates for which basic service group the supplementary service should be erased. If it is not included, the erasure request applies to all basic services.

Forwarding information

This parameter is returned by the responder at successful outcome of the service, if the erasure request concerned one or a group of Call Forwarding supplementary services.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data Missing;
- Unexpected data value;
- Bearer service not provisioned;

This error is returned only if not even a subset of the requested bearer service group has been subscribed to.

- Teleservice not provisioned;

This error is returned only if not even a subset of the requested teleservice group has been subscribed to.

- Call Barred;
- Illegal SS operation;
- SS error status.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.3 MAP_ACTIVATE_SS service

11.3.1 Definition

This service is used between the MSC and the VLR and between the VLR and the HLR to activate a supplementary service. The VLR will relay the message to the HLR.

The service is a confirmed service and consists of four service primitives.

11.3.2 Service primitives

The service primitives are shown in table 11.3/1.

Table 11.3/1: MAP_ACTIVATE_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Basic service	C	C(=)		
Forwarding information			C	C(=)
Call barring information			C	C(=)
SS-Data			C	C(=)
User error			C	C(=)
Provider error				O

11.3.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

This parameter indicates the supplementary service which the mobile subscriber wants to activate.

Basic service

This parameter indicates for which basic service groups the requested supplementary service(s) should be activated. If it is not included, the activation request applies to all basic services.

Forwarding information

This parameter is returned by the responder at successful outcome of the service, if the activation request concerned Call Forwarding.

Call barring information

This parameter is returned by the responder at successful outcome of the service, if the activation request concerned Call Barring.

SS-Data

This parameter is returned by the responder at successful outcome of the service, if the activation request concerned for example Call Waiting.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data Missing;
- Unexpected data value;
- Bearer service not provisioned;

This error is returned only if not even a subset of the requested bearer service group has been subscribed to.

- Teleservice not provisioned;

This error is returned only if not even a subset of the requested teleservice group has been subscribed to.

- Call Barred;
- Illegal SS operation;
- SS error status;
- SS subscription violation;
- SS incompatibility;
- Negative PW check;
- Number Of PW Attempts Violation.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.4 MAP_DEACTIVATE_SS service

11.4.1 Definitions

This service is used between the MSC and the VLR and between the VLR and the HLR to deactivate a supplementary service. The VLR will relay the message to the HLR.

The service is a confirmed service and consists of four service primitives.

11.4.2 Service primitives

The service primitives are shown in table 11.4/1.

Table 11.4/1: MAP_DEACTIVATE_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Basic service	C	C(=)		
Forwarding information			C	C(=)
Call barring information			C	C(=)
SS-Data			C	C(=)
User error			C	C(=)
Provider error				O

11.4.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

This parameter indicates the supplementary service which the mobile subscriber wants to deactivate.

Basic service

This parameter indicates for which basic service group the requested supplementary service(s) should be deactivated. If it is not included the deactivation request applies to all basic services.

Forwarding information

This parameter is returned by the responder at successful outcome of the service, if the deactivation request concerned one or a group of Call Forwarding supplementary services.

Call barring information

This parameter is returned by the responder at successful outcome of the service, if the activation request concerned one or a group of Call Barring supplementary services.

SS-Data

This parameter is returned by the responder at successful outcome of the service, for example if the deactivation request concerned the Call Waiting supplementary service.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data Missing;
- Unexpected data value;
- Bearer service not provisioned;
This error is returned only if not even a subset of the requested bearer service group has been subscribed to.
- Teleservice not provisioned;
This error is returned only if not even a subset of the requested teleservice group has been subscribed to.
- Call Barred;
- Illegal SS operation;
- SS error status;
- SS subscription violation;
- Negative PW check;
- Number Of PW Attempts Violation.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.5 MAP_INTERROGATE_SS service

11.5.1 Definitions

This service is used between the MSC and the VLR and between the VLR and the HLR to retrieve information related to a supplementary service. The VLR will relay the message to the HLR if necessary.

The service is a confirmed service and consists of four service primitives.

11.5.2 Service primitives

The service primitives are shown in table 11.5/1.

Table 11.5/1: MAP_INTERROGATE_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Basic service	C	C(=)		
SS-Status			C	C(=)
Basic service Group LIST			C	C(=)
Forwarding feature LIST			C	C(=)
CLI restriction Info			C	C(=)
EMLPP Info			C	C(=)
CCBS Feature LIST			C	C(=)
User error			C	C(=)
Provider error				O

11.5.3 Parameter use

For additional information on parameter use refer to the GSM 04.8x and 04.9x-series of technical specifications.

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

The mobile subscriber can only interrogate a single supplementary service per service request.

Basic service

This parameter indicates for which basic service group the given supplementary service is interrogated. If it is not included, the interrogation request applies to all basic services.

SS-Status

This parameter is included by the responder if:

- the interrogated supplementary service can only be subscribed for all applicable basic services simultaneously; or
- the interrogated supplementary service is not active for any of the interrogated basic services, or
- the interrogation was for the CCBS supplementary service and no CCBS request is active or the service is not provisioned.

Basic service group LIST

This parameter LIST is used to include one or a series of basic service groups for which the interrogated supplementary service is active. If the interrogated supplementary service is not active for any of the interrogated (and provisioned) basic service groups, the SS-Status parameter is returned.

Forwarding feature LIST

The forwarding feature parameter is described in subclause 7.6.4. A list of one or more forwarding features is returned by the responder when the interrogation request applied to Call Forwarding supplementary service.

If no basic service code parameter is provided within this sequence, the forwarding feature parameter applies to all provisioned basic services.

CLI restriction Info

The CLI-RestrictionInfo parameter is returned by the responder when the interrogation request applies to the CLIR supplementary service.

EMLPP Info

The eMLPP info (maximum entitled priority and default priority) is returned by the responder if the interrogation request applies to the eMLPP supplementary service.

CCBS Feature LIST

The CCBS feature parameter is described in subclause 7.6. A list of one or more CCBS features is returned by the responder when the interrogation request applied to the CCBS supplementary service. See GSM 03.93 [107] for the conditions for the presence of the parameters included in the CCBS feature.

User error

This error is sent by the responder upon unsuccessful outcome of the interrogation service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data Missing;
- Unexpected data value;
- Bearer Service not provisioned;

This error is returned only if not even a subset of the interrogated bearer services are provided.

- Teleservice not provisioned;

This error is returned only if not even a subset of the interrogated teleservices are provided.

- Call Barred;
- Illegal SS operation;
- SS not available.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.6 MAP_INVOKE_SS service

11.6.1 Definitions

This service is used between the MSC and the VLR to check the subscriber's subscription to a given supplementary service in the VLR, in connection with in-call invocation of that supplementary service, i.e. after the call set-up phase is finished. For supplementary service invocation during call set-up phase, please refer to the call handling descriptions.

The service is a confirmed service and consists of four service primitives.

11.6.2 Service primitives

The service primitives are shown in table 11.6/1.

Table 11.6/1: MAP_INVOKE_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Basic service	C	C(=)		
User error			C	C(=)
Provider error				O

11.6.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

This SS-Code can only refer to a single supplementary service, e.g. the Call Hold or Multi Party supplementary services.

Basic service

This parameter indicates for which basic service the supplementary service invocation is required.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values:

- System Failure;
- Data Missing;
- Unexpected data value;
- Call Barred;
- Illegal SS operation;
- SS error status;
- SS not available.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.7 MAP_REGISTER_PASSWORD service

11.7.1 Definitions

This service is used between the MSC and the VLR and between the VLR and the HLR if the mobile subscriber requests to register a new password. The VLR will relay the message to the HLR.

The service is a confirmed service and consists of four service primitives.

11.7.2 Service primitives

The service primitives are shown in table 11.7/1.

Table 11.7/1: MAP_REGISTER_PASSWORD parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
New password			C	C(=)
User error			C	C(=)
Provider error				O

11.7.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

This parameter indicates for which supplementary service(s) the password should be registered.

New Password

See subclause 7.6.4 for the use of this parameter.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data Missing;
- Unexpected data value;
- Call Barred;
- SS subscription violation;
- Password registration failure;
- Negative PW check;
- Number Of PW Attempts Violation.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.8 MAP_GET_PASSWORD service

11.8.1 Definitions

This service is used between the HLR and the VLR and between the VLR and the MSC when the HLR receives a request from the mobile subscriber for an operation on a supplementary service which requires a password from the subscriber. The VLR will relay the message to the MSC.

The service is a confirmed service and consists of four service primitives.

11.8.2 Service primitives

The service primitives are shown in table 11.8/1.

Table 11.8/1: MAP_GET_PASSWORD parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Linked id	C	C(=)		
Guidance info	M	M(=)		
Current password			M	M(=)
Provider error				O

11.8.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

Linked Id

See subclause 7.6.1 for the use of this parameter. If the MAP GET PASSWORD service is used in conjunction with the MAP REGISTER PASSWORD service, this parameter must be present; otherwise it must be absent.

Guidance info

See subclause 7.6.4 for the use of this parameter.

Current password

See subclause 7.6.4 for the use of this parameter.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.9 MAP_PROCESS_UNSTRUCTURED_SS_REQUEST service

11.9.1 Definitions

This service is used between the MSC and the VLR, between the VLR and the HLR and between the HLR and gsmSCF to relay information in order to allow unstructured supplementary service operation.

The MAP_PROCESS_UNSTRUCTURED_SS_REQUEST service is a confirmed service using the primitives from table 11.9/1.

11.9.2 Service primitives

Table 11.9/1: MAP_PROCESS_UNSTRUCTURED_SS_REQUEST parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
USSD Data Coding Scheme	M	M(=)	C	C(=)
USSD String	M	M(=)	C	C(=)
MSISDN	U	C(=)		
User error			C	C(=)
Provider error				O

11.9.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

USSD Data Coding Scheme:

See subclause 7.6.4 for the use of this parameter. The presence of the parameter in the response is dependent on the unstructured supplementary service application. If this parameter is present, then the USSD String parameter has to be present.

USSD String:

See subclause 7.6.1 for the use of this parameter. The presence of the parameter in the response is dependent on the unstructured supplementary service application. If this parameter is present, then the USSD Data Coding Scheme parameter has to be present.

MSISDN:

The subscriber's basic MSISDN.

See definition in subclause 7.6.2. The MSISDN is included as an operator option, e.g. to allow addressing the subscriber's data in the gsmSCF with the MSISDN.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- System failure;
- Data missing;
- Unexpected data value;

This error is returned by the responder if it is not able to deal with the contents of the USSD string.

- Call Barred;
- Unknown Alphabet.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.10 MAP_UNSTRUCTURED_SS_REQUEST service

11.10.1 Definitions

This service is used between the gsmSCF and the HLR, the HLR and the VLR and between the VLR and the MSC when the invoking entity requires information from the mobile user, in connection with unstructured supplementary service handling.

The MAP_UNSTRUCTURED_SS_REQUEST service is a confirmed service using the primitives from table 11.10/1.

11.10.2 Service primitives

The service primitives are shown in table 11.10/1.

Table 11.10/1: MAP_UNSTRUCTURED_SS_REQUEST parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
USSD Data Coding Scheme	M	M(=)	C	C(=)
USSD String	M	M(=)	C	C(=)
Alerting Pattern	C	C(=)		
User error			C	C(=)
Provider error				O

11.10.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

USSD Data Coding Scheme:

See subclause 7.6.4 for the use of this parameter. The presence of the parameter in the response is dependent on the mobile user's MMI input. If this parameter is present, then the USSD String parameter has to be present.

USSD String:

See subclause 7.6.1 for the use of this parameter. The presence of the parameter in the response is dependent on the mobile user's MMI input. If this parameter is present, then the USSD Data Coding Scheme parameter has to be present.

Alerting Pattern

See subclause 7.6.3 for the use of this parameter.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- System failure;
- Data missing;
- Unexpected data value;

This error is returned by the responder if it is not able to deal with the contents of the USSD string.

- Absent Subscriber;
- Illegal Subscriber;

This error indicates that delivery of the unstructured supplementary service data failed because the MS failed authentication.

- Illegal Equipment;
- USSD Busy;
- Unknown Alphabet.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.11 MAP_UNSTRUCTURED_SS_NOTIFY service

11.11.1 Definitions

This service is used between the gsmSCF and the HLR, the HLR and the VLR and between the VLR and the MSC when the invoking entity requires a notification to be sent to the mobile user, in connection with unstructured supplementary services handling.

The MAP_UNSTRUCTURED_SS_NOTIFY service is a confirmed service using the primitives from table 11.11/1.

11.11.2 Service primitives

The service primitives are shown in table 11.11/1.

Table 11.11/1: MAP_UNSTRUCTURED_SS_NOTIFY parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
USSD Data Coding Scheme	M	M(=)		
USSD String	M	M(=)		
Alerting Pattern	C	C(=)		
User error			C	C(=)
Provider error				O

11.11.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

USSD Data Coding Scheme:

See subclause 7.6.4 for the use of this parameter.

USSD String:

See subclause 7.6.1 for the use of this parameter.

Alerting Pattern

See subclause 7.6.3 for the use of this parameter.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- System failure;
- Data missing;
- Unexpected data value;

This error is returned by the responder if it is not able to deal with the contents of the USSD string.

- Absent Subscriber;
- Illegal Subscriber;

This error indicates that delivery of the unstructured supplementary service data failed because the MS failed authentication.

- Illegal Equipment;
- USSD Busy;
- Unknown Alphabet.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.12 MAP_SS_INVOCATION_NOTIFY

11.12.1 Definition

This service is used between the MSC and the gsmSCF when the subscriber invokes one of the following supplementary services; Call Deflection (CD), Explicit Call Transfer (ECT) or Multi Party (MPTY).

This service is used between the HLR and the gsmSCF when the subscriber invokes the CCBS supplementary service.

11.12.2 Service primitives

The service primitives are shown in table 11.12/1.

Table 11.12/1: SS_INVOCATION_NOTIFY parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
MSISDN	M	M(=)		
IMSI	M	M(=)		
SS- event	M	M(=)		
SS- event data	C	C(=)		
User error			C	C(=)
Provider error				O

11.12.3 Parameter use

All parameters are described in subclause 7.6. The use of these parameters and the requirements for their presence are specified in 3G TS 23.078.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Data Missing;
- Unexpected Data Value;
- Unknown Subscriber.

Provider error

This is defined in subclause 7.6.1.

11.13 MAP_REGISTER_CC_ENTRY service

11.13.1 Definition

This service is used between the MSC and the VLR and between the VLR and the HLR to register data for a requested call completion supplementary service. The VLR will relay the message to the HLR.

The service is a confirmed service and uses the service primitives shown in table 11.13/1.

11.13.2 Service primitives

The service primitives are shown in table 11.13/1.

Table 11.13/1: MAP_REGISTER_CC_ENTRY parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS Code	M	M(=)		
CCBS Feature	C	C(=)	C	C(=)
Translated B number	C	C(=)		
Service Indicator	C	C(=)		
Call Info	C	C(=)		
Network Signal Info	C	C(=)		
User error			C	C(=)
Provider error				O

11.13.3 Parameter use

See subclause 7.6 for a definition of the parameters used, in addition to the following.

SS-Code

This parameter indicates the call completion supplementary service for which the mobile subscriber wants to register an entry.

CCBS Feature

See GSM 03.93 for the conditions for the presence of the parameters included in the CCBS feature.

Translated B Number

See GSM 03.93 for the use of this parameter and the conditions for its presence.

Service Indicator

This parameter corresponds to the parameters 'Presentation Indicator' and 'CAMEL Invoked' in GSM 03.93 [107]. It indicates which services have been invoked for the original call (e.g. CLIR, Camel). See GSM 03.93 [107] for the use of this parameter and the conditions for its presence.

Call Info

See GSM 03.93 [107] for the use of this parameter and the conditions for its presence.

Network Signal Info

See GSM 03.93 [107] for the use of this parameter and the conditions for its presence.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data missing;
- Unexpected data value;
- Call Barred;
- Illegal SS operation;

- SS error status;
- SS incompatibility.
- Short Term Denial;
- Long Term Denial;
- Facility Not Supported;

Note: This error is reserved for future use.

Private Extensions shall not be sent with these user errors for this operation.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.14 MAP_ERASE_CC_ENTRY service

11.14.1 Definition

This service is used between the MSC and the VLR and between the VLR and the HLR to erase data related to a call completion supplementary service. The VLR will relay the message to the HLR.

The service is a confirmed service and uses the service primitives shown in table 11.14/1.

11.14.2 Service primitives

The service primitives are shown in table 11.14/1.

Table 11.14/1: MAP_ERASE_CC_ENTRY parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)	C(=)	C(=)
CCBS Index	C	C(=)		
SS-Status			C	C(=)
User error			C	C(=)
Provider error				O

11.14.3 Parameter use

See subclause 7.6 for a definition of the parameters used, in addition to the following.

SS-Code

This parameter indicates the call completion supplementary service for which the mobile subscriber wants to erase an entry/entries.

CCBS Index

See GSM 03.93 for the use of this parameter and the condition for its presence.

SS-Status

Depending on the outcome of the service request this parameter may indicate either provisioned and active or not provisioned.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data Missing;
- Unexpected data value;
- Call Barred;
- Illegal SS operation;
- SS error status.

Private Extensions shall not be sent with these user errors for this operation.

Provider error

See subclause 7.6.1 for the use of this parameter.

12 Short message service management services

12.1 MAP-SEND-ROUTING-INFO-FOR-SM service

12.1.1 Definition

This service is used between the gateway MSC and the HLR to retrieve the routing information needed for routing the short message to the servicing MSC.

The MAP-SEND-ROUTING-INFO-FOR-SM is a confirmed service using the primitives from table 12.1/1.

12.1.2 Service primitives

The service primitives are shown in table 12.1/1.

Table 12.1/1: MAP-SEND-ROUTING-INFO-FOR-SM

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
MSISDN	M	M(=)		
SM-RP-PRI	M	M(=)		
Service Centre Address	M	M(=)		
SM-RP-MTI	C	C(=)		
SM-RP-SMEA	C	C(=)		
GPRS Support Indicator	C	C(=)		
IMSI			C	C(=)
Network Node Number			C	C(=)
LMSI			C	C(=)
GPRS Node Indicator			C	C(=)
Additional Number			C	C(=)
User error			C	C(=)
Provider error				O

12.1.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

MSISDN:

See definition in subclause 7.6.2.

SM-RP-PRI:

See definition in subclause 7.6.8.

Service Centre Address:

See definition in subclause 7.6.2.

SM-RP-MTI:

See definition in subclause 7.6.8. This parameter shall be present when the feature « SM filtering by the HPLMN » is supported by the SMS-GMSC and when the equivalent parameter is received from the short message service relay sub-layer protocol.

SM-RP-SMEA:

See definition in subclause 7.6.8. This parameter shall be present when the feature « SM filtering by the HPLMN » is supported by the SMS-GMSC and when the equivalent parameter is received from the short message service relay sub-layer protocol.

GPRS Support Indicator:

See definition in subclause 7.6.8. The presence of this parameter is mandatory if the SMS-GMSC supports receiving of the two numbers from the HLR.

IMSI:

See definition in subclause 7.6.2. The presence of this parameter is mandatory in a successful case.

Network Node Number:

See definition in subclause 7.6.2. This parameter is provided in a successful response.

LMSI:

See definition in subclause 7.6.2. It is an operator option to provide this parameter from the VLR; it is mandatory for the HLR to include the LMSI in a successful response, if the VLR has used the LMSI.

GPRS Node Indicator:

See definition in subclause 7.6.8. The presence of this parameter is mandatory if only the SGSN number is sent in the Network Node Number.

Additional Number:

See definition in subclause 7.6.2. This parameter is provided in a successful response.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown subscriber;
- Call Barred;
- Teleservice Not Provisioned;

- Absent Subscriber_SM;
- Facility Not Supported;
- System failure;
- Unexpected Data Value;
- Data missing.

Provider error:

For definition of provider errors see subclause 7.6.1.

12.2 MAP-MO-FORWARD-SHORT-MESSAGE service

12.2.1 Definition

This service is used between the serving MSC or the SGSN and the gateway MSC to forward mobile originated short messages.

The MAP-MO-FORWARD-SHORT-MESSAGE service is a confirmed service using the service primitives given in table 12.2/1.

12.2.2 Service primitives

The service primitives are shown in table 12.2/1.

Table 12.2/1: MAP-MO-FORWARD-SHORT-MESSAGE

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
SM RP DA	M	M(=)		
SM RP OA	M	M(=)		
SM RP UI	M	M(=)	C	C(=)
IMSI	C	C(=)		
User error			C	C(=)
Provider error				O

12.2.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

SM RP DA:

See definition in subclause 7.6.8.

In the mobile originated SM transfer this parameter contains the Service Centre address received from the mobile station.

SM RP OA:

See definition in subclause 7.6.8.

The MSISDN received from the VLR or from the SGSN is inserted in this parameter in the mobile originated SM transfer.

SM RP UI:

See definition in subclause 7.6.8. The short message transfer protocol data unit received from the Service Centre is inserted in this parameter.

IMSI

See definition in subclause 7.6.2.1. The IMSI of the originating subscriber is inserted in this parameter in the mobile originated SM transfer.

This parameter shall be included if the sending entity, whether MSC or SGSN, supports mobile number portability.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Facility Not Supported;
- System Failure;
- SM Delivery Failure;
 - The reason of the SM Delivery Failure can be one of the following in the mobile originated SM:
 - unknown Service Centre address;
 - Service Centre congestion;
 - invalid Short Message Entity address;
 - subscriber not Service Centre subscriber;
 - protocol error.
- Unexpected Data Value

Provider error:

For definition of provider errors see subclause 7.6.1.

12.3 MAP-REPORT-SM-DELIVERY-STATUS service

12.3.1 Definition

This service is used between the gateway MSC and the HLR. The MAP-REPORT-SM-DELIVERY-STATUS service is used to set the Message Waiting Data into the HLR or to inform the HLR of successful SM transfer after polling. This service is invoked by the gateway MSC.

The MAP-REPORT-SM-DELIVERY-STATUS service is a confirmed service using the service primitives given in table 12.3/1.

12.3.2 Service primitives

The service primitives are shown in table 12.3/1.

Table 12.3/1: MAP-REPORT-SM-DELIVERY-STATUS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
MSISDN	M	M(=)		
Service Centre Address	M	M(=)		
SM Delivery Outcome	M	M(=)		
Absent Subscriber	C	C(=)		
Diagnostic SM				
GPRS Support Indicator	C	C(=)		
Delivery Outcome Indicator	C	C(=)		
Additional SM Delivery Outcome	C	C(=)		
Additional Absent Subscriber	C	C(=)		
Diagnostic SM				
MSISdn-Alert			C	C(=)
User error			C	C(=)
Provider error				O

12.3.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

MSISDN:

See definition in subclause 7.6.2.

Service Centre Address:

See definition in subclause 7.6.2.

SM Delivery Outcome:

See definition in subclause 7.6.8. This parameter indicates the status of the mobile terminated SM delivery.

Absent Subscriber Diagnostic SM:

See definition in subclause 7.6.8.

GPRS Support Indicator:

See definition in subclause 7.6.8. The presence of this parameter is mandatory if the SMS-GMSC supports handling of two delivery outcomes.

Delivery Outcome Indicator:

See definition in subclause 7.6.8.

Additional SM Delivery Outcome:

See definition in subclause 7.6.8.

Additional Absent Subscriber Diagnostic SM:

See definition in subclause 7.6.8.

MSISdn-Alert:

See definition in subclause 7.6.2. This parameter shall be present in case of unsuccessful delivery, when the MSISDN received in the operation is different from the stored MSISdn-Alert; the stored MSISdn-Alert is the value that is returned to the gateway MSC.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown Subscriber;
- Message Waiting List Full;
- Unexpected Data Value;
- Data missing.

Provider error:

For definition of provider errors see subclause 7.6.1.

12.4 MAP-READY-FOR-SM service

12.4.1 Definition

This service is used between the MSC and VLR and as well between the VLR and the HLR. The MSC initiates this service if a subscriber indicates memory available situation. The VLR uses the service to indicate this to the HLR.

The VLR initiates this service if a subscriber, whose message waiting flag is active in the VLR, has radio contact in the MSC.

Also this service is used between the SGSN and the HLR. The SGSN initiates this service if a subscriber indicates memory available situation. The SGSN uses the service to indicate this to the HLR.

The SGSN initiates this service if a subscriber, whose message waiting flag is active in the SGSN, has radio contact in the GPRS.

The MAP-READY-FOR-SM service is a confirmed service using the primitives from table 12.4/1.

12.4.2 Service primitives

The service primitives are shown in table 12.4/1.

Table 12.4/1: MAP-READY-FOR-SM

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
TMSI	C	C(=)		
Alert Reason	M	M(=)		
Alert Reason Indicator	C	C(=)		
User error			C	C(=)
Provider error				O

12.4.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

See definition in subclause 7.6.2. The IMSI is used always between the VLR and the HLR and between the SGSN and the HLR. Between the MSC and the VLR the identification can be either IMSI or TMSI.

TMSI:

See definition in subclause 7.6.2. The identification can be either IMSI or TMSI between MSC and VLR.

Alert Reason:

See definition in subclause 7.6.8. This parameter indicates if the mobile subscriber is present or the MS has memory available.

Alert Reason Indicator:

See definition in subclause 7.6.8.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown Subscriber;
- Facility Not Supported;
- System Failure;
- Unexpected Data Value;
- Data missing;

Provider error:

For definition of provider errors see subclause 7.6.1.

12.5 MAP-ALERT-SERVICE-CENTRE service

12.5.1 Definition

This service is used between the HLR and the interworking MSC. The HLR initiates this service, if the HLR detects that a subscriber, whose MSISDN is in the Message Waiting Data file, is active or the MS has memory available.

The MAP-ALERT-SERVICE-CENTRE service is a confirmed service using the primitives from table 12.5/1.

12.5.2 Service primitives

The service primitives are shown in table 12.5/1.

Table 12.5/1: MAP-ALERT-SERVICE-CENTRE

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
MSISdn-Alert	M	M(=)		
Service Centre Address	M	M(=)		
User error			C	C(=)
Provider error				O

12.5.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

MSISdn-Alert:

See definition in subclause 7.6.2. The provided MSISDN shall be the one which is stored in the Message Waiting Data file.

Service Centre Address:

See definition in subclause 7.6.2.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- System Failure;
- Unexpected Data Value;
- Data missing.

Provider error:

For definition of provider errors see subclause 7.6.1.

12.6 MAP-INFORM-SERVICE-CENTRE service

12.6.1 Definition

This service is used between the HLR and the gateway MSC to inform the Service Centre which MSISDN number is stored in the Message Waiting Data file. If the stored MSISDN number is not the same than the one received from the gateway MSC in the MAP-SEND-ROUTING-INFO-FOR-SM service primitive the stored MSISDN number is included in the message.

Additionally the status of MCEF, MNRF and MNRG flags and the inclusion of the particular Service Centre address in the Message Waiting Data list is informed to the gateway MSC when appropriate.

The MAP-INFORM-SERVICE-CENTRE service is a non-confirmed service using the primitives from table 12.6/1.

12.6.2 Service primitives

The service primitives are shown in table 12.6/1.

Table 12.6/1: MAP-INFORM-SERVICE-CENTRE

Parameter name	Request	Indication
Invoke Id	M	M(=)
MSIsdn-Alert	C	C(=)
MWD Status	C	C(=)

12.6.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

MSIsdn-Alert:

See definition in subclause 7.6.2 This parameter refers to the MSISDN stored in a Message Waiting Data file in the HLR.

MWD Status:

See definition in subclause 7.6.8. This parameter indicates the status of the MCEF, MNRF and MNRG flags and the status of the particular SC address presence in the Message Waiting Data list.

12.7 MAP-SEND-INFO-FOR-MT-SMS service

12.7.1 Definition

This service is used between the MSC and the VLR. The service is invoked by the MSC receiving an mobile terminated short message to request subscriber related information from the VLR.

The MAP-SEND-INFO-FOR-MT-SMS service is a confirmed service using the primitives from table 12.7/1.

12.7.2 Service primitives

The service primitives are shown in table 12.7/1.

Table 12.7/1: MAP-SEND-INFO-FOR-MT-SMS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
SM RP DA	M	M(=)		
MSISDN			C	C(=)
User error			C	C(=)
Provider error				O

12.7.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

SM RP DA:

See definition in subclause 7.6.8. This parameter shall contain either an IMSI or a LMSI.

MSISDN:

See definition in subclause 7.6.2.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown subscriber;
- Unidentified Subscriber;
- Absent subscriber;
- Unexpected Data Value;
- Data Missing;
- Illegal subscriber;
- Illegal equipment;
- Subscriber busy for MT SMS;
- System Failure.

Provider error:

For definition of provider errors see subclause 7.6.1.

12.8 MAP-SEND-INFO-FOR-MO-SMS service

12.8.1 Definition

This service is used between the MSC and the VLR. The service is invoked by the MSC which has to handle a mobile originated short message request to request the subscriber related information from the VLR.

The MAP-SEND-INFO-FOR-MO-SMS service is a confirmed service using the primitives from table 12.8/1.

12.8.2 Service primitives

The service primitives are shown in table 12.8/1.

Table 12.8/1: MAP-SEND-INFO-FOR-MO-SMS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Service Centre Address	M	M(=)		
MSISDN			C	C(=)
User error			C	C(=)
Provider error				O

12.8.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

Service Centre Address:

See definition in subclause 7.6.2.

MSISDN:

See definition in subclause 7.6.2.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Teleservice Not Provisioned;
- Call Barred;
- Unexpected Data Value;
- Data Missing.

Provider error:

For definition of provider errors see subclause 7.6.1.

12.9 MAP-MT-FORWARD-SHORT-MESSAGE service

12.9.1 Definition

This service is used between the gateway MSC and the servicing MSC or the SGSN to forward mobile mobile terminated short messages.

The MAP-MT-FORWARD-SHORT-MESSAGE service is a confirmed service using the service primitives given in table 12.9/1.

12.9.2 Service primitives

The service primitives are shown in table 12.9/1.

Table 12.9/1: MAP-MT-FORWARD-SHORT-MESSAGE

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
SM RP DA	M	M(=)		
SM RP OA	M	M(=)		
SM RP UI	M	M(=)	C	C(=)
More Messages To Send	C	C(=)		
User error			C	C(=)
Provider error				O

12.9.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

SM RP DA:

See definition in subclause 7.6.8. This parameter can contain either an IMSI or a LMSI. The use of the LMSI is an operator option. The LMSI can be provided if it is received from the HLR. The IMSI is used if the use of the LMSI is not available.

This parameter is omitted in the mobile terminated subsequent SM transfers.

SM RP OA:

See definition in subclause 7.6.8. The Service Centre address received from the originating Service Centre is inserted in this parameter .

This parameter is omitted in the mobile terminated subsequent SM transfers.

SM RP UI:

See definition in subclause 7.6.8. The short message transfer protocol data unit received from the Service Centre is inserted in this parameter. A short message transfer protocol data unit may also be inserted in this parameter in the message delivery acknowledgement from the MSC or from the SGSN to the Service Centre.

More Messages To Send:

See definition in subclause 7.6.8. The information from the MMS indication received from the Service Centre is inserted in this parameter.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unidentified subscriber;
- Absent Subscriber_SM;
- Subscriber busy for MT SMS;
- Facility Not Supported;
- Illegal Subscriber indicates that delivery of the mobile terminated short message failed because the mobile station failed authentication;
- Illegal equipment indicates that delivery of the mobile terminated short message failed because an IMEI check failed, i.e. the IMEI was blacklisted or not white-listed;
- System Failure;
- SM Delivery Failure;
 - The reason of the SM Delivery Failure can be one of the following in the mobile terminated SM:
 - memory capacity exceeded in the mobile equipment;
 - protocol error;
 - mobile equipment does not support the mobile terminated short message service.
- Unexpected Data Value;
- Data Missing.

Provider error:

For definition of provider errors see subclause 7.6.1.

13 Network-Requested PDP Context Activation services

13.1 MAP_SEND_ROUTING_INFO_FOR_GPRS service

13.1.1 Definition

This service is used by the GGSN to request GPRS routing information from the HLR.

13.1.2 Service primitives

Table 13.1/1: MAP_SEND_ROUTING_INFO_FOR_GPRS

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
GGSN address	C	C(=)	C	C(=)
SGSN address			C	C(=)
Mobile Not Reachable Reason			C	C(=)
User error			C	C(=)
Provider error				O

13.1.3 Parameter definition and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2.

GGSN address

This parameter shall be present if the protocol-converting GSN is used between the GGSN and the HLR.

SGSN address

This parameter shall be present if the outcome of the Send Routing Info For GPRS request to the GPRS application process in the HLR is positive.

Mobile Not Reachable Reason

This parameter shall be present if the outcome of the Send Routing Info For GPRS request to the GPRS application process in the HLR is positive and the MNRG flag in the HLR is set. See definition in subclause 7.6.3.51.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Absent Subscriber;
- System Failure;
- Data Missing;
- Unexpected Data Value;
- UnknownSubscriber.

The diagnostic in the Unknown Subscriber may indicate “Imsi Unknown” or “Gprs Subscription Unknown”.

Provider error

These are defined in subclause 7.6.1.

13.2 MAP_FAILURE_REPORT service

13.2.1 Definition

This service is used by the GGSN to inform the HLR that network requested PDP-context activation has failed.

13.2.2 Service primitives

Table 13.2/1: MAP_FAILURE_REPORT

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
GGSN address	C	C(=)	C	C(=)
GGSN number	M	M(=)		
User error			C	C(=)
Provider error				O

13.2.3 Parameter definition and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2.

GGSN address

This parameter shall be present if the protocol-converting GSN is used between the GGSN and the HLR.

GGSN number

See definition in subclause 7.6.2.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- System Failure;
- Data Missing;
- Unexpected Data Value;
- UnknownSubscriber.

Provider error

These are defined in subclause 7.6.1.

13.3 MAP_NOTE_MS_PRESENT_FOR_GPRS service

13.3.1 Definition

This service is used by the HLR to inform the GGSN that the MS is present for GPRS again.

13.3.2 Service primitives

Table 13.3/1: MAP_NOTE_MS_PRESENT_FOR_GPRS

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
GGSN address	C	C(=)		
SGSN address	M	M(=)		
User error			C	C(=)
Provider error				O

13.3.3 Parameter definition and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2.

GGSN address

This parameter shall be present if the protocol-converting GSN is used between the GGSN and the HLR.

SGSN address

See definition in subclause 7.6.2.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- System Failure;
- Data Missing;
- Unexpected Data Value;
- UnknownSubscriber.

Provider error

These are defined in subclause 7.6.1.

13A Location Service Management Services

13A.1 MAP-SEND-ROUTING-INFO-FOR-LCS Service

13A.1.1 Definition

This service is used between the GMLC and the HLR to retrieve the routing information needed for routing a location service request to the servicing VMSC. The MAP-SEND-ROUTING-INFO-FOR-LCS is a confirmed service using the primitives from table A.1/1.

13A.1.2 Service Primitives

The service primitives are shown in table 13A.1/1.

Table 13A.1/1: MAP-SEND-ROUTING-INFO-FOR-LCS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
MLC Number	M	M(=)		
MSISDN	C	C(=)	C	C(=)
IMSI	C	C(=)	C	C(=)
LMSI			C	C(=)
MSC Number			C	C(=)
User error			C	C(=)
Provider error				O

13A.1.3 Parameter Use

Invoke id:

See definition in subclause 7.6.1.

MLC Number:

See definition in subclause 7.6.2.

MSISDN:

See definition in subclause 7.6.2. The request shall carry either the IMSI or MSISDN. The response shall carry whichever of these was not included in the request (see GSM 03.71 for details).

IMSI:

See definition in subclause 7.6.2.

LMSI:

See definition in subclause 7.6.2. It is an operator option to provide this parameter from the VLR; it is mandatory for the HLR to include the LMSI in a successful response, if the VLR has used the LMSI.

MSC Number:

See definition in subclause 7.6.2. This parameter is provided in a successful response.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown subscriber;
- Absent Subscriber;
- Facility Not Supported;
- System failure;
- Unexpected Data Value;
- Data missing;
- Unauthorized requesting network

Provider error:

For definition of provider errors see subclause 7.6.1.

13A.2 MAP-PROVIDE-SUBSCRIBER-LOCATION Service

13A.2.1 Definition

This service is used by a GMLC to request the location of a target MS from the visited MSC at any time. This is a confirmed service using the primitives from table 13A.2/1.

13A.2.2 Service Primitives

Table 13A.2/1: Provide_Subscriber_Location

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Location Type	M	M(=)		
MLC Number	M	M(=)		
LCS Client ID	M	M(=)		
Privacy Override	U	C(=)		
IMSI	C	C(=)		
MSISDN	C	C(=)		
LMSI	C	C(=)		
LCS Priority	C	C(=)		
LCS QoS	C	C(=)		
NA-ESRK	C	C(=)		
IMEI	C	C(=)		
Location Estimate			M	M(=)

Age of Location Estimate			C	C(=)
User error			C	C(=)
Provider error				O

13A.2.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

Location Type

This parameter identifies the type of location requested

MLC Number

This is the E.164 number of the requesting GMLC.

LCS Client ID

This parameter provides information related to the identity of an LCS client.

Privacy Override

This parameter indicates if MS privacy is overridden by the LCS client when the GMLC and VMSC for an MR-LR are in the same country.

IMSI

The IMSI is provided to identify the target MS. At least one of the IMSI, MSISDN or NA-ESRK is mandatory.

MSISDN

The MSISDN is provided to identify the target MS. At least one of the IMSI, MSISDN or NA-ESRK is mandatory.

LMSI

The LMSI shall be provided if previously supplied by the HLR

LCS Priority

This parameter indicates the priority of the location request.

LCS QoS

This parameter indicates the required quality of service in terms of response time and accuracy.

NA-ESRK

This parameter only applies to North America and provides a North American Emergency Service Routing Key.

IMEI

The IMEI shall be provided if available when the target MS is identified by an NA-ESRK.

Location Estimate

This parameter provides the location estimate.

Age of Location Estimate

This parameter indicates how long ago the location estimate was obtained.

User error

This parameter is sent by the responder when the location request has failed or cannot proceed and if present, takes one of the following values defined in section 7.6.1.

- Data Missing;
- Unexpected Data Value;
- Unknown Subscriber
- Absent Subscriber (diagnostic information may also be provided)
- Unauthorized requesting network
- Unauthorized LCS Client with detailed reason
- Position method failure with detailed reason

Provider error

These are defined in subclause 7.6.1.

13A.3 MAP-SUBSCRIBER-LOCATION-REPORT Service

13A.3.1 Definition

This service is used by a VMSC to provide the location of a target MS to a GMLC when a request for location is either implicitly administered or made at some earlier time. This is a confirmed service using the primitives from table 13A.3/1.

13A.3.2 Service Primitives

Table 13A.3/1: Subscriber_Location_Report

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
LCS Event	M	M(=)		
LCS Client ID	M	M(=)		
IMSI	C	C(=)		
MSISDN	C	C(=)		
NA-ESRD	C	C(=)		
NA-ESRK	C	C(=)		
IMEI	C	C(=)		
Location Estimate	C	C(=)		
Age of Location Estimate	C	C(=)		
User error			C	C(=)
Provider error				O

13A.3.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

LCS Event

This parameter indicates the event that triggered the Subscriber Location Report.

LCS Client ID

This parameter provides information related to the identity of the recipient LCS client.

IMSI

The IMSI shall be provided if available to the VMSC

MSISDN

The MSISDN shall be provided if available to the VMSC

NA-ESRD

If the target MS has originated an emergency service call in North America, the NA-ESRD shall be provided by the VMSC.

NA-ESRK

If the target MS has originated an emergency service call in North America, the NA-ESRK may be provided by the VMSC if available.

IMEI

If the target MS has originated an emergency service call in North America, the IMEI may be provided by the VMSCV.

Location Estimate

This parameter provides the location estimate. The absence of this parameter implies that a location estimate was not available or could not be successfully obtained.

Age of Location Estimate

This parameter indicates how long ago the location estimate was obtained.

User error

This parameter is sent by the responder when the received message contains an error, cannot be forwarded or stored for an LCS client or cannot be accepted for some other reason and if present, takes one of the following values defined in section 7.6.1.

- Data Missing;
- Unexpected Data Value;
- Unknown Subscriber
- Unauthorized requesting network
- Unknown or unreachable LCS Client

Provider error

These are defined in subclause 7.6.1.

13A.4 MAP-PERFORM -LOCATION Service

13A.4.1 Definition

This service is used by a serving MSC to request location information from an SMLC for a target MS. This is a confirmed service using the primitives from table 13A.4/1.

13A.4.2 Service Primitives

Table 13A.4/1: Perform_Location

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Global cell Id	M	M(=)		
Radio Channel Type	C	C(=)		
LCS Priority	C	C(=)		
LCS QoS	C	C(=)		
LCS-APDU	C	C(=)		
Location Estimate			C	C(=)
Positioning Data			C	C(=)
User error			C	C(=)
Provider error				O

13A.4.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

Global cell Id

This is the current cell location of the MS being located.

Radio Channel Type

This parameter gives the type of radio channel currently assigned to the MS.

LCS Priority

This parameter indicates the priority of the location request.

LCS QoS

This is the Quality of Service required for the location request in terms of response time and accuracy.

LCS-APDU

This parameter contains LCS related information (e.g. Timing Advance) received from the BSC.

Location Estimate

This parameter gives an estimate of the MS location and the accuracy of the estimate.

Positioning Data

This parameter provides data on the positioning process including the result and resources used.

User error

This parameter is sent by the SMLC when the location request has failed or cannot proceed and if present, takes one of the following values defined in section 7.6.1.

- System Failure
- Data Missing;
- Unexpected Data Value
- Position method failure with detailed reason (restart not allowed)
- Position method failure with restart allowed

Provider error

These are defined in subclause 7.6.1.

13A.5 MAP-LCS-Registration Service

13A.5.1 Definition

This service is used by a VLR to register or deregister an LMU in an SMLC. This is a confirmed service using the primitives from table 13A.5/1.

13A.5.2 Service Primitives

Table 13A.5/1: LCS Registration

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
LMSI	U	C(=)		
Registration Type	M	M(=)		
MSC Number	C	C(=)		
User error			C	C(=)
Provider error				O

13A.5.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

IMSI

This is the E.212 IMSI identity of the LMU.

LMSI

The LMSI of the LMU shall be provided by the MSC if assigned in the VLR and if the registration type indicates registration.

Registration Type

The registration type distinguishes registration and deregistration.

MSC Number

This is the E.164 number of the MSC serving the LMU. Inclusion of the MSC number is mandatory if the registration type indicates registration.

User error

This parameter is sent by the SMLC when the registration procedure has failed and, if present, takes one of the following values defined in section 7.6.1.

- LMU unknown or offline;
- system failure;
- unexpected Data Value;
- Data Missing

Provider error

These are defined in subclause 7.6.1.

13A.6 MAP-LCS-INFORMATION-REQUEST Service

13A.6.1 Definition

This service is used by an SMLC to transfer LCS related data to an MSC for onward transfer to an LMU or serving BSC. This is an unconfirmed service using the primitives from table 13A.6/1.

13A.6.2 Service Primitives

Table 13A.6/1: LCS Information Request

Parameter name	Request	Indication
Invoke id	M	M(=)
IMSI	C	C(=)
LMSI	C	C(=)
MLC Number	U	C(=)
Release Forbidden	U	C(=)
Report Error Indication	U	C(=)
LCS-APDU	C	C(=)

13A.6.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

IMSI

This is the E.212 IMSI identity of an LMU. Inclusion of the IMSI is mandatory when the destination for the LCS data is

an LMU, For other destinations, an IMSI shall not be included.

LMSI

When the destination is an LMU, the LMSI of the LMU shall be provided by the SMLC if previously supplied by the MSC.

MLC Number

This parameter contains the E.164 address for the SMLC. The inclusion of this parameter is optional.

Release Forbidden

This parameter is applicable only when the destination is an LMU. It indicates if an LMU is forbidden to release a signaling channel to the MSC.

Report Error Indication

If present, this parameter requests an LCS Information Report error message from the serving MSC if the LCS Information Request message cannot be transferred to the required destination.

LCS-APDU

This parameter contains the LCS data to be sent on by the MSC to the required destination. For transfer to an LMU, the content of the data is defined in GSM 04.71 For transfer to a BSC, it is defined in GSM 08.71.

13A.7 MAP-LCS-INFORMATION-REPORT Service

13A.7.1 Definition

This service is used by an MSC to transfer LCS related data to an SMLC that was received from or intended for an LMU or BSC. This is an unconfirmed service using the primitives from table 13A.7/1. The message shall be transferred to the SMLC using SCCP class 1.

13A.7.2 Service Primitives

Table 13A.7/1: LCS Information Report

Parameter name	Request	Indication
Invoke id	M	M(=)
IMSI	C	C(=)
LMSI	U	C(=)
LCS Cause	C	C(=)
LCS-APDU	C	C(=)

13A.7.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

IMSI

This is the E.212 IMSI identity of the LMU. Inclusion of the IMSI is mandatory for data transfer related to an LMU. An IMSI shall not be included for other types of data transfer.

LMSI

For data transfer related to an LMU, the MSC may include the LMSI if available in the VLR.

LCS Cause

This parameter contains the reason why LCS data received by the MSC in an LCS Information Request could not be transferred to its intended destination. This parameter shall be included if and only if the MSC is returning LCS data to the SMLC that could not be transferred to the intended destination.

LCS-APDU

This parameter contains the LCS data received from or intended for an LMU or BSC. The content of this parameter is defined in GSM 04.71 for an LMU and in GSM 08.71 for a BSC.

13A.8 MAP-LCS-RESET Service

13A.8.1 Definition

This service is used by an SMLC after either a restart or discovery of inconsistent data to request that a VLR instigate a reset for either all LMUs that are served by the VLR or just certain specific LMUs. This is an unconfirmed service using the primitives from table 13A.8/1.

13A.8.2 Service Primitives

Table 13A.8/1: LCS Reset

Parameter name	Request	Indication
Invoke id	M	M(=)
MLC number	M	M(=)
LMU List	U	C(=)

13A.8.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

MLC

This is the E.164 address for the SMLC.

LMU List

This is a list of LMUs sharing the same SMLC.

13A.9 MAP-LCS-ASSIGN-TRAFFIC-CHANNEL Service

13A.9.1 Definition

This service is used by an SMLC to request assignment of a traffic channel to the target MS by the visited MSC. This is a confirmed service using the primitives from table 13A.9/1.

13A.9.2 Service primitives

Table 13A.9/1: LCS Assign Traffic Channel

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Radio Channel Type	M	M(=)		
User error			C	C(=)
Provider error				O

13A.9.3 Parameter definition and use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

Radio Channel Type

This parameter defines the type of traffic channel to be assigned.

User error

This parameter is sent by the MSC when the required type of traffic channel cannot be assigned and, if present, takes one of the following values defined in section 7.6.1.

- Traffic channel establishment failure;
- system failure;
- unexpected Data Value;
- data missing;

Provider error

These are defined in subclause 7.6.1.

14 General

14.1 Overview

Clause 14 to 17 specify the protocol elements to be used to provide the MAP services described in clause 7.

Clause 15 specifies the elements of procedures for the MAP protocol. Clause 16 specifies the mapping on to TC service primitives. Clause 17 specifies the application contexts, operation packages and abstract syntaxes for the MAP protocol as well as the encoding rules to be applied.

14.2 Underlying services

The MAP protocol relies on the services provided by the Transaction Capabilities (TC) of signalling system number 7, as referenced in clause 6.

14.3 Model

The MAP Protocol Machine (MAP PM) can be modelled as a collection of service state machines (SSMs) - one per MAP specific service invoked - coordinated by a MAP dialogue control function with its one state machine: MAP dialogue state machine (DSM). There are two types of Service State Machines: Requesting Service State Machines (RSM) and Performing Service State Machines (PSM).

A new invocation of a MAP PM is employed on the receipt of a MAP-OPEN request primitive or a TC-BEGIN indication primitive. Each invocation controls exactly one MAP dialogue. For each MAP specific service invoked during a dialogue, a MAP RSM is created at the requestor's side and a MAP PSM is created at the performer's side.

This modelling is used only to facilitate understanding and the MAP behaviour descriptions and is not intended to suggest any implementation. SDL descriptions are organized according to this model.

How the MAP-service-user and the MAP refer to a MAP dialogue (i.e. a MAP PM invocation) is a local implementation matter.

How TC dialogue identifiers are assigned to a MAP PM invocation is also a local implementation matter.

14.4 Conventions

The behaviour of the MAP PM depends on the application-context-name associated with the dialogue. One major difference is that the MAP requests the transfer of the application-context-name by TC only for those contexts which do not belong to the so-called "version one context set".

The "version one context set" is a set of application-contexts which model the behaviour of a MAP V1 implementation according to the latest phase 1 version of GSM 09.02. This set is defined in clause 15.

The procedures described in clause 15 are used when the application-context-name does not refer to a dialogue between an MSC and its VLR. When the application-context-name refers to a dialogue between an MSC and its VLR the MAP PM procedures are a local implementation matter.

15 Elements of procedure

15.1 Dialogue establishment

The establishment of a MAP dialogue involves two MAP-service-users, one that is the dialogue-initiator and one that is the dialogue-responder.

This procedure is driven by the following signals:

- a MAP-OPEN request primitive from the dialogue-initiator;
- a TC-BEGIN indication primitive occurring at the responding side;
- a MAP-OPEN response primitive from the dialogue-responder;
- the first TC-CONTINUE indication primitive occurring at the initiating side;

and under specific conditions:

- a TC-END indication primitive occurring at the initiating side;
- a TC-U-ABORT indication primitive occurring at the initiating side;
- a TC-P-ABORT indication primitive occurring at the initiating side.

15.1.1 Handling of unknown operations

Unknown operations (i.e. a standard operation introduced in a later version of 09.02 or a private operation) can be introduced in MAP in a backwards compatible way. This means, that the receiver of an unknown operation shall, if the dialogue state allows it, send a TC-REJECT component to the sender of the operation indicating 'unrecognised operation' and continue with the processing of further components or messages exchanged within the dialogue as if the unknown operation had not been received.

The standardised structure of a MAP dialogue shall not be affected by the invocation of unknown operations, i.e. if a dialogue uses only a TC-BEGIN message which is acknowledged by a TC-END message, a TC-CONTINUE message shall not be used to invoke an unknown operation. However the standardised structure of a MAP dialogue may be affected by the rejection of unknown operations, i.e. if a dialogue uses only a TC-BEGIN message which is acknowledged by a TC-END message, a TC-CONTINUE message followed by a TC-END message may be used to carry the rejection of an unknown operation and the response to the standardised operation. The entity which initiated a dialogue whose standardised structure is a TC-BEGIN message which is acknowledged by a TC-END message shall not send any messages in that dialogue after the TC-BEGIN.

Note that if the dialogue structure is affected as described in this paragraph the TC-CONTINUE shall include the dialogue portion required to confirm the acceptance of the dialogue.

Unknown operations can be invoked in the following types of messages (there is no restriction as to how many unknown operations can be invoked in a message):

- TC-BEGIN the component to invoke the unknown operation shall follow the component of the standard operation that is included in this message.
- TC-CONTINUE: the component to invoke the unknown operation may be transported as the only component in a stand-alone message or can be grouped with existing operations. In the latter case a specific sequencing of components is not required.
- TC-END: if the component to invoke the unknown operation is grouped with an existing operation a specific sequencing of components is not required

The TC-REJECT component may be sent in the following messages:

- TC-CONTINUE or TC-END: either as the only component of the message or grouped with an existing component. The choice is up to the MAP-Service User.

If the received message contains only unknown operations the MAP-Service User shall send the TC-REJECT components in a TC-CONTINUE message to the peer entity, if the dialogue state allows it.

If the received message contains unknown operations and standard operations and the standardised structure of the dialogue requires the response to the standard operation to be sent within a TC-END message, then the MAP-Service User may send the response to the standard operations and the TC-REJECT components for the unknown operations in a TC-CONTINUE message followed by a TC-END message. A specific distribution of the components to the TC messages or a specific sequencing of components is not required.

Note that SDLs of chapters 19 - 25 do not show the report to the MAP-Service User about the reception of the unknown operation. This has been done for the sake of simplicity of description; the MAP PM may inform the MAP-Service User.

The sender of the unknown operation shall ensure that there is enough room in the used message for the unknown operation.

15.1.2 Receipt of a MAP-OPEN request primitive

On receipt of a MAP-OPEN request primitive the behaviour of the MAP PM shall be as follows:

The MAP PM shall accept zero, one or several user request primitives until a MAP-DELIMITER request primitive is received.

For each user request primitive, the MAP PM shall request the invocation of the associated operation using the TC-INVOKE service. See subclause 15.6 for a description of the associated SSMs.

On receipt of the MAP-DELIMITER request primitive the MAP PM shall issue a TC-BEGIN request primitive. The application-context-name as well as the user information parameter (if any) shall be mapped to the corresponding TC-BEGIN parameters.

The requesting MAP PM waits for a TC indication primitive and does not accept any other primitive from its user, except a MAP-U-ABORT request or a MAP-CLOSE request.

15.1.3 Receipt of a TC-BEGIN indication

On receipt of a TC-BEGIN indication primitive, the MAP PM shall:

- if no application-context-name is included in the primitive and if the "Components present" indicator indicates "no components", issue a TC-U-ABORT request primitive (note 2). The local MAP-User is not informed.
- if no application-context-name is included in the primitive and if presence of components is indicated, wait for the first TC-INVOKE primitive, and derive a version 1 application-context-name from the operation code according to table 15.1/1 (note 1).

NOTE 1: In some cases, it may be necessary to analyse the operation argument.

Then:

- a) if no application-context-name can be derived (i.e. the operation code does not exist in MAP V1 specifications), the MAP PM shall issue a TC-U-ABORT request primitive (note 2). The local MAP-User is not informed.
- b) if an application-context-name can be derived and if it is acceptable from a load control point of view, the MAP PM shall:
 - i) if this primitive requests the beginSubscriberActivity operation, the MAP PM shall check whether more components have been received associated with this operation. If more components are present, the MAP PM shall issue a MAP-OPEN indication primitive with the version 1 application-context-name "networkFunctionalSsContext-v1". The Destination-reference shall include the IMSI taken from the argument of the beginSubscriberActivity operation; the Originating-reference shall cover the originatingEntityNumber.

A beginSubscriberActivity operation that is not associated with any other Component shall be rejected by the MAP PM by issuing a TC-U-ABORT request primitive (note 2). The local MAP-User shall not be informed.

- ii) otherwise, the MAP PM shall issue a MAP-OPEN indication primitive with the version 1 application-context-name set according to table 15.1/1. DestinationReference and OriginatingReference must not be included in the MAP-OPEN indication primitive.

Then the MAP PM shall function in a way that the dialogue responding MAP behaves as specified in the GSM phase 1 protocol (latest version of TS GSM 09.02 phase 1).

NOTE 2: If no AARQ apdu was included in the BEGIN message, TC (Component Sub-layer) will not include an AARE apdu or an ABRT apdu in a TR-U-ABORT request primitive that is to be issued on receipt of a TC-U-ABORT request primitive from the local MAP service provider.

- c) if an application-context-name can be derived but if it is not acceptable from a load control point of view, the MAP PM shall ignore this dialogue request and not inform the MAP-user;
- if a version 1 application-context-name is included, the MAP PM shall issue a TC-U-ABORT request primitive with abort-reason "User-specific" and user-information "MAP-ProviderAbortInfo" indicating "abnormalDialogue". The local MAP-user shall not be informed.
 - if an application-context-name different from version 1 is included in the primitive and if User-information is present, the User-information must constitute a syntactically correct MAP-OPEN dialogue PDU. Otherwise a TC-U-ABORT request primitive with abort-reason "User-specific" and user-information "MAP-ProviderAbortInfo" indicating "abnormalDialogue" shall be issued and the local MAP-user shall not be informed.

- if no User-information is present it is checked whether presence of User Information in the TC-BEGIN indication primitive is required for the received application-context-name. If User Information is required but not present, a TC-U-ABORT request primitive with abort-reason "User-specific" and user-information "MAP-ProviderAbortInfo" indicating "abnormalDialogue" shall be issued. The local MAP-user shall not be informed.
- if an application-context-name different from version 1 is received in a syntactically correct TC-BEGIN indication primitive but is not acceptable from a load control point of view, the MAP PM shall ignore this dialogue request. The MAP-user is not informed.
- if an application-context-name different from version 1 is received in a syntactically correct TC-BEGIN indication primitive and if it is acceptable from a load control point of view, the MAP PM shall check whether the application-context-name is supported.

NOTE 3: Unknown application-context-names are treated like unsupported ones.

If it is, the MAP PM shall issue a MAP-OPEN indication primitive with all parameters (application-context-name included) set according to the value of the corresponding parameter of the TC-BEGIN indication primitive.

The MAP PM shall then process any other indication primitives received from TC as described in subclause 15.6. Once all the received components have been processed, the MAP PM shall inform the local MAP service user by a MAP-DELIMITER indication primitive.

If the TC-BEGIN indication primitive is not associated with any component, the MAP PM shall inform the MAP User by a MAP-DELIMITER indication primitive.

Once all the received primitives have been processed, the MAP PM does not accept any primitive from the provider and waits for a MAP-OPEN response primitive from its user.

- if an application-context-name different from version 1 is received in a syntactically correct TC-BEGIN indication primitive and if it is acceptable from a load control point of view but the application-context-name is not supported, the MAP PM shall issue a TC-U-ABORT request primitive with abort-reason indicating "application-context-not-supported". If an alternative application-context-name cannot be offered, the received application-context-name shall be returned in the TC-U-ABORT Req primitive.

In the following cases an alternative application-context can be offered and its name included in the TC-U-ABORT Req primitive:

- a) if an application-context of version 2 or higher is requested, but only version 1 application-context supported, then the v1 application context shall be returned;
- b) if an application-context of version 3 or higher is requested, but only version 2 application-context supported, then the v2 application context shall be returned.
- c) if an application-context of version 4 or higher is requested, but only version 3 application-context supported, then the v3 application context shall be returned.

Table 15.1/1: Mapping of V1 operation codes on to application-context-names

Operation	Application-context-name (note 1)
updateLocation	networkLocUpContext-v1
cancelLocation	locationCancellationContext-v1
provideRoamingNumber	roamingNumberEnquiryContext-v1
insertSubscriberData	subscriberDataMngtContext-v1
deleteSubscriberData	subscriberDataMngtContext-v1
sendParameters	infoRetrievalContext-v1 networkLocUpContext-v1 (note 2)
beginSubscriberActivity	networkFunctionalSsContext-v1
sendRoutingInfo	locationInfoRetrievalContext-v1
performHandover	handoverControlContext-v1
reset	resetContext-v1
activateTraceMode	tracingContext-v1
deactivateTraceMode	tracingContext-v1
sendRoutingInfoForSM	shortMsgGatewayContext-v1
forwardSM	shortMsgRelayContext-v1
reportSM-deliveryStatus	shortMsgGatewayContext-v1
noteSubscriberPresent	mwdMngtContext-v1
alertServiceCentreWithoutResult	shortMsgAlertContext-v1
checkIMEI	EquipmentMngtContext-v1

NOTE 1: These symbolic names refer to the object identifier value defined in clause 17 and allocated to each application-context used for the MAP.

NOTE 2: The choice between the application contexts is based on the parameters received in the operation.

15.1.4 Receipt of a MAP-OPEN response

On receipt of a MAP-OPEN response primitive indicating that the dialogue is accepted, the MAP PM shall build a MAP-Accept PDU if the user-information parameter is included in the response primitive and accept any MAP specific service request or service response until a MAP-DELIMITER request or a MAP-CLOSE request is received from the MAP user. The MAP PM shall process the MAP specific primitives as described in subclause 15.6. The MAP PM shall then issue a TC-CONTINUE request primitive after it receives the MAP-DELIMITER request primitive if no MAP-CLOSE request primitive has been received, otherwise it shall issue a TC-END request primitive. In both cases the MAP-Accept PDU (if any) is included in the user-information parameter of the TC primitive.

If the dialogue is not associated with a version 1 application context, the MAP PM shall include the application-context-name in the TC primitive.

If no MAP-CLOSE request has been received, the MAP PM waits for a request primitive from its user or an indication primitive from TC.

On receipt of a MAP-OPEN response primitive indicating that the dialogue is not accepted, the MAP PM shall build a MAP-Refuse PDU and request its transfer using the TC-U-ABORT req primitive (abort reason = user specific).

15.1.5 Receipt of the first TC-CONTINUE ind

On receipt of the first TC-CONTINUE indication primitive for a dialogue, the MAP PM shall check the value of the application-context-name parameter. If this value matches the one used in the MAP-OPEN request primitive, the MAP PM shall issue a MAP-OPEN confirm primitive with the result parameter indicating "accepted", then process the following TC component handling indication primitives as described in subclause 15.6, and then waits for a request primitive from its user or an indication primitive from TC, otherwise it shall issue a TC-U-ABORT request primitive with a MAP-providerAbort PDU indicating "abnormal dialogue" and a MAP-P-ABORT indication primitive with the "provider-reason" parameter indicating "abnormal dialogue".

15.1.6 Receipt of a TC-END ind

On receipt of a TC-END indication primitive in the dialogue initiated state, the MAP PM shall check the value of the application-context-name parameter. If this value does not match the one used in the MAP-OPEN request primitive, the

MAP PM shall discard any following component handling primitive and shall issue a MAP-P-ABORT indication primitive with the "provider-reason" parameter indicating "abnormal dialogue".

Otherwise it shall issue a MAP-OPEN confirm primitive with the result parameter set to "accepted" and process the following TC component handling indication primitives as described in subclause 15.6; then it shall issue a MAP-CLOSE indication primitive and return to idle all state machines associated with the dialogue.

15.1.7 Receipt of a TC-U-ABORT ind

On receipt of a TC-U-ABORT indication primitive in the "Dialogue Initiated" state with an abort-reason parameter indicating "ApplicationContextNotSupported", the MAP PM shall issue a MAP-OPEN confirm primitive with the result parameter indicating "Dialogue Refused" and the refuse-reason parameter indicating "ApplicationContextNotSupported".

On receipt of a TC-U-ABORT indication primitive in the "Dialogue Initiated" state with an abort-reason parameter indicating "User Specific" and without user information, the MAP PM shall issue a MAP-OPEN confirm primitive with the result parameter indicating "Dialogue Refused" and the refuse-reason parameter indicating "Potential Version Incompatibility".

On receipt of a TC-U-ABORT indication primitive in the "Dialogue Initiated" state with an abort-reason parameter indicating "User Specific" and a MAP-Refuse PDU included as user information, the MAP PM shall issue a MAP-OPEN confirm primitive with the result set to refused and the refuse reason set as received in the MAP Refuse PDU.

Receipt of a TC-U-ABORT indication primitive with abort-reason "User Specific" and with user information is described as part of abnormal termination (see subclause 15.4.2).

15.1.8 Receipt of a TC-P-ABORT ind

On receipt of a TC-P-ABORT indication primitive in the "Dialogue Initiated" state with a P-abort parameter indicating "Incorrect Transaction Portion", the MAP PM shall issue a MAP-OPEN confirm primitive with the result parameter indicating "Dialogue Refused" and the refuse reason parameter indicating "Potential Version Incompatibility".

On receipt of a TC-P-ABORT indication primitive in the "Dialogue Initiated" state with a P-abort parameter indicating "No Common Dialogue Portion", the MAP PM shall issue a MAP-P-ABORT indication primitive with the provider reason parameter indicating "Version Incompatibility".

Receipt of a TC-P-ABORT indication primitive with another P-abort parameter value is described as part of abnormal termination (see subclause 15.5.2).

15.2 Dialogue continuation

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

Both MAP users can request the transfer of MAP APDUs until one of them requests the termination of the dialogue.

15.2.1 Sending entity

The MAP PM shall accept any MAP specific service request or response primitives and process them as described in subclause 15.6.

On receipt of a MAP-DELIMITER request primitive, the MAP PM shall issue a TC-CONTINUE request primitive.

15.2.2 Receiving entity

On receipt of a TC-CONTINUE indication primitive the MAP PM shall accept zero, one or several TC component handling indication primitives and process them as described in subclause 15.6.

15.3 Dialogue termination

Both the dialogue-initiator and the dialogue-responder have the ability to request the termination of a dialogue after it has been established.

The dialogue termination procedure is driven by the following events:

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

15.3.1 Receipt of a MAP-CLOSE request

On receipt of a MAP-CLOSE request primitive, the MAP PM shall issue a TC-END request primitive and, if applicable, return to idle the associated active SSMs. Note that if the release method parameter of the MAP-CLOSE request indicates "normal" the TC-END request primitive will trigger the transmission of components associated with any user specific request or response primitives which may have been issued after the last MAP-DELIMITER request.

15.3.2 Receipt of a TC-END indication

On receipt of a TC-END indication primitive, the MAP shall accept any component handling indication primitives and process them as described in subclause 15.6.

Once all the received primitives have been processed, the MAP PM shall return to idle the associated SSMs and issue a MAP-CLOSE indication primitive.

15.4 User Abort

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

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

- a MAP-U-ABORT request primitive;
- a TC-U-ABORT indication primitive carrying a MAP-user-abort PDU.

15.4.1 MAP-U-ABORT request

On receipt of a MAP-U-ABORT request the MAP PM shall construct a MAP-user-abort PDU from the user-reason and diagnostic parameters and issue a TC-U-ABORT request primitive. All state machines associated with the dialogue are returned to idle.

15.4.2 TC-U-ABORT ind

On receipt of a TC-U-ABORT indication carrying a MAP-user-abort PDU, the MAP PM shall issue a MAP-U-ABORT indication primitive. The user-reason and diagnostic information elements are mapped to the corresponding parameters of the MAP-U-ABORT indication primitive.

All state machines associated with the dialogue are returned to idle.

15.5 Provider Abort

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

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

- a MAP PM error situation;
- a TC-P-ABORT indication primitive;

- a TC-U-ABORT indication primitive carrying a MAP-abort PDU.

15.5.1 MAP PM error situation

In the case of an abnormal situation detected at the MAP level during an established dialogue, the MAP PM shall:

- issue a MAP-P-ABORT indication primitive with the appropriate value of the provider-reason parameter;
- construct a MAP-abort PDU from the value of these parameters and request its transfer using a TC-U-ABORT request primitive.

15.5.2 TC-P-ABORT ind

On receipt of a TC-P-ABORT indication, the MAP PM shall issue a MAP-P-ABORT indication primitive.

All state machines associated with the dialogue are returned to idle.

15.5.3 TC-U-ABORT ind

On receipt of a TC-U-ABORT indication carrying a MAP-abort PDU, the MAP PM shall issue a MAP-P-ABORT indication primitive, with the appropriate value of the provider-reason parameter. The source parameter shall indicate "MAP-provider".

All state machines associated with the dialogue are returned to idle.

15.6 Procedures for MAP specific services

This subclause describes the MAP procedures for MAP specific services.

These procedures are driven by the following types of events:

- a MAP specific request or a MAP specific MAP response primitive;
- a component handling primitive from TC.

A Service State Machine is activated on receipt of one of the following signals:

- a MAP request primitive, which activates a requesting SSM;
- a TC-INVOKE indication primitive without linked identifier, which activates a responding SSM.

For component handling primitives there are two types of events:

- events which activate a Service State Machine or which can be related to an existing one;
The procedure elements driven by these events are described in subclauses 15.6.1 to 15.6.4.
- events which cannot be related to a Service State Machine.

The procedure elements driven by these events are described in subclause 15.6.5.

15.6.1 Service invocation

The MAP specific procedures are initiated by the MAP request primitives.

On receipt of a MAP request primitive, the MAP PM shall build an operation argument from the parameters received in the request primitive and request the invocation of the associated operation using the TC-INVOKE procedure. If a linked ID parameter is inserted in the primitive this indicates a child service and implies that the operation on which the service is mapped is linked to the operation on which the parent service is mapped.

The mapping of MAP specific services on to remote operations is given in table 16.2/1.

15.6.2 Service invocation receipt

On receipt of a TC-INVOKE indication primitive, the MAP PM shall:

- if the invoke ID is already in use by an active service, request the transfer of a reject component using the TC-U-REJECT request primitive with the appropriate problem code (duplicated invokeID) and issue a MAP-NOTICE indication primitive with a diagnostic parameter set to "abnormal event received from the peer";
- if the operation code does not correspond to an operation supported by the application-context, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (unrecognized operation), and -if the dialogue version is lower than 3- issue a MAP-NOTICE indication primitive with a diagnostic parameter set to „abnormal event received from the peer“;
- if a linked ID is included, perform the following checks: If the operation referred to by the linked ID does not allow linked operations or if the operation code does not correspond to a permitted linked operation, issue a TC-U-REJECT request primitive with the appropriate problem code (linked response unexpected or unexpected linked operation);
- if the type of the argument is not the one defined for the operation, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter), and issue a MAP-NOTICE indication primitive with a diagnostic parameter set to "abnormal event from the peer";
- if the type of the argument is correct but the values of the information elements it contains do not permit the type of MAP service being invoked to be determined, request the transfer of an error component using the TC-U-ERROR request primitive with an error code set to "unexpected data value" and issue a MAP-NOTICE indication primitive with a diagnostic parameter set to "abnormal event from the peer";

NOTE 1: These checks are only relevant when there is not a one-to-one mapping between a service and an operation.

- if the type of the argument is correct but information elements required for the service being invoked are missing, request the transfer of an error component using the TC-U-ERROR request primitive with an error code set to "data missing" and issue a MAP-NOTICE indication primitive with a diagnostic parameter set to "abnormal event from the peer";

NOTE 2: These checks are only relevant when there is not a one-to-one mapping between a service and an operation.

- if the type of the argument is correct but contains information elements which are not relevant for the type of MAP service being invoked, request the transfer of an error component using the TC-U-ERROR request primitive with an error code set to "unexpected data value" and issue a MAP-NOTICE indication primitive with a diagnostic parameter set to "abnormal event from the peer";

NOTE 3: These checks are only relevant when there is not a one-to-one mapping between a service and an operation.

- Otherwise, issue the relevant MAP indication primitive to the MAP-service-user. If the service is to be user confirmed, the MAP PM waits for the corresponding response primitive.

15.6.3 Service response

For user confirmed services, the MAP PM shall accept a MAP response primitive and shall:

- if no error indication is included in the primitive and the service maps on to a class 1 or 3 operation, construct a result information element from the parameters received and request its transfer using the TC-RESULT-L service and optionally the TC-RESULT-NL service.

The TC-RESULT-NL services shall be used when the user specific parameters of the response primitives cannot be transferred in a single signalling frame and no segmenting mechanism is available from the underlying layers. The MAP PM shall issue one or several TC-RESULT-NL request primitives followed by a TC-RESULT-L primitive. The user parameters shall be split so that each portion contains sufficient information to construct a value compatible with the type defined for the result of the associated operation.

- if no error indication is included in the primitive and the service response maps on to a class 4 linked operation, construct an operation argument from the parameters received and request its transfer using the TC-INVOKE service for this class 4 linked operation. The operation to be invoked is deduced from the value of the result parameter of the service primitive;
- if an error indication is included in the primitive and the service maps on to a class 1 or 2 operation, either issue a TC-U-REJECT request primitive if the user error parameter indicates "resource limitation" or "initiating release", or construct an error parameter from the parameters received and request its transfer using the TC-U-ERROR request primitive. The error code should be the one associated with the value of the user error parameter of the response primitive.

NOTE: The only user errors that a MAP user can generate in addition to the list of errors attached to the operation which is associated with the service are: resource limitation and initiating release. Any other abnormal situation is detected either by the TC entity or by the MAP entity.

- if an error indication is received and the operation maps on to a class 3 operation, or if no error indication is received but the service maps on to a class 2 operation which has no class 4 linked operation, return the local service state machine to idle without requesting any service from TC.

15.6.4 Receipt of a response

A component handling indication primitive is considered as driving a response for a confirmed service if the invoke ID parameter value matches the one stored for the service, or if the linked ID parameter value matches the one stored for the service and the operation invoked is a class 4 operation. On receipt of a response (except a TC-L-CANCEL indication) for an unconfirmed service the MAP PM shall issue a MAP-NOTICE indication primitive with the appropriate provider error (return result unexpected or return error unexpected).

15.6.4.1 Receipt of a TC-RESULT-NL indication

If the type of the partial result parameter is not compatible with the one defined for the complete result of this operation, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter) and issue a confirm primitive with the provider error parameter set to "invalid response received". The MAP PM shall also issue a TC-U-CANCEL request primitive so that all subsequent result components for this operation are discarded by TC.

Otherwise, store the value of the partial result parameter and wait for subsequent TC-RESULT-NL indication primitives until a TC-RESULT-L indication primitive is received.

15.6.4.2 Receipt of a TC-RESULT-L indication

If the type of the result parameter is not the one defined for the result of this operation, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter), and issue a confirm primitive with the provider error parameter set to "invalid response received".

If the type of the result parameter is correct but does not contain all the information elements required by the service associated with the invocation, issue a confirm primitive with the provider error parameter set to "invalid response received".

NOTE 1: These checks are only relevant when there is not a one-to-one mapping between a service and an operation.

If the type of the result parameter is correct but contains information elements which are not relevant for the service associated with the invocation are missing, issue a confirm primitive with the provider error parameter set to "invalid response received".

NOTE 2: These checks are only relevant when there is not a one-to-one mapping between a service and an operation.

Otherwise, issue a MAP confirm primitive to the MAP-service-user mapping the result parameter of the TC-RESULT-L primitive on to the MAP specific parameters.

If partial results have been previously received, the value of the partial result parameters shall also be taken into account before performing the three previous checks.

15.6.4.3 Receipt of a TC-U-ERROR indication

If the error code is not defined for the MAP or is not one associated with the operation referred to by the invoke identifier, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (unrecognized error or unexpected error), and issue a confirm primitive with the provider error parameter set to "invalid response received".

If the type of the error parameter is not the one defined for this error, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter), and issue a confirm primitive with the provider error parameter set to "invalid response received".

If the type of the error parameter is correct but does not contain all the information elements required by the service associated with the invocation, issue a confirm primitive with the provider error parameter set to "invalid response received".

NOTE 1: In some cases, it may be necessary to analyse the operation argument.

If the type of the error parameter is correct but its value includes information elements which are not relevant for the service associated with the invocation, issue a confirm primitive with the provider error parameter set to "invalid response received".

NOTE 2: In some cases, it may be necessary to analyse the operation argument.

Otherwise, issue a MAP confirm primitive to the MAP-service-user with the user error parameter set according to the received error code. If applicable the error parameter is mapped to the diagnostic parameter.

15.6.4.4 Receipt of a TC-INVOKE indication

A TC-INVOKE indication primitive is considered as carrying a possible response to a specific service if the linked ID refers to an active specific service and the associated operation is a class 4 operation. Note that the presence of a linked ID parameter in a TC-INVOKE primitive requesting a non class 4 operation indicates a child service whose procedures are the same as the procedures for the parent service.

On receipt of a TC-INVOKE indication confirming an active service, the MAP PM shall:

- if the operation code is not defined for MAP and the dialogue version is at least 3, issue a TC-U-REJECT request primitive with the appropriate problem code (unrecognized operation).
- if the operation code is not defined for MAP and the dialogue version is lower than 3, or if the operation referred to by the linked ID does not allow linked operations or if the operation code does not correspond to an allowed linked operation, issue a TC-U-REJECT request primitive with the appropriate problem code (unrecognized operation, linked response unexpected or unexpected linked operation). If the service is confirmed, the MAP shall also issue a Confirm primitive with provider error indication "unexpected response from the peer", otherwise it may issue a MAP-NOTICE indication primitive with an appropriate diagnostic "abnormal event received from the peer".
- otherwise issue a confirm primitive mapping the operation argument parameter to the user specific parameters and setting the result parameter according to the operation code of the linked operation.

15.6.4.5 Receipt of a TC-U-REJECT indication

On receipt of a TC-U-REJECT indication primitive which affects a pending service, the MAP PM shall issue a MAP confirm primitive to the MAP-service-user with the appropriate value of the provider error or user error parameter.

The mapping of TC invoke problem codes on to MAP Provider Error and MAP User Error parameter values is described in clause 16.

15.6.4.6 Receipt of a TC-L-REJECT indication

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

On receipt of a TC-L-REJECT indicating "return result problem, unexpected return result", the MAP shall issue a confirm primitive with the parameter provider error indicating "unexpected response from the peer".

On receipt of a TC-L-REJECT indicating "return error problem, unexpected error result", the MAP shall issue a confirm primitive with the parameter provider error indicating "unexpected response from the peer".

Note that when the problem code indicates a general problem, it is considered that the event cannot be related to an existing SSM even if the invoke Id is provided by TC. This is because whether the invoke Id refers to a local or remote invocation is ambiguous. The behaviour of the MAP PM in such a case is described in subclause 15.6.5.3.

15.6.4.7 Receipt of a TC-L-CANCEL indication

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

- if the associated operation is a class 1 operation, issue a confirm primitive with the provider error cause indicating "no response from the peer";
- if the associated operation is a class 2 operation and no linked operations are defined for this operation, issue a confirm primitive without parameter (i.e. indicating implicitly the successful completion of the service);
- if the associated operation is a class 2 operation and has linked operations but none of them has been invoked, issue a confirm primitive with the provider error parameter indicating "service completion failure";
- if the associated operation is a class 2 operation and a linked operation invocation has already been received in response to this operation, ignore the primitive;
- if the associated operation is a class 3 operation, issue a confirm primitive with the provider error cause indicating "service completion failure";
- if the associated operation is a class 4 operation, ignore the primitive.

NOTE: When a TC-L-CANCEL ind primitive is received before the dialogue has been confirmed (i.e. no backward message is received by the dialogue initiator node), the MAP PM shall first issue a MAP-OPEN Cnf primitive with the result parameter indicating "accepted" (which means that the dialogue is considered as being implicitly accepted). Then, as indicated above, the TC-L-CANCEL Indication is interpreted according to the class of the operation to which it refers.

15.6.4.8 Receipt of a TC-NOTICE indication

If a TC-NOTICE indication primitive is received before the dialogue has been confirmed (i.e. no backward message is received by the dialogue initiator node), the MAP PM shall issue a MAP-OPEN Cnf primitive with the result parameter indicating Refused and a refuse reason Remote node not reachable".

If a TC-NOTICE indication primitive is received after the dialogue has been confirmed, the MAP PM shall issue a MAP-NOTICE indication to the user, with a problem diagnostic indicating "message cannot be delivered to the peer".

15.6.5 Other events

This subclause describes the behaviour of the MAP PM on receipt of a component handling indication primitive which cannot be related to any service or which does not affect a pending one. The MAP user is only informed that an abnormal event occurred during the associated dialogue. It is up to the MAP user to abort, continue or terminate the dialogue.

15.6.5.1 Receipt of a TC-U-REJECT

On receipt of a TC-U-REJECT indication primitive which does not affect an active SSM (i.e. indicating a return result or return error problem), the MAP PM shall issue a MAP-NOTICE indication primitive with the diagnostic parameter set to "response rejected by the peer".

This is also applicable for invoke problems related to a class 4 linked operation.

15.6.5.2 Receipt of a TC-R-REJECT indication

On receipt of a TC-R-REJECT indication (i.e. when a protocol error has been detected by the peer TC entity) which does not affect an active SSM, the MAP PM shall either discard this indication or issue a MAP-NOTICE indication primitive with the provider error indicating "abnormal event detected by the peer".

In case of notification, it is up to the MAP user to continue, abort or terminate the dialogue. Note also that for MAP V1 the reject component is received in an END message and therefore the dialogue is terminated anyway.

15.6.5.3 Receipt of a TC-L-REJECT indication

On receipt of a TC-L-REJECT indication primitive (i.e. when a protocol error has been detected by the local TC entity) which cannot be related to an active SSM, the MAP PM shall either discard this indication or issue a MAP-NOTICE indication primitive with the provider error indicating "abnormal event received from the peer".

In case of notification, it is up to the MAP user to continue, or to terminate the dialogue and implicitly trigger the transmission of the reject component or to abort the dialogue.

15.6.6 Parameter checks

As described in the previous subclauses, the MAP PM performs a set of checks to ensure the correctness of the information elements received; these are:

- check if the syntax and encoding (note) of the operation argument, result or error parameter are correct.

NOTE: Depending on the implementation, encoding problems on the TC user portion may be detected at TC level or by the MAP user. In the second case the problem is reported in a similar manner to a syntactical problem.

The syntax shall be considered incorrect if a mandatory information element is missing in any constructed element or if the value of an information element is out of the range defined for the type it is supposed to belong to;

- if there is not a one-to-one mapping between a service and an operation:
 - i) check if the value of the information elements (generally a single one) permits the MAP PM to determine the service associated with the operation invocation;
 - ii) check that there are no information elements which are irrelevant for the indication or a confirm primitive to be issued;
- check if all the information elements required to built an indication or a confirm primitive are available.

However some additional checks may have to be performed by the MAP user (see clause 18).

15.6.7 Returning state machines to idle

Unlike TC invocation state machines, service state machines exist at both requestor and performer side.

A service state machine at the requestor side is returned to idle when the MAP-specific confirm primitive is issued or when the dialogue terminates.

A service state machine at the performer side is returned to idle on receipt of a MAP-specific response primitive from the MAP user, when the dialogue terminates or at expiry of an implementation dependent watch-dog timer which is started when the state machine is created.

15.6.8 Load control

As stated in the previous subclauses, before issuing a MAP-OPEN indication primitive the MAP PM performs a check to verify if there are sufficient resources to open the dialogue taking into account possible overload conditions.

The decision is based on the priority allocated to the application-context whose name is explicitly included in the TC-BEGIN indication primitive or implied by the first operation invocation when V1 contexts are in use. How a V1 application-context-name is derived from an operation code is described in table 15.1/1.

The priority level allocated to each application-context is described in clause 3 tables 5.1/1 and 5.1/2.

16 Mapping on to TC services

16.1 Dialogue control

Dialogue control services are mapped to TC dialogue handling services. The TC-UNI service is not used by the MAP PM.

16.1.1 Directly mapped parameters

The following parameters of the MAP-OPEN request and indication primitives are directly mapped on to the corresponding parameters of the TC-BEGIN primitives:

- destination address;
- originating address.

16.1.2 Use of other parameters of dialogue handling primitives

16.1.2.1 Dialogue Id

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

16.1.2.2 Application-context-name

The application-context-name parameter of a MAP primitive is mapped to the application-context-name parameter of TC dialogue handling primitives according to the rules described in subclause 15.1.

16.1.2.3 User information

The user information parameter of TC dialogue primitives is used to carry the MAP dialogue APDUs.

16.1.2.4 Component present

This parameter is used by the MAP PM as described in CCITT Recommendation Q.771. It is not visible to the MAP user.

16.1.2.5 Termination

The value of this parameter of the TC-END request primitive is set by the MAP PM on the basis of the release method parameter of the MAP-CLOSE request primitive, except when the dialogue state machine is in the state DIALOGUE INITIATED, in which case the Termination parameter shall always indicate "pre-arranged end".

16.1.2.6 P-Abort-Cause

Values of the P-abort-cause parameter are mapped to the values of the provider-reason parameter of the MAP-P-ABORT indication primitive according to table 16.1/1, except in the dialogue initiated phase for the "incorrectTransactionPortion" and "noCommonDialoguePortion" values which are mapped to the "potential incompatibility problem" value of the refuse-reason parameter of the MAP-OPEN cnf primitive. The source parameter in the MAP-P-ABORT ind takes the value "TC problem".

16.1.2.7 Quality of service

The quality of service of TC request primitives is set by the MAP as shown below.

- Return option: "Return message on error" or "Discard message on error" as required by the network operator;

- Sequence control: "Sequence guaranteed" or "Sequence result not guaranteed" as required by the network operator;

"Sequence guaranteed" shall be used when a segmented result is to be transferred (e.g. subscriber data in response to SendParameters). It may also be appropriate to use Sequence guaranteed when a series of InsertSubscriberData, ProcessAccessSignalling or ForwardAccessSignalling operations is used.

It is essential that the TC message which indicates acceptance of a dialogue opening request is received by the dialogue initiator before any subsequent message in that dialogue; otherwise the dialogue opening will fail. The dialogue responder shall ensure that this requirement is met by:

- Sending the dialogue acceptance message in a TC-END, if the dialogue structure requires it; or
- Using "Sequence guaranteed", if the dialogue acceptance message is sent in a TC-CONTINUE; or
- Waiting until the dialogue acceptance message has been acknowledged by the dialogue initiator before sending a subsequent message, if the dialogue acceptance message is sent in a TC-CONTINUE.

Table 16.1/1: Mapping of P-Abort cause in TC-P-ABORT indication on to provider-reason in MAP-P-ABORT indication

TC P-Abort cause	MAP provider-reason
unrecognized message type	provider malfunction
unrecognized transaction Id	supporting dialogue released
badlyFormattedTransactionPortion	provider malfunction
incorrectTransactionPortion	provider malfunction (note)
resourceLimitation	resource limitation
abnormalDialogue	provider malfunction
noCommonDialoguePortion	version incompatibility

NOTE: Or version incompatibility in the dialogue initiated phase.

16.2 Service specific procedures

Specific services are mapped to TC component handling services.

16.2.1 Directly mapped parameters

The Invoke Id parameter of the MAP request and indication primitive is directly mapped on to the Invoke Id parameter of the component handling primitives.

16.2.2 Use of other parameters of component handling primitives

16.2.2.1 Dialogue Id

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

16.2.2.2 Class

The value of this parameter is set by the MAP PM according to the type of the operation to be invoked.

16.2.2.3 Linked Id

When a service response is mapped to a class 4 operation, the value of this parameter is set by the MAP PM and corresponds to the value assigned by the user to the initial service request (i.e. the value of the invoke ID parameter of the request primitive). Otherwise if such a parameter is included in MAP request/indication primitives it is directly mapped to the linked ID parameter of the associated TC-INVOKE request/indication primitives.

16.2.2.4 Operation

When mapping a request primitive on to a Remote Operations PDU (invoke), the MAP PM shall set the operation code according to the mapping described in table 16.2/1.

When mapping a response primitive on to a Remote Operations service, the MAP PM shall set the operation code of the TC-RESULT-L/NL primitive (if required) to the same value as the one received at invocation time.

Table 16.2/1: Mapping of MAP specific services on to MAP operations

MAP-SERVICE	operation
MAP-ACTIVATE-SS	activateSS
MAP-ACTIVATE-TRACE-MODE	activateTraceMode
MAP-ALERT-SERVICE-CENTRE	alertServiceCentre
MAP-ANY-TIME-INTERROGATION	anyTimeInterrogaton
MAP-ANY-TIME-MODIFICATION	anyTimeModification
MAP-ANY-TIME-SUBSCRIPTION-INTERROGATION	anyTimeSubscriptionInterrogaton
MAP-CANCEL-LOCATION	cancelLocation
MAP-CHECK-IMEI	checkIMEI
MAP-DEACTIVATE-SS	deactivateSS
MAP-DEACTIVATE-TRACE-MODE	deactivateTraceMode
MAP-DELETE-SUBSCRIBER-DATA	deleteSubscriberData
MAP-ERASE-CC-ENTRY	eraseCC-Entry
MAP-ERASE-SS	eraseSS
MAP-FAILURE-REPORT	failureReport
MAP-FORWARD-ACCESS-SIGNALLING	forwardAccessSignalling
MAP-FORWARD-CHECK-SS-INDICATION	forwardCheckSsIndication
MAP-FORWARD-GROUP-CALL-SIGNALLING	forwardGroupCallSignalling
MAP-MT-FORWARD-SHORT-MESSAGE	mt-forwardSM
MAP-MO-FORWARD-SHORT-MESSAGE	mo-forwardSM
MAP-GET-PASSWORD	getPassword
MAP-INFORM-SERVICE-CENTRE	informServiceCentre
MAP-INSERT-SUBSCRIBER-DATA	insertSubscriberData
MAP-INTERROGATE-SS	interrogateSs
MAP-IST-ALERT	istAlert
MAP-IST-COMMAND	istCommand
MAP-LCS-ASSIGN-TRAFFIC-CHANNEL	lcsAssignTrafficChannel
MAP-LCS-INFORMATION-REPORT	lcsInformationReport
MAP-LCS-INFORMATION-REQUEST	lcsInformationRequest
MAP-LCS-REGISTRATION	lcsRegistration
MAP-LCS-RESET	lcsReset
MAP-NOTE-MS-PRESENT-FOR-GPRS	noteMsPresentForGprs
MAP-NOTE-SUBSCRIBER-DATA-MODIFIED	noteSubscriberDataModified
MAP-PERFORM-LOCATION	performLocation
MAP-PREPARE-GROUP-CALL	prepareGroupCall
MAP-PREPARE-HANDOVER	prepareHandover
MAP-PREPARE-SUBSEQUENT-HANDOVER	prepareSubsequentHandover
MAP-PROCESS-ACCESS-SIGNALLING	processAccessSignalling
MAP-PROCESS-GROUP-CALL-SIGNALLING	processGroupCallSignalling
MAP-PROCESS-UNSTRUCTURED-SS-REQUEST	processUnstructuredSS-Request
MAP-PROVIDE-ROAMING-NUMBER	provideRoamingNumber
MAP-PROVIDE-SIWFS-NUMBER	provideSIWFSNumber
MAP-PROVIDE-SUBSCRIBER-LOCATION	provideSubscriberLocation
MAP-PROVIDE-SUBSCRIBER-INFO	provideSubscriberInfo
MAP-PURGE-MS	purgeMS
MAP-READY-FOR-SM	readyForSM
MAP-REGISTER-CC-ENTRY	registerCC-Entry
MAP-REGISTER-PASSWORD	registerPassword
MAP-REGISTER-SS	registerSS
MAP-REMOTE-USER-FREE	remoteUserFree
MAP-REPORT-SM-DELIVERY-STATUS	reportSmDeliveryStatus
MAP-RESET	reset
MAP-RESTORE-DATA	restoreData
MAP-SEND_GROUP-CALL_END_SIGNAL	sendGroupCallEndSignal
MAP-SEND-END-SIGNAL	sendEndSignal
MAP-SEND-AUTHENTICATION-INFO	sendAuthenticationInfo
MAP-SEND-IMSI	sendIMSI
MAP-SEND-IDENTIFICATION	sendIdentification
MAP-SEND-ROUTING-INFO-FOR-SM	sendRoutingInfoForSM
MAP-SEND-ROUTING-INFO-FOR-GPRS	sendRoutingInfoForGprs
MAP-SEND-ROUTING-INFO-FOR-LCS	sendRoutingInfoForLCS
MAP-SEND-ROUTING-INFORMATION	sendRoutingInfo
MAP-SET-REPORTING-STATE	setReportingState

MAP-SIWFS-SIGNALLING-MODIFY	SIWFSSignallingModify
MAP-STATUS-REPORT	statusReport
MAP-SUBSCRIBER-LOCATION-REPORT	subscriberLocationReport
MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION	ss-Invocation-Notification
MAP-UNSTRUCTURED-SS-NOTIFY	unstructuredSS-Notify
MAP-UNSTRUCTURED-SS-REQUEST	unstructuredSS-Request
MAP-UPDATE-GPRS-LOCATION	updateGprsLocation
MAP-UPDATE-LOCATION	UpdateLocation
MAP-NOTE-MM-EVENT	NoteMM-Event

16.2.2.5 Error

The error parameter in a TC-U-ERROR indication primitive is mapped to the user error parameter in the MAP confirm primitive of the service associated with the operation to which the error is attached.

The user error parameter in MAP response primitives is mapped to the error parameter of the TC-U-ERROR request primitive, except for "initiating-release" and "resource-limitation" which are mapped to the problem code parameter of the TC-U-REJECT request primitive.

16.2.2.6 Parameters

The parameters of MAP specific request and indication primitives are mapped to the argument parameter of TC-INVOKE primitives.

The parameters of MAP specific response and confirm primitives are mapped to the result parameter of TC-RESULT-L primitives, the parameter of TC-U-ERROR primitives or the argument of TC-INVOKE primitives when mapping on linked class 4 operations is used.

16.2.2.7 Time out

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

16.2.2.8 Last component

This parameter is used by the MAP PM as described in CCITT Recommendation Q.711. It is not visible from the MAP user.

16.2.2.9 Problem code

16.2.2.9.1 Mapping to MAP User Error

The following values of the user error parameter are mapped as follows to values of the TC problem code parameter. These values are generated by the MAP user. This mapping is valid from the TC-U-REJECT indication primitive to the MAP confirm service primitive and from the MAP response service primitive to the TC-U-REJECT request primitive.

Table 16.2/2: Mapping of MAP User Error parameter on to TC problem code in TC-U-REJECT primitives

MAP User Error	TC problem code
resource limitation	resource limitation
initiating release	initiating release

16.2.2.9.2 Mapping to MAP Provider Error parameter

The following values of the TC problem code parameter of the TC-U-REJECT indication primitive are mapped as follows to values of the MAP Provider Error parameter of the MAP confirm primitive.

Table 16.2/3: Mapping of TC problem code in TC-U-REJECT on to MAP Provider Error parameter

TC problem code	MAP Provider Error
duplicated invoke Id	duplicated invoke id
unrecognized operation	service not supported
mistyped parameter	mistyped parameter

The following values of the problem code parameters of the TC-L-REJECT primitive are mapped to values of the provider error parameter of the MAP confirm primitive as follows:

Table 16.2/4: Mapping of TC problem code in TC-L-REJECT on to MAP Provider Error parameter

TC problem code	MAP Provider Error
return result unexpected	unexpected response from the peer
return error unexpected	unexpected response from the peer

16.2.2.9.3 Mapping to diagnostic parameter

The following values of the problem code parameter of the TC-R-REJECT and TC-U-REJECT primitive are mapped to values of the diagnostic parameter of the MAP-NOTICE indication primitive as follows:

Table 16.2/5: Mapping of TC problem code of TC-R-REJECT and TC-U-REJECT on to diagnostic parameter

TC problem code	MAP diagnostic
General problem	
abnormal event detected by the peer	
Invoke problem	
- unrecognized linked ID	- abnormal event detected by the peer
- linked response unexpected	- response rejected by the peer
- unexpected linked operation	- response rejected by the peer
Return result problem	
- unrecognized invoke ID	- response rejected by the peer
- return result unexpected	- response rejected by the peer
- mistyped parameter	- response rejected by the peer
Return error problem	
- unrecognized invoke ID	- response rejected by the peer
- return error unexpected	- response rejected by the peer
- unrecognized error	- response rejected by the peer
- unexpected error	- response rejected by the peer
- mistyped parameter	- response rejected by the peer

The following values of the problem code parameter of the TC-L-REJECT primitive are mapped to values of the diagnostic parameter of the MAP-NOTICE indication primitive as follows:

Table 16.2/6: Mapping of TC problem code of TC-L-REJECT on to diagnostic parameter

TC problem code	MAP diagnostic
General problems:	- abnormal event received from the peer
Invoke problem:	
- unrecognized linked ID	- abnormal event received from the peer
Return result problem:	
- unrecognized invoke ID	- abnormal event received from the peer
Return error problem:	
- unrecognized invoke ID	- abnormal event received from the peer

16.3 SDL descriptions

The following SDL specification describes a system which includes three blocks: MAP-user, MAP-provider and TC.

Such a system resides in each network component supporting MAP and communicates with its peers via the lower layers of the signalling network which are part of the environment.

Only the MAP-provider is fully described in this subclause. The various type of processes which form the MAP-User block and the TC block are described respectively in clauses 18 to 25 of the present document and in CCITT Recommendation Q.774.

The MAP-Provider block communicates with the MAP_USER via two channels U1 and U2. Via U1 the MAP-provider receives the MAP request and response primitives. Via U2 it sends the MAP indication and confirm primitives.

The MAP-Provider block communicates with TC via two channels P1 and P2. Via P1 the MAP-Provider sends all the TC request primitives. Via P2 it receives all the TC indication primitives.

The MAP-Provider block is composed of the four following types of processes:

- a) MAP_DSM: This type of process handles a dialogue. There exists one process instance per MAP dialogue.
- b) LOAD_CTRL: This type of process is in charge of load control. There is only one instance of this process in each system.
- c) PERFORMING_MAP_SSM: This type of process handle a MAP service performed during a dialogue. An instance of this process is created by the instance of the MAP_DSM process for each MAP-service to be performed.
- d) REQUESTING_MAP_SSM: This type of process handle a MAP service requested during a dialogue. An instance of this process is created by the instance of the MAP_DSM process for each requested MAP-service.

A process MAP_DSM exchanges external signals with other blocks as well as internal signals with the other processes of the MAP-Provider block. The external signals are either MAP service primitives or TC service primitives.

The signal routes used by the various processes are organized as follows:

- a) A process MAP_DSM receives and sends events from/to the MAP_user via signal route User1/User2. These routes uses respectively channel U1 and U2.
- b) A process MAP_DSM receives and sends events from/to the TC via signal route Tc1/Tc2. These routes uses respectively channel P1 and P2.
- c) A process MAP_DSM receives and sends events from/to the LOAD_CTRL process via signal route Load1/Load2. These routes are internal.
- d) A process MAP_DSM sends events to the PERFORMING_MAP_SSM processes via signal route Intern1. This route is internal.
- e) A process MAP_DSM sends events to the REQUESTING_MAP_SSM processes via signal route Intern2. This route is internal.
- f) A process MAP_PERFORMING_SSM sends events to the MAP_USER via signal route User4. This route uses channel U2.
- g) A process MAP_PERFORMING_SSM sends events to TC via signal route Tc3. This route uses channel P1.
- h) A process MAP_REQUESTING_SSM sends events to the MAP_USER via signal route User5. This route uses channel U2.
- j) A process MAP_REQUESTING_SSM sends events to TC via signal route Tc4. This route uses channel P1.

Figure 16.2/1:

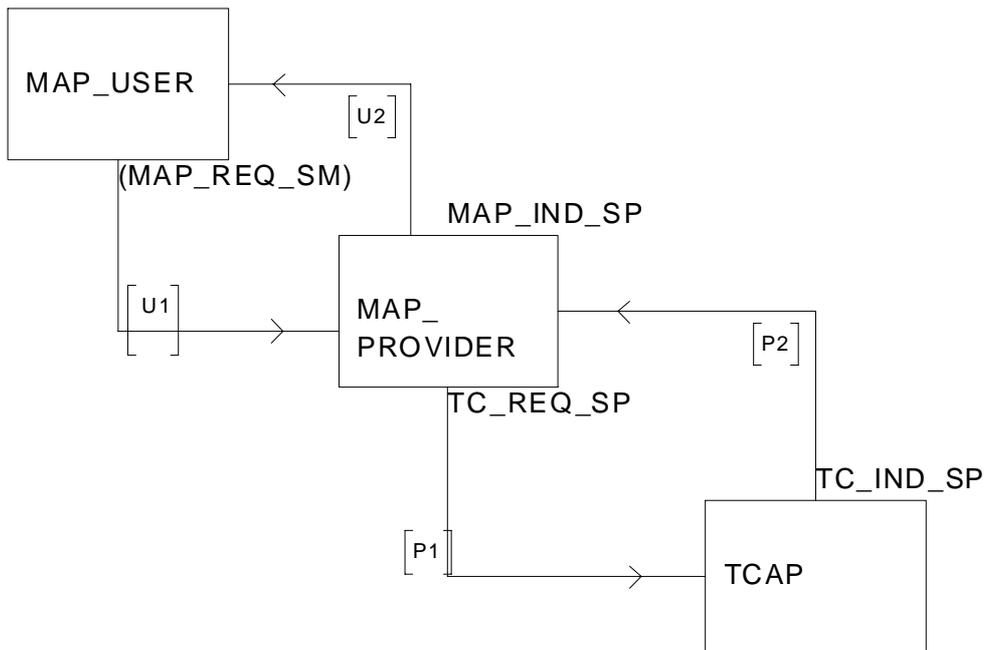


Figure 16.2/1: System MAP_STACK

Figure 16.1/2:

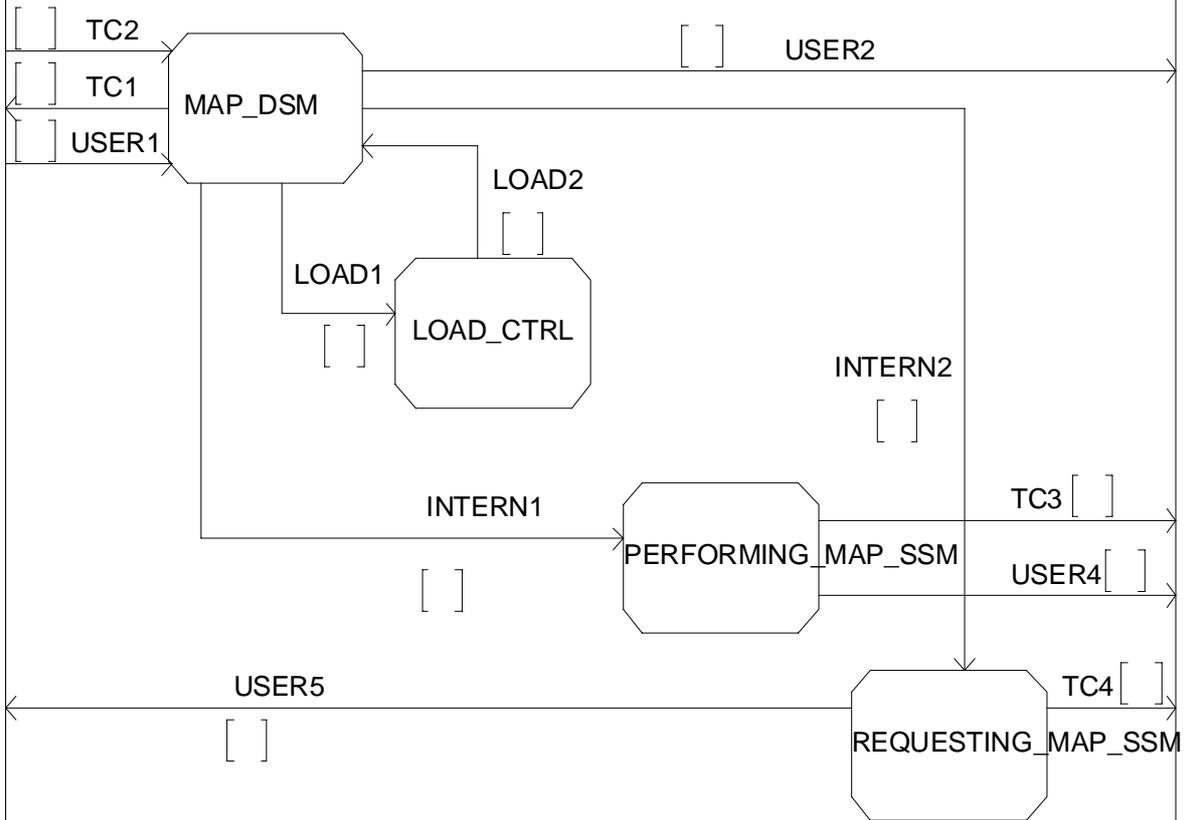


Figure 16.2/2: Block MAPPROVIDER

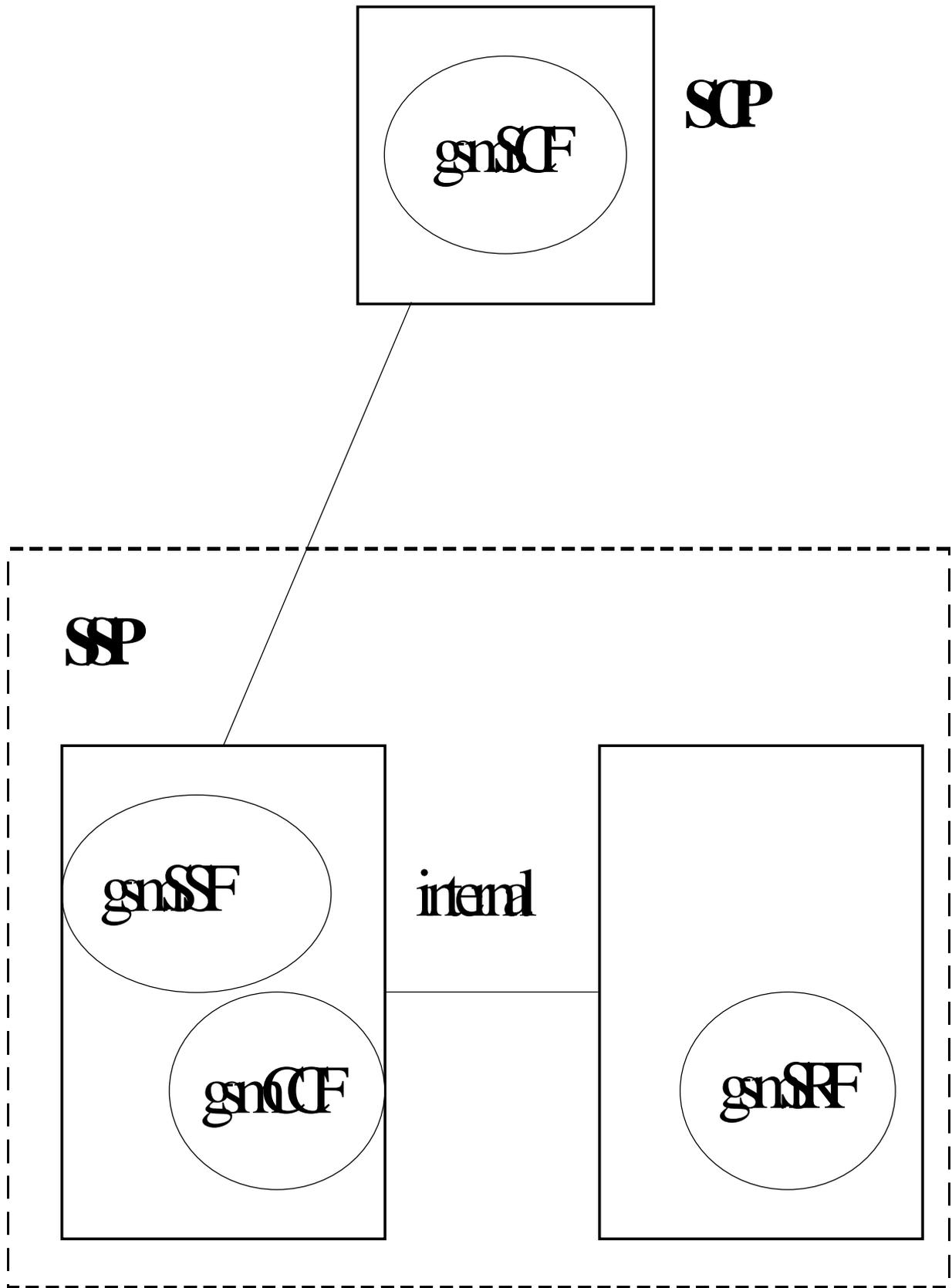


Figure 16.2/3 (sheet 1 of 11): Process MAP_DSM

Figure 16.2/3:

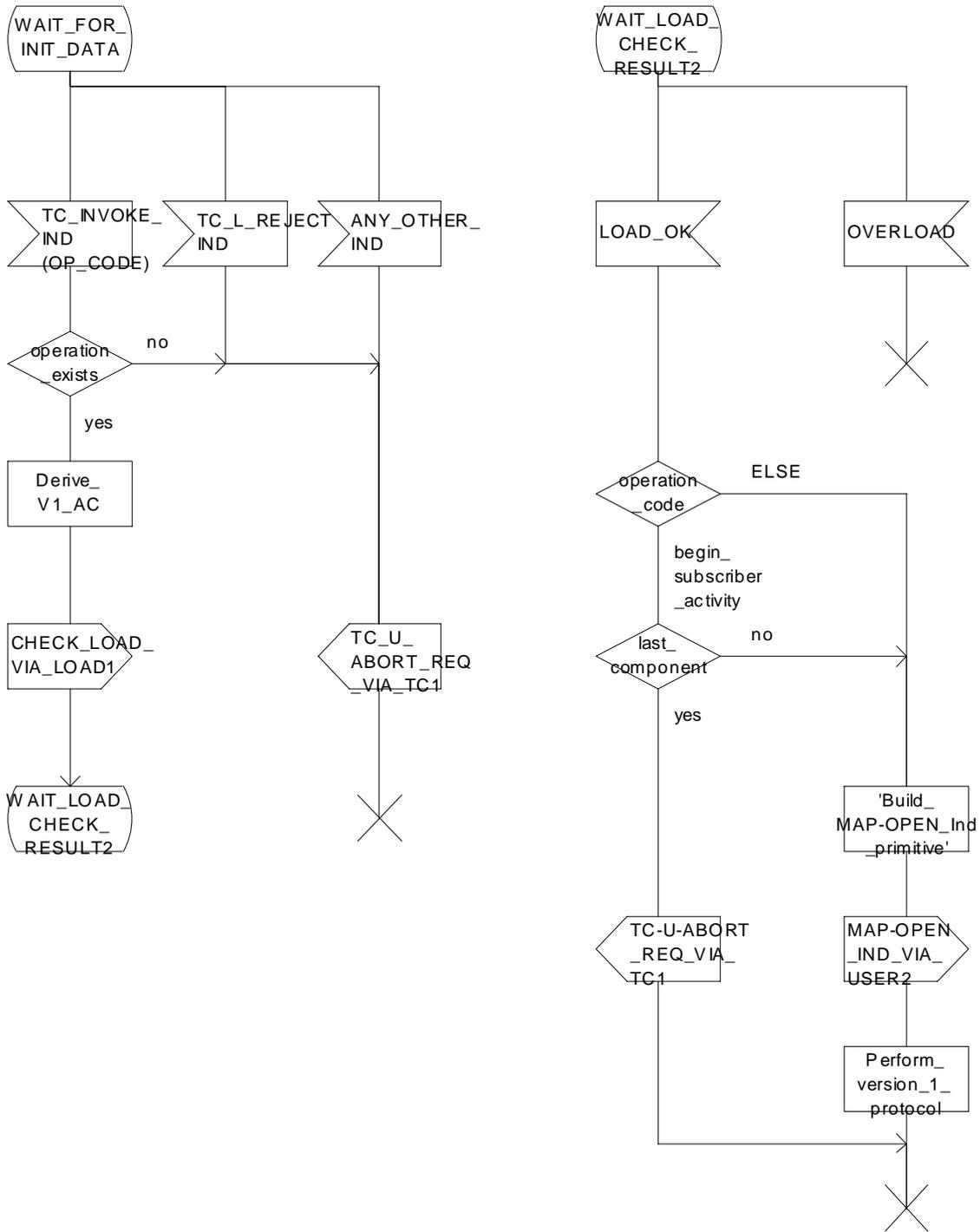


Figure 16.2/3 (sheet 2 of 11): Process MAP_DSM

Process MAP_DSM

16.2_3.3(11)

Figure 16.2/3:

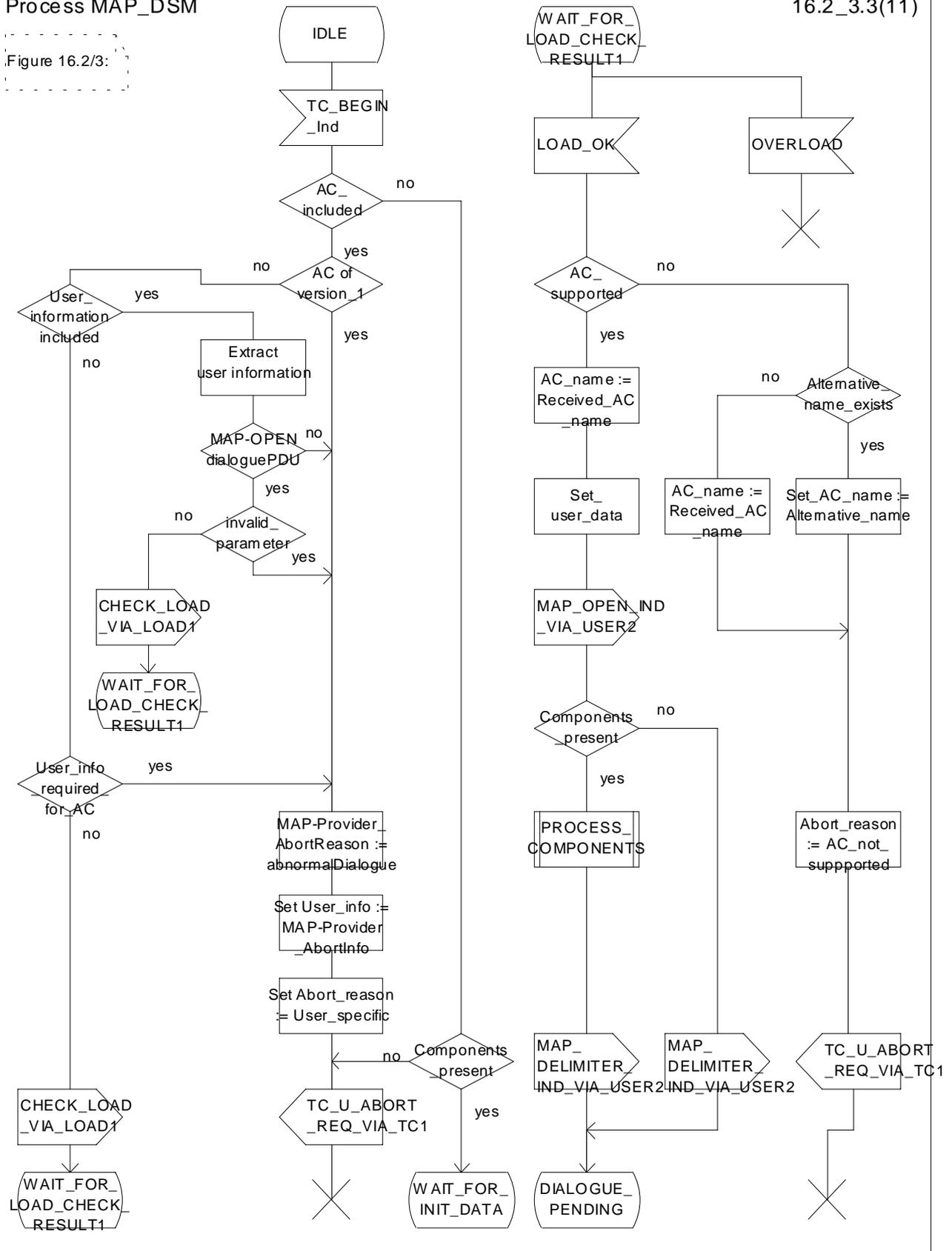


Figure 16.2/3 (sheet 3 of 11): Process MAP_DSM

Figure 16.2/3:

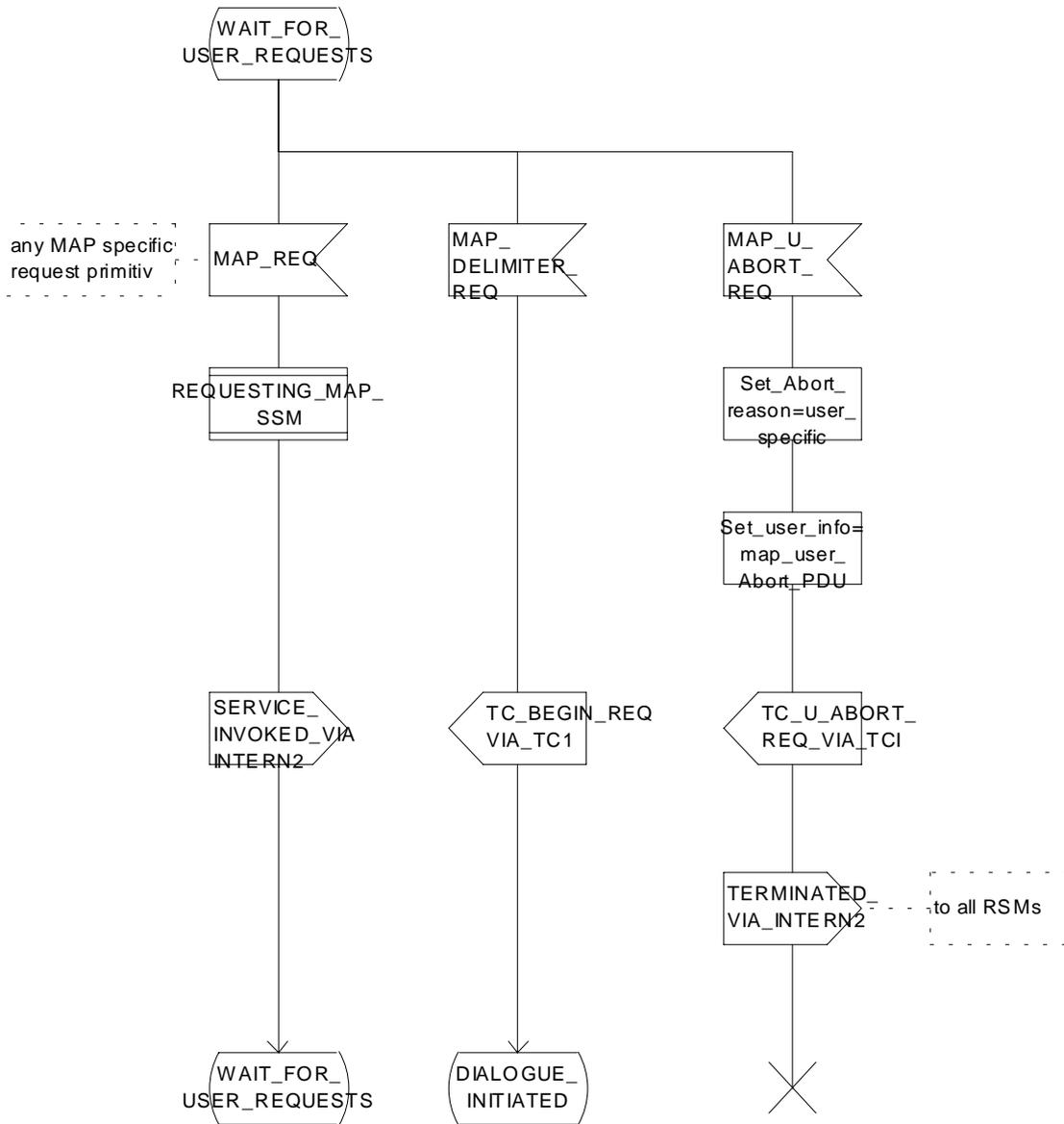


Figure 16.2/3 (sheet 4 of 11): Process MAP_DSM

Figure 16.2/3:

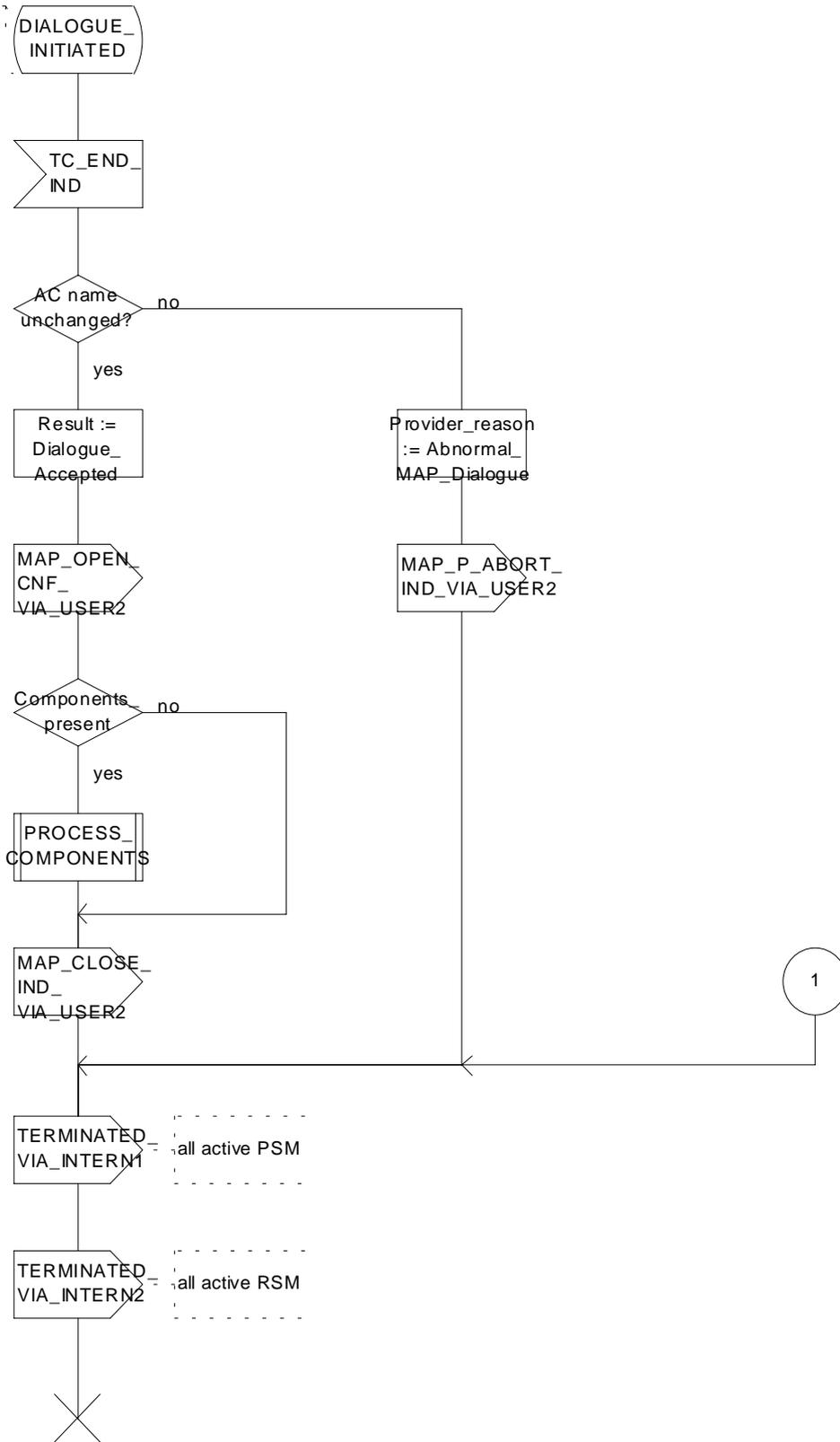


Figure 16.2/3 (sheet 5 of 11): Process MAP_DSM

Figure 16.2/3:

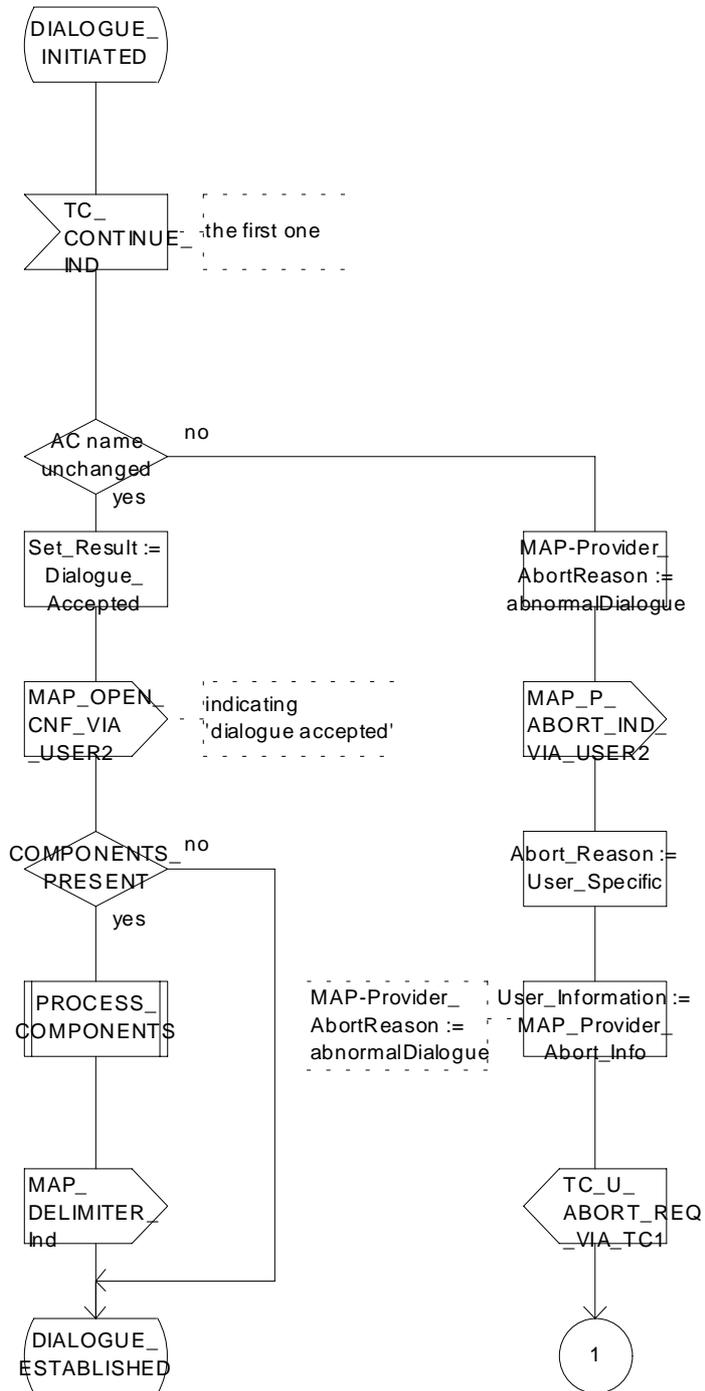


Figure 16.2/3 (sheet 6 of 11): Process MAP_DSM

Figure 16.2/3:

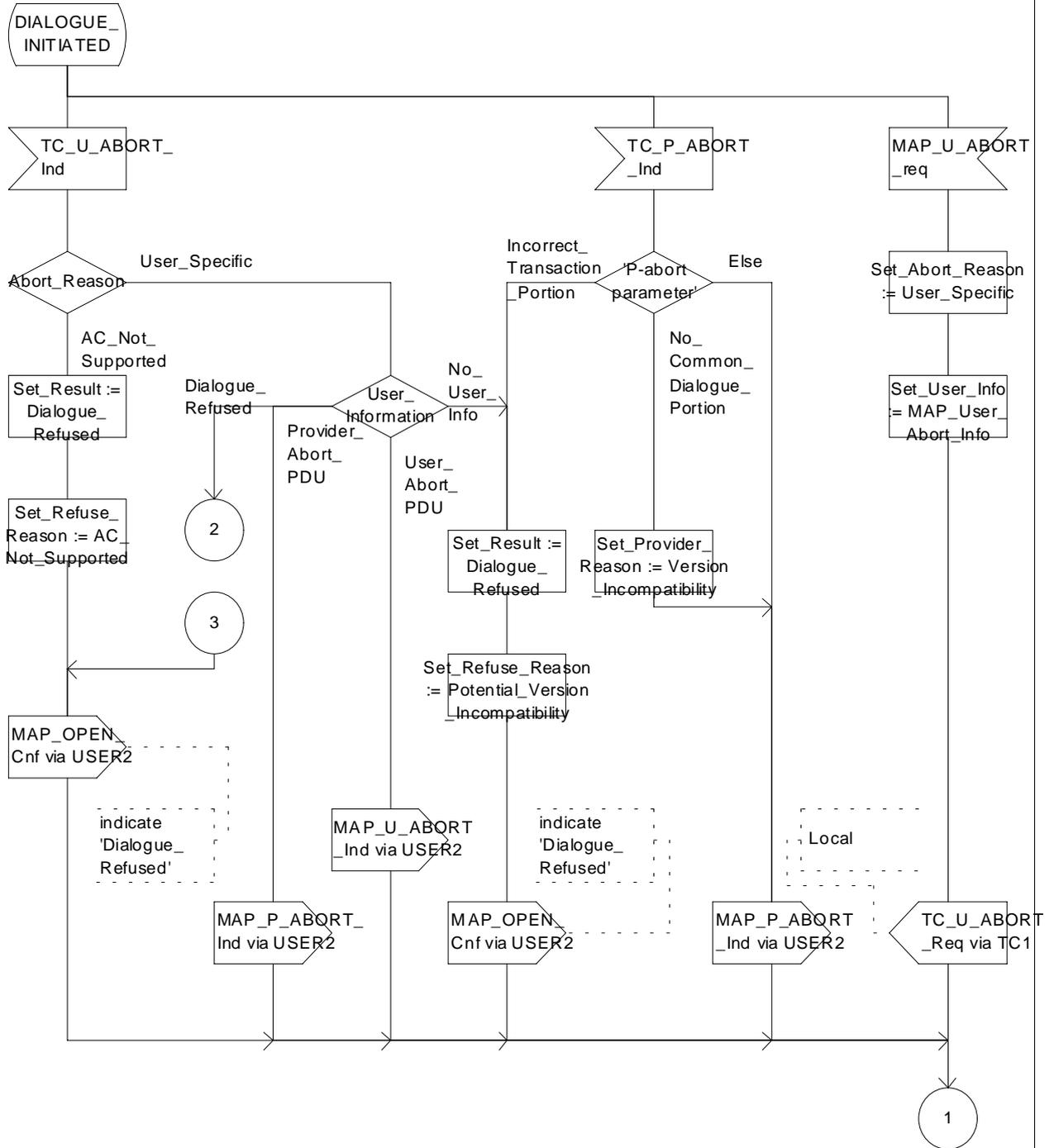


Figure 16.2/3 (sheet 7 of 11): Process MAP_DSM

Figure 16.2/3:

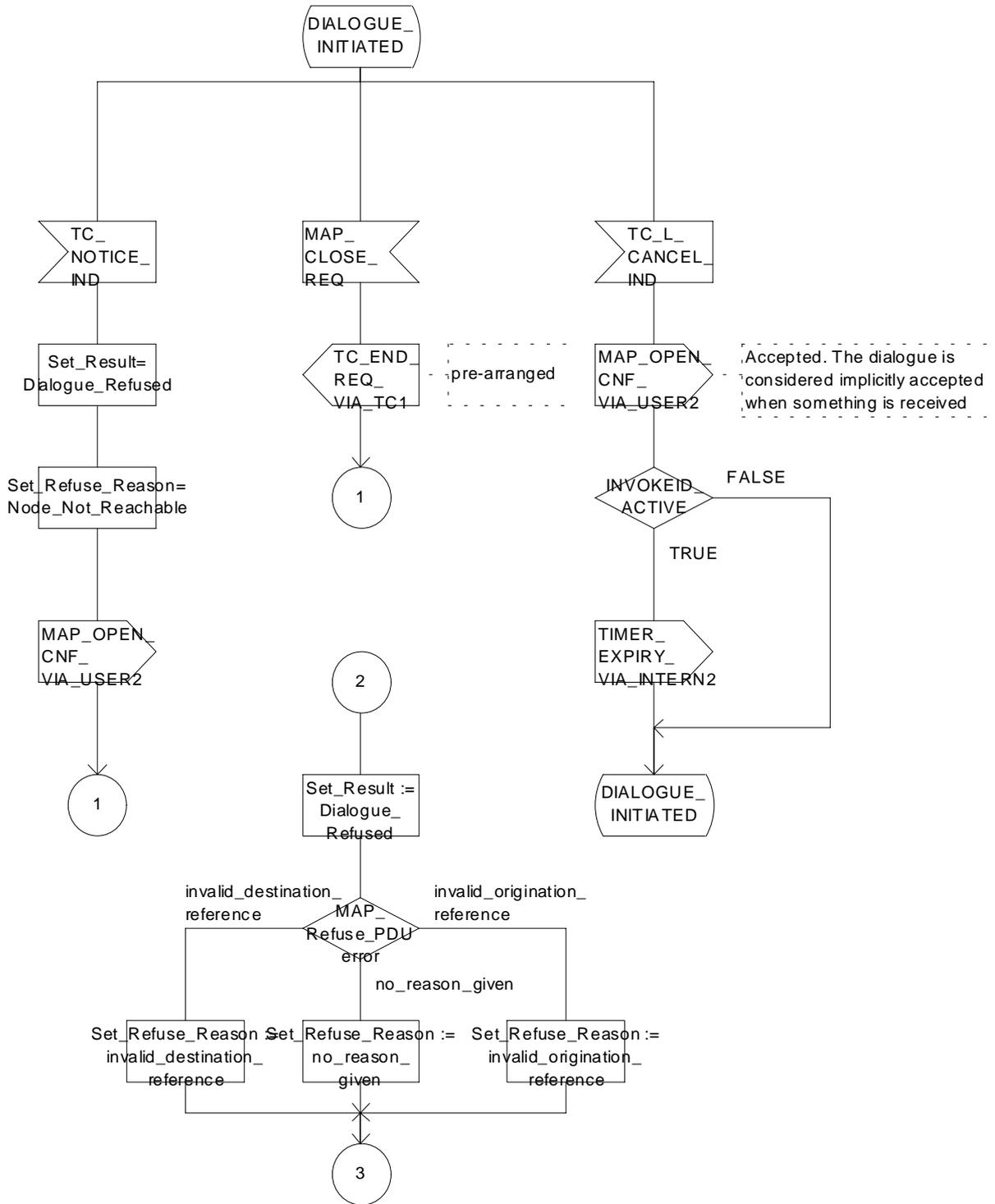


Figure 16.2/3 (sheet 8 of 11): Process MAP_DSM

Figure 16.2/3:

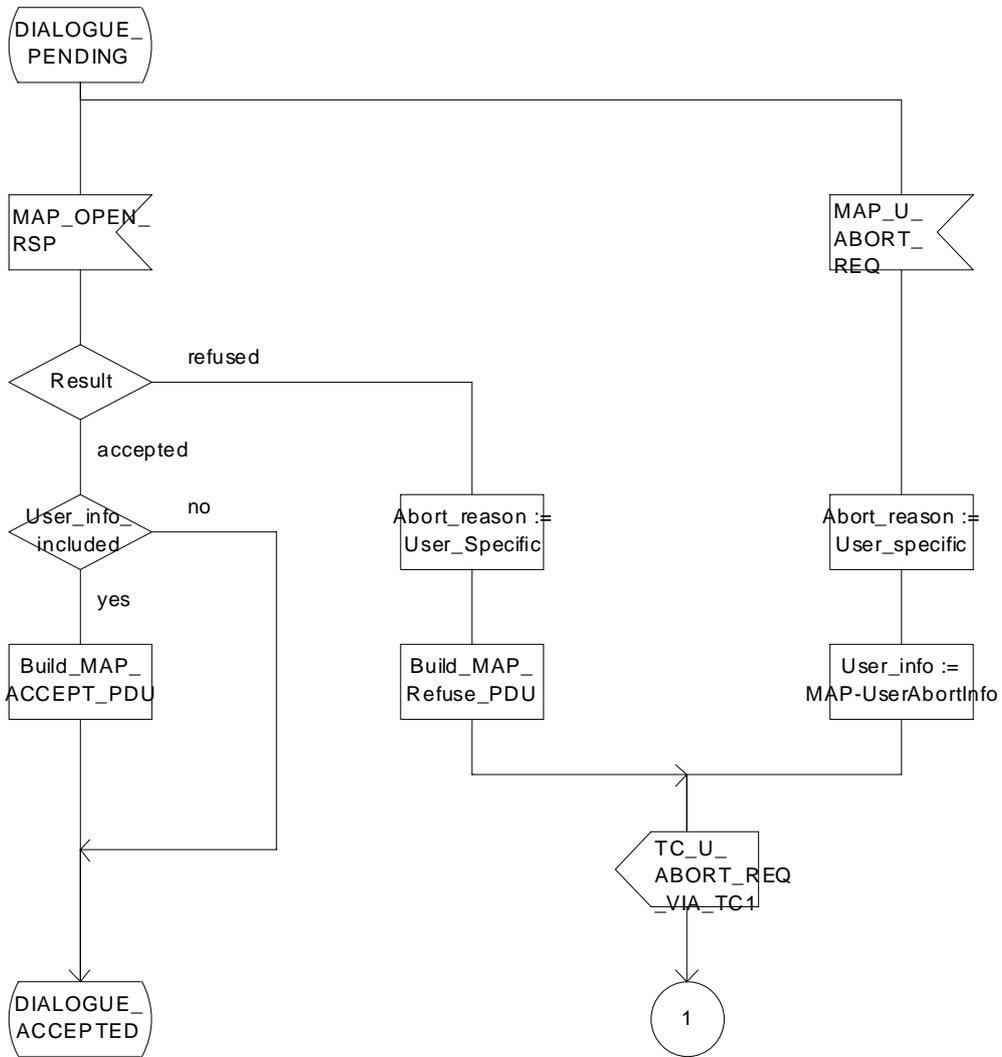


Figure 16.2/3 (sheet 9 of 11): Process MAP_DSM

Figure 16.2/3:

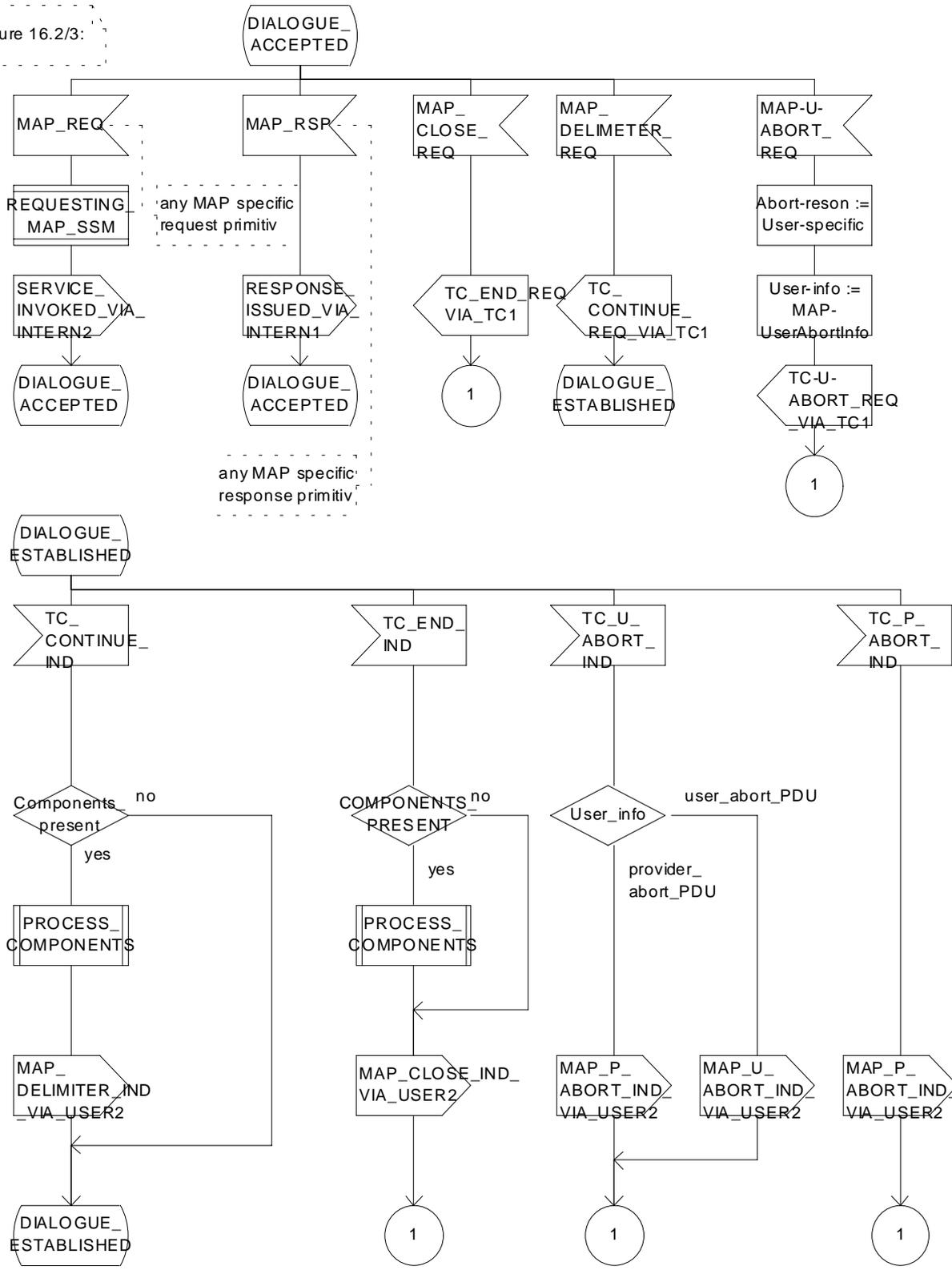


Figure 16.2/3 (sheet 10 of 11): Process MAP_DSM

Figure 16.2/3:

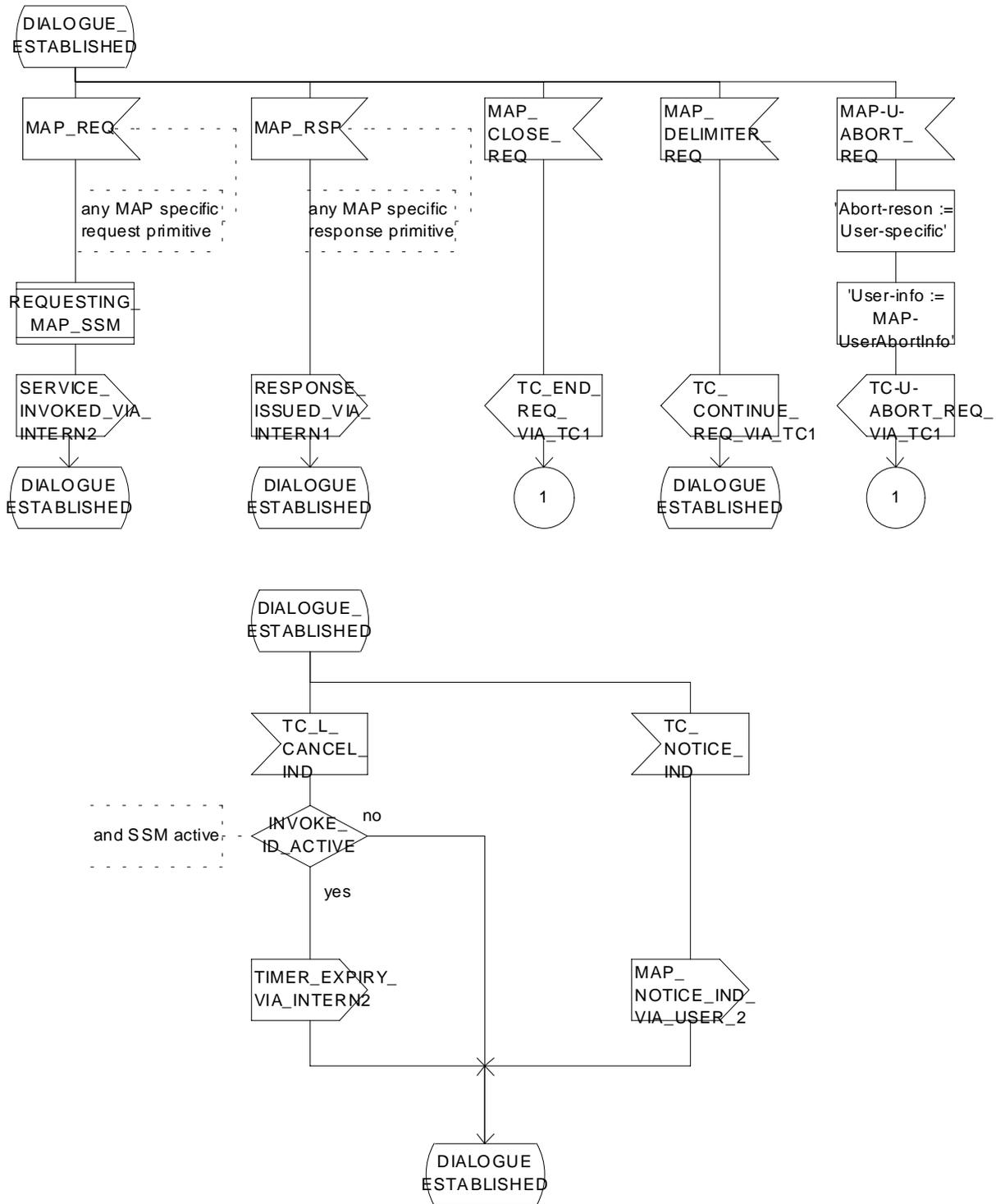


Figure 16.2/3 (sheet 11 of 11): Process MAP_DSM

Figure 16.2/4:

Comments: Components from TCAP:
DCL
OP_CODE INTERGER,
OP_EXIST, LAST_COMPONENT, INVOKEID_ASS, LINKEDID_PRES, LINKEDID_ASS BOOLEAN;

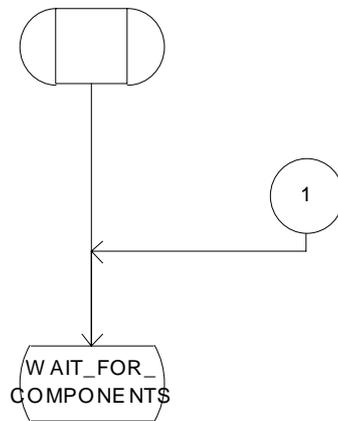


Figure 16.2/4 (sheet 1 of 4): Procedure PROCESS_COMPONENTS

Figure 16.2/4:

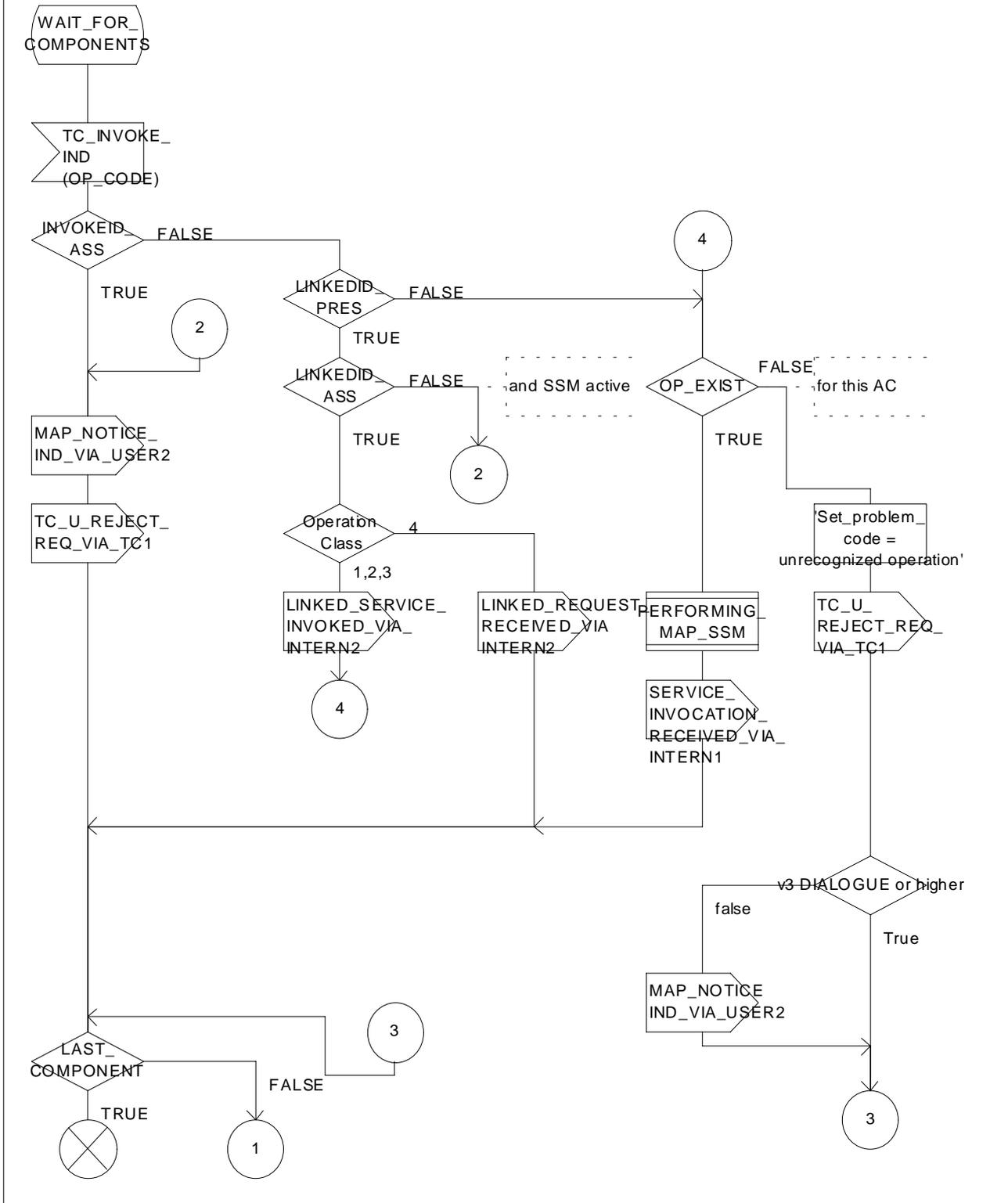


Figure 16.2/4 (sheet 2 of 4): Procedure PROCESS_COMPONENTS

Figure 16.2/4:

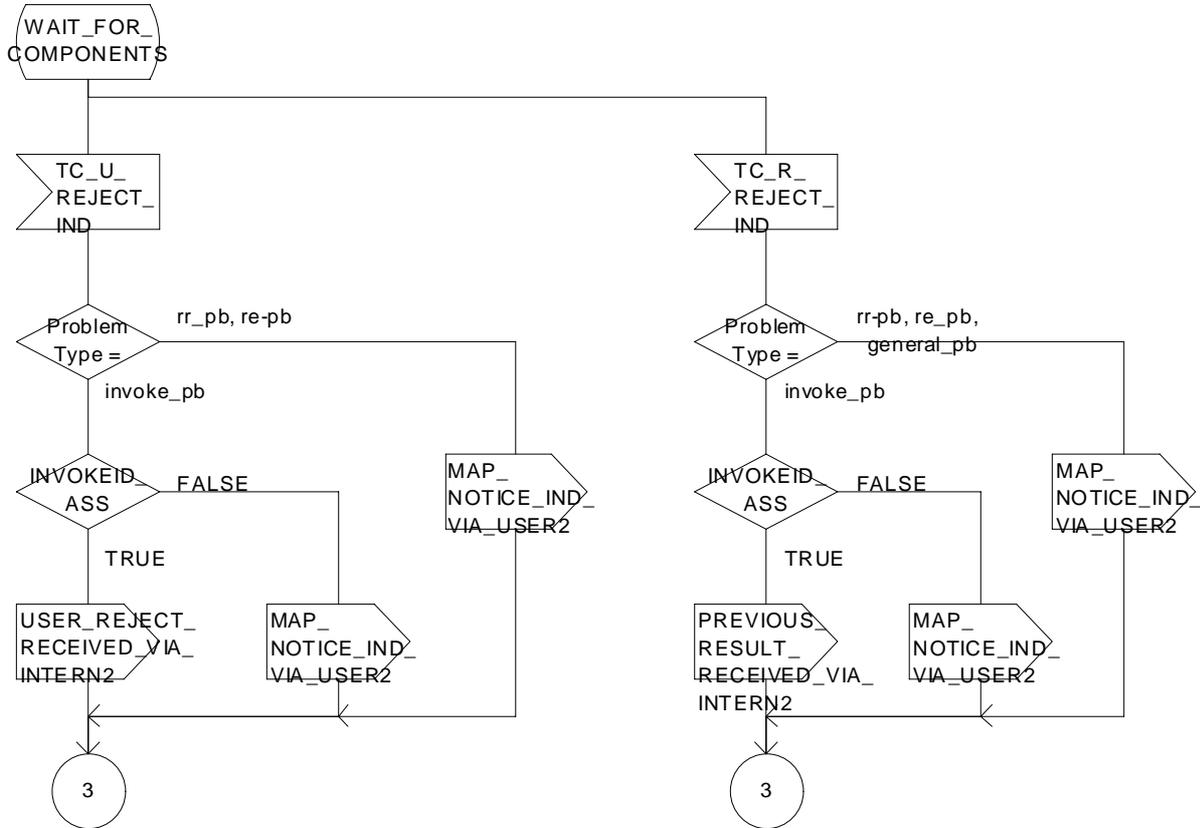
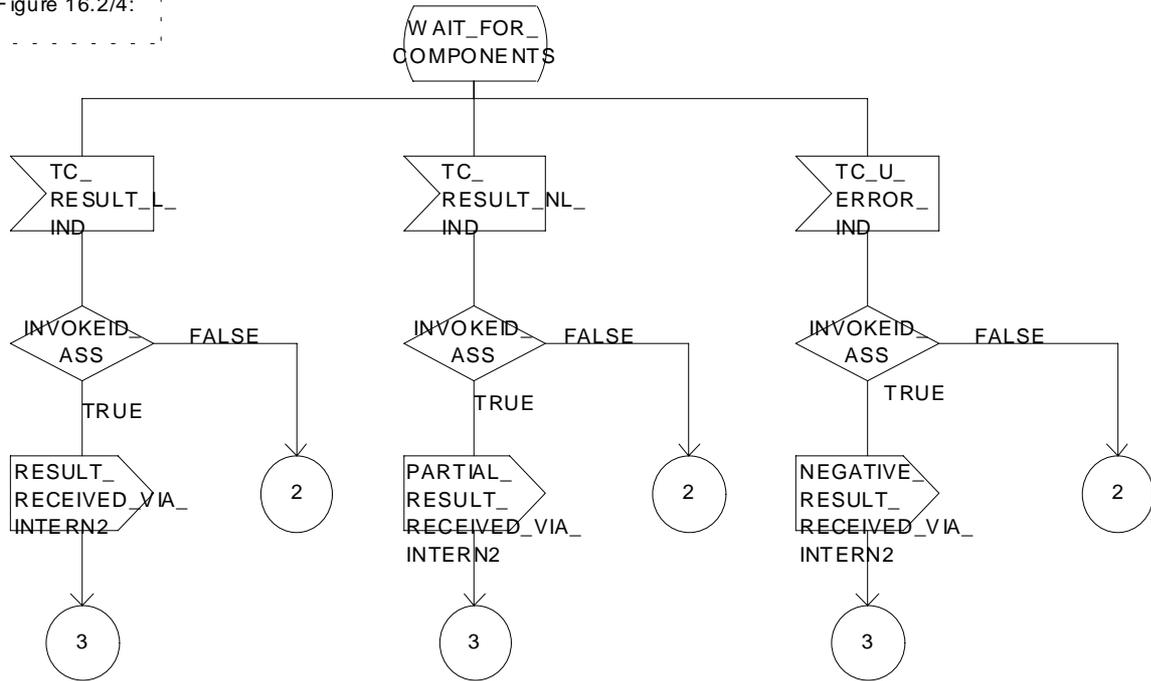


Figure 16.2/4 (sheet 3 of 4): Procedure PROCESS_COMPONENTS

Figure 16.2/4:

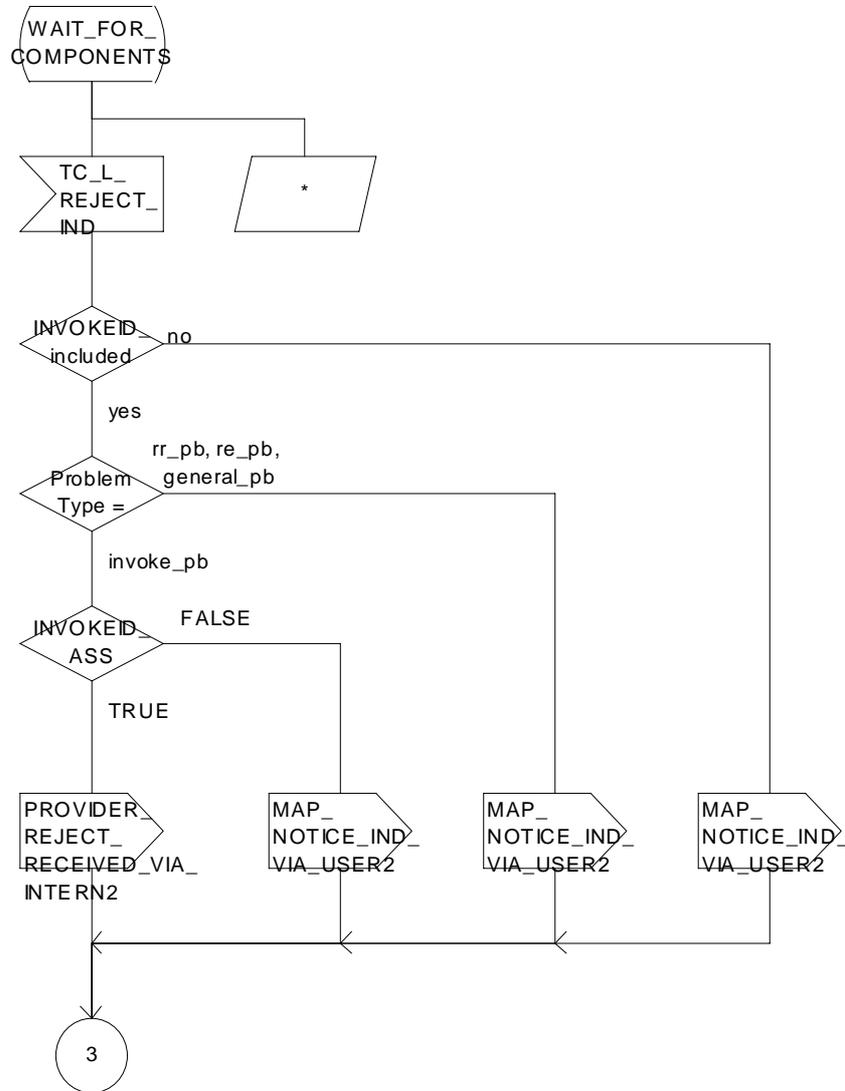


Figure 16.2/4 (sheet 4 of 4): Procedure PROCESS_COMPONENTS

Figure 16.2/5:

Comment 'LOAD CONTROL':
DCL
CONGESTION, DIALOGUE_ACCEPTABLE BOOLEAN

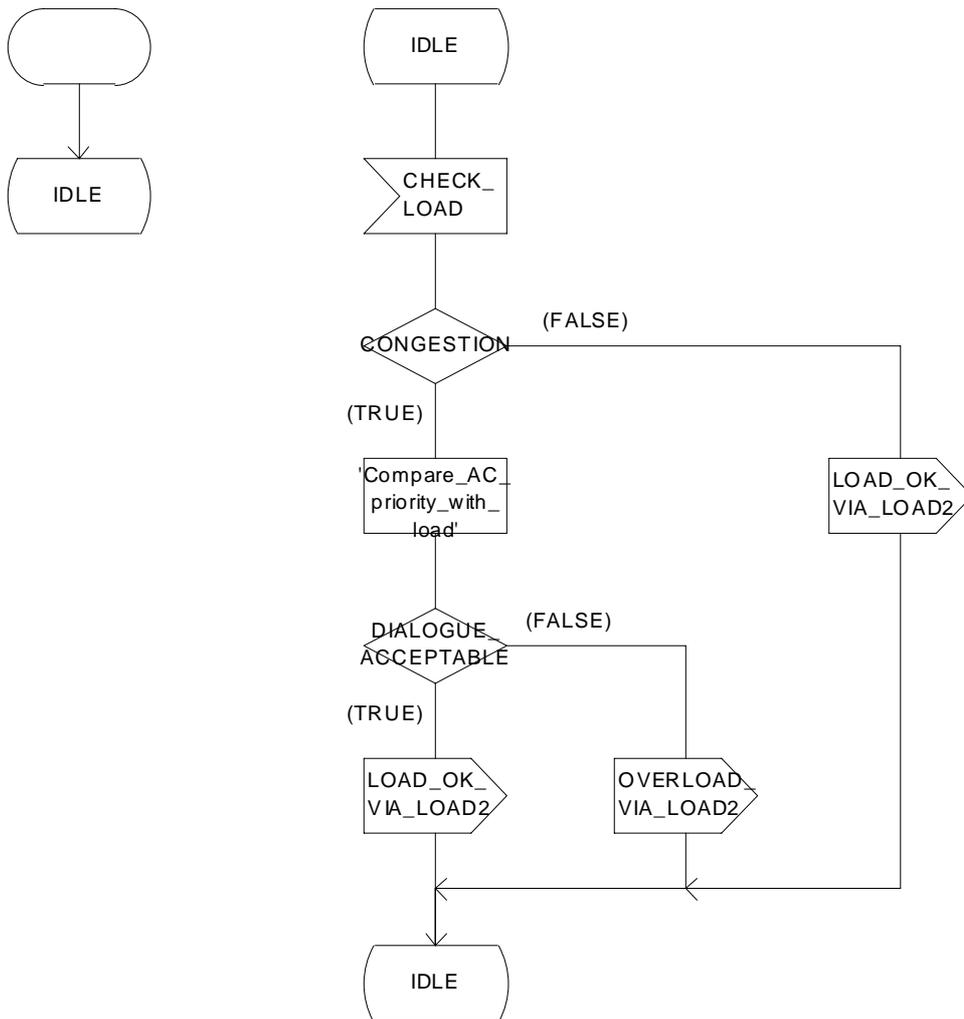


Figure 16.2/5: Process LOAD_CTRL

Figure 16.2/6:

Comment 'MAP Service State Machine':
DCL
ARGUMENT_CORRECT, USER_ERROR_PRESENT,
SPECIFIC_ERROR_LINKED_REQUEST, CNF BOOLEAN,

OP_CLASS INTEGER,

TIMER GUARD_TIMER COMMENT 'expires if MAP user does not respond';

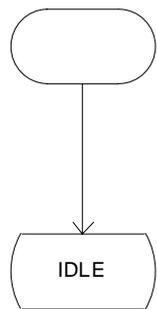


Figure 16.2/6 (sheet 1 of 3): Process PERFORMING_MAP_SSM

Figure 16.2/6:

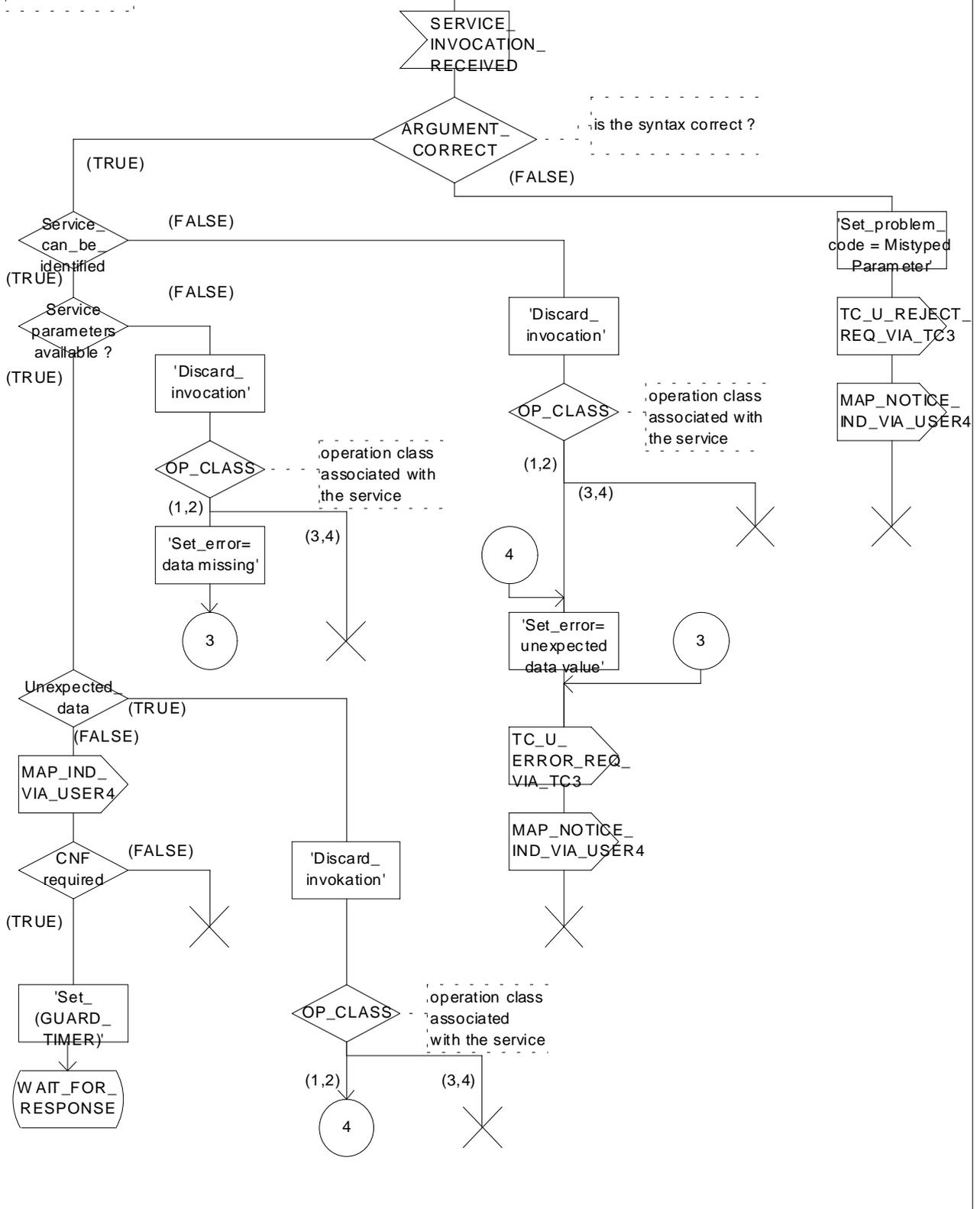


Figure 16.2/6 (sheet 2 of 3): Process PERFORMING_MAP_SSM

Figure 16.2/6:

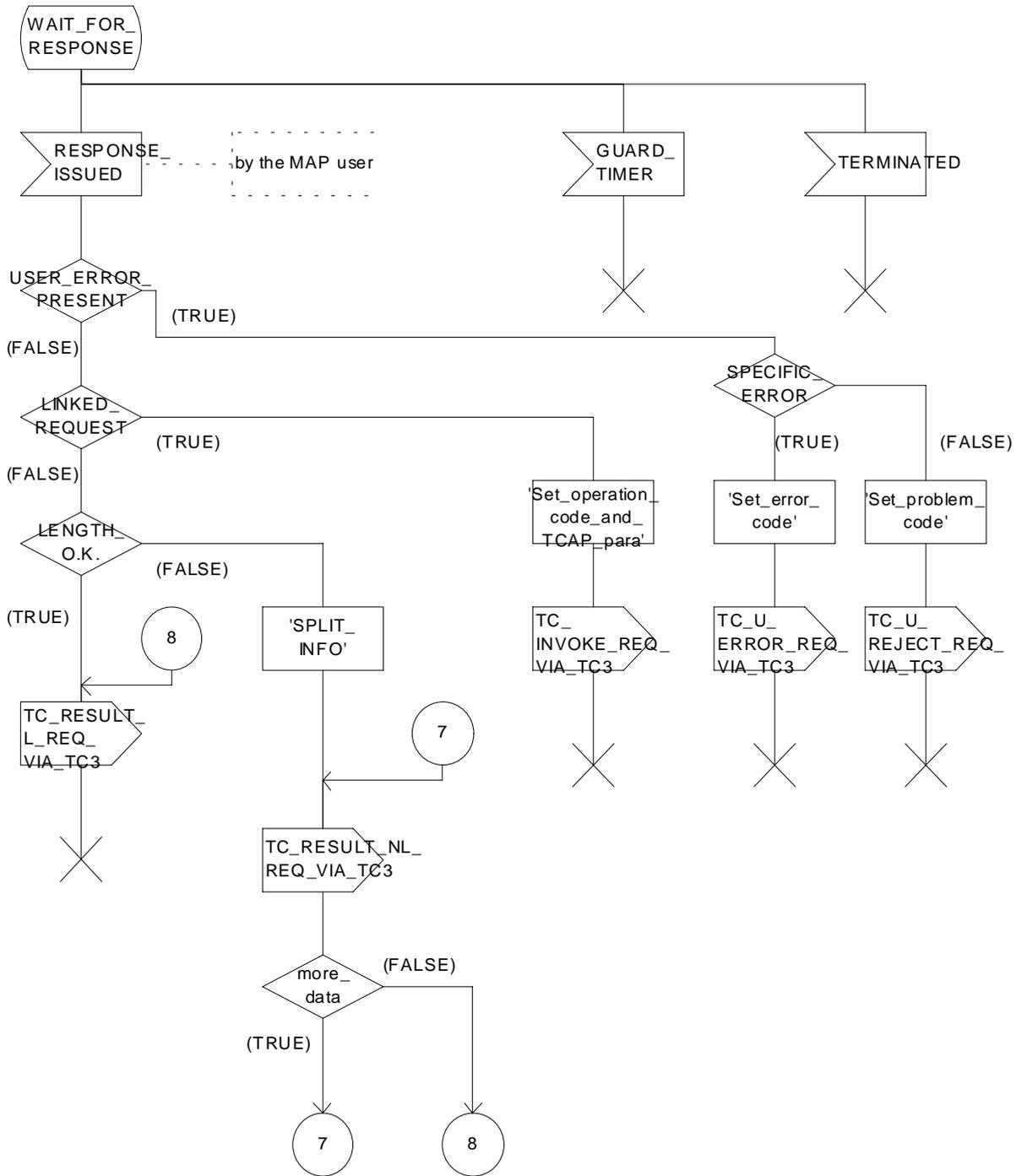


Figure 16.2/6 (sheet 3 of 3): Process PERFORMING_MAP_SSM

Figure 16.2/7:

Comment 'MAP Service State Maschine':
 DCL
 ARGUMENT_CORRECT, ERROR_CODE_CORRECT, LINKED_REQ_DEF, SYNTAX_CORRECT,
 MAP_INITIATED, CNF, LINKED_OPERATION_ALLOWED BOOLEAN,
 OP_CLASS INTEGER;

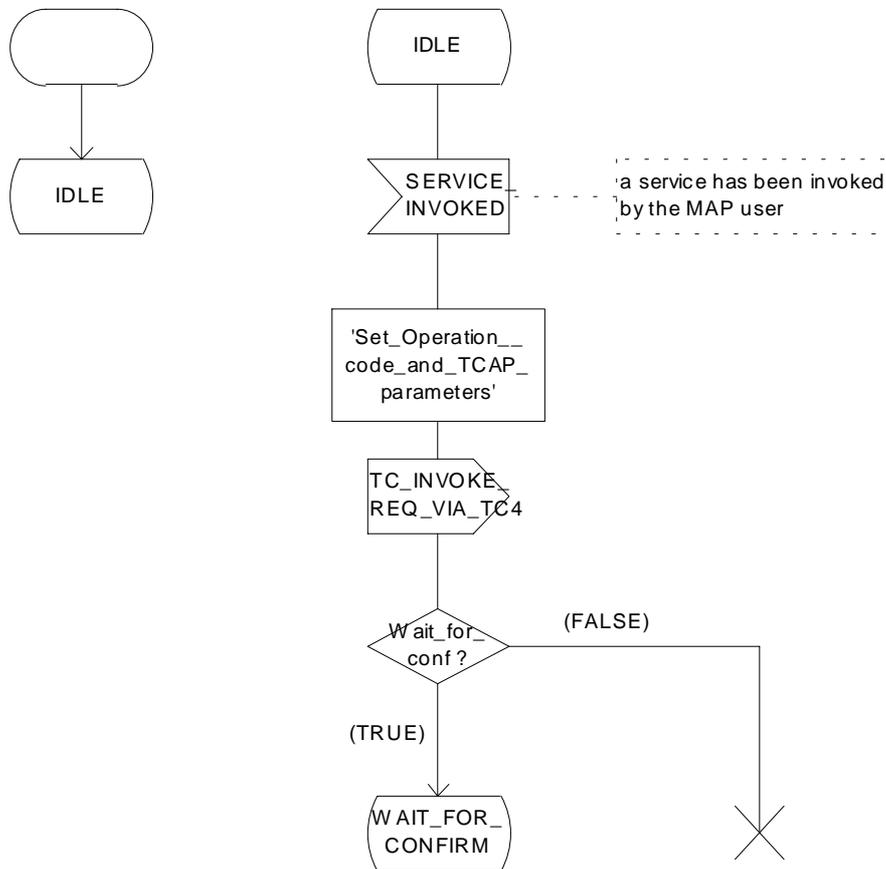


Figure 16.2/7 (sheet 1 of 4): Process REQUESTING_MAP_SSM

Figure 16.2/7:

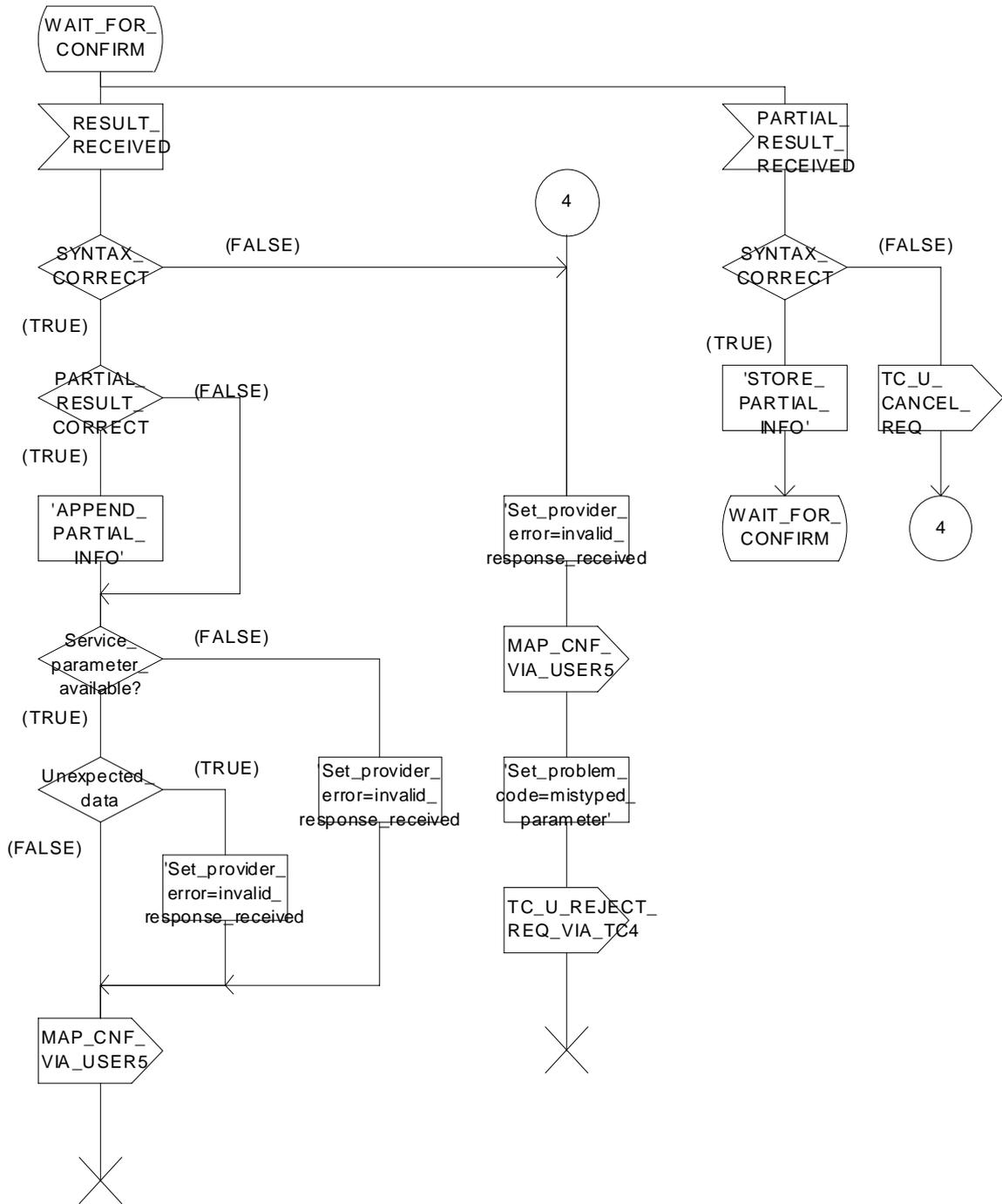


Figure 16.2/7 (sheet 2 of 4): Process REQUESTING_MAP_SSM

Figure 16.2/7:

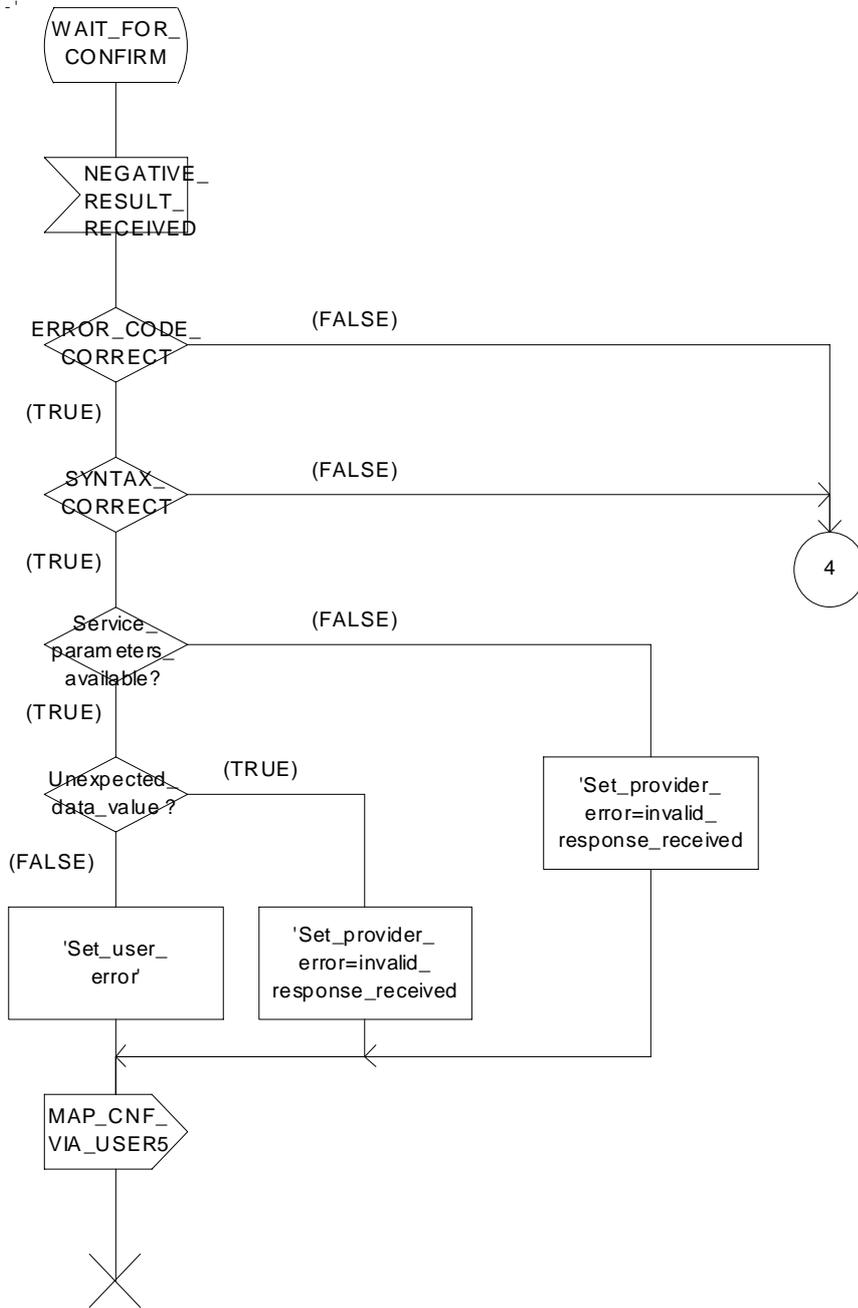


Figure 16.2/7 (sheet 3 of 4): Process REQUESTING_MAP_SSM

Figure 16.2/7:

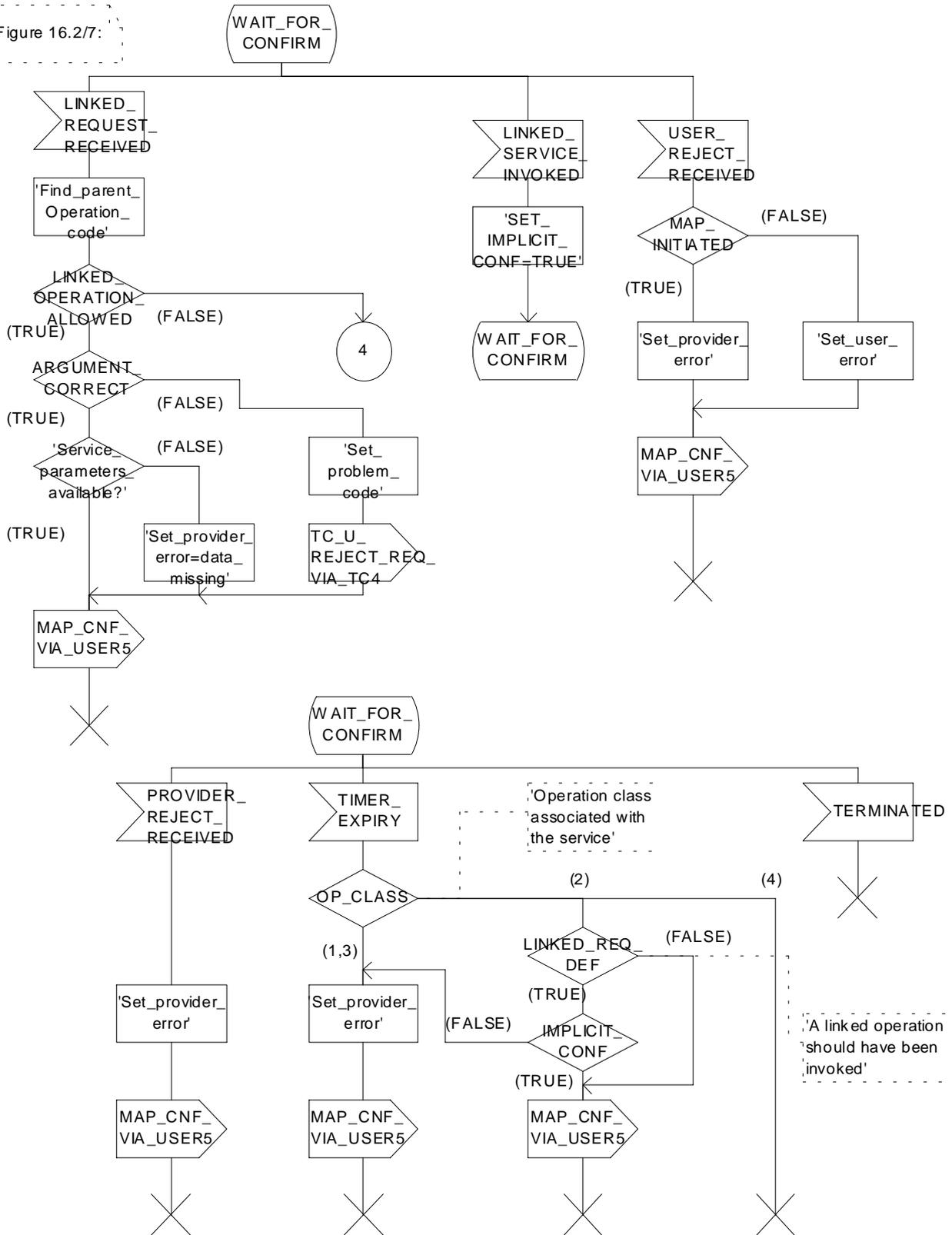


Figure 16.2/7 (sheet 4 of 4): Process REQUESTING_MAP_SSM

17 Abstract syntax of the MAP protocol

17.1 General

This subclause specifies the Abstract Syntaxes for the Mobile Application Part as well as the associated set of Operations and Errors, using the Abstract Syntax Notation One (ASN.1), defined in CCITT Recommendation X.208 (1988) or X.680 (1994) with additions as defined in subclause 17.1.4 on Compatibility Considerations and the OPERATION and ERROR external MACROs, defined in CCITT Recommendation Q.773.

The Abstract Syntax is defined for all interfaces specified in subclause 4.4 except for the A- and B-interfaces.

The Mobile Application Part protocol is defined by two Abstract Syntaxes:

- one Abstract Syntax which encompass all Operations; and
- Errors identified by the various MAP subsystem numbers.

This Abstract Syntax represents the set of values each of which is a value of the ASN.1 type TCAPMessages.MessageType as defined in CCITT Recommendation Q.773 with the ANY DEFINED BY sections resolved by the operation and error codes included in the ASN.1 module MAP-Protocol. However, only the subset of this abstract syntax which is required by the procedures defined for an entity needs to be supported:

- one Abstract Syntax identified by the OBJECT IDENTIFIER value MAP-DialogueInformation.map-DialogueAS.

This Abstract Syntax represents the set of values each of which is a value of the ASN.1 type MAP-DialogueInformation.MAP-DialoguePDU. Such a value of the ASN.1 single-ASN.1-type element is contained within the user-information element of the TCAPMessages.DialoguePortion ASN.1 type. This Abstract Syntax name is to be used as a direct reference.

17.1.1 Encoding rules

The encoding rules which are applicable to the defined Abstract Syntaxes are the Basic Encoding Rules for Abstract Syntax Notation One, defined in CCITT Recommendation X.690 with the same exceptions as in CCITT Recommendation Q.773 section 4 Message Representation.

When the definite form is used for length encoding, a data value of length less than 128 octets must have the length encoded in the short form.

When the long form is employed to code a length, the minimum number of octets shall be used to code the length field.

OCTET STRING values and BIT STRING values must be encoded in a primitive form.

There is no restriction to the use of empty constructors (e.g. an empty SEQUENCE type). That is, the encoding of the content of any data value shall consist of zero, one or more octets.

17.1.2 Use of TC

The mapping of OPERATION and ERROR to TC components is defined in ETS 300 287 (version 2) which is based on CCITT Recommendation Q.773 (1992).

NOTE 1: The class of an operation is not stated explicitly but is specified as well in the ASN.1 operation type definition.

Class 1: RESULT and ERROR appear in ASN.1 operation type definition.

Class 2: only ERROR appears in ASN.1 operation type definition.

Class 3: only RESULT appears in ASN.1 operation type definition.

Class 4: both RESULT and ERROR do not appear in ASN.1 operation type definition.

The ASN.1 data type which follows the keywords "ARGUMENT", "PARAMETER" or "RESULT" (for OPERATION and ERROR) is always optional from a syntactic point of view. However, except when specifically mentioned with the ASN.1 comment «-- optional», the «parameter» part of a component has to be considered as mandatory from a semantic point of view.

When an optional element is missing in an invoke component or in an inner data structure while it is required by the context, an error component is returned if specified in the operation type; the associated type of error is DataMissing. This holds also when the entire parameter of an invoke component is missing while it is required by the context.

NOTE 2: When a mandatory element is missing in the parameter or inner data structure of any component, a reject component is returned (if the dialogue still exists). The problem code to be used is "Mistyped parameter".

The Timer Values used in the operation type definitions are indicated as ASN.1 comment. The Timer Value Ranges are:

s = from 3 seconds to 10 seconds;

m = from 15 seconds to 30 seconds;

ml = from 1 minute to 10 minutes;

l = from 28 hours to 38 hours.

17.1.2.1 Use of Global Operation and Error codes defined outside MAP

An entity supporting an application context greater than 2 shall be capable of receiving an operation or error code, within an application context defined in GSM 09.02, encoded as either an Object Identifier (as defined in CCITT Recommendation X.690 (1994)) or an integer value (as defined in section 17.5). Related restrictions regarding the use of Object Identifiers are as follows:

- The length of the Object Identifier shall not exceed 16 octets and the number of components of the Object Identifier shall not exceed 16.
- Object Identifiers shall be used only for operations or errors defined outside of GSM 09.02.
- Global error codes may be sent only in response to a global operation. If a standard operation is received then a global error code shall not be sent in response.

Handling of an unknown operation codes by the receiving entity is defined in section 15.1.1

17.1.3 Use of information elements defined outside MAP

An information element or a set of information elements (messages) transparently carried in the Mobile Application Part but defined in other recommendation/technical specifications are handled in one of the following ways:

- i) The contents of each information element (without the octets encoding the identifier and the length in the recommendation/technical specification where it is defined) is carried as the value of an ASN.1 NamedType derived from the OCTET STRING data type. Additionally, the internal structure may be explained by means of comments. In case of misalignment the referred to recommendation/technical specification takes precedence.
- ii) The complete information element (including the octets encoding the identifier and the length in the recommendation/technical specification where it is defined) or set of information elements and the identity of the associated protocol are carried as the value of the ExternalSignalInfo data type defined in the present document. Where more than one information element is carried, the information elements are sent contiguously with no filler octets between them.

17.1.4 Compatibility considerations

The following ASN.1 modules conform to CCITT Recommendation X.208 (1988) or X.680 (1994) (the only module which makes use of X.680 is MAP-ExtensionDataTypes), but in addition Ellipsis Notation ("..." - notation) is used as described in ITU-T Recommendation X.680 Amendment 1 (1995) wherever future protocol extensions are foreseen.

The "..." construct applies only to SEQUENCE and ENUMERATED data types. An entity supporting a version greater than 1 shall not reject an unsupported extension following "..." of that SEQUENCE or ENUMERATED data type. The Encoding Rules from subclause 17.1.1 apply to every element of the whole Transfer Syntax especially to the ASN.1 type EXTERNAL.

Private extensions shall:

- 1) if included in operations of an AC of V2, follow the extension marker and be tagged using PRIVATE tags up to and including 29.

NOTE: This type of extension is in most cases used only within a PLMN.

- 2) if included in operations of an AC of V3 or higher: be included only in the Private Extension Container that is defined in the specification.

NOTE: This type of extension can be used between PLMNs.

Private extensions shall not be included in v2 supplementary service operations.

Private extensions shall not be included within user error for RegisterCCEnter and EraseCCEnter operations.

PCS extensions shall be included in the PCS Extension Container that is defined in this specification.

In order to improve extensibility, a few error parameters have been defined as a CHOICE between the version 2 description and a SEQUENCE including the version 2 description and an extension container. Operations used in a v2-application-context must consider only the first alternative while operations used in a vn-application-context (n>2) must consider only the second alternative.

17.1.5 Structure of the Abstract Syntax of MAP

For each MAP parameter which has to be transferred by a MAP Protocol Data Unit (MAP message), there is a PDU field (an ASN.1 NamedType) whose ASN.1 identifier has the same name as the corresponding parameter, except for the differences required by the ASN.1 notation (blanks between words are removed or replaced by hyphen, the first letter of the first word is lower-case and the first letter of the following words are capitalized, e.g. "no reply condition time" is mapped to "noReplyConditionTime"). Additionally some words may be abbreviated as follows:

bs basic service
ch call handling
cugclosed user group
ho handover
ic incoming call
id identity
infoinformation
mm mobility management
lcslocation services
ms mobile service
oc outgoing call
om operation & maintenance
pw Password

sm short message service

ss supplementary service

The MAP protocol is composed of several ASN.1 modules dealing with either operations, errors, data types, and, if applicable, split into those dealing with mobile services, call handling services, supplementary services and short message services. For operations and errors no values are assigned, but only the operation and error types in order to allow use of the defined types also by other protocols (e.g. TS GSM 04.80). The values (operation codes and error codes) are defined in a separate module. The ASN.1 source lines are preceded by line-numbers at the left margin in order to enable the usage of the cross-reference in annex A.

The module containing the definition of the operation packages for MAP is:

1. MAP-OperationPackages.

The module containing the definition of the application contexts for MAP is:

2. MAP-ApplicationContexts.

The module containing the data types for the Abstract Syntax to be used for TCAPMessages.DialoguePortion for MAP is:

3. MAP-DialogueInformation.

The module containing the operation codes and error codes for MAP is:

4. MAP-Protocol.

The modules containing all operation type definitions for MAP are:

5. MAP-MobileServiceOperations;
6. MAP-OperationAndMaintenanceOperations;
7. MAP-CallHandlingOperations;
8. MAP-SupplementaryServiceOperations;
9. MAP-ShortMessageServiceOperations;
10. MAP-Group-Call-Operations.
11. MAP-LocationServiceOperations

The module containing all error type definitions for MAP is:

12. MAP-Errors.

Modules containing all data type definitions for MAP are:

13. MAP-MS-DataTypes;
14. MAP-OM-DataTypes;
15. MAP-CH-DataTypes;
16. MAP-SS-DataTypes;
17. MAP-SS-Code;
18. MAP-SM-DataTypes;
19. MAP-ER-DataTypes;
20. MAP-CommonDataTypes;
21. MAP-TS-Code;

- 22. MAP-BS-Code;
- 23. MAP-ExtensionDataTypes;
- 24. MAP-GR-DataTypes;
- 25. MAP-LCS-DataTypes.

References are made also to modules defined outside of the present document. They are defined in the technical specification Mobile Services Domain and technical specification Transaction Capability respectively:

- MobileDomainDefinitions;
- TCAPMessages;
- DialoguePDUs.

17.1.6 Application Contexts

The following informative table lists the latest versions of the Application Contexts used in this specification, with the operations used by them and, where applicable, whether or not the operation description is exactly the same as for previous versions. Information in sections 17.6 & 17.7 relates only to the ACs in this table.

AC Name	AC Version	Operations Used	Comments *
locationCancellationContext	v3	cancelLocation	
equipmentMngtContext	v2	checkIMEI	
imsiRetrievalContext	v2	sendIMSI	
infoRetrievalContext	v2	sendAuthenticationInfo	
interVlrInfoRetrievalContext	v2	sendIdentification	
handoverControlContext	v2	prepareHandover forwardAccessSignalling sendEndSignal processAccessSignalling prepareSubsequentHandover	
mwdMngtContext	v3	readyForSM	
msPurgingContext	v3	purgeMS	
shortMsgAlertContext	v2	alertServiceCentre	
resetContext	v2	reset	
networkUnstructuredSsContext	v2	processUnstructuredSS-Request unstructuredSS-Request unstructuredSS-Notify	
tracingContext	v3	activateTraceMode deactivateTraceMode	
networkFunctionalSsContext	v2	registerSS eraseSS activateSS deactivateSS registerPassword interrogateSS getPassword	
shortMsgMO-RelayContext	v3	mo-forwardSM	
shortMsgMT-RelayContext	v3	mt-forwardSM	
shortMsgGatewayContext	v3	sendRoutingInfoForSM reportSM-DeliveryStatus InformServiceCentre	the syntax of this operation has been extended in comparison with release 96 version
networkLocUpContext	v3	updateLocation forwardCheckSs-Indication restoreData insertSubscriberData activateTraceMode	the syntax is the same in v1 & v2

gprsLocationUpdateContext	v3	updateGprsLocation insertSubscriberData activateTraceMode	
subscriberDataMngtContext	v3	insertSubscriberData deleteSubscriberData	
roamingNumberEnquiryContext	v3	provideRoamingNumber	
locationInfoRetrievalContext	v3	sendRoutingInfo	
gprsNotifyContext	v3	noteMsPresentForGprs	
gprsLocationInfoRetrievalContext	v3	sendRoutingInfoForGprs	
failureReportContext	v3	failureReport	
callControlTransferContext	v4	resumeCallHandling	
subscriberInfoEnquiryContext	v3	provideSubscriberInfo	
anyTimeEnquiryContext	v3	anyTimeInterrogation	
anyTimeInfoHandlingContext	v3	anyTimeSubscriptionInterrogation anyTimeModification	
ss-InvocationNotificationContext	v3	ss-InvocationNotification	
sIWFSAllocationContext	v3	provideSIWFSNumber sIWFSsignallingModify	
groupCallControlContext	v3	prepareGroupCall processGroupCallSignalling forwardGroupCallSignalling sendGroupCallEndSignal	
reportingContext	v3	setReportingState statusReport remoteUserFree	
callCompletionContext	v3	registerCC-Entry eraseCC-Entry	
istAlertingContext	v3	istAlert	
ImmediateTerminationContext	v3	istCommand	
locationSvcLMUControlContext	v3	lcsRegistrationlcsReset	
locationSvcDataTransferContext	v3	lcsInformationRequest lcsInformationReport	
locationSvcEnquiryContext	v3	provideSubscriberLocation subscriberLocationReport	
locationSvcGatewayContext	v3	sendRoutingInfoForLCS	
locationSvcPositioningContext	v3	lcsAssignTrafficChannel lcsInformationRequest lcsInformationReport performLocation	
mm-EventReportingContext	v3	noteMM-Event	
subscriberDataModificationNotificationContext	v3	noteSubscriberDataModified	

NOTE (*): The syntax of the operations is not the same as in previous versions unless explicitly stated

17.2 Operation packages

17.2.1 General aspects

This subclause describes the operation-packages which are used to build the application-contexts defined in subclause 17.3.

Each operation-package is a specification of the roles of a pair of communicating objects (i.e. a pair of MAP-Providers), in term of operations which they can invoke of each other.

The grouping of operations into one or several packages does not necessarily imply any grouping in term of Application Service Elements.

The following ASN.1 MACRO is used to describe operation-packages in this subclause:

```

OPERATION-PACKAGE MACRO ::=
BEGIN
TYPE NOTATION ::= Symmetric | ConsumerInvokes SupplierInvokes |
empty
VALUE NOTATION ::= value(VALUE OBJECT IDENTIFIER)
Symmetric ::= "OPERATIONS" "{" OperationList "}"
ConsumerInvokes ::= "CONSUMER INVOKES" "{" OperationList "}"
SupplierInvokes ::= "SUPPLIER INVOKES" "{" OperationList "}" | empty
OperationList ::= Operation | OperationList "," Operation
Operation ::= value(OPERATION)
END

```

Since the application-context definitions provided in subclause 17.3 use only an informal description technique, only the type notation is used in the following subclauses to define operation-packages.

The following definitions are used throughout this subclause ($n \geq 2$):

- v1-only operation: An operation which shall be used only in v1 application-contexts;
- vn-only operation: An operation which shall be used only in vn application-contexts;
- v(n-1)-operation: An operation whose specification has not been modified since the MAP v(n-1) specifications or if the modifications are considered as not affecting v(n-1) implementations;
- v(n-1)-equivalent operation: The version of an operation which excludes all the information elements and errors which have been added since the MAP v(n-1) specification;
- vn-only package: An operation package which contains only vn-only operations;
- v(n-1)-package: An operation package which contains only v(n-1)- operations.

The names of vn-packages are suffixed by "-vn" where $n \geq 2$.

For each operation package which is not vn-only ($n \geq 2$) and which does not include only v(n-1)-operations, there is a v(n-1)-equivalent package. Except when a definition is explicitly provided in the following subclauses, the v(n-1)-equivalent package includes the v(n-1)-equivalent operations of the operations which belong to this package.

17.2.2 Packages specifications

17.2.2.1 Location updating

This operation package includes the operations required for location management procedures between HLR and VLR.

```

LocationUpdatingPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VLR
CONSUMER INVOKES {
    updateLocation}
SUPPLIER INVOKES {
    forwardCheckSs-Indication}

```

The v1-equivalent and v2-equivalent packages can be determined according to the rules described in subclause 17.2.1.

17.2.2.2 Location cancellation

This operation package includes the operations required for location cancellation and MS purging procedures between HLR and VLR and between HLR and SGSN.

```

LocationCancellationPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is VLR or SGSN if Consumer is HLR
CONSUMER INVOKES {
    cancelLocation}

```

The v1-equivalent and v2-equivalent packages can be determined according to the rules described in subclause 17.2.1.

17.2.2.3 Roaming number enquiry

This operation package includes the operations required for roaming number enquiry procedures between HLR and VLR.

```
RoamingNumberEnquiryPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is VLR if Consumer is HLR
CONSUMER INVOKES {
    provideRoamingNumber}
```

The v1-equivalent and v2-equivalent packages can be determined according to the rules described in subclause 17.2.1.

17.2.2.4 Information retrieval

This operation package includes the operation required for the authentication information retrieval procedure between HLR and VLR and between HLR and SGSN.

```
InfoRetrievalPackage-v2 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VLR
-- Supplier is HLR if Consumer is SGSN
CONSUMER INVOKES {
    sendAuthenticationInfo}
```

The v1-equivalent package is defined as follows:

```
InfoRetrievalPackage-v1 ::= OPERATION-PACKAGE
-- Supplier is HLR or VLR if Consumer is VLR
-- Supplier is HLR if Consumer is SGSN
CONSUMER INVOKES {
    sendParameters}
```

17.2.2.5 Inter-VLR information retrieval

This operation package includes the operations required for inter VLR information retrieval procedures.

```
InterVlrInfoRetrievalPackage-v2 ::= OPERATION-PACKAGE
-- Supplier is VLR if Consumer is VLR
CONSUMER INVOKES {
    sendIdentification}
```

The v1-equivalent package is : InfoRetrievalPackage-v1

17.2.2.6 IMSI retrieval

This operation package includes the operation required for the IMSI retrieval procedure between HLR and VLR.

```
IMSIRetrievalPackage-v2 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VLR
CONSUMER INVOKES {
    sendIMSI}
```

This package is v2 only.

17.2.2.7 Call control transfer

This operation package includes the operation required for the call control transfer procedure between VMSC and GMSC.

```
CallControlTransferPackage-v4 ::= OPERATION-PACKAGE
-- Supplier is GMSC if Consumer is VMSC
CONSUMER INVOKES {
    resumeCallHandling}
```

The v3-equivalent package can be determined according to the rules described in subclause 17.2.1.

17.2.2.8 - 17.2.2.9 [spare]

17.2.2.10 Interrogation

This operation package includes the operations required for interrogation procedures between MSC and HLR or NPLR.

```
InterrogationPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR or NPLR if Consumer is MSC
CONSUMER INVOKES {
    sendRoutingInfo}
```

The v1-equivalent and v2-equivalent packages can be determined according to the rules described in subclause 17.2.1.

17.2.2.11 [spare]

17.2.2.12 Handover Control

This operation package includes the operations required for handover procedures between MSCs.

```
HandoverControlPackage-v2 ::= OPERATION-PACKAGE
-- Supplier is MSCB if Consumer is MSCA
CONSUMER INVOKES {
    prepareHandover,
    forwardAccessSignalling}
SUPPLIER INVOKES {
    sendEndSignal,
    processAccessSignalling,
    prepareSubsequentHandover}
```

The v1-equivalent package is defined as follows.

```
HandoverControlPackage-v1 ::= OPERATION-PACKAGE
-- Supplier is MSCB if Consumer is MSCA
CONSUMER INVOKES {
    performHandover,
    forwardAccessSignalling,
    traceSubscriberActivity}
SUPPLIER INVOKES {
    sendEndSignal,
    noteInternalHandover,
    processAccessSignalling,
    performSubsequentHandover}
```

17.2.2.13 Subscriber Data management stand alone

This operation package includes the operations required for stand alone subscriber data management procedures between HLR and VLR or between HLR and SGSN.

```
SubscriberDataMngtStandAlonePackage-v3 ::= OPERATION-PACKAGE
-- Supplier is VLR or SGSN if Consumer is HLR
CONSUMER INVOKES {
    insertSubscriberData,
    deleteSubscriberData}
```

The v1-equivalent and v2-equivalent packages can be determined according to the rules described in subclause 17.2.1.

17.2.2.14 Equipment management

This operation package includes the operations required for equipment management procedures between EIR and MSC or between EIR and SGSN.

```
EquipmentMngtPackage-v2 ::= OPERATION-PACKAGE
-- Supplier is EIR if Consumer is MSC
-- Supplier is EIR if Consumer is SGSN
CONSUMER INVOKES {
    checkIMEI}
```

The v1-equivalent package can be determined according to the rules described in subclause 17.2.1.

17.2.2.15 Subscriber data management

This operation package includes the operations required for subscriber data management procedures between HLR and VLR or between HLR and SGSN.

```
SubscriberDataMngtPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is VLR or SGSN if Consumer is HLR
CONSUMER INVOKES {
    insertSubscriberData}
```

The v1-equivalent and v2-equivalent packages can be determined according to the rules described in subclause 17.2.1.

17.2.2.16 Location register restart

This operation package includes the operations required for location register restart procedures between HLR and VLR or between HLR and SGSN.

```
ResetPackage-v2 ::= OPERATION-PACKAGE
-- Supplier is VLR or SGSN if Consumer is HLR
CONSUMER INVOKES {
    reset}
```

The v1-equivalent package can be determined according to the rules described in subclause 17.2.1.

17.2.2.17 Tracing stand-alone

This operation package includes the operations required for stand alone tracing procedures between HLR and VLR or between HLR and SGSN.

```
TracingStandAlonePackage-v3 ::= OPERATION-PACKAGE
-- Supplier is VLR or SGSN if Consumer is HLR
CONSUMER INVOKES {
    activateTraceMode,
    deactivateTraceMode}
```

The v1-equivalent and v2-equivalent packages can be determined according to the rules described in subclause 17.2.1.

17.2.2.18 Functional SS handling

This operation package includes the operations required for functional supplementary services procedures between VLR and HLR.

```
FunctionalSsPackage-v2 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VLR
CONSUMER INVOKES {
    registerSS,
    eraseSS,
    activateSS,
    deactivateSS,
    registerPassword,
    interrogateSS}
SUPPLIER INVOKES {
    getPassword}
```

The v1-equivalent package can be determined according to the rules described in subclause 17.2.1.

17.2.2.19 Tracing

This operation package includes the operations required for tracing procedures between HLR and VLR or between HLR and SGSN.

```
TracingPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is VLR or SGSN if Consumer is HLR
CONSUMER INVOKES {
    activateTraceMode}
```

The v1-equivalent and v2-equivalent packages can be determined according to the rules described in subclause 17.2.1.

17.2.2.20 Binding

This operation package includes the operation required to initialize a supplementary service procedure between VLR and HLR or between gsmSCF and HLR.

```
BindingPackage-v1 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VLR
-- Supplier is gsmSCF if Consumer is HLR
CONSUMER INVOKES {
    beginSubscriberActivity}
```

This package is v1 only.

17.2.2.21 Unstructured SS handling

This operation package includes the operations required for unstructured supplementary services procedures between VLR and HLR, and between the HLR and the gsmSCF.

```
UnstructuredSsPackage-v2 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VLR
-- Supplier is gsmSCF if Consumer is HLR
CONSUMER INVOKES {
    processUnstructuredSS-Request}
SUPPLIER INVOKES {
    unstructuredSS-Request,
    unstructuredSS-Notify}
```

The v1-equivalent package is defined as follows:

```
UnstructuredSsPackage-v1 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VLR
-- Supplier is gsmSCF if Consumer is HLR
CONSUMER INVOKES {
    processUnstructuredSS-Data}
```

17.2.2.22 MO Short message relay services

This operation package includes the operations required for short message relay service procedures between IWMSC and VMSC or between GMSC and MSC or between SGSN and IWMSC.

```
MOShortMsgRelayPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is IWMSC if Consumer is MSC
-- Supplier is IWMSC if Consumer is SGSN
CONSUMER INVOKES {
    MO-forwardSM}
```

The v2-equivalent package is defined as follows:

```
ShortMsgRelayPackage-v2 ::= OPERATION-PACKAGE
-- Supplier is IWMSC if Consumer is MSC
-- Supplier is MSC or SGSN if Consumer is GMSC
-- Supplier is IWMSC if Consumer is SGSN
CONSUMER INVOKES {
    forwardSM}
```

The v1-equivalent package can be determined according to the rules described in subclause 17.2.1.

17.2.2.23 Short message gateway services

This operation package includes the operations required for short message service gateway procedures between MSC and HLR.

```
ShortMsgGatewayPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is GMSC
CONSUMER INVOKES {
    sendRoutingInfoForSM,
    reportSM-DeliveryStatus}
SUPPLIER INVOKES {
    informServiceCentre}
```

The v2-equivalent package can be determined according to the rules described in subclause 17.2.1

The v1-equivalent package is defined as follows:

```
ShortMsgGatewayPackage-v1 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is GMSC
CONSUMER INVOKES {
    sendRoutingInfoForSM
    reportSMDeliveryStatus}
```

17.2.2.24 MT Short message relay services

This operation package includes the operations required for short message relay service procedures between GMSC and MSC or between GMSC and SGSN.

```
MTShortMsgRelayPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is MSC or SGSN if Consumer is GMSC
CONSUMER INVOKES {
    MT-forwardSM}
```

The v2-equivalent package is: **ShortMsgRelayPackage-v2**

17.2.2.25 [spare]

17.2.2.26 Message waiting data management

This operation package includes the operations required for short message waiting data procedures between HLR and VLR, between HLR and SGSN.

```
MwdMngtPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is SGSN
-- Supplier is HLR if Consumer is VLR
CONSUMER INVOKES {
    readyForSM}
```

The v2-equivalent package can be determined according to the rules described in subclause 17.2.1.

The v1-equivalent package is defined as follows:

```
MwdMngtPackage-v1 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VLR
CONSUMER INVOKES {
    noteSubscriberPresent}
```

17.2.2.27 Alerting

This operation package includes the operations required for alerting between HLR and IWMSC.

```
AlertingPackage-v2 ::= OPERATION-PACKAGE
-- Supplier is IWMSC if Consumer is HLR
CONSUMER INVOKES {
    alertServiceCentre}
```

The v1-equivalent package is defined as follows.

```
AlertingPackage-v1 ::= OPERATION-PACKAGE
-- Supplier is IWMSC if Consumer is HLR
CONSUMER INVOKES {
    alertServiceCentreWithoutResult}
```

17.2.2.28 Data restoration

This operation package includes the operations required for VLR data restoration between HLR and VLR.

```
DataRestorationPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VLR
CONSUMER INVOKES {
    restoreData}
```

The v2-equivalent package can be determined according to the rules described in subclause 17.2.1.

The v1-equivalent package is: InfoRetrievalPackage-v1

17.2.2.29 Purging

This operation package includes the operations required for purging between HLR and VLR or between HLR and SGSN.

```
PurgingPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VLR
-- Supplier is HLR if Consumer is SGSN
CONSUMER INVOKES {
    purgeMS}
```

The v2-equivalent package can be determined according to the rules described in subclause 17.2.1.

17.2.2.30 Subscriber information enquiry

This operation package includes the operations required for subscriber information enquiry procedures between HLR and VLR.

```
SubscriberInformationEnquiryPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is VLR if Consumer is HLR
CONSUMER INVOKES {
    provideSubscriberInfo}
```

This package is v3 only.

17.2.2.31 Any time information enquiry

This operation package includes the operations required for any time information enquiry procedures between gsmSCF and HLR or GMLC.

```
AnyTimeInformationEnquiryPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR or GMLC if Consumer is gsmSCF
CONSUMER INVOKES {
    anyTimeInterrogation}
```

This package is v3 only.

17.2.2.32 Group Call Control

This operation package includes the operations required for group call and broadcast call procedures between MSCs.

```
GroupCallControlPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is relay MSC if Consumer is anchor MSC
CONSUMER INVOKES {
    prepareGroupCall,
    forwardGroupCallSignalling}
SUPPLIER INVOKES {
    sendGroupCallEndSignal,
    processGroupCallSignalling}
```

This package is v3 only.

17.2.2.33 Provide SIWFS number

This operation package includes the operations required between VMSC and SIWF for requesting resources from an SIWF.

```
ProvideSIWFSNumberPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is SIWF if Consumer is VMSC
CONSUMER INVOKES {
    provideSIWFSNumber}
```

This package is v3 only.

17.2.2.34 SIWFS Signalling Modify

This operation package includes the operations required for the modification of the resources in an SIWF between the VMSC and SIWF.

```
SIWFSSignallingModifyPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is SIWF if Consumer is VMSC
CONSUMER INVOKES {
    siWFSSignallingModify}
```

This package is v3 only.

17.2.2.35 Gprs location updating

This operation package includes the operations required for the gprs location management procedures between HLR and SGSN.

```
GprsLocationUpdatingPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is SGSN
CONSUMER INVOKES {
    updateGprsLocation}
```

This package is v3 only.

17.2.2.36 Gprs Interrogation

This operation package includes the operations required for interrogation procedures between HLR and GGSN.

```
GprsInterrogationPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is GGSN
CONSUMER INVOKES {
    sendRoutingInfoForGprs}
```

This package is v3 only.

17.2.2.37 Failure reporting

This operation package includes the operations required for failure reporting between HLR and GGSN.

```
FailureReportingPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is GGSN
CONSUMER INVOKES {
    failureReport}
```

This package is v3 only.

17.2.2.38 GPRS notifying

This operation package includes the operations required for notifying that GPRS subscriber is present between HLR and GGSN.

```
GprsNotifyingPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is GGSN if Consumer is HLR
CONSUMER INVOKES {
    noteMsPresentForGprs}
```

This package is v3 only.

17.2.2.39 Supplementary Service invocation notification

This operation package includes the operations required for Supplementary Service invocation notification procedures between the MSC and the gsmSCF and between the HLR and the gsmSCF.

```
SS-InvocationNotificationPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is gsmSCF if Consumer is MSC
-- Supplier is gsmSCF if Consumer is HLR
CONSUMER INVOKES {
    ss-InvocationNotification}
```

This package is v3 only.

17.2.2.40 Set Reporting State

This operation package includes the operation required for procedures between HLR and VLR to set the reporting state.

```
SetReportingStatePackage-v3 ::= OPERATION-PACKAGE
-- Supplier is VLR if Consumer is HLR
CONSUMER INVOKES {
    setReportingState}
```

This package is v3 only.

17.2.2.41 Status Report

This operation package includes the operation required for procedures between VLR and HLR to report call results and events.

```
StatusReportPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VLR
CONSUMER INVOKES {
    statusReport}
```

This package is v3 only.

17.2.2.42 Remote User Free

This operation package includes the operation required by the HLR to indicate to the VLR that the remote user is free.

```
RemoteUserFreePackage-v3 ::= OPERATION-PACKAGE
-- Supplier is VLR if Consumer is HLR
CONSUMER INVOKES {
    remoteUserFree}
```

This package is v3 only.

17.2.2.43 Call Completion

This operation package includes the operations required for procedures between VLR and HLR for subscriber control of call completion services.

```
CallCompletionPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VLR
CONSUMER INVOKES {
    registerCC-Entry,
```

```
eraseCC-Entry}
```

This package is v3 only.

17.2.2.44 Location service gateway services

This operation package includes the operations required for location service gateway procedures between GMLC and HLR.

```
LocationSvcGatewayPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is GMLC
CONSUMER INVOKES {
    sendRoutingInfoForLCS}
```

This package is v3 only.

17.2.2.45 Location service enquiry

This operation package includes the operations required for the location service enquiry procedures between GMLC and MSC.

```
LocationSvcEnquiryPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is MSC if Consumer is GMLC
CONSUMER INVOKES {
    provideSubscriberLocation}
SUPPLIER INVOKES {
    subscriberLocationReport}
```

This package is v3 only.

17.2.2.46 Location service Positioning

This operation package includes the operations required for the location service positioning procedures between MSC and SMLC.

```
LocationSvcPositioningPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is SMLC if Consumer is MSC
CONSUMER INVOKES {
    performLocation,
    lcsInformationReport}
SUPPLIER INVOKES {
    lcsAssignTrafficChannel,          lcsInformationRequest}
```

This package is v3 only.

17.2.2.47 Location service LMU Control

This operation package includes the operations required for the location service LMU control procedures between MSC and SMLC.

```
LocationSvcLMUControlPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is SMLC if Consumer is VLR
CONSUMER INVOKES {
    lcsRegistration }
SUPPLIER INVOKES {
    LcsReset}
```

This package is v3 only.

17.2.2.48 Location service Data Transfer

This operation package includes the operations required for the location service data transfer procedures between MSC and SMLC when performed in stand alone mode.

```

LocationSvcDataTransferPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is MSC if Consumer is SMLC
CONSUMER INVOKES {
    lcsInformationRequest}
SUPPLIER INVOKES {
    lcsInformationReport}

```

This package is v3 only.

17.2.2.49 IST Alerting

This operation package includes the operation required for alerting procedures between the MSC (Visited MSC or Gateway MSC) and HLR.

```

IST-AlertingPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is VMSC
-- Supplier is HLR if Consumer is GMSC
CONSUMER INVOKES {
    istAlert}

```

This package is v3 only.

17.2.2.50 Service Termination

This operation package includes the operation required for immediate service termination procedures between the HLR and the Visited MSC or between the HLR and the Gateway MSC.

```

ServiceTerminationPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is VMSC or GMSC if Consumer is HLR
CONSUMER INVOKES {
    istCommand}

```

This package is v3 only.

17.2.2.51 Mobility Management event notification

This operation package includes the operations required for Mobility Management event notification procedures between VLR and gsmSCF.

```

MM-EventReportingPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is gsmSCF if Consumer is VLR
CONSUMER INVOKES {
    noteMM-Event}

```

This package is v3 only.

17.2.2.52 Any time information handling

This operation package includes the operations required for any time information handling procedures between gsmSCF and HLR.

```

AnyTimeInformationHandlingPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is HLR if Consumer is gsmSCF
CONSUMER INVOKES {
    anyTimeSubscriptionInterrogation,
    anyTimeModification}

```

This package is v3 only.

17.2.2.53 Subscriber Data modification notification

This operation package includes the operations required for Subscriber Data modification notification procedures between HLR and gsmSCF.

```
SubscriberDataModificationNotificationPackage-v3 ::= OPERATION-PACKAGE
-- Supplier is gsmSCF if Consumer is HLR
CONSUMER INVOKES {
    noteSubscriberDataModified}
```

This package is v3 only.

17.3 Application contexts

17.3.1 General aspects

An application-context is assigned for each dialogue established by a MAP-user. In the present document each application-context is assigned a name which is supplied in the MAP-OPEN Req primitive by the MAP-User and transmitted to the peer under certain circumstances.

The following ASN.1 MACRO is used to describe the main aspects of application-contexts in the following subclasses:

```
APPLICATION-CONTEXT MACRO ::=
BEGIN
TYPE NOTATION ::= Symmetric | InitiatorConsumerOf
ResponderConsumerOf | empty
VALUE NOTATION ::= value(VALUE OBJECT IDENTIFIER)
Symmetric ::= "OPERATIONS OF" "{" PackageList "}"
InitiatorConsumerOf ::= "INITIATOR CONSUMER OF" "{" PackageList "}"
ResponderConsumerOf ::= "RESPONDER CONSUMER OF" "{" PackageList "}"
| empty
PackageList ::= Package | PackageList "," Package
Package ::= value(OPERATION-PACKAGE)
| type -- shall reference a package type
END
```

The following definitions are used throughout this subclass:

- v1-application-context: An application-context which contains only v1-packages and uses only TC v1 facilities;
- v1 context set: the set of v1-application-contexts defined in the present document.
- vn-application-context (n>=2): An application-context which contains only vn-packages;

The names of v1-application-contexts are suffixed by "-v1" while other names are suffixed by "-vn" where n>=2.

Application-contexts which do not belong to the v1 context set use v2 TC facilities.

The last component of each application-context-name (i.e. the last component of the object identifier value) assigned to an application-context which belongs to the v1 context set indicates explicitly "version1".

For each application-context which does not belong to the "v1 context set" there is a v1-equivalent application context. This is a v1-application-context which includes the v1-equivalents of the packages included in the original context.

Each application-context uses the abstract-syntax associated with the operation-packages it includes and uses the transfer-syntax derived from it by applying the encoding rules defined in subclass 17.1.1.

ACs which do not belong to the v1 context set require the support of the abstract-syntax identified by the object identifier value: MAP-DialogueInformation.map-Dialogue-AS defined in subclause 17.4.

17.3.2 Application context definitions

17.3.2.1 [spare]

17.3.2.2 Location Updating

This application context is used between HLR and VLR for location updating procedures.

```
networkLocUpContext-v3 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is VLR
INITIATOR CONSUMER OF {
    LocationUpdatingPackage-v3,
    DataRestorationPackage-v3}
RESPONDER CONSUMER OF {
    SubscriberDataMngtPackage-v3
    TracingPackage-v3}
 ::= {map-ac networkLocUp(1) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
{map-ac networkLocUp(1) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac networkLocUp(1) version1(1)}
```

17.3.2.3 Location Cancellation

This application context is used between HLR and VLR or between HLR and SGSN for location cancellation procedures. For the HLR - SGSN interface only version 3 of this application context is applicable.

```
locationCancellationContext-v3 APPLICATION-CONTEXT
-- Responder is VLR or SGSN if Initiator is HLR
INITIATOR CONSUMER OF {
    LocationCancellationPackage-v3}
 ::= {map-ac locationCancel(2) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
map-ac locationCancel(2) version2(2)
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
map-ac locationCancel(2) version1(1)
```

17.3.2.4 Roaming number enquiry

This application context is used between HLR and VLR for roaming number enquiry procedures.

```
roamingNumberEnquiryContext-v3 APPLICATION-CONTEXT
-- Responder is VLR if Initiator is HLR
INITIATOR CONSUMER OF {
    RoamingNumberEnquiryPackage-v3}
 ::= {map-ac roamingNbEnquiry(3) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
{map-ac roamingNbEnquiry(3) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac roamingNbEnquiry(3) version1(1)}
```

17.3.2.5 [spare]

17.3.2.6 Location Information Retrieval

This application-context is used between GMSC and HLR or between GMSC and NPLR when retrieving location information. For the GMSC - NPLR interface version 1, version 2 and version 3 of this application context are applicable.

```
locationInfoRetrievalContext-v3 APPLICATION-CONTEXT
-- Responder is HLR or NPLR if Initiator is GMSC
INITIATOR CONSUMER OF {
    InterrogationPackage-v3}
::= {map-ac locInfoRetrieval(5) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
{map-ac locInfoRetrieval(5) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac locInfoRetrieval(5) version1(1)}
```

17.3.2.7 Call control transfer

This application context is used for the call control transfer procedure between the VMSC and the GMSC.

```
callControlTransferContext-v4 APPLICATION-CONTEXT
-- Responder is GMSC if Initiator is VMSC
INITIATOR CONSUMER OF {
    CallControlTransferPackage-v4}
::= {map-ac callControlTransfer(6) version4(4)}
```

The following application-context-name is assigned to the v3-equivalent application-context:

```
{map-ac callControlTransfer(6) version3(3)}
```

17.3.2.8 - 17.3.2.10 [spare]

17.3.2.11 Location registers restart

This application context is used between HLR and VLR or between HLR and SGSN for location register restart procedures. For the HLR - SGSN interface version 1 and version 2 of this application context are applicable.

```
resetContext-v2 APPLICATION-CONTEXT
-- Responder is VLR or SGSN if Initiator is HLR
INITIATOR CONSUMER OF {
    ResetPackage-v2}
::= {map-ac reset(10) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac reset(10) version1(1)}
```

17.3.2.12 Handover control

This application context is used for handover procedures between MSCs.

```
handoverControlContext-v2 APPLICATION-CONTEXT
-- Responder is MSCB if Initiator is MSCA
INITIATOR CONSUMER OF {
    HandoverControlPackage-v2}
::= {map-ac handoverControl(11) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac handoverControl(11) version1(1)}
```

17.3.2.13 IMSI Retrieval

This application context is used for IMSI retrieval between HLR and VLR.

```
imsiRetrievalContext-v2 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is VLR
INITIATOR CONSUMER OF {
    IMSIRetrievalPackage-v2}
 ::= {map-ac imsiRetrieval(26) version2(2)}
```

This application-context is v2 only.

17.3.2.14 Equipment Management

This application context is used for equipment checking between MSC and EIR or between SGSN and EIR. For the SGSN - EIR interface version 1 and version 2 of this application context are applicable:

```
equipmentMngtContext-v2 APPLICATION-CONTEXT
-- Responder is EIR if Initiator is MSC
-- Responder is EIR if Initiator is SGSN
INITIATOR CONSUMER OF {
    EquipmentMngtPackage-v2}
 ::= {map-ac equipmentMngt(13) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac equipmentMngt(13) version1(1)}
```

17.3.2.15 Information retrieval

This application context is used for authentication information retrieval between HLR and VLR or between HLR and SGSN. For the HLR - SGSN interface version 1 and version 2 of this application context are applicable.

```
infoRetrievalContext-v2 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is VLR
-- Responder is HLR if Initiator is SGSN
INITIATOR CONSUMER OF {
    InfoRetrievalPackage-v2}
 ::= {map-ac infoRetrieval(14) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
-- Responder is HLR if Initiator is VLR
{map-ac infoRetrieval(14) version1(1)}
```

17.3.2.16 Inter-VLR information retrieval

This application context is used for information retrieval between VLRs.

```
interVlrInfoRetrievalContext-v2 APPLICATION-CONTEXT
-- Responder is VLR if Initiator is VLR
INITIATOR CONSUMER OF {
    InterVlrInfoRetrievalPackage-v2}
 ::= {map-ac interVlrInfoRetrieval(15) version2(2)}
```

The v1-equivalent application-context is:

```
-- Responder is VLR if Initiator is VLR
{map-ac infoRetrieval(14) version1(1)}
```

17.3.2.17 Stand Alone Subscriber Data Management

This application context is used for stand alone subscriber data management between HLR and VLR or between HLR and SGSN. For the HLR - SGSN interface only version 3 of this application context is applicable:

```
subscriberDataMngtContext-v3 APPLICATION-CONTEXT
-- Responder is VLR or SGSN if Initiator is HLR
INITIATOR CONSUMER OF {
    SubscriberDataMngtStandAlonePackage-v3}
::= {map-ac subscriberDataMngt(16) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
{map-ac subscriberDataMngt(16) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac subscriberDataMngt(16) version1(1)}
```

17.3.2.18 Tracing

This application context is used between HLR and VLR or between HLR and SGSN for stand alone tracing control procedures: For the HLR - SGSN interface version 1, version 2 and version 3 of this application context are applicable.

```
tracingContext-v3 APPLICATION-CONTEXT
-- Responder is VLR or SGSN if Initiator is HLR
INITIATOR CONSUMER OF {
    TracingStandAlonePackage-v3}
::= {map-ac tracing(17) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
{map-ac tracing(17) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac tracing(17) version1(1)}
```

17.3.2.19 Network functional SS handling

This application context is used for functional-like SS handling procedures between VLR and HLR.

```
networkFunctionalSsContext-v2 APPLICATION-CONTEXT
-- Responder is HLR, Initiator is VLR
INITIATOR CONSUMER OF {
    FunctionalSsPackage-v2}
::= {map-ac networkFunctionalSs(18) version2(2)}
```

The v1-equivalent application-context is defined as follows:

```
networkFunctionalSsContext-v1 APPLICATION-CONTEXT
-- Responder is HLR, Initiator is VLR
INITIATOR CONSUMER OF {
    FunctionalSsPackage-v1,
    UnstructuredSsPackage-v1,
    BindingPackage-v1}
::= {map-ac networkFunctionalSs(18) version1(1)}
```

17.3.2.20 Network unstructured SS handling

This application context is used for handling stimuli-like procedures between HLR and VLR, and between the HLR and gsmSCF.

```
networkUnstructuredSsContext-v2 APPLICATION-CONTEXT
-- Responder is HLR, Initiator is VLR
-- Responder is VLR, Initiator is HLR
-- Responder is gsmSCF, Initiator is HLR
-- Responder is HLR, Initiator is gsmSCF
OPERATIONS OF {
    UnstructuredSsPackage-v2}
 ::= {map-ac networkUnstructuredSs(19) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac networkFunctionalSs(18) version1(1)}
```

17.3.2.21 Short Message Gateway

This application context is used for short message gateway procedures.

```
shortMsgGatewayContext-v3 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is GMSC
INITIATOR CONSUMER OF {
    ShortMsgGatewayPackage-v3}
 ::= {map-ac shortMsgGateway(20) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
{map-ac shortMsgGateway(20) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac shortMsgGateway(20) version1(1)}
```

17.3.2.22 Mobile originating Short Message Relay

This application context is used between MSC and IWMSC or between SGSN and IWMSC for mobile originating short message relay procedures. For the SGSN - IWMSC interface version 1, version 2 and version 3 of this application context are applicable.

```
shortMsgMO-RelayContext-v3 APPLICATION-CONTEXT
-- Responder is IWMSC if Initiator is MSC
-- Responder is IWMSC if Initiator is SGSN
INITIATOR CONSUMER OF {
    MOShortMsgRelayPackage-v3}
 ::= {map-ac shortMsgMO-Relay(21) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
{map-ac shortMsgMO-Relay(21) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac shortMsg-Relay(21) version1(1)}
```

17.3.2.23 [spare]

17.3.2.24 Short message alert

This application context is used for short message alerting procedures.

```
shortMsgAlertContext-v2 APPLICATION-CONTEXT
-- Responder is IWMSC if Initiator is HLR
INITIATOR CONSUMER OF {
    AlertingPackage-v2}
 ::= {map-ac shortMsgAlert(23) version2(2)}
```

The following application-context-name is symbolically assigned to the v1-equivalent application-context:

```
{map-ac shortMsgAlert(23) version1(1)}
```

17.3.2.25 Short message waiting data management

This application context is used between VLR and HLR or between SGSN and HLR for short message waiting data management procedures. For the SGSN - HLR interface only version 3 of this application context is applicable.

```
mwdMngtContext-v3 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is SGSN
-- Responder is HLR if Initiator is VLR
INITIATOR CONSUMER OF {
    MwdMngtPackage-v3}
 ::= {map-ac mwdMngt(24) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
{map-ac mwdMngt(24) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac mwdMngt(24) version1(1)}
```

17.3.2.26 Mobile terminating Short Message Relay

This application context is used between GMSC and MSC or between GMSC and SGSN for mobile terminating short message relay procedures. For the GMSC - SGSN interface version 2 and version 3 of this application context and the equivalent version 1 application context are applicable.

```
shortMsgMT-RelayContext-v3 APPLICATION-CONTEXT
-- Responder is MSC or SGSN if Initiator is GMSC
INITIATOR CONSUMER OF {
    MTShortMsgRelayPackage-v3}
 ::= {map-ac shortMsgMT-Relay(25) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
{map-ac shortMsgMT-Relay(25) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac shortMsgMO-Relay(21) version1(1)}
```

17.3.2.27 MS purging

This application context is used between HLR and VLR or between HLR and SGSN for MS purging procedures. For the SGSN - HLR interface only version 3 of this application context is applicable.

```
msPurgingContext-v3 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is VLR
-- Responder is HLR if Initiator is SGSN
INITIATOR CONSUMER OF {
    purgingPackage-v3
}
::= {map-ac msPurging(27) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
{map-ac msPurging(27) version2(2)}
```

17.3.2.28 Subscriber information enquiry

This application context is used between HLR and VLR for subscriber information enquiry procedures.

```
subscriberInfoEnquiryContext-v3 APPLICATION-CONTEXT
-- Responder is VLR if Initiator is HLR
INITIATOR CONSUMER OF {
    SubscriberInformationEnquiryPackage-v3
}
::= {map-ac subscriberInfoEnquiry(28) version3(3)}
```

This application-context is v3 only.

17.3.2.29 Any time information enquiry

This application context is used between gsmSCF and HLR or GMLC for any time information enquiry procedures.

```
anyTimeInfoEnquiryContext-v3 APPLICATION-CONTEXT
-- Responder is HLR or GMLC if Initiator is gsmSCF
INITIATOR CONSUMER OF {
    AnyTimeInformationEnquiryPackage-v3
}
::= {map-ac anyTimeInfoEnquiry(29) version3(3)}
```

This application-context is v3 only.

17.3.2.30 Group Call Control

This application context is used between anchor MSC and relay MSC for group call and broadcast call procedures.

```
groupCallControlContext-v3 APPLICATION-CONTEXT
-- Responder is relay MSC if Initiator is anchor MSC
INITIATOR CONSUMER OF {
    GroupCallControlPackage-v3
}
::= {map-ac groupCallControl(31) version3(3)}
```

This application-context is v3 only.

17.3.2.31 Provide SIWFS Number

This application context is used for activation or modification of SIWF resources.

```
sIWFSAllocationContext-v3 APPLICATION-CONTEXT
-- Responder is SIWF if Initiator is VMSC
INITIATOR CONSUMER OF {
    ProvideSIWFSNumberPackage-v3,
    SIWFSSignallingModifyPackage-v3
}
::= {map-ac sIWFSAllocation(12) version3(3)}
```

This application-context is v3 only.

17.3.2.32 Gprs Location Updating

This application context is used between HLR and SGSN for gprs location updating procedures.

```
gprsLocationUpdateContext-v3 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is SGSN
INITIATOR CONSUMER OF {
  GprsLocationUpdatingPackage-v3}
RESPONDER CONSUMER OF {
  SubscriberDataMngtPackage-v3
  TracingPackage-v3}
::= {map-ac gprsLocationUpdate(32) version3(3)}
```

This application-context is v3 only.

17.3.2.33 Gprs Location Information Retrieval

This application context is used between HLR and GGSN when retrieving gprs location information.

```
gprsLocationInfoRetrievalContext-v3 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is GGSN
INITIATOR CONSUMER OF {
  GprsInterrogationPackage-v3}
::= {map-ac gprsLocationInfoRetrieval(33) version3(3)}
```

This application-context is v3 only.

17.3.2.34 Failure Reporting

This application context is used between HLR and GGSN to inform that network requested PDP-context activation has failed.

```
failureReportContext-v3 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is GGSN
INITIATOR CONSUMER OF {
  FailureReportingPackage-v3}
::= {map-ac failureReport(34) version3(3)}
```

This application-context is v3 only.

17.3.2.35 GPRS Notifying

This application context is used between HLR and GGSN for notifying that GPRS subscriber is present again.

```
gprsNotifyContext-v3 APPLICATION-CONTEXT
-- Responder is GGSN if Initiator is HLR
INITIATOR CONSUMER OF {
  GprsNotifyingPackage-v3}
::= {map-ac gprsNotify(35) version3(3)}
```

This application-context is v3 only.

17.3.2.36 Supplementary Service invocation notification

This application context is used between the MSC and the gsmSCF and between the HLR and the gsmSCF for Supplementary Service invocation notification procedures.

```
ss-InvocationNotificationContext-v3 APPLICATION-CONTEXT
-- Responder is gsmSCF, Initiator is MSC
-- Responder is gsmSCF, Initiator is HLR
INITIATOR CONSUMER OF {
  SS-InvocationNotificationPackage-v3}
::= {map-ac ss-InvocationNotification(36) version3(3)}
```

This application-context is v3 only.

17.3.2.37 Reporting

This application context is used between HLR and VLR for reporting procedures.

```
reportingContext-v3 APPLICATION-CONTEXT
-- Responder is VLR if Initiator is HLR
-- Responder is HLR if Initiator is VLR
INITIATOR CONSUMER OF {
    SetReportingStatePackage-v3,
    StatusReportPackage-v3,
    RemoteUserFreePackage-v3}
RESPONDER CONSUMER OF {
    SetReportingStatePackage-v3,
    StatusReportPackage-v3}
 ::= {map-ac reporting(7) version3(3)}
```

This application-context is v3 only.

17.3.2.38 Call Completion

This application context is used between VLR and the HLR for subscriber control of call completion services.

```
callCompletionContext-v3 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is VLR
INITIATOR CONSUMER OF {
    CallCompletionPackage-v3}
 ::= {map-ac callCompletion(8) version3(3)}
```

This application-context is v3 only.

17.3.2.39 Location Service Gateway

This application context is used for location service gateway procedures.

```
locationSvcGatewayContext-v3 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is GMLC
INITIATOR CONSUMER OF {
    locationSvcGatewayPackage-v3}
 ::= {map-ac locationSvcGateway(37) version3(3)}
```

17.3.2.40 Location Service Enquiry

This application context is used for location service enquiry procedures.

```
locationSvcEnquiryContext-v3 APPLICATION-CONTEXT
-- Responder is MSC if Initiator is GMLC
INITIATOR CONSUMER OF {
    locationSvcEnquiryPackage-v3}
 ::= {map-ac locationScvEnquiry(38) version3 (3)}
```

17.3.2.41 Location Service Positioning

This application context is used for location service positioning procedures.

```
locationSvcPositioningContext-v3 APPLICATION-CONTEXT
-- Responder is SMLC if Initiator is MSC
INITIATOR CONSUMER OF {
    locationSvcPositioningPackage-v3}
 ::= {map-ac locationSvcPositioning(39) version3(3)}
```

17.3.2.42 Location Service LMU Control

This application context is used for location service LMU control procedures.

```
locationSvcLMUControlContext-v3 APPLICATION-CONTEXT
-- Responder is SMLC if Initiator is VLR
INITIATOR CONSUMER OF {
    locationSvcLMUControlPackage-v3}
 ::= {map-ac locationSvcLMUControl(40) version3(3)}
```

17.3.2.43 Location Service Data Transfer

This application context is used for location service data transfer procedures.

```
locationSvcDataTransferContext-v3 APPLICATION-CONTEXT
-- Responder is MSC if Initiator is SMLC
INITIATOR CONSUMER OF {
    locationSvcDataTransferPackage-v3}
 ::= {map-ac locationSvcDataTransfer(41) version3(3)}
```

17.3.2.44 IST Alerting

This application context is used between MSC (Visited MSC or Gateway MSC) and HLR for for alerting services within IST procedures.

```
istAlertingContext-v3 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is VMSC
-- Responder is HLR if Initiator is GMSC
INITIATOR CONSUMER OF {
    IST-AlertingPackage-v3}
 ::= {map-ac alerting (4) version3(3)}
```

This application-context is v3 only.

17.3.2.45 Service Termination

This application context is used between HLR and MSC (Visited MSC or Gateway MSC) for service termination services within IST procedures.

```
serviceTerminationContext-v3 APPLICATION-CONTEXT
-- Responder is VMSC or GMSC if Initiator is HLR
INITIATOR CONSUMER OF {
    ServiceTerminationPackage-v3}
 ::= {map-ac serviceTermination (9) version3(3)}
```

This application-context is v3 only.

17.3.2.46 Mobility Management event notification

This application context is used between VLR and gsmSCF for Mobility Management event notification procedures.

```
mm-EventReportingContext-v3 APPLICATION-CONTEXT
-- Responder is gsmSCF, Initiator is VLR
INITIATOR CONSUMER OF {
    MM-EventReportingPackage-v3}
 ::= {map-ac mm-EventReporting(42) version3(3)}
```

This application-context is v3 only.

17.3.2.47 Any time information handling

This application context is used between gsmSCF and HLR for any time information handling procedures.

```
anyTimeInfohandlingContext-v3 APPLICATION-CONTEXT
-- Responder is HLR if Initiator is gsmSCF
INITIATOR CONSUMER OF {
    AnyTimeInformationHandlingPackage-v3}
 ::= {map-ac anyTimeInfoHandling(43) version3(3)}
```

This application-context is v3 only.

17.3.2.48 Subscriber Data modification notification

This application context is used between HLR and gsmSCF for Subscriber Data modification notification procedures.

```
subscriberDataModificationNotificationContext-v3 APPLICATION-CONTEXT
-- Responder is gsmSCF, Initiator is HLR
INITIATOR CONSUMER OF {
    SubscriberDataModificationNotificationPackage-v3}
 ::= {map-ac subscriberDataModificationNotification(22) version3(3)}
```

This application-context is v3 only.

17.3.3 ASN.1 Module for application-context-names

The following ASN.1 module summarizes the application-context-name assigned to MAP application-contexts.

```
1 MAP-ApplicationContexts {
2   ccitt identified-organization (4) etsi (0) mobileDomain (0)
3   gsm-Network (1) modules (3) map-ApplicationContexts (2) version6 (6)}
4
5 DEFINITIONS
6
7 ::=
8
9 BEGIN
10
11
12 -- EXPORTS everything
13
14
15 IMPORTS
16   gsm-NetworkId,
17   ac-Id
```

```

18 FROM MobileDomainDefinitions {
19     ccitt (0) identified-organization (4) etsi (0) mobileDomain (0)
20     mobileDomainDefinitions (0) version1 (1)}
21 ;
22
23 -- application-context-names
24
25 map-ac OBJECT IDENTIFIER ::= {gsm-NetworkId ac-Id}
26
27 networkLocUpContext-v3 OBJECT IDENTIFIER ::=
28     {map-ac networkLocUp(1) version3(3)}
29
30 locationCancellationContext-v3 OBJECT IDENTIFIER ::=
31     {map-ac locationCancel(2) version3(3)}
32
33 roamingNumberEnquiryContext-v3 OBJECT IDENTIFIER ::=
34     {map-ac roamingNbEnquiry(3) version3(3)}
35
36 locationInfoRetrievalContext-v3 OBJECT IDENTIFIER ::=
37     {map-ac locInfoRetrieval(5) version3(3)}
38
39 resetContext-v2 OBJECT IDENTIFIER ::=
40     {map-ac reset(10) version2(2)}
41
42 handoverControlContext-v2 OBJECT IDENTIFIER ::=
43     {map-ac handoverControl(11) version2(2)}
44
45 equipmentMngtContext-v2 OBJECT IDENTIFIER ::=
46     {map-ac equipmentMngt(13) version2(2)}
47
48 infoRetrievalContext-v2 OBJECT IDENTIFIER ::=
49     {map-ac infoRetrieval(14) version2(2)}
50
51 interVlrInfoRetrievalContext-v2 OBJECT IDENTIFIER ::=
52     {map-ac interVlrInfoRetrieval(15) version2(2)}
53
54 subscriberDataMngtContext-v3 OBJECT IDENTIFIER ::=
55     {map-ac subscriberDataMngt(16) version3(3)}
56
57 tracingContext-v3 OBJECT IDENTIFIER ::=
58     {map-ac tracing(17) version3(3)}
59
60 networkFunctionalSsContext-v2 OBJECT IDENTIFIER ::=
61     {map-ac networkFunctionalSs(18) version2(2)}
62
63 networkUnstructuredSsContext-v2 OBJECT IDENTIFIER ::=
64     {map-ac networkUnstructuredSs(19) version2(2)}
65
66 shortMsgGatewayContext-v3 OBJECT IDENTIFIER ::=
67     {map-ac shortMsgGateway(20) version3(3)}
68
69 shortMsgMO-RelayContext-v3 OBJECT IDENTIFIER ::=
70     {map-ac shortMsgMO-Relay(21) version3(3)}
71
72 shortMsgAlertContext-v2 OBJECT IDENTIFIER ::=
73     {map-ac shortMsgAlert(23) version2(2)}
74
75 mwdMngtContext-v3 OBJECT IDENTIFIER ::=
76     {map-ac mwdMngt(24) version3(3)}
77
78 shortMsgMT-RelayContext-v3 OBJECT IDENTIFIER ::=
79     {map-ac shortMsgMT-Relay(25) version3(3)}
80
81 imsiRetrievalContext-v2 OBJECT IDENTIFIER ::=
82     {map-ac imsiRetrieval(26) version2(2)}
83
84 msPurgingContext-v3 OBJECT IDENTIFIER ::=
85     {map-ac msPurging(27) version3(3)}
86
87 subscriberInfoEnquiryContext-v3 OBJECT IDENTIFIER ::=
88     {map-ac subscriberInfoEnquiry(28) version3(3)}
89
90 anyTimeInfoEnquiryContext-v3 OBJECT IDENTIFIER ::=
91     {map-ac anyTimeInfoEnquiry(29) version3(3)}
92

```

```

93 callControlTransferContext-v4 OBJECT IDENTIFIER ::=
94     {map-ac callControlTransfer(6) version4(4)}
95
96 ss-InvocationNotificationContext-v3 OBJECT IDENTIFIER ::=
97     {map-ac ss-InvocationNotification(36) version3(3)}
98
99 sIWFSAllocationContext-v3 OBJECT IDENTIFIER ::=
100     {map-ac sIWFSAllocation(12) version3(3)}
101
102 groupCallControlContext-v3 OBJECT IDENTIFIER ::=
103     {map-ac groupCallControl(31) version3(3)}
104
105 gprsLocationUpdateContext-v3 OBJECT IDENTIFIER ::=
106     {map-ac gprsLocationUpdate(32) version3(3)}
107
108 gprsLocationInfoRetrievalContext-v3 OBJECT IDENTIFIER ::=
109     {map-ac gprsLocationInfoRetrieval(33) version3(3)}
110
111 failureReportContext-v3 OBJECT IDENTIFIER ::=
112     {map-ac failureReport(34) version3(3)}
113
114 gprsNotifyContext-v3 OBJECT IDENTIFIER ::=
115     {map-ac gprsNotify(35) version3(3)}
116
117 reportingContext-v3 OBJECT IDENTIFIER ::=
118     {map-ac reporting(7) version3(3)}
119
120 callCompletionContext-v3 OBJECT IDENTIFIER ::=
121     {map-ac callCompletion(8) version3(3)}
122
123 istAlertingContext-v3 OBJECT IDENTIFIER ::=
124     {map-ac istAlerting(4) version3(3)}
125
126 serviceTerminationContext-v3 OBJECT IDENTIFIER ::=
127     {map-ac immediateTermination(9) version3(3)}
128
129 locationSvcGatewayContext-v3 OBJECT IDENTIFIER ::=
130     {map-ac locationSvcGateway(37) version3(3)}
131
132 locationSvcEnquiryContext-v3 OBJECT IDENTIFIER ::=
133     {map-ac locationSvcEnquiry(38) version3(3)}
134
135 locationSvcPositioningContext-v3 OBJECT IDENTIFIER ::=
136     {map-ac locationSvcPositioning(39) version3(3)}
137
138 locationSvcLMUControlContext-v3 OBJECT IDENTIFIER ::=
139     {map-ac locationSvcLMUControl(40) version3(3)}
140
141 locationSvcDataTransferContext-v3 OBJECT IDENTIFIER ::=
142     {map-ac locationSvcDataTransfer(41) version3(3)}
143
144 MM-EventReportingContext-v3 OBJECT IDENTIFIER ::=
145     {map-ac mm-EventReporting(42) version3(3)}
146
147 anyTimeInfoHandlingContext-v3 OBJECT IDENTIFIER ::=
148     {map-ac anyTimeInfoHandling(43) version3(3)}
149
150 subscriberDataModificationNotificationContext-v3 OBJECT IDENTIFIER ::=
151     {map-ac subscriberDataModificationNotification(22) version3(3)}
152
153
154 -- The following Object Identifiers are reserved for application-
155 -- contexts existing in previous versions of the protocol
156

```

	Object Identifier		
157	-- AC Name & Version		
158	--		
159	-- networkLocUpContext-v1	map-ac networkLocUp (1)	version1 (1)
160	-- networkLocUpContext-v2	map-ac networkLocUp (1)	version2 (2)
161	-- locationCancellationContext-v1	map-ac locationCancellation (2)	version1 (1)
162	-- locationCancellationContext-v2	map-ac locationCancellation (2)	version2 (2)
163	-- roamingNumberEnquiryContext-v1	map-ac roamingNumberEnquiry (3)	version1 (1)
164	-- roamingNumberEnquiryContext-v2	map-ac roamingNumberEnquiry (3)	version2 (2)
165	-- locationInfoRetrievalContext-v1	map-ac locationInfoRetrieval (5)	version1 (1)
166	-- locationInfoRetrievalContext-v2	map-ac locationInfoRetrieval (5)	version2 (2)
167	-- resetContext-v1	map-ac reset (10)	version1 (1)
168	-- handoverControlContext-v1	map-ac handoverControl (11)	version1 (1)
169	-- equipmentMngtContext-v1	map-ac equipmentMngt (13)	version1 (1)
170	-- infoRetrievalContext-v1	map-ac infoRetrieval (14)	version1 (1)
171	-- subscriberDataMngtContext-v1	map-ac subscriberDataMngt (16)	version1 (1)
172	-- subscriberDataMngtContext-v2	map-ac subscriberDataMngt (16)	version2 (2)
173	-- tracingContext-v1	map-ac tracing (17)	version1 (1)
174	-- tracingContext-v2	map-ac tracing (17)	version2 (2)
175	-- networkFunctionalSsContext-v1	map-ac networkFunctionalSs (18)	version1 (1)
176	-- shortMsgGatewayContext-v1	map-ac shortMsgGateway (20)	version1 (1)
177	-- shortMsgGatewayContext-v2	map-ac shortMsgGateway (20)	version2 (2)
178	-- shortMsgRelayContext-v1	map-ac shortMsgRelay (21)	version1 (1)
179	-- shortMsgAlertContext-v1	map-ac shortMsgAlert (23)	version1 (1)
180	-- mwdMngtContext-v1	map-ac mwdMngt (24)	version1 (1)
181	-- mwdMngtContext-v2	map-ac mwdMngt (24)	version2 (2)
182	-- shortMsgMT-RelayContext-v2	map-ac shortMsgMT-Relay (25)	version2 (2)
183	-- msPurgingContext-v2	map-ac msPurging (27)	version2 (2)
184	-- callControlTransferContext-v3	map-ac callControlTransferContext (6)	version3 (3)
185			
186			
187	END		

17.4 MAP Dialogue Information

```

1  MAP-DialogueInformation {
2      ccitt identified-organization (4) etsi (0) mobileDomain (0)
3      gsm-Network (1) modules (3) map-DialogueInformation (3) version6 (6)}
4
5  DEFINITIONS
6
7  IMPLICIT TAGS
8
9  ::=
10
11 BEGIN
12
13 EXPORTS
14     map-DialogueAS,
15     MAP-DialoguePDU
16 ;
17
18 IMPORTS
19     gsm-NetworkId,
20     as-Id
21 FROM MobileDomainDefinitions {
22     ccitt (0) identified-organization (4) etsi (0) mobileDomain (0)
23     mobileDomainDefinitions (0) version1 (1)}
24
25     AddressString
26 FROM MAP-CommonDataTypes {
27     ccitt identified-organization (4) etsi (0) mobileDomain (0)
28     gsm-Network(1) modules (3) map-CommonDataTypes (18) version6 (6)}
29
30     ExtensionContainer
31 FROM MAP-ExtensionDataTypes {
32     ccitt identified-organization (4) etsi (0) mobileDomain (0)
33     gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
34
35 ;
36
37
38 -- abstract syntax name for MAP-DialoguePDU
39
40 map-DialogueAS OBJECT IDENTIFIER ::=
41     {gsm-NetworkId as-Id map-DialoguePDU (1) version1 (1)}
42

```

```

43 MAP-DialoguePDU ::= CHOICE {
44     map-open [0] MAP-OpenInfo,
45     map-accept [1] MAP-AcceptInfo,
46     map-close [2] MAP-CloseInfo,
47     map-refuse [3] MAP-RefuseInfo,
48     map-userAbort [4] MAP-UserAbortInfo,
49     map-providerAbort [5] MAP-ProviderAbortInfo}
50
51 MAP-OpenInfo ::= SEQUENCE {
52     destinationReference [0] AddressString OPTIONAL,
53     originationReference [1] AddressString OPTIONAL,
54     ...,
55     extensionContainer ExtensionContainer OPTIONAL
56     -- extensionContainer must not be used in version 2
57 }
58
59 MAP-AcceptInfo ::= SEQUENCE {
60     ...,
61     extensionContainer ExtensionContainer OPTIONAL
62     -- extensionContainer must not be used in version 2
63 }
64
65 MAP-CloseInfo ::= SEQUENCE {
66     ...,
67     extensionContainer ExtensionContainer OPTIONAL
68     -- extensionContainer must not be used in version 2
69 }
70
71 MAP-RefuseInfo ::= SEQUENCE {
72     reason Reason,
73     ...,
74     extensionContainer ExtensionContainer OPTIONAL
75     -- extensionContainer must not be used in version 2
76 }
77
78 Reason ::= ENUMERATED {
79     noReasonGiven (0),
80     invalidDestinationReference (1),
81     invalidOriginatingReference (2)}
82
83 MAP-UserAbortInfo ::= SEQUENCE {
84     map-UserAbortChoice MAP-UserAbortChoice,
85     ...,
86     extensionContainer ExtensionContainer OPTIONAL
87     -- extensionContainer must not be used in version 2
88 }
89
90 MAP-UserAbortChoice ::= CHOICE {
91     userSpecificReason [0] NULL,
92     userResourceLimitation [1] NULL,
93     resourceUnavailable [2] ResourceUnavailableReason,
94     applicationProcedureCancellation [3] ProcedureCancellationReason}
95
96 ResourceUnavailableReason ::= ENUMERATED {
97     shortTermResourceLimitation (0),
98     longTermResourceLimitation (1)}
99
100 ProcedureCancellationReason ::= ENUMERATED {
101     handoverCancellation (0),
102     radioChannelRelease (1),
103     networkPathRelease (2),
104     callRelease (3),
105     associatedProcedureFailure (4),
106     tandemDialogueRelease (5),
107     remoteOperationsFailure (6)}
108
109 MAP-ProviderAbortInfo ::= SEQUENCE {
110     map-ProviderAbortReason MAP-ProviderAbortReason,
111     ...,
112     extensionContainer ExtensionContainer OPTIONAL
113     -- extensionContainer must not be used in version 2
114 }
115
116 MAP-ProviderAbortReason ::= ENUMERATED {
117     abnormalDialogue (0),
118     invalidPDU (1)}
119

```

17.5 MAP operation and error codes

```

1  MAP-Protocol {
2      ccitt identified-organization (4) etsi (0) mobileDomain (0)
3      gsm-Network (1) modules (3) map-Protocol (4) version6 (6)}
4
5  DEFINITIONS
6
7  ::=
8
9  BEGIN
10
11  IMPORTS
12      UpdateLocation,
13      CancelLocation,
14      PurgeMS,
15      SendIdentification,
16      UpdateGprsLocation,
17      PrepareHandover,
18      SendEndSignal,
19      ProcessAccessSignalling,
20      ForwardAccessSignalling,
21      PrepareSubsequentHandover,
22      SendAuthenticationInfo,
23      CheckIMEI,
24      InsertSubscriberData,
25      DeleteSubscriberData,
26      Reset,
27      ForwardCheckSS-Indication,
28      RestoreData,
29      ProvideSubscriberInfo,
30      AnyTimeInterrogation,
31      AnyTimeSubscriptionInterrogation,
32      AnyTimeModification,
33      SendRoutingInfoForGprs,
34      FailureReport,
35      NoteMsPresentForGprs,
36      NoteMM-Event,
37      NoteSubscriberDataModified
38
39
40
41  FROM MAP-MobileServiceOperations {
42      ccitt identified-organization (4) etsi (0) mobileDomain (0)
43      gsm-Network (1) modules (3) map-MobileServiceOperations (5)
44      version6 (6)}
45
46      ActivateTraceMode,
47      DeactivateTraceMode,
48      SendIMSI
49  FROM MAP-OperationAndMaintenanceOperations {
50      ccitt identified-organization (4) etsi (0) mobileDomain (0)
51      gsm-Network (1) modules (3) map-OperationAndMaintenanceOperations (6)
52      version6 (6)}
53
54      SendRoutingInfo,
55      ProvideRoamingNumber,
56      ResumeCallHandling,
57      ProvideSIWFSNumber,
58      SIWFSSignallingModify,
59      SetReportingState,
60      StatusReport,
61      RemoteUserFree,
62      IST-Alert,
63      IST-Command
64  FROM MAP-CallHandlingOperations {
65      ccitt identified-organization (4) etsi (0) mobileDomain (0)
66      gsm-Network (1) modules (3) map-CallHandlingOperations (7)
67      version6 (6)}
68
69      RegisterSS,
70      EraseSS,
71      ActivateSS,
72      DeactivateSS,
73      InterrogateSS,
74      ProcessUnstructuredSS-Request,

```

```

75  UnstructuredSS-Request,
76  UnstructuredSS-Notify,
77  RegisterPassword,
78  GetPassword,
79  SS-InvocationNotification,
80  RegisterCC-Entry,
81  EraseCC-Entry
82  FROM MAP-SupplementaryServiceOperations {
83    ccitt identified-organization (4) etsi (0) mobileDomain (0)
84    gsm-Network (1) modules (3) map-SupplementaryServiceOperations (8)
85    version6 (6)}
86
87  SendRoutingInfoForSM,
88  MO-ForwardSM,
89  MT-ForwardSM,
90  ReportSM-DeliveryStatus,
91  AlertServiceCentre,
92  InformServiceCentre,
93  ReadyForSM
94  FROM MAP-ShortMessageServiceOperations {
95    ccitt identified-organization (4) etsi (0) mobileDomain (0)
96    gsm-Network (1) modules (3) map-ShortMessageServiceOperations (9)
97    version6 (6)}
98
99  PrepareGroupCall,
100 ProcessGroupCallSignalling,
101 ForwardGroupCallSignalling,
102 SendGroupCallEndSignal
103 FROM MAP-Group-Call-Operations {
104   ccitt identified-organization (4) etsi (0) mobileDomain (0)
105   gsm-Network (1) modules (3) map-Group-Call-Operations (22)
106   version6 (6)}
107
108   LCSAssignTrafficChannel,
109   LCSInformationReport,
110   LCSInformationRequest,
111   LCSRegistration,
112   LCSReset,
113   ProvideSubscriberLocation,
114   PerformLocation,
115   SendRoutingInfoForLCS,
116   SubscriberLocationReport
117 FROM MAP-LocationServiceOperations {
118   ccitt identified-organization (4) etsi (0) mobileDomain (0)
119   gsm-Network (1) modules (3) map-LocationServiceOperations (24)
120   version6 (6)}
121
122   SystemFailure,
123   DataMissing,
124   UnexpectedDataValue,
125   FacilityNotSupported,
126   UnknownSubscriber,
127   NumberChanged,
128   UnknownMSC,
129   UnidentifiedSubscriber,
130   UnknownEquipment,
131   RoamingNotAllowed,
132   IllegalSubscriber,
133   IllegalEquipment,
134   BearerServiceNotProvisioned,
135   TeleserviceNotProvisioned,
136   NoHandoverNumberAvailable,
137   SubsequentHandoverFailure,
138   TracingBufferFull,
139   OR-NotAllowed,
140   NoRoamingNumberAvailable,
141   AbsentSubscriber,
142   BusySubscriber,
143   NoSubscriberReply,
144   CallBarred,
145   ForwardingViolation,
146   ForwardingFailed,
147   CUG-Reject,
148   ATI-NotAllowed,
149   IllegalSS-Operation,
150   SS-ErrorStatus,
151   SS-NotAvailable,
152   SS-SubscriptionViolation,
153   SS-Incompatibility,

```

```

154     UnknownAlphabet,
155     USSD-Busy,
156     PW-RegistrationFailure,
157     NegativePW-Check,
158     NumberOfPW-AttemptsViolation,
159     SubscriberBusyForMT-SMS,
160     SM-DeliveryFailure,
161     MessageWaitingListFull,
162     AbsentSubscriberSM,
163     ResourceLimitation,
164     NoGroupCallNumberAvailable,
165     ShortTermDenial,
166     LongTermDenial,
167     IncompatibleTerminal,
168     UnauthorizedRequestingNetwork,
169     UnauthorizedLCSCClient,
170     PositionMethodFailure,
171     PositionMethodFailureWithRestart,
172     LMUUnknownOrOffline,
173     TrafficChannelEstablishmentFailure,
174     UnknownOrUnreachableLCSCClient,
175     ATSI-NotAllowed,
176     ATM-NotAllowed,
177     InformationNotAvailable,
178     MM-EventNotSupported
179
180 FROM MAP-Errors {
181     ccitt identified-organization (4) etsi (0) mobileDomain (0)
182     gsm-Network (1) modules (3) map-Errors (10) version6 (6)}
183 ;
184
185
186 -- location registration operation codes
187
188 updateLocation UpdateLocation ::= localValue 2
189 cancelLocation CancelLocation ::= localValue 3
190 purgeMS PurgeMS ::= localValue 67
191 sendIdentification SendIdentification ::= localValue 55
192
193
194 -- handover operation codes
195
196 prepareHandover PrepareHandover ::= localValue 68
197 sendEndSignal SendEndSignal ::= localValue 29
198 processAccessSignalling ProcessAccessSignalling ::= localValue 33
199 forwardAccessSignalling ForwardAccessSignalling ::= localValue 34
200 prepareSubsequentHandover PrepareSubsequentHandover ::=
201     localValue 69
202
203
204 -- authentication operation codes
205
206 sendAuthenticationInfo SendAuthenticationInfo ::= localValue 56
207
208
209 -- IMEI MANAGEMENT operation codes
210
211 checkIMEI CheckIMEI ::= localValue 43
212
213
214 -- subscriber management operation codes
215
216 insertSubscriberData InsertSubscriberData ::= localValue 7
217 deleteSubscriberData DeleteSubscriberData ::= localValue 8
218
219
220 -- fault recovery operation codes
221
222 reset Reset ::= localValue 37
223 forwardCheckSS-Indication ForwardCheckSS-Indication ::=
224     localValue 38
225 restoreData RestoreData ::= localValue 57
226
227
228 -- operation and maintenance operation codes
229

```

```

230 activateTraceMode ActivateTraceMode ::= localValue 50
231 deactivateTraceMode DeactivateTraceMode ::= localValue 51
232 sendIMSI SendIMSI ::= localValue 58
233
234
235 -- call handling operation codes
236
237 sendRoutingInfo SendRoutingInfo ::= localValue 22
238 provideRoamingNumber ProvideRoamingNumber ::= localValue 4
239 resumeCallHandling ResumeCallHandling ::= localValue 6
240 provideSIWFSNumber ProvideSIWFSNumber ::= localValue 31
241 siWFSSignallingModify SIWFSSignallingModify ::= localValue 32
242 setReportingState SetReportingState ::= localValue 73
243 statusReport StatusReport ::= localValue 74
244 remoteUserFree RemoteUserFree ::= localValue 75
245 istAlert IST-Alert ::= localValue 87
246 istCommand IST-Command ::= localValue 88
247
248
249 -- supplementary service handling operation codes
250
251 registerSS RegisterSS ::= localValue 10
252 eraseSS EraseSS ::= localValue 11
253 activateSS ActivateSS ::= localValue 12
254 deactivateSS DeactivateSS ::= localValue 13
255 interrogateSS InterrogateSS ::= localValue 14
256 processUnstructuredSS-Request ProcessUnstructuredSS-Request ::=
257     localValue 59
258 unstructuredSS-Request UnstructuredSS-Request ::= localValue 60
259 unstructuredSS-Notify UnstructuredSS-Notify ::= localValue 61
260 registerPassword RegisterPassword ::= localValue 17
261 getPassword GetPassword ::= localValue 18
262 registerCC-Entry RegisterCC-Entry ::= localValue 76
263 eraseCC-Entry EraseCC-Entry ::= localValue 77
264
265
266 -- short message service operation codes
267
268 sendRoutingInfoForSM SendRoutingInfoForSM ::= localValue 45
269 mo-forwardSM MO-ForwardSM ::= localValue 46
270 mt-forwardSM MT-ForwardSM ::= localValue 44
271 reportSM-DeliveryStatus ReportSM-DeliveryStatus ::= localValue 47
272 informServiceCentre InformServiceCentre ::= localValue 63
273 alertServiceCentre AlertServiceCentre ::= localValue 64
274 readyForSM ReadyForSM ::= localValue 66
275
276 -- provide subscriber info operation codes
277
278 provideSubscriberInfo ProvideSubscriberInfo ::= localValue 70
279
280 -- any time interrogation operation codes
281
282 anyTimeInterrogation AnyTimeInterrogation ::= localValue 71
283
284 -- any time information handling operation codes
285
286 anyTimeSubscriptionInterrogation AnyTimeSubscriptionInterrogation ::= localValue 62
287 anyTimeModification AnyTimeModification ::= localValue 65
288
289 -- subscriber data modification notification operation codes
290
291 noteSubscriberDataModified NoteSubscriberDataModified ::= localValue 5
292 -- supplementary service invocation notification operation codes
293
294 ss-InvocationNotification SS-InvocationNotification ::= localValue 72
295
296
297 --Group Call operation codes
298
299 prepareGroupCall PrepareGroupCall ::= localValue 39
300 sendGroupCallEndSignal SendGroupCallEndSignal ::= localValue 40
301 processGroupCallSignalling ProcessGroupCallSignalling ::= localValue 41
302 forwardGroupCallSignalling ForwardGroupCallSignalling ::= localValue 42
303
304
305 -- gprs location updating operation codes
306

```

```

307 updateGprsLocation UpdateGprsLocation ::= localValue 23
308
309 -- gprs location information retrieval operation codes
310
311 sendRoutingInfoForGprs SendRoutingInfoForGprs ::= localValue 24
312
313 -- failure reporting operation codes
314
315 failureReport FailureReport ::= localValue 25
316
317 -- GPRS notification operation codes
318
319 noteMsPresentForGprs NoteMsPresentForGprs ::= localValue 26
320
321 -- Location service operation codes
322
323 lcsAssignTrafficChannel LCSAssignTrafficChannel ::= localValue 78
324 lcsInformationReport LCSInformationReport ::= localValue 79
325 lcsInformationRequest LCSInformationRequest ::= localValue 80
326 lcsRegistration LCSRegistration ::= localValue 81
327 lcsReset LCSReset ::= localValue 82
328 provideSubscriberLocation ProvideSubscriberLocation ::= localValue 83
329 performLocation PerformLocation ::= localValue 84
330 sendRoutingInfoForLCS SendRoutingInfoForLCS ::= localValue 85
331 subscriberLocationReport SubscriberLocationReport ::= localValue 86
332
333 -- Mobility Management operation codes
334
335 noteMM-Event NoteMM-Event ::= localValue 89
336
337
338 -- generic error codes
339
340 systemFailure SystemFailure ::= localValue 34
341 dataMissing DataMissing ::= localValue 35
342 unexpectedDataValue UnexpectedDataValue ::= localValue 36
343 facilityNotSupported FacilityNotSupported ::= localValue 21
344 incompatibleTerminal IncompatibleTerminal ::= localValue 28
345 resourceLimitation ResourceLimitation ::= localValue 51
346
347
348 -- identification and numbering error codes
349
350 unknownSubscriber UnknownSubscriber ::= localValue 1
351 numberChanged NumberChanged ::= localValue 44
352 unknownMSC UnknownMSC ::= localValue 3
353 unidentifiedSubscriber UnidentifiedSubscriber ::= localValue 5
354 unknownEquipment UnknownEquipment ::= localValue 7
355
356
357 -- subscription error codes
358
359 roamingNotAllowed RoamingNotAllowed ::= localValue 8
360 illegalSubscriber IllegalSubscriber ::= localValue 9
361 illegalEquipment IllegalEquipment ::= localValue 12
362 bearerServiceNotProvisioned BearerServiceNotProvisioned ::=
363     localValue 10
364 teleserviceNotProvisioned TeleserviceNotProvisioned ::=
365     localValue 11
366
367
368 -- handover error codes
369
370 noHandoverNumberAvailable NoHandoverNumberAvailable ::=
371     localValue 25
372 subsequentHandoverFailure SubsequentHandoverFailure ::=
373     localValue 26
374
375
376 -- operation and maintenance error codes
377
378 tracingBufferFull TracingBufferFull ::= localValue 40
379
380
381 -- call handling error codes
382

```

```

383 noRoamingNumberAvailable NoRoamingNumberAvailable ::= localValue 39
384 absentSubscriber AbsentSubscriber ::= localValue 27
385 busySubscriber BusySubscriber ::= localValue 45
386 noSubscriberReply NoSubscriberReply ::= localValue 46
387 callBarred CallBarred ::= localValue 13
388 forwardingFailed ForwardingFailed ::= localValue 47
389 or-NotAllowed OR-NotAllowed ::= localValue 48
390 forwardingViolation ForwardingViolation ::= localValue 14
391 cug-Reject CUG-Reject ::= localValue 15
392
393
394 -- any time interrogation error codes
395 ati-NotAllowed ATI-NotAllowed ::= localValue 49
396
397 -- any time information handling error codes
398 atsi-NotAllowed ATSI-NotAllowed ::= localValue 60
399 atm-NotAllowed ATM-NotAllowed ::= localValue 61
400 informationNotAvailable InformationNotAvailable ::= localValue 62
401
402
403 -- Group Call error codes
404 noGroupCallNumberAvailable NoGroupCallNumberAvailable ::= localValue 50
405
406
407 -- supplementary service error codes
408
409 illegalSS-Operation IllegalSS-Operation ::= localValue 16
410 ss-ErrorStatus SS-ErrorStatus ::= localValue 17
411 ss-NotAvailable SS-NotAvailable ::= localValue 18
412 ss-SubscriptionViolation SS-SubscriptionViolation ::= localValue 19
413 ss-Incompatibility SS-Incompatibility ::= localValue 20
414 unknownAlphabet UnknownAlphabet ::= localValue 71
415 ussd-Busy USSD-Busy ::= localValue 72
416 pw-RegistrationFailure PW-RegistrationFailure ::= localValue 37
417 negativePW-Check NegativePW-Check ::= localValue 38
418 numberOfPW-AttemptsViolation NumberOfPW-AttemptsViolation ::=
419     localValue 43
420 shortTermDenial ShortTermDenial ::= localValue 29
421 longTermDenial LongTermDenial ::= localValue 30
422
423
424 -- short message service error codes
425
426 subscriberBusyForMT-SMS SubscriberBusyForMT-SMS ::= localValue 31
427 sm-DeliveryFailure SM-DeliveryFailure ::= localValue 32
428 messageWaitingListFull MessageWaitingListFull ::= localValue 33
429 absentSubscriberSM AbsentSubscriberSM ::= localValue 6
430
431 -- location service error codes
432
433 unauthorizedRequestingNetwork UnauthorizedRequestingNetwork ::= localValue 52
434 unauthorizedLCSCClient UnauthorizedLCSCClient ::= localValue 53
435 positionMethodFailure PositionMethodFailure ::= localValue 54
436 positionMethodFailureWithRestart PositionMethodFailureWithRestart ::= localValue 55
437 lmuUnknownOrOffline LMUUnknownOrOffline ::= localValue 56
438 trafficChannelEstablishmentFailure TrafficChannelEstablishmentFailure ::= localValue 57
439 unknownOrUnreachableLCSCClient UnknownOrUnreachableLCSCClient ::= localValue 58
440
441 -- Mobility Management error codes
442
443 mm-EventNotSupported MM-EventNotSupported ::= localValue 59
444
445
446 -- The following operation codes are reserved for operations
447 -- existing in previous versions of the protocol
448

```

```

449 -- Operation Name          AC used          Oper. Code
450 --
451 -- sendParameters          map-ac infoRetrieval (14) version1 (1)    localValue 9
452 -- processUnstructuredSS-Data map-ac networkFunctionalSs (18) version1 (1) localValue 19
453 -- performHandover         map-ac handoverControl (11) version1 (1)  localValue 28
454 -- performSubsequentHandover map-ac handoverControl (11) version1 (1)  localValue 30
455 -- noteInternalHandover    map-ac handoverControl (11) version1 (1)  localValue 35
456 -- noteSubscriberPresent   map-ac mwdMngt (24) version1 (1)         localValue 48
457 -- alertServiceCentreWithoutResult map-ac shortMsgAlert (23) version1 (1) localValue 49
458 -- traceSubscriberActivity  map-ac handoverControl (11) version1 (1)  localValue 52
459 -- beginSubscriberActivity  map-ac networkFunctionalSs (18) version1 (1) localValue 54
460
461 -- The following error codes are reserved for errors
462 -- existing in previous versions of the protocol
463
464 -- Error Name          AC used          Error Code
465 --
466 -- unknownBaseStation  map-ac handoverControl (11) version1 (1)  localValue 2
467 -- invalidTargetBaseStation map-ac handoverControl (11) version1 (1) localValue 23
468 -- noRadioResourceAvailable map-ac handoverControl (11) version1 (1) localValue 24
469
470
471 END

```

17.6 MAP operation and error types

17.6.1 Mobile Service Operations

```

1  MAP-MobileServiceOperations {
2      ccitt identified-organization (4) etsi (0) mobileDomain (0)
3      gsm-Network (1) modules (3) map-MobileServiceOperations (5)
4      version6 (6)}
5
6  DEFINITIONS
7
8  ::=
9
10 BEGIN
11
12 EXPORTS
13
14     -- location registration operations
15     UpdateLocation,
16     CancelLocation,
17     PurgeMS,
18     SendIdentification,
19
20     -- gprs location registration operations
21     UpdateGprsLocation,
22
23     -- subscriber information enquiry operations
24     ProvideSubscriberInfo,
25
26     -- any time information enquiry operations
27     AnyTimeInterrogation,
28
29     -- any time information handling operations
30     AnyTimeSubscriptionInterrogation,
31     AnyTimeModification,
32
33     -- subscriber data modification notification operations
34     NoteSubscriberDataModified,
35
36     -- handover operations
37     PrepareHandover,
38     SendEndSignal,
39     ProcessAccessSignalling,
40     ForwardAccessSignalling,
41     PrepareSubsequentHandover,
42
43     -- authentication management operations
44     SendAuthenticationInfo,
45
46     -- IMEI management operations
47     CheckIMEI,
48

```

```

49  -- subscriber management operations
50  InsertSubscriberData,
51  DeleteSubscriberData,
52
53  -- fault recovery operations
54  Reset,
55  ForwardCheckSS-Indication,
56  RestoreData,
57
58  -- gprs location information retrieval operations
59  SendRoutingInfoForGprs,
60
61  -- failure reporting operations
62  FailureReport,
63
64  -- gprs notification operations
65  NoteMsPresentForGprs,
66
67  -- Mobility Management operations
68  NoteMM-Event
69
70 ;
71
72 IMPORTS
73  OPERATION
74  FROM TCAPMessages {
75    ccitt recommendation q 773 modules (2) messages (1) version2 (2)}
76
77    SystemFailure,
78    DataMissing,
79    UnexpectedDataValue,
80    UnknownSubscriber,
81    UnknownMSC,
82    UnidentifiedSubscriber,
83    UnknownEquipment,
84    RoamingNotAllowed,
85    ATI-NotAllowed,
86    NoHandoverNumberAvailable,
87    SubsequentHandoverFailure,
88    AbsentSubscriber,
89    MM-EventNotSupported,
90    ATSI-NotAllowed,
91    ATM-NotAllowed,
92    BearerServiceNotProvisioned,
93    TeleserviceNotProvisioned,
94    CallBarred,
95    IllegalSS-Operation,
96    SS-ErrorStatus,
97    SS-NotAvailable,
98    SS-Incompatibility,
99    SS-SubscriptionViolation,
100   InformationNotAvailable
101
102  FROM MAP-Errors {
103    ccitt identified-organization (4) etsi (0) mobileDomain (0)
104    gsm-Network (1) modules (3) map-Errors (10) version6 (6)}
105
106    UpdateLocationArg,
107    UpdateLocationRes,
108    CancelLocationArg,
109    CancelLocationRes,
110    PurgeMS-Arg,
111    PurgeMS-Res,
112    SendIdentificationRes,
113    UpdateGprsLocationArg,
114    UpdateGprsLocationRes,
115    PrepareHO-Arg,
116    PrepareHO-Res,
117    PrepareSubsequentHO-Arg,
118    SendAuthenticationInfoArg,
119    SendAuthenticationInfoRes,
120    EquipmentStatus,
121    InsertSubscriberDataArg,
122    InsertSubscriberDataRes,
123    DeleteSubscriberDataArg,
124    DeleteSubscriberDataRes,
125    ResetArg,
126    RestoreDataArg,
127    RestoreDataRes,

```

```

128 ProvideSubscriberInfoArg,
129 ProvideSubscriberInfoRes,
130 AnyTimeSubscriptionInterrogationArg,
131 AnyTimeSubscriptionInterrogationRes,
132 AnyTimeModificationArg,
133 AnyTimeModificationRes,
134 NoteSubscriberDataModifiedArg,
135 NoteSubscriberDataModifiedRes,
136 AnyTimeInterrogationArg,
137 AnyTimeInterrogationRes,
138 SendRoutingInfoForGprsArg,
139 SendRoutingInfoForGprsRes,
140 FailureReportArg,
141 FailureReportRes,
142 NoteMsPresentForGprsArg,
143 NoteMsPresentForGprsRes,
144 NoteMM-EventArg,
145 NoteMM-EventRes
146
147
148 FROM MAP-MS-DataTypes {
149     ccitt identified-organization (4) etsi (0) mobileDomain (0)
150     gsm-Network (1) modules (3) map-MS-DataTypes (11) version6 (6)}
151
152     ExternalSignalInfo,
153     TMSI,
154     IMEI
155 FROM MAP-CommonDataTypes {
156     ccitt identified-organization (4) etsi (0) mobileDomain (0)
157     gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}
158 ;

```

```

159
160
161 -- location registration operations
162

```

163	UpdateLocation ::= OPERATION	--Timer m
164	ARGUMENT	
165	updateLocationArg	UpdateLocationArg
166	RESULT	
167	updateLocationRes	UpdateLocationRes
168	ERRORS {	
169	SystemFailure,	
170	DataMissing,	
171	UnexpectedDataValue,	
172	UnknownSubscriber,	
173	RoamingNotAllowed}	

175	CancelLocation ::= OPERATION	--Timer m
176	ARGUMENT	
177	cancelLocationArg	CancelLocationArg
178	RESULT	
179	cancelLocationRes	CancelLocationRes
180	-- optional	
181	ERRORS {	
182	DataMissing,	
183	UnexpectedDataValue}	

185	PurgeMS ::= OPERATION	--Timer m
186	ARGUMENT	
187	purgeMS-Arg	PurgeMS-Arg
188	RESULT	
189	purgeMS-Res	PurgeMS-Res
190	-- optional	
191	ERRORS{	
192	DataMissing,	
193	UnexpectedDataValue,	
194	UnknownSubscriber}	

```

195

```

```

196 SendIdentification ::= OPERATION                                --Timer s
197     ARGUMENT
198         tmsi                                                    TMSI
199     RESULT
200         sendIdentificationRes    SendIdentificationRes
201     ERRORS {
202         DataMissing,
203         UnidentifiedSubscriber}
204
205 -- gprs location registration operations
206
207 UpdateGprsLocation ::= OPERATION                                --Timer m
208     ARGUMENT
209         updateGprsLocationArg    UpdateGprsLocationArg
210     RESULT
211         updateGprsLocationRes    UpdateGprsLocationRes
212     ERRORS {
213         SystemFailure,
214         UnexpectedDataValue,
215         UnknownSubscriber,
216         RoamingNotAllowed}
217
218 -- subscriber information enquiry operations
219
220 ProvideSubscriberInfo ::= OPERATION                            --Timer m
221     ARGUMENT
222         provideSubscriberInfoArg  ProvideSubscriberInfoArg
223     RESULT
224         provideSubscriberInfoRes  ProvideSubscriberInfoRes
225     ERRORS {
226         DataMissing,
227         UnexpectedDataValue}
228
229 -- any time information enquiry operations
230
231 AnyTimeInterrogation ::= OPERATION                            --Timer m
232     ARGUMENT
233         anyTimeInterrogationArg   AnyTimeInterrogationArg
234     RESULT
235         anyTimeInterrogationRes   AnyTimeInterrogationRes
236     ERRORS {
237         SystemFailure,
238         ATI-NotAllowed,
239         DataMissing,
240         UnexpectedDataValue,
241         UnknownSubscriber}
242
243 -- any time information handling operations
244

```

```

245 AnyTimeSubscriptionInterrogation ::= OPERATION --Timer m
246 ARGUMENT
247 anyTimeSubscriptionInterrogationArg AnyTimeSubscriptionInterrogationArg
248 RESULT
249 anyTimeSubscriptionInterrogationRes AnyTimeSubscriptionInterrogationRes
250 ERRORS {
251 ATSI-NotAllowed,
252 DataMissing,
253 UnexpectedDataValue,
254 UnknownSubscriber,
255 BearerServiceNotProvisioned,
256 TeleserviceNotProvisioned,
257 CallBarred,
258 IllegalSS-Operation,
259 SS-NotAvailable,
260 InformationNotAvailable}
261 AnyTimeModification ::= OPERATION --Timer m
262 ARGUMENT
263 anyTimeModificationArg AnyTimeModificationArg
264 RESULT
265 anyTimeModificationRes AnyTimeModificationRes
266 ERRORS {
267 ATM-NotAllowed,
268 DataMissing,
269 UnexpectedDataValue,
270 UnknownSubscriber,
271 BearerServiceNotProvisioned,
272 TeleserviceNotProvisioned,
273 CallBarred,
274 IllegalSS-Operation,
275 SS-SubscriptionViolation,
276 SS-ErrorStatus,
277 SS-Incompatibility,
278 InformationNotAvailable}
279
280 -- subscriber data modification notification operations
281
282 NoteSubscriberDataModified ::= OPERATION --Timer m
283 ARGUMENT
284 noteSubscriberDataModifiedArg NoteSubscriberDataModifiedArg
285 RESULT
286 noteSubscriberDataModifiedRes NoteSubscriberDataModifiedRes
287 -- optional
288 ERRORS {
289 UnexpectedDataValue,
290 UnknownSubscriber}
291
292 -- handover operations
293
294 PrepareHandover ::= OPERATION --Timer m
295 ARGUMENT
296 prepareHO-Arg PrepareHO-Arg
297 RESULT
298 prepareHO-Res PrepareHO-Res
299 ERRORS {
300 SystemFailure,
301 DataMissing,
302 UnexpectedDataValue,
303 NoHandoverNumberAvailable}
304
305 SendEndSignal ::= OPERATION --Timer l
306 ARGUMENT
307 bss-APDU ExternalSignalInfo
308 RESULT
309
310 ProcessAccessSignalling ::= OPERATION --Timer s
311 ARGUMENT
312 bss-APDU ExternalSignalInfo
313
314 ForwardAccessSignalling ::= OPERATION --Timer s
315 ARGUMENT
316 bss-APDU ExternalSignalInfo
317

```

```

318 PrepareSubsequentHandover ::= OPERATION --Timer m
319 ARGUMENT
320     prepareSubsequentHO-Arg PrepareSubsequentHO-Arg
321 RESULT
322     bss-APDU ExternalSignalInfo
323 ERRORS {
324     UnexpectedDataValue,
325     DataMissing,
326     UnknownMSC,
327     SubsequentHandoverFailure}
328
329 -- authentication management operations
330
331 SendAuthenticationInfo ::= OPERATION --Timer m
332 ARGUMENT
333     sendAuthenticationInfoArg SendAuthenticationInfoArg
334 RESULT
335     sendAuthenticationInfoRes SendAuthenticationInfoRes
336     -- optional
337 ERRORS {
338     SystemFailure,
339     DataMissing,
340     UnexpectedDataValue,
341     UnknownSubscriber}
342
343 -- IMEI management operations
344
345 CheckIMEI ::= OPERATION --Timer m
346 ARGUMENT
347     imei IMEI
348 RESULT
349     equipmentStatus EquipmentStatus
350 ERRORS {
351     SystemFailure,
352     DataMissing,
353     UnknownEquipment}
354
355 -- subscriber management operations
356
357 InsertSubscriberData ::= OPERATION --Timer m
358 ARGUMENT
359     insertSubscriberDataArg InsertSubscriberDataArg
360 RESULT
361     insertSubscriberDataRes InsertSubscriberDataRes
362     -- optional
363 ERRORS {
364     DataMissing,
365     UnexpectedDataValue,
366     UnidentifiedSubscriber}
367
368 DeleteSubscriberData ::= OPERATION --Timer m
369 ARGUMENT
370     deleteSubscriberDataArg DeleteSubscriberDataArg
371 RESULT
372     deleteSubscriberDataRes DeleteSubscriberDataRes
373     -- optional
374 ERRORS {
375     DataMissing,
376     UnexpectedDataValue,
377     UnidentifiedSubscriber}
378
379 -- fault recovery operations
380
381 Reset ::= OPERATION --Timer m
382 ARGUMENT
383     resetArg ResetArg
384
385 ForwardCheckSS-Indication ::= OPERATION --Timer s
386

```

```

387 RestoreData ::= OPERATION --Timer m
388 ARGUMENT
389     restoreDataArg          RestoreDataArg
390 RESULT
391     restoreDataRes          RestoreDataRes
392 ERRORS {
393     SystemFailure,
394     DataMissing,
395     UnexpectedDataValue,
396     UnknownSubscriber}
397
398 -- gprs location information retrieval operations
399
400 SendRoutingInfoForGprs ::= OPERATION --Timer m
401 ARGUMENT
402     sendRoutingInfoForGprsArg      SendRoutingInfoForGprsArg
403 RESULT
404     sendRoutingInfoForGprsRes      SendRoutingInfoForGprsRes
405 ERRORS {
406     AbsentSubscriber,
407     SystemFailure,
408     DataMissing,
409     UnexpectedDataValue,
410     UnknownSubscriber}
411
412 -- failure reporting operations
413
414 FailureReport ::= OPERATION --Timer m
415 ARGUMENT
416     failureReportArg              FailureReportArg
417 RESULT
418     failureReportRes              FailureReportRes
419     -- optional
420 ERRORS {
421     SystemFailure,
422     DataMissing,
423     UnexpectedDataValue,
424     UnknownSubscriber}
425
426 -- gprs notification operations
427
428 NoteMsPresentForGprs ::= OPERATION --Timer m
429 ARGUMENT
430     noteMsPresentForGprsArg        NoteMsPresentForGprsArg
431 RESULT
432     noteMsPresentForGprsRes        NoteMsPresentForGprsRes
433     -- optional
434 ERRORS {
435     SystemFailure,
436     DataMissing,
437     UnexpectedDataValue,
438     UnknownSubscriber}
439
440 NoteMM-Event ::= OPERATION --Timer m
441 ARGUMENT
442     noteMM-EventArg                NoteMM-EventArg
443 RESULT
444     noteMM-EventRes                NoteMM-EventRes
445 ERRORS {
446     DataMissing,
447     UnexpectedDataValue,
448     UnknownSubscriber,
449     MM-EventNotSupported}
450
451
452
453
454 END

```

17.6.2 Operation and Maintenance Operations

```

1 MAP-OperationAndMaintenanceOperations {
2     ciitt identified-organization (4) etsi (0) mobileDomain (0)
3     gsm-Network (1) modules (3) map-OperationAndMaintenanceOperations (6)
4     version6 (6)}
5
6 DEFINITIONS
7

```

```

8 ::=
9
10 BEGIN
11
12 EXPORTS
13     ActivateTraceMode,
14     DeactivateTraceMode,
15     SendIMSI
16 ;
17
18 IMPORTS
19     OPERATION
20 FROM TCAPMessages {
21     ccitt recommendation q 773 modules (2) messages (1) version2 (2)}
22
23     SystemFailure,
24     DataMissing,
25     UnexpectedDataValue,
26     FacilityNotSupported,
27     UnknownSubscriber,
28     UnidentifiedSubscriber,
29     TracingBufferFull
30 FROM MAP-Errors {
31     ccitt identified-organization (4) etsi (0) mobileDomain (0)
32     gsm-Network (1) modules (3) map-Errors (10) version6 (6)}
33
34     ActivateTraceModeArg,
35     ActivateTraceModeRes,
36     DeactivateTraceModeArg,
37     DeactivateTraceModeRes
38 FROM MAP-OM-DataTypes {
39     ccitt identified-organization (4) etsi (0) mobileDomain (0)
40     gsm-Network (1) modules (3) map-OM-DataTypes (12) version6 (6)}
41
42     ISDN-AddressString,
43     IMSI
44 FROM MAP-CommonDataTypes {
45     ccitt identified-organization (4) etsi (0) mobileDomain (0)
46     gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}
47 ;
48
49
50 ActivateTraceMode ::= OPERATION --Timer m
51     ARGUMENT
52         activateTraceModeArg          ActivateTraceModeArg
53     RESULT
54         activateTraceModeRes          ActivateTraceModeRes
55         -- optional
56     ERRORS {
57         SystemFailure,
58         DataMissing,
59         UnexpectedDataValue,
60         FacilityNotSupported,
61         UnidentifiedSubscriber,
62         TracingBufferFull}
63
64 DeactivateTraceMode ::= OPERATION --Timer m
65     ARGUMENT
66         deactivateTraceModeArg        DeactivateTraceModeArg
67     RESULT
68         deactivateTraceModeRes        DeactivateTraceModeRes
69         -- optional
70     ERRORS {
71         SystemFailure,
72         DataMissing,
73         UnexpectedDataValue,
74         FacilityNotSupported,
75         UnidentifiedSubscriber}
76

```

```

77 SendIMSI ::= OPERATION --Timer m
78     ARGUMENT
79         msisdn ISDN-AddressString
80     RESULT
81         imsi IMSI
82     ERRORS {
83         DataMissing,
84         UnexpectedDataValue,
85         UnknownSubscriber}
86
87 END

```

17.6.3 Call Handling Operations

```

1 MAP-CallHandlingOperations {
2     ccitt identified-organization (4) etsi (0) mobileDomain (0)
3     gsm-Network (1) modules (3) map-CallHandlingOperations (7)
4     version6 (6)}
5
6 DEFINITIONS
7
8 ::=
9
10 BEGIN
11
12 EXPORTS
13     SendRoutingInfo,
14     ProvideRoamingNumber,
15     ResumeCallHandling,
16     ProvideSIWFSNumber,
17     SIWFSSignallingModify,
18     SetReportingState,
19     StatusReport,
20     RemoteUserFree,
21     IST-Alert,
22     IST-Command
23 ;
24
25 IMPORTS
26     OPERATION
27 FROM TCAPMessages {
28     ccitt recommendation q 773 modules (2) messages (1) version2 (2)}
29
30     SystemFailure,
31     DataMissing,
32     UnexpectedDataValue,
33     FacilityNotSupported,
34     OR-NotAllowed,
35     UnknownSubscriber,
36     NumberChanged,
37     BearerServiceNotProvisioned,
38     TeleserviceNotProvisioned,
39     NoRoamingNumberAvailable,
40     AbsentSubscriber,
41     BusySubscriber,
42     NoSubscriberReply,
43     CallBarred,
44     ForwardingViolation,
45     ForwardingFailed,
46     CUG-Reject,
47     ResourceLimitation,
48     IncompatibleTerminal,
49     UnidentifiedSubscriber
50
51 FROM MAP-Errors {
52     ccitt identified-organization (4) etsi (0) mobileDomain (0)
53     gsm-Network (1) modules (3) map-Errors (10) version6 (6)}
54     SendRoutingInfoArg,
55     SendRoutingInfoRes,
56     ProvideRoamingNumberArg,
57     ProvideRoamingNumberRes,
58     ResumeCallHandlingArg,
59     ResumeCallHandlingRes,
60     ProvideSIWFSNumberArg,
61     ProvideSIWFSNumberRes,
62     SIWFSSignallingModifyArg,
63     SIWFSSignallingModifyRes,
64     SetReportingStateArg,

```

```

65     SetReportingStateRes,
66     StatusReportArg,
67     StatusReportRes,
68     RemoteUserFreeArg,
69     RemoteUserFreeRes,
70     IST-AlertArg,
71     IST-AlertRes,
72     IST-CommandArg,
73     IST-CommandRes
74 FROM MAP-CH-DataTypes {
75     ccitt identified-organization (4) etsi (0) mobileDomain (0)
76     gsm-Network (1) modules (3) map-CH-DataTypes (13) version6 (6)}
77
78 ;
79

```

```

80 SendRoutingInfo ::= OPERATION --Timer m
81 -- The timer is set to the upper limit of the range if the GMSC supports pre-paging.
82     ARGUMENT
83         sendRoutingInfoArg          SendRoutingInfoArg
84     RESULT
85         sendRoutingInfoRes          SendRoutingInfoRes
86     ERRORS {
87         SystemFailure,
88         DataMissing,
89         UnexpectedDataValue,
90         FacilityNotSupported,
91         OR-NotAllowed,
92         UnknownSubscriber,
93         NumberChanged,
94         BearerServiceNotProvisioned,
95         TeleserviceNotProvisioned,
96         AbsentSubscriber,
97         BusySubscriber,
98         NoSubscriberReply,
99         CallBarred,
100        CUG-Reject,
101        ForwardingViolation}
102

```

```

103 ProvideRoamingNumber ::= OPERATION --Timer m
104 -- The timer is set to the upper limit of the range if the HLR supports pre-paging.
105     ARGUMENT
106         provideRoamingNumberArg      ProvideRoamingNumberArg
107     RESULT
108         provideRoamingNumberRes      ProvideRoamingNumberRes
109     ERRORS {
110         SystemFailure,
111         DataMissing,
112         UnexpectedDataValue,
113         FacilityNotSupported,
114         OR-NotAllowed,
115         AbsentSubscriber,
116         NoRoamingNumberAvailable}
117

```

```

118 ResumeCallHandling ::= OPERATION --Timer m
119     ARGUMENT
120         resumeCallHandlingArg        ResumeCallHandlingArg
121     RESULT
122         resumeCallHandlingRes        ResumeCallHandlingRes
123         -- optional
124     ERRORS {
125         ForwardingFailed,
126         OR-NotAllowed,
127         UnexpectedDataValue,
128         DataMissing }
129

```

```

130 ProvideSIWFSNumber ::= OPERATION --Timer m
131     ARGUMENT
132         provideSIWFSNumberArg        ProvideSIWFSNumberArg
133     RESULT
134         provideSIWFSNumberRes        ProvideSIWFSNumberRes
135     ERRORS {
136         ResourceLimitation,
137         DataMissing,
138         UnexpectedDataValue,
139         SystemFailure}
140

```

```

141 SIWFSSignallingModify ::= OPERATION --Timer m
142 ARGUMENT
143     sIWFSSignallingModifyArg      SIWFSSignallingModifyArg
144 RESULT
145     sIWFSSignallingModifyRes      SIWFSSignallingModifyRes
146     -- optional
147 ERRORS {
148     ResourceLimitation,
149     DataMissing,
150     UnexpectedDataValue,
151     SystemFailure}
152
153 SetReportingState ::= OPERATION --Timer m
154 ARGUMENT
155     setReportingStateArg           SetReportingStateArg
156 RESULT
157     setReportingStateRes          SetReportingStateRes
158     -- optional
159 ERRORS {
160     SystemFailure,
161     UnidentifiedSubscriber,
162     UnexpectedDataValue,
163     DataMissing,
164     ResourceLimitation,
165     FacilityNotSupported}
166
167 StatusReport ::= OPERATION --Timer m
168 ARGUMENT
169     statusReportArg               StatusReportArg
170 RESULT
171     statusReportRes               StatusReportRes
172     -- optional
173 ERRORS {
174     UnknownSubscriber,
175     SystemFailure,
176     UnexpectedDataValue,
177     DataMissing}
178
179 RemoteUserFree ::= OPERATION --Timer m1
180 ARGUMENT
181     remoteUserFreeArg             RemoteUserFreeArg
182 RESULT
183     remoteUserFreeRes             RemoteUserFreeRes
184 ERRORS {
185     UnexpectedDataValue,
186     DataMissing,
187     IncompatibleTerminal,
188     AbsentSubscriber,
189     SystemFailure,
190     BusySubscriber}
191
192 IST-Alert ::= OPERATION --Timer m
193 ARGUMENT
194     istAlertArg                   IST-AlertArg
195 RESULT
196     istAlertRes                   IST-AlertRes
197     -- optional
198 ERRORS {
199     UnexpectedDataValue,
200     ResourceLimitation,
201     UnknownSubscriber,
202     SystemFailure,
203     FacilityNotSupported}
204
205 IST-Command ::= OPERATION --Timer m
206 ARGUMENT
207     istCommandArg                 IST-CommandArg
208 RESULT
209     istCommandRes                 IST-CommandRes
210     -- optional
211 ERRORS {
212     UnexpectedDataValue,
213     ResourceLimitation,
214     UnknownSubscriber,
215     SystemFailure,
216     FacilityNotSupported}
217
218 END

```

17.6.4 Supplementary service operations

```
1 MAP-SupplementaryServiceOperations {
2   ccitt identified-organization (4) etsi (0) mobileDomain (0)
3   gsm-Network (1) modules (3) map-SupplementaryServiceOperations (8)
4   version6 (6)}
5
6 DEFINITIONS
7
8 ::=
9
10 BEGIN
11
12 EXPORTS
13   RegisterSS,
14   EraseSS,
15   ActivateSS,
16   DeactivateSS,
17   InterrogateSS,
18   ProcessUnstructuredSS-Request,
19   UnstructuredSS-Request,
20   UnstructuredSS-Notify,
21   RegisterPassword,
22   GetPassword,
23   SS-InvocationNotification,
24   RegisterCC-Entry,
25   EraseCC-Entry
26 ;
27
28 IMPORTS
29   OPERATION
30 FROM TCAPMessages {
31   ccitt recommendation q 773 modules (2) messages (1) version2 (2)}
32
33   SystemFailure,
34   DataMissing,
35   UnexpectedDataValue,
36   UnknownSubscriber,
37   BearerServiceNotProvisioned,
38   TeleserviceNotProvisioned,
39   CallBarred,
40   IllegalSS-Operation,
41   SS-ErrorStatus,
42   SS-NotAvailable,
43   SS-SubscriptionViolation,
44   SS-Incompatibility,
45   PW-RegistrationFailure,
46   NegativePW-Check,
47   NumberOfPW-AttemptsViolation,
48   UnknownAlphabet,
49   USSD-Busy,
50   AbsentSubscriber,
51   IllegalSubscriber,
52   IllegalEquipment,
53   ShortTermDenial,
54   LongTermDenial,
55   FacilityNotSupported
56 FROM MAP-Errors {
57   ccitt identified-organization (4) etsi (0) mobileDomain (0)
58   gsm-Network (1) modules (3) map-Errors (10) version6 (6)}
59
60   RegisterSS-Arg,
61   SS-Info,
62   SS-ForBS-Code,
63   InterrogateSS-Res,
64   USSD-Arg,
65   USSD-Res,
66   Password,
67   GuidanceInfo,
68   SS-InvocationNotificationArg,
69   SS-InvocationNotificationRes,
70   RegisterCC-EntryArg,
71   RegisterCC-EntryRes,
72   EraseCC-EntryArg,
73   EraseCC-EntryRes
74 FROM MAP-SS-DataTypes {
75   ccitt identified-organization (4) etsi (0) mobileDomain (0)
```

```

76   gsm-Network (1) modules (3) map-SS-DataTypes (14) version6 (6)}
77
78   SS-Code
79 FROM MAP-SS-Code {
80   ccitt identified-organization (4) etsi (0) mobileDomain (0)
81   gsm-Network (1) modules (3) map-SS-Code (15) version6 (6)}
82 ;
83
84
85 -- supplementary service handling operations
86

```

```

87 RegisterSS ::= OPERATION                                --Timer m
88   ARGUMENT
89     registerSS-Arg                                     RegisterSS-Arg
90   RESULT
91     ss-Info                                           SS-Info
92     -- optional
93   ERRORS {
94     SystemFailure,
95     DataMissing,
96     UnexpectedDataValue,
97     BearerServiceNotProvisioned,
98     TeleserviceNotProvisioned,
99     CallBarred,
100    IllegalSS-Operation,
101    SS-ErrorStatus,
102    SS-Incompatibility}

```

```

104 EraseSS ::= OPERATION                                --Timer m
105   ARGUMENT
106     ss-ForBS                                           SS-ForBS-Code
107   RESULT
108     ss-Info                                           SS-Info
109     -- optional
110   ERRORS {
111     SystemFailure,
112     DataMissing,
113     UnexpectedDataValue,
114     BearerServiceNotProvisioned,
115     TeleserviceNotProvisioned,
116     CallBarred,
117     IllegalSS-Operation,
118     SS-ErrorStatus
119   }

```

```

121 ActivateSS ::= OPERATION                             --Timer m
122   ARGUMENT
123     ss-ForBS                                           SS-ForBS-Code
124   RESULT
125     ss-Info                                           SS-Info
126     -- optional
127   ERRORS {
128     SystemFailure,
129     DataMissing,
130     UnexpectedDataValue,
131     BearerServiceNotProvisioned,
132     TeleserviceNotProvisioned,
133     CallBarred,
134     IllegalSS-Operation,
135     SS-ErrorStatus,
136     SS-SubscriptionViolation,
137     SS-Incompatibility,
138     NegativePW-Check,
139     NumberOfPW-AttemptsViolation}

```

```

140

```

```

141 DeactivateSS ::= OPERATION --Timer m
142 ARGUMENT
143     ss-ForBS SS-ForBS-Code
144 RESULT
145     ss-Info SS-Info
146     -- optional
147 ERRORS {
148     SystemFailure,
149     DataMissing,
150     UnexpectedDataValue,
151     BearerServiceNotProvisioned,
152     TeleserviceNotProvisioned,
153     CallBarred,
154     IllegalSS-Operation,
155     SS-ErrorStatus,
156     SS-SubscriptionViolation,
157     NegativePW-Check,
158     NumberOfPW-AttemptsViolation}
159

```

```

160 InterrogateSS ::= OPERATION --Timer m
161 ARGUMENT
162     ss-ForBS SS-ForBS-Code
163 RESULT
164     interrogateSS-Res InterrogateSS-Res
165 ERRORS {
166     SystemFailure,
167     DataMissing,
168     UnexpectedDataValue,
169     BearerServiceNotProvisioned,
170     TeleserviceNotProvisioned,
171     CallBarred,
172     IllegalSS-Operation,
173     SS-NotAvailable}
174

```

```

175 ProcessUnstructuredSS-Request ::= OPERATION --Timer 10 minutes
176 ARGUMENT
177     ussd-Arg USSD-Arg
178 RESULT
179     ussd-Res USSD-Res
180 ERRORS {
181     SystemFailure,
182     DataMissing,
183     UnexpectedDataValue,
184     UnknownAlphabet,
185     CallBarred}
186

```

```

187 UnstructuredSS-Request ::= OPERATION --Timer ml
188 ARGUMENT
189     ussd-Arg USSD-Arg
190 RESULT
191     ussd-Res USSD-Res
192     -- optional
193 ERRORS {
194     SystemFailure,
195     DataMissing,
196     UnexpectedDataValue,
197     AbsentSubscriber,
198     IllegalSubscriber,
199     IllegalEquipment,
200     UnknownAlphabet,
201     USSD-Busy}
202

```

```

203 UnstructuredSS-Notify ::= OPERATION --Timer ml
204 ARGUMENT
205     ussd-Arg USSD-Arg
206 RESULT
207 ERRORS {
208     SystemFailure,
209     DataMissing,
210     UnexpectedDataValue,
211     AbsentSubscriber,
212     IllegalSubscriber,
213     IllegalEquipment,
214     UnknownAlphabet,
215     USSD-Busy}
216

```

```

217 RegisterPassword ::= OPERATION --Timer ml
218 ARGUMENT
219     ss-Code SS-Code
220 RESULT
221     newPassword Password
222 ERRORS {
223     SystemFailure,
224     DataMissing,
225     UnexpectedDataValue,
226     CallBarred,
227     SS-SubscriptionViolation,
228     PW-RegistrationFailure,
229     NegativePW-Check,
230     NumberOfPW-AttemptsViolation}
231 LINKED {
232     GetPassword}
233
234 GetPassword ::= OPERATION --Timer m
235 ARGUMENT
236     guidanceInfo GuidanceInfo
237 RESULT
238     currentPassword Password
239
240 SS-InvocationNotification ::= OPERATION --Timer m
241 ARGUMENT
242     ss-InvocationNotificationArg SS-InvocationNotificationArg
243 RESULT
244     ss-InvocationNotificationRes SS-InvocationNotificationRes
245     -- optional
246 ERRORS {
247     DataMissing,
248     UnexpectedDataValue,
249     UnknownSubscriber}
250
251 RegisterCC-Entry ::= OPERATION --Timer m
252 ARGUMENT
253     registerCC-EntryArg RegisterCC-EntryArg
254 RESULT
255     registerCC-EntryRes RegisterCC-EntryRes
256 ERRORS {
257     SystemFailure,
258     DataMissing,
259     UnexpectedDataValue,
260     CallBarred,
261     IllegalSS-Operation,
262     SS-ErrorStatus,
263     SS-Incompatibility,
264     ShortTermDenial,
265     LongTermDenial,
266     FacilityNotSupported}
267
268 EraseCC-Entry ::= OPERATION --Timer m
269 ARGUMENT
270     eraseCC-EntryArg EraseCC-EntryArg
271 RESULT
272     eraseCC-EntryRes EraseCC-EntryRes
273 ERRORS {
274     SystemFailure,
275     DataMissing,
276     UnexpectedDataValue,
277     CallBarred,
278     IllegalSS-Operation,
279     SS-ErrorStatus}
280
281 END

```

17.6.5 Short message service operations

```

1 MAP-ShortMessageServiceOperations {
2   ccitt identified-organization (4) etsi (0) mobileDomain (0)
3   gsm-Network (1) modules (3) map-ShortMessageServiceOperations (9)
4   version6 (6)}
5
6 DEFINITIONS
7
8 ::=
9
10 BEGIN

```

```

11
12 EXPORTS
13   SendRoutingInfoForSM,
14   MO-ForwardSM,
15   MT-ForwardSM,
16   ReportSM-DeliveryStatus,
17   AlertServiceCentre,
18   InformServiceCentre,
19   ReadyForSM
20 ;
21
22 IMPORTS
23   OPERATION
24 FROM TCAPMessages {
25   ccitt recommendation q 773 modules (2) messages (1) version2 (2)}
26
27   SystemFailure,
28   DataMissing,
29   UnexpectedDataValue,
30   FacilityNotSupported,
31   UnknownSubscriber,
32   UnidentifiedSubscriber,
33   IllegalSubscriber,
34   IllegalEquipment,
35   TeleserviceNotProvisioned,
36   AbsentSubscriber,
37   CallBarred,
38   SubscriberBusyForMT-SMS,
39   SM-DeliveryFailure,
40   MessageWaitingListFull,
41   AbsentSubscriberSM
42 FROM MAP-Errors {
43   ccitt identified-organization (4) etsi (0) mobileDomain (0)
44   gsm-Network (1) modules (3) map-Errors (10) version6 (6)}
45
46   RoutingInfoForSM-Arg,
47   RoutingInfoForSM-Res,
48   MO-ForwardSM-Arg,
49   MO-ForwardSM-Res,
50   MT-ForwardSM-Arg,
51   MT-ForwardSM-Res,
52   ReportSM-DeliveryStatusArg,
53   ReportSM-DeliveryStatusRes,
54   AlertServiceCentreArg,
55   InformServiceCentreArg,
56   ReadyForSM-Arg,
57   ReadyForSM-Res
58 FROM MAP-SM-DataTypes {
59   ccitt identified-organization (4) etsi (0) mobileDomain (0)
60   gsm-Network (1) modules (3) map-SM-DataTypes (16) version6 (6)}
61
62
63
64 ;
65
66
67 SendRoutingInfoForSM ::= OPERATION --Timer m
68   ARGUMENT
69     routingInfoForSM-Arg          RoutingInfoForSM-Arg
70   RESULT
71     routingInfoForSM-Res          RoutingInfoForSM-Res
72   ERRORS {
73     SystemFailure,
74     DataMissing,
75     UnexpectedDataValue,
76     FacilityNotSupported,
77     UnknownSubscriber,
78     TeleserviceNotProvisioned,
79     CallBarred,
80     AbsentSubscriberSM}
81

```

```

82 MO-ForwardSM ::= OPERATION --Timer ml
83 ARGUMENT
84     mo-forwardSM-Arg          MO-ForwardSM-Arg
85 RESULT
86     mo-forwardSM-Res          MO-ForwardSM-Res
87     -- optional
88 ERRORS {
89     SystemFailure,
90     UnexpectedDataValue,
91     FacilityNotSupported,
92     SM-DeliveryFailure}
93
94 MT-ForwardSM ::= OPERATION --Timer ml
95 ARGUMENT
96     mt-forwardSM-Arg          MT-ForwardSM-Arg
97 RESULT
98     mt-forwardSM-Res          MT-ForwardSM-Res
99     -- optional
100 ERRORS {
101     SystemFailure,
102     DataMissing,
103     UnexpectedDataValue,
104     FacilityNotSupported,
105     UnidentifiedSubscriber,
106     IllegalSubscriber,
107     IllegalEquipment,
108     SubscriberBusyForMT-SMS,
109     SM-DeliveryFailure,
110     AbsentSubscriberSM}
111
112 ReportSM-DeliveryStatus ::= OPERATION --Timer s
113 ARGUMENT
114     reportSM-DeliveryStatusArg  ReportSM-DeliveryStatusArg
115 RESULT
116     reportSM-DeliveryStatusRes  ReportSM-DeliveryStatusRes
117     -- optional
118 ERRORS {
119     DataMissing,
120     UnexpectedDataValue,
121     UnknownSubscriber,
122     MessageWaitingListFull}
123
124 AlertServiceCentre ::= OPERATION --Timer s
125 ARGUMENT
126     alertServiceCentreArg       AlertServiceCentreArg
127 RESULT
128 ERRORS {
129     SystemFailure,
130     DataMissing,
131     UnexpectedDataValue}
132
133 InformServiceCentre ::= OPERATION --Timer s
134 ARGUMENT
135     informServiceCentreArg      InformServiceCentreArg
136
137 ReadyForSM ::= OPERATION --Timer m
138 ARGUMENT
139     readyForSM-Arg              ReadyForSM-Arg
140 RESULT
141     readyForSM-Res              ReadyForSM-Res
142     -- optional
143 ERRORS {
144     DataMissing,
145     UnexpectedDataValue,
146     FacilityNotSupported,
147     UnknownSubscriber}
148
149 END

```

17.6.6 Errors

```

1 MAP-Errors {
2     ccitt identified-organization (4) etsi (0) mobileDomain (0)
3     gsm-Network (1) modules (3) map-Errors (10) version6 (6)}
4
5 DEFINITIONS
6
7 ::=
8
9 BEGIN
10
11 EXPORTS
12
13     -- generic errors
14     SystemFailure,
15     DataMissing,
16     UnexpectedDataValue,
17     FacilityNotSupported,
18     IncompatibleTerminal,
19     ResourceLimitation,
20
21     -- identification and numbering errors
22     UnknownSubscriber,
23     NumberChanged,
24     UnknownMSC,
25     UnidentifiedSubscriber,
26     UnknownEquipment,
27
28     -- subscription errors
29     RoamingNotAllowed,
30     IllegalSubscriber,
31     IllegalEquipment,
32     BearerServiceNotProvisioned,
33     TeleserviceNotProvisioned,
34
35     -- handover errors
36     NoHandoverNumberAvailable,
37     SubsequentHandoverFailure,
38
39     -- operation and maintenance errors
40     TracingBufferFull,
41
42     -- call handling errors
43     OR-NotAllowed,
44     NoRoamingNumberAvailable,
45     BusySubscriber,
46     NoSubscriberReply,
47     AbsentSubscriber,
48     CallBarred,
49     ForwardingViolation,
50     ForwardingFailed,
51     CUG-Reject,
52
53     -- any time interrogation errors
54     ATI-NotAllowed,
55
56     -- any time information handling errors
57     ATSI-NotAllowed,
58     ATM-NotAllowed,
59     InformationNotAvailable,
60
61     -- supplementary service errors
62     IllegalSS-Operation,
63     SS-ErrorStatus,
64     SS-NotAvailable,
65     SS-SubscriptionViolation,
66     SS-Incompatibility,
67     UnknownAlphabet,
68     USSD-Busy,
69     PW-RegistrationFailure,
70     NegativePW-Check,
71     NumberOfPW-AttemptsViolation,
72     ShortTermDenial,
73     LongTermDenial,
74
75     -- short message service errors
76     SubscriberBusyForMT-SMS,
77     SM-DeliveryFailure,
78     MessageWaitingListFull,
79     AbsentSubscriberSM,

```

```

80
81 -- Group Call errors
82 NoGroupCallNumberAvailable,
83
84 -- location service errors
85 UnauthorizedRequestingNetwork,
86 UnauthorizedLCSCClient,
87 PositionMethodFailure,
88 PositionMethodFailureWithRestart,
89 LMUUnknownOrOffline,
90 TrafficChannelEstablishmentFailure,
91 UnknownOrUnreachableLCSCClient,
92
93 -- Mobility Management errors
94 MM-EventNotSupported
95
96
97 ;
98
99 IMPORTS
100 ERROR
101 FROM TCAPMessages {
102     ccitt recommendation q 773 modules (2) messages (1) version2 (2)}
103
104     SS-Status
105 FROM MAP-SS-DataTypes {
106     ccitt identified-organization (4) etsi (0) mobileDomain (0)
107     gsm-Network (1) modules (3) map-SS-DataTypes (14) version6 (6)}
108
109     SS-IncompatibilityCause,
110     PW-RegistrationFailureCause,
111     SM-DeliveryFailureCause,
112     SystemFailureParam,
113     DataMissingParam,
114     UnexpectedDataParam,
115     FacilityNotSupParam,
116     UnknownSubscriberParam,
117     NumberChangedParam,
118     UnidentifiedSubParam,
119     RoamingNotAllowedParam,
120     IllegalSubscriberParam,
121     IllegalEquipmentParam,
122     BearerServNotProvParam,
123     TeleservNotProvParam,
124     TracingBufferFullParam,
125     NoRoamingNbParam,
126     OR-NotAllowedParam,
127     AbsentSubscriberParam,
128     BusySubscriberParam,
129     NoSubscriberReplyParam,
130     CallBarredParam,
131     ForwardingViolationParam,
132     ForwardingFailedParam,
133     CUG-RejectParam,
134     ATI-NotAllowedParam,
135     SubBusyForMT-SMS-Param,
136     MessageWaitListFullParam,
137     AbsentSubscriberSM-Param,
138     ResourceLimitationParam,
139     NoGroupCallNbParam,
140     IncompatibleTerminalParam,
141     ShortTermDenialParam,
142     LongTermDenialParam,
143     UnauthorizedRequestingNetwork-Param,
144     UnauthorizedLCSCClient-Param,
145     PositionMethodFailure-Param,
146     PositionMethodFailureWithRestart-Param,
147     LMUUnknownOrOffline-Param,
148     TrafficChannelEstablishmentFailure-Param,
149     UnknownOrUnreachableLCSCClient-Param,
150     MM-EventNotSupported-Param,
151     ATSI-NotAllowedParam,
152     ATM-NotAllowedParam,
153     IllegalSS-OperationParam,
154     SS-NotAvailableParam,
155     SS-SubscriptionViolationParam,
156     InformationNotAvailableParam
157
158 FROM MAP-ER-DataTypes {

```

```
159 ccitt identified-organization (4) etsi (0) mobileDomain (0)
160 gsm-Network (1) modules (3) map-ER-DataTypes (17) version6 (6)}
161 ;
162
163
```

```
164 -- generic errors
165
```

```
166 SystemFailure ::= ERROR
167     PARAMETER
168         systemFailureParam          SystemFailureParam
169         -- optional
```

```
171 DataMissing ::= ERROR
172     PARAMETER
173         dataMissingParam            DataMissingParam
174         -- optional
175         -- dataMissingParam must not be used in version <3
```

```
177 UnexpectedDataValue ::= ERROR
178     PARAMETER
179         unexpectedDataParam         UnexpectedDataParam
180         -- optional
181         -- unexpectedDataParam must not be used in version <3
```

```
183 FacilityNotSupported ::= ERROR
184     PARAMETER
185         facilityNotSupParam         FacilityNotSupParam
186         -- optional
187         -- facilityNotSupParam must not be used in version <3
```

```
189 IncompatibleTerminal ::= ERROR
190     PARAMETER
191         incompatibleTerminalParam    IncompatibleTerminalParam
192         -- optional
```

```
194 ResourceLimitation ::= ERROR
195     PARAMETER
196         resourceLimitationParam      ResourceLimitationParam
197         -- optional
```

```
198
199 -- identification and numbering errors
200
```

```
201 UnknownSubscriber ::= ERROR
202     PARAMETER
203         unknownSubscriberParam       UnknownSubscriberParam
204         -- optional
205         -- unknownSubscriberParam must not be used in version <3
```

```
207 NumberChanged ::= ERROR
208     PARAMETER
209         numberChangedParam           NumberChangedParam
210         -- optional
```

```
212 UnknownMSC ::= ERROR
213
```

```
214 UnidentifiedSubscriber ::= ERROR
215     PARAMETER
216         unidentifiedSubParam         UnidentifiedSubParam
217         -- optional
218         -- unidentifiedSubParam must not be used in version <3
```

```
220 UnknownEquipment ::= ERROR
221
222
```

```
223 -- subscription errors
224
```

```
225 RoamingNotAllowed ::= ERROR
226     PARAMETER
227         roamingNotAllowedParam       RoamingNotAllowedParam
```

```
229 IllegalSubscriber ::= ERROR
230     PARAMETER
231         illegalSubscriberParam       IllegalSubscriberParam
232         -- optional
233         -- illegalSubscriberParam must not be used in version <3
```

```
234
235 IllegalEquipment ::= ERROR
```

```

236     PARAMETER
237         illegalEquipmentParam          IllegalEquipmentParam
238         -- optional
239         -- illegalEquipmentParam must not be used in version <3
240
241 BearerServiceNotProvisioned ::= ERROR
242     PARAMETER
243         bearerServNotProvParam          BearerServNotProvParam
244         -- optional
245         -- bearerServNotProvParam must not be used in version <3
246
247 TeleserviceNotProvisioned ::= ERROR
248     PARAMETER
249         teleservNotProvParam            TeleservNotProvParam
250         -- optional
251         -- teleservNotProvParam must not be used in version <3
252
253
254 -- handover errors
255
256 NoHandoverNumberAvailable ::= ERROR
257
258 SubsequentHandoverFailure ::= ERROR
259
260
261 -- operation and maintenance errors
262
263 TracingBufferFull ::= ERROR
264     PARAMETER
265         tracingBufferFullParam          TracingBufferFullParam
266         -- optional
267
268
269 -- call handling errors
270
271 NoRoamingNumberAvailable ::= ERROR
272     PARAMETER
273         noRoamingNbParam                NoRoamingNbParam
274         -- optional
275
276 AbsentSubscriber ::= ERROR
277     PARAMETER
278         absentSubscriberParam           AbsentSubscriberParam
279         -- optional
280
281         -- absentSubscriberParam must not be used in version <3
282
283 BusySubscriber ::= ERROR
284     PARAMETER
285         busySubscriberParam             BusySubscriberParam
286         -- optional
287
288 NoSubscriberReply ::= ERROR
289     PARAMETER
290         noSubscriberReplyParam          NoSubscriberReplyParam
291         -- optional
292
293 CallBarred ::= ERROR
294     PARAMETER
295         callBarredParam                  CallBarredParam
296         -- optional
297
298 ForwardingViolation ::= ERROR
299     PARAMETER
300         forwardingViolationParam         ForwardingViolationParam
301         -- optional
302
303 ForwardingFailed ::= ERROR
304     PARAMETER
305         forwardingFailedParam           ForwardingFailedParam
306         -- optional
307
308 CUG-Reject ::= ERROR
309     PARAMETER
310         cug-RejectParam                  CUG-RejectParam
311         -- optional
312

```

```

313 OR-NotAllowed ::= ERROR
314     PARAMETER
315         or-NotAllowedParam          OR-NotAllowedParam
316         -- optional
317
318
319 -- any time interrogation errors
320 ATI-NotAllowed ::= ERROR
321     PARAMETER
322         ati-NotAllowedParam          ATI-NotAllowedParam
323         -- optional
324
325 -- any time information handling errors
326 ATSI-NotAllowed ::= ERROR
327     PARAMETER
328         atsi-NotAllowedParam          ATSI-NotAllowedParam
329         -- optional
330
331 ATM-NotAllowed ::= ERROR
332     PARAMETER
333         atm-NotAllowedParam          ATM-NotAllowedParam
334         -- optional
335
336 InformationNotAvailable ::= ERROR
337     PARAMETER
338         informationNotAvailableParam  InformationNotAvailableParam
339         -- optional
340
341
342 -- supplementary service errors
343
344 IllegalSS-Operation ::= ERROR
345     PARAMETER
346         illegalSS-OperationParam      IllegalSS-OperationParam
347         -- optional
348         -- illegalSS-OperationParam must not be used in version <3
349
350 SS-ErrorStatus ::= ERROR
351     PARAMETER
352         ss-Status                      SS-Status
353         -- optional
354
355 SS-NotAvailable ::= ERROR
356     PARAMETER
357         ss-NotAvailableParam          SS-NotAvailableParam
358         -- optional
359         -- ss-NotAvailableParam must not be used in version <3
360
361 SS-SubscriptionViolation ::= ERROR
362     PARAMETER
363         ss-SubscriptionViolationParam  SS-SubscriptionViolationParam
364         -- optional
365         -- ss-NotAvailableParam must not be used in version <3
366
367 SS-Incompatibility ::= ERROR
368     PARAMETER
369         ss-IncompatibilityCause        SS-IncompatibilityCause
370         -- optional
371
372 UnknownAlphabet ::= ERROR
373
374 USSD-Busy ::= ERROR
375
376 PW-RegistrationFailure ::= ERROR
377     PARAMETER
378         pw-RegistrationFailureCause    PW-RegistrationFailureCause
379
380 NegativePW-Check ::= ERROR
381
382 NumberOfPW-AttemptsViolation ::= ERROR
383
384 ShortTermDenial ::= ERROR
385     PARAMETER
386         shortTermDenialParam          ShortTermDenialParam
387         -- optional
388

```

```

389 LongTermDenial ::= ERROR
390     PARAMETER
391         longTermDenialParam          LongTermDenialParam
392         -- optional
393
394
395 -- short message service errors
396
397 SubscriberBusyForMT-SMS ::= ERROR
398     PARAMETER
399         subBusyForMT-SMS-Param      SubBusyForMT-SMS-Param
400         -- optional
401
402 SM-DeliveryFailure ::= ERROR
403     PARAMETER
404         sm-DeliveryFailureCause     SM-DeliveryFailureCause
405
406 MessageWaitingListFull ::= ERROR
407     PARAMETER
408         messageWaitListFullParam    MessageWaitListFullParam
409         -- optional
410
411 AbsentSubscriberSM ::= ERROR
412     PARAMETER
413         absentSubscriberSM-Param     AbsentSubscriberSM-Param
414         -- optional
415
416 -- Group Call errors
417
418 NoGroupCallNumberAvailable ::= ERROR
419     PARAMETER
420         noGroupCallNbParam          NoGroupCallNbParam
421         -- optional
422
423 -- location service errors
424
425 UnauthorizedRequestingNetwork ::= ERROR
426     PARAMETER
427         unauthorizedRequestingNetwork-Param  UnauthorizedRequestingNetwork-Param
428         -- optional
429
430 UnauthorizedLCSCClient ::= ERROR
431     PARAMETER
432         unauthorizedLCSCClient-Param  UnauthorizedLCSCClient-Param
433         -- optional
434
435 PositionMethodFailure ::= ERROR
436     PARAMETER
437         positionMethodFailure-Param    PositionMethodFailure-Param
438         -- optional
439
440 PositionMethodFailureWithRestart ::= ERROR
441     PARAMETER
442         positionMethodFailureWithRestart-Param  PositionMethodFailureWithRestart-Param
443         -- optional
444
445 LMUUnknownOrOffline ::= ERROR
446     PARAMETER
447         lmuUnknownOrOffline-Param      LMUUnknownOrOffline-Param
448         -- optional
449
450 TrafficChannelEstablishmentFailure ::= ERROR
451     PARAMETER
452         trafficChannelEstablishmentFailure  TrafficChannelEstablishmentFailure-Param
453         -- optional
454
455 UnknownOrUnreachableLCSCClient ::= ERROR
456     PARAMETER
457         unknownOrUnreachableLCSCClient-Param  UnknownOrUnreachableLCSCClient-Param
458         -- optional
459
460 MM-EventNotSupported ::= ERROR
461     PARAMETER
462         mm-EventNotSupported-Param      MM-EventNotSupported-Param
463         -- optional
464
465 END

```

17.6.7 Group Call operations

```

1  MAP-Group-Call-Operations {
2      ccitt identified-organization (4) etsi (0) mobileDomain (0)
3      gsm-Network (1) modules (3) map-Group-Call-Operations (22)
4      version6 (6)}
5
6  DEFINITIONS
7
8  ::=
9
10 BEGIN
11
12 EXPORTS
13     PrepareGroupCall,
14     SendGroupCallEndSignal,
15     ForwardGroupCallSignalling,
16     ProcessGroupCallSignalling
17 ;
18
19 IMPORTS
20     OPERATION
21 FROM TCAPMessages {
22     ccitt recommendation q 773 modules (2) messages (1) version2 (2)}
23
24     SystemFailure,
25     UnexpectedDataValue,
26     NoGroupCallNumberAvailable
27 FROM MAP-Errors {
28     ccitt identified-organization (4) etsi (0) mobileDomain (0)
29     gsm-Network (1) modules (3) map-Errors (10) version6 (6)}
30
31     PrepareGroupCallArg,
32     PrepareGroupCallRes,
33     SendGroupCallEndSignalArg,
34     SendGroupCallEndSignalRes,
35     ForwardGroupCallSignallingArg,
36     ProcessGroupCallSignallingArg
37 FROM MAP-GR-DataTypes {
38     ccitt identified-organization (4) etsi (0) mobileDomain (0)
39     gsm-Network (1) modules (3) map-GR-DataTypes (23) version6 (6)}
40
41
42
43 ;
44
45
46 PrepareGroupCall ::= OPERATION --Timer m
47     ARGUMENT
48         prepareGroupCallArg          PrepareGroupCallArg
49     RESULT
50         prepareGroupCallRes          PrepareGroupCallRes
51     ERRORS {
52         SystemFailure,
53         NoGroupCallNumberAvailable,
54         UnexpectedDataValue}
55
56 SendGroupCallEndSignal ::= OPERATION --Timer l
57     ARGUMENT
58         sendGroupCallEndSignalArg      SendGroupCallEndSignalArg
59     RESULT
60         sendGroupCallEndSignalRes      SendGroupCallEndSignalRes
61
62
63 ProcessGroupCallSignalling ::= OPERATION --Timer s
64     ARGUMENT
65         processGroupCallSignallingArg  ProcessGroupCallSignallingArg
66
67 ForwardGroupCallSignalling ::= OPERATION --Timer s
68     ARGUMENT
69         forwardGroupCallSignallingArg  ForwardGroupCallSignallingArg
70
71 END

```

17.6.8 Location service operations

```

1  MAP-LocationServiceOperations {
2      ccitt identified-organization (4) etsi (0) mobileDomain (0)
3      gsm-Network (1) modules (3) map-LocationServiceOperations (24)
4      version6 (6)}
5
6  DEFINITIONS
7
8  ::=
9
10 BEGIN
11
12 EXPORTS
13     LCSAssignTrafficChannel,
14     LCSInformationReport,
15     LCSInformationRequest,
16     LCSRegistration,
17     LCSReset,
18     ProvideSubscriberLocation,
19     PerformLocation,
20     SendRoutingInfoForLCS,
21     SubscriberLocationReport
22 ;
23
24 IMPORTS
25     OPERATION
26 FROM TCAPMessages {
27     ccitt recommendation q 773 modules (2) messages (1) version2 (2)}
28
29     SystemFailure,
30     DataMissing,
31     UnexpectedDataValue,
32     FacilityNotSupported,
33     UnknownSubscriber,
34     AbsentSubscriber,
35     UnauthorizedRequestingNetwork,
36     UnauthorizedLCSClient,
37     PositionMethodFailure,
38     PositionMethodFailureWithRestart,
39     LMUUnknownOrOffline,
40     TrafficChannelEstablishmentFailure,
41     UnknownOrUnreachableLCSClient
42 FROM MAP-Errors {
43     ccitt identified-organization (4) etsi (0) mobileDomain (0)
44     gsm-Network (1) modules (3) map-Errors (10) version6 (6)}
45
46     LCSAssignTrafficChannel-Arg,
47     LCSAssignTrafficChannel-Res,
48     LCSInformationReport-Arg,
49     LCSInformationRequest-Arg,
50     LCSRegistration-Arg,
51     LCSRegistration-Res,
52     LCSReset-Arg,
53     RoutingInfoForLCS-Arg,
54     RoutingInfoForLCS-Res,
55     ProvideSubscriberLocation-Arg,
56     ProvideSubscriberLocation-Res,
57     PerformLocation-Arg,
58     PerformLocation-Res,
59     SubscriberLocationReport-Arg,
60     SubscriberLocationReport-Res
61 FROM MAP-LCS-DataTypes {
62     ccitt identified-organization (4) etsi (0) mobileDomain (0)
63     gsm-Network (1) modules (3) map-LCS-DataTypes (25) version6 (6)}
64 ;
65
66 SendRoutingInfoForLCS ::= OPERATION           --Timer m
67     ARGUMENT
68         routingInfoForLCS-Arg           RoutingInfoForLCS-Arg
69     RESULT
70         routingInfoForLCS-Res           RoutingInfoForLCS-Res
71     ERRORS {
72         SystemFailure,
73         DataMissing,
74         UnexpectedDataValue,
75         FacilityNotSupported,
76         UnknownSubscriber,
77         AbsentSubscriber,
78         UnauthorizedRequestingNetwork }
79

```

```

80 ProvideSubscriberLocation ::= OPERATION          --Timer ml
81     ARGUMENT
82         provideSubscriberLocation-Arg    ProvideSubscriberLocation-Arg
83     RESULT
84         provideSubscriberLocation-Res    ProvideSubscriberLocation-Res
85     ERRORS {
86         DataMissing,
87         UnexpectedDataValue,
88         UnknownSubscriber,
89         AbsentSubscriber,
90         UnauthorizedRequestingNetwork,
91         UnauthorizedLCSCClient,
92         PositionMethodFailure }
93
94 SubscriberLocationReport ::= OPERATION          --Timer m
95     ARGUMENT
96         subscriberLocationReport-Arg    SubscriberLocationReport-Arg
97     RESULT
98         subscriberLocationReport-Res    SubscriberLocationReport-Res
99     ERRORS {
100        DataMissing,
101        UnexpectedDataValue,
102        UnknownSubscriber,
103        UnauthorizedRequestingNetwork,
104        UnknownOrUnreachableLCSCClient}
105
106 PerformLocation ::= OPERATION                  --Timer ml
107     ARGUMENT
108         performLocation-Arg             PerformLocation-Arg
109     RESULT
110         performLocation-Res             PerformLocation-Res
111     ERRORS {
112         SystemFailure,
113         DataMissing,
114         UnexpectedDataValue,
115         PositionMethodFailure,
116         PositionMethodFailureWithRestart }
117
118 LCSRegistration ::= OPERATION                  --Timer m
119     ARGUMENT
120         lcsRegistration-Arg             LCSRegistration-Arg
121     RESULT
122         lcsRegistration-Res             LCSRegistration-Res
123     ERRORS {
124         SystemFailure,
125         LMUUnknownOrOffline,
126         DataMissing,
127         UnexpectedDataValue }
128
129 LCSInformationRequest ::= OPERATION            --Timer s
130     ARGUMENT
131         lcsInformationRequest-Arg       LCSInformationRequest-Arg
132
133 LCSInformationReport ::= OPERATION            --Timer s
134     ARGUMENT
135         lcsInformationReport-Arg        LCSInformationReport-Arg
136
137 LCSReset ::= OPERATION                        --Timer s
138     ARGUMENT
139         lcsReset-Arg                    LCSReset-Arg
140
141 LCSAssignTrafficChannel ::= OPERATION         --Timer m
142     ARGUMENT
143         lcsAssignTrafficChannel-Arg     LCSAssignTrafficChannel-Arg
144     RESULT
145         lcsAssignTrafficChannel-Res     LCSAssignTrafficChannel-Res
146     ERRORS {
147         SystemFailure,
148         DataMissing,
149         UnexpectedDataValue,
150         TrafficChannelEstablishmentFailure }
151
152 END
153

```

17.7 MAP constants and data types

17.7.1 Mobile Service data types

```
1  MAP-MS-DataTypes {
2      ccitt identified-organization (4) etsi (0) mobileDomain (0)
3      gsm-Network (1) modules (3) map-MS-DataTypes (11) version6 (6)}
4
5  DEFINITIONS
6
7  IMPLICIT TAGS
8
9  ::=
10
11  BEGIN
12
13  EXPORTS
14
15      -- location registration types
16      UpdateLocationArg,
17      UpdateLocationRes,
18      CancelLocationArg,
19      CancelLocationRes,
20      PurgeMS-Arg,
21      PurgeMS-Res,
22      SendIdentificationRes,
23      UpdateGprsLocationArg,
24      UpdateGprsLocationRes,
25      IST-SupportIndicator,
26
27
28      -- handover types
29      PrepareHO-Arg,
30      PrepareHO-Res,
31      PrepareSubsequentHO-Arg,
32
33      -- authentication management types
34      SendAuthenticationInfoArg,
35      SendAuthenticationInfoRes,
36
37      -- security management types
38      EquipmentStatus,
39      Kc,
40
41      -- subscriber management types
42      InsertSubscriberDataArg,
43      InsertSubscriberDataRes,
44      DeleteSubscriberDataArg,
45      DeleteSubscriberDataRes,
46      SubscriberData,
47      ODB-Data,
48      SubscriberStatus,
49      ZoneCodeList,
50      maxNumOfZoneCodes,
51      O-CSI,
52      D-CSI,
53      O-BcsmCamelTDPCriteriaList,
54      T-BCSM-CAMEL-TDP-CriteriaList,
55      SS-CSI,
56      ServiceKey,
57      DefaultCallHandling,
58      CamelCapabilityHandling,
59      BasicServiceCriteria,
60      SupportedCamelPhases,
61      maxNumOfCamelTDPData,
62      CUG-Index,
63      CUG-Interlock,
64      InterCUG-Restrictions,
65      IntraCUG-Options,
66      IST-AlertTimerValue,
67
68      -- fault recovery types
69      ResetArg,
70      RestoreDataArg,
71      RestoreDataRes,
```

```

72
73 -- subscriber information enquiry types
74 ProvideSubscriberInfoArg,
75 ProvideSubscriberInfoRes,
76 SubscriberInfo,
77 LocationInformation,
78 SubscriberState,
79
80 -- any time information enquiry types
81 AnyTimeInterrogationArg,
82 AnyTimeInterrogationRes,
83
84 -- any time information handling types
85 AnyTimeSubscriptionInterrogationArg,
86 AnyTimeSubscriptionInterrogationRes,
87 AnyTimeModificationArg,
88 AnyTimeModificationRes,
89
90 -- subscriber data modification notification types
91 NoteSubscriberDataModifiedArg,
92 NoteSubscriberDataModifiedRes,
93
94 -- gprs location information retrieval types
95 SendRoutingInfoForGprsArg,
96 SendRoutingInfoForGprsRes,
97
98 -- failure reporting types
99 FailureReportArg,
100 FailureReportRes,
101
102 -- gprs notification types
103 NoteMsPresentForGprsArg,
104 NoteMsPresentForGprsRes,
105
106 -- Mobility Management types
107 NoteMM-EventArg,
108 NoteMM-EventRes
109
110 ;
111
112 IMPORTS
113 IST-SupportIndicator,
114 IST-AlertTimerValue,
115 T-CSI,
116 T-BcsmTriggerDetectionPointFROM MAP-CH-DataTypes {
117 ccitt identified-organization (4) etsi (0) mobileDomain (0)
118 gsm-Network (1) modules (3) map-CH-DataTypes (13) version6 (6) }
119
120 maxNumOfSS,
121 SS-SubscriptionOption,
122 SS-List,
123 SS-ForBS-Code,
124 Password
125 FROM MAP-SS-DataTypes {
126 ccitt identified-organization (4) etsi (0) mobileDomain (0)
127 gsm-Network (1) modules (3) map-SS-DataTypes (14) version6 (6)}
128
129 SS-Code
130 FROM MAP-SS-Code {
131 ccitt identified-organization (4) etsi (0) mobileDomain (0)
132 gsm-Network (1) modules (3) map-SS-Code (15) version6 (6)}
133
134 Ext-BearerServiceCode
135 FROM MAP-BS-Code {
136 ccitt identified-organization (4) etsi (0) mobileDomain (0)
137 gsm-Network (1) modules (3) map-BS-Code (20) version6 (6)}
138
139 Ext-TeleserviceCode
140 FROM MAP-TS-Code {
141 ccitt identified-organization (4) etsi (0) mobileDomain (0)
142 gsm-Network (1) modules (3) map-TS-Code (19) version6 (6)}
143
144
145 ISDN-AddressString,
146 maxISDN-AddressLength,
147 ISDN-SubaddressString,
148 ExternalSignalInfo,
149 IMSI,
150 HLR-List,

```

```

151     LMSI,
152     Identity,
153     GlobalCellId,
154     CellIdOrLAI,
155     Ext-BasicServiceCode,
156     NAEA-PreferredCI,
157     EMLPP-Info,
158     SubscriberIdentity,
159     AgeOfLocationInformation,
160     LCSClientExternalID,
161     LCSClientInternalID
162
163
164 FROM MAP-CommonDataTypes {
165     ccitt identified-organization (4) etsi (0) mobileDomain (0)
166     gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}
167
168     ExtensionContainer
169 FROM MAP-ExtensionDataTypes {
170     ccitt identified-organization (4) etsi (0) mobileDomain (0)
171     gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
172
173     AbsentSubscriberDiagnosticSM
174 FROM MAP-ER-DataTypes {
175     ccitt identified-organization (4) etsi (0) mobileDomain (0)
176     gsm-Network (1) modules (3) map-ER-DataTypes (17) version6 (6)}
177
178 ;
179
180
181 -- location registration types
182

```

UpdateLocationArg ::= SEQUENCE {			
imsi	IMSI,		
msc-Number	[1] ISDN-AddressString,		
vlr-Number	ISDN-AddressString,		
lmsi	[10] LMSI OPTIONAL,		
extensionContainer	ExtensionContainer		OPTIONAL,
...	,		
vlr-Capability	[6] VLR-Capability		OPTIONAL }

VLR-Capability ::= SEQUENCE{			
supportedCamelPhases	[0] SupportedCamelPhases		OPTIONAL,
extensionContainer	ExtensionContainer		OPTIONAL,
...	,		
solsaSupportIndicator	[2] NULL		OPTIONAL,
istSupportIndicator	[1] IST-SupportIndicator		OPTIONAL }

IST-SupportIndicator ::= ENUMERATED {			
basicISTSupported	(0),		
istCommandSupported	(1), ...}		
-- exception handling:			
-- reception of values > 1 shall be mapped to ' istCommandSupported '			

UpdateLocationRes ::= SEQUENCE {			
hlr-Number	ISDN-AddressString,		
extensionContainer	ExtensionContainer		OPTIONAL,
...	}		

CancelLocationArg ::= [3] SEQUENCE {			
identity	Identity,		
cancellationType	CancellationType		OPTIONAL,
extensionContainer	ExtensionContainer		OPTIONAL,
...	}		

CancellationType ::= ENUMERATED {			
updateProcedure	(0),		
subscriptionWithdraw	(1),		
...	}		
-- The HLR shall not send values other than listed above			

```

227 CancelLocationRes ::= SEQUENCE {
228     extensionContainer          ExtensionContainer          OPTIONAL,
229     ...}
230
231 PurgeMS-Arg ::= [3] SEQUENCE {
232     imsi                        IMSI,
233     vlr-Number                  [0] ISDN-AddressString    OPTIONAL,
234     sgsn-Number                 [1] ISDN-AddressString    OPTIONAL,
235     extensionContainer          ExtensionContainer          OPTIONAL,
236     ...}
237
238 PurgeMS-Res ::= SEQUENCE {
239     freezeTMSI                  [0] NULL              OPTIONAL,
240     freezeP-TMSI                [1] NULL              OPTIONAL,
241     extensionContainer          ExtensionContainer          OPTIONAL,
242     ...}
243
244 SendIdentificationRes ::= SEQUENCE {
245     imsi                        IMSI,
246     authenticationSetList       AuthenticationSetList  OPTIONAL,
247     ...}
248
249 AuthenticationSetList ::= SEQUENCE SIZE (1..5) OF
250     AuthenticationSet
251
252 AuthenticationSet ::= SEQUENCE {
253     rand                        RAND,
254     sres                        SRES,
255     kc                          Kc,
256     ...}
257
258 RAND ::= OCTET STRING (SIZE (16))
259
260 SRES ::= OCTET STRING (SIZE (4))
261
262 Kc ::= OCTET STRING (SIZE (8))
263
264 -- gprs location registration types
265
266 UpdateGprsLocationArg ::= SEQUENCE {
267     imsi                        IMSI,
268     sgsn-Number                 ISDN-AddressString,
269     sgsn-Address                GSN-Address,
270     extensionContainer          ExtensionContainer          OPTIONAL,
271     ... ,
272     sgsn-Capability             [0] SGSN-Capability        OPTIONAL }
273
274 SGSN-Capability ::= SEQUENCE{
275     solsaSupportIndicator       NULL                  OPTIONAL,
276     extensionContainer          [1] ExtensionContainer  OPTIONAL,
277     ... ,
278     supportedCamelPhases       [2] SupportedCamelPhases  OPTIONAL }
279
280 GSN-Address ::= OCTET STRING (SIZE (5..17))
281 -- Octets are coded according to TS GSM 03.03
282
283 UpdateGprsLocationRes ::= SEQUENCE {
284     hlr-Number                  ISDN-AddressString,
285     extensionContainer          ExtensionContainer          OPTIONAL,
286     ...}
287
288 -- handover types
289
290 PrepareHO-Arg ::= SEQUENCE {
291     targetCellId                GlobalCellId          OPTIONAL,
292     ho-NumberNotRequired         NULL                  OPTIONAL,
293     bss-APDU                    ExternalSignalInfo    OPTIONAL,
294     ...}
295
296 PrepareHO-Res ::= SEQUENCE {
297     handoverNumber              ISDN-AddressString    OPTIONAL,
298     bss-APDU                    ExternalSignalInfo    OPTIONAL,
299     ...}
300

```

```

301 PrepareSubsequentHO-Arg ::= SEQUENCE {
302     targetCellId                GlobalCellId,
303     targetMSC-Number            ISDN-AddressString,
304     bss-APDU                    ExternalSignalInfo,
305     ...}
306
307 -- authentication management types
308
309 SendAuthenticationInfoArg ::= IMSI
310
311 SendAuthenticationInfoRes ::= AuthenticationSetList
312
313 -- security management types
314
315
316 EquipmentStatus ::= ENUMERATED {
317     whiteListed (0),
318     blackListed (1),
319     greyListed (2)}
320
321 -- subscriber management types
322
323
324 InsertSubscriberDataArg ::= SEQUENCE {
325     imsi                        [0] IMSI                OPTIONAL,
326     COMPONENTS OF              SubscriberData,
327     extensionContainer          [14] ExtensionContainer  OPTIONAL,
328     ... ,
329     naea-PreferredCI            [15] NAEA-PreferredCI    OPTIONAL,
330     -- naea-PreferredCI is included at the discretion of the HLR operator.
331     gprsSubscriptionData        [16] GPRSSubscriptionData OPTIONAL,
332     roamingRestrictedInSgsnDueToUnsupportedFeature [23]    NULL
333
334     networkAccessMode           [24] NetworkAccessMode   OPTIONAL,
335     lsaInformation               [25] LSAInformation      OPTIONAL,
336     lmu-Indicator                [21] NULL                OPTIONAL,
337     lcsInformation               [22] LCSInformation      OPTIONAL,
338     istAlertTimer                [26] IST-AlertTimerValue OPTIONAL
339     }
340     -- If the Network Access Mode parameter is sent, it shall be present only in
341     -- the first sequence if the segmentation is used
342
343 IST-AlertTimerValue ::= INTEGER (15..255)
344
345 LCSInformation ::= SEQUENCE {
346     hplmn-GMLC-List              [0] HPLMN-GMLC-List    OPTIONAL,
347     lcs-PrivacyExceptionList     [1] LCS-PrivacyExceptionList OPTIONAL,
348     ...}
349
350 HPLMN-GMLC-List ::= SEQUENCE SIZE (1..maxNumOfGMLC) OF
351     ISDN-AddressString
352
353 maxNumOfGMLC INTEGER ::= 5
354
355
356 NetworkAccessMode ::= ENUMERATED {
357     bothMSCAndSGSN                (0),
358     onlyMSC                        (1),
359     onlySGSN                       (2),
360     ...}
361     -- if unknown values are received in NetworkAccessMode
362     -- they shall be discarded.
363
364 GPRSDataList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
365     PDP-Context
366
367 maxNumOfPDP-Contexts INTEGER ::= 50
368

```

```

369 PDP-Context ::= SEQUENCE {
370     pdp-ContextId          ContextId,
371     pdp-Type               [16] PDP-Type,
372     pdp-Address            [17] PDP-Address          OPTIONAL,
373     qos-Subscribed         [18] QoS-Subscribed,
374     vplmnAddressAllowed    [19] NULL OPTIONAL,
375     apn                    [20] APN ,
376     extensionContainer     [21] ExtensionContainer   OPTIONAL,
377     ... }
378
379 ContextId ::= INTEGER (1..maxNumOfPDP-Contexts)
380
381 GPRSSubscriptionData ::= SEQUENCE {
382     completedDataListIncluded    NULL          OPTIONAL,
383
384     -- If segmentation is used, completedDataListIncluded may only be present in the
385     -- first segment.
386     gprsDataList                 [1] GPRSDataList,
387     extensionContainer            [2] ExtensionContainer   OPTIONAL,
388     ...,
389     sgsn-CAMEL-SubscriptionInfo [3] SGSN-CAMEL-SubscriptionInfo OPTIONAL }
390
391 SGSN-CAMEL-SubscriptionInfo ::= SEQUENCE {
392     gprs-CSI                     [0] GPRS-CSI          OPTIONAL,
393     sms-CSI                      [1] SMS-CSI           OPTIONAL,
394     extensionContainer            [2] ExtensionContainer   OPTIONAL,
395     ... }
396
397 GPRS-CSI ::= SEQUENCE {
398     gprs-CamelTDPDataList        [0] GPRS-CamelTDPDataList,
399     camelCapabilityHandling       [1] CamelCapabilityHandling,
400     extensionContainer            [2] ExtensionContainer   OPTIONAL,
401     notificationToCSE            [3] NULL              OPTIONAL,
402     csiActive                    [4] NULL              OPTIONAL,
403     ... }
404 -- notificationToCSE and csiActive shall not be present when GPRS-CSI is sent to SGSN.
405 -- They may only be included in ATSI/ATM Ack message.
406
407 GPRS-CamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
408     GPRS-CamelTDPData
409 -- GPRS-CamelTDPDataList shall not contain more than one instance of
410 -- GPRS-CamelTDPData containing the same value for gprs-TriggerDetectionPoint.
411
412 GPRS-CamelTDPData ::= SEQUENCE {
413     gprs-TriggerDetectionPoint    [0] GPRS-TriggerDetectionPoint,
414     serviceKey                    [1] ServiceKey,
415     gsmSCF-Address                [2] ISDN-AddressString,
416     defaultSessionHandling        [3] DefaultGPRS-Handling,
417     extensionContainer             [4] ExtensionContainer   OPTIONAL,
418     ...
419 }
420
421 DefaultGPRS-Handling ::= ENUMERATED {
422     continueTransaction (0) ,
423     releaseTransaction (1) ,
424     ... }
425 -- exception handling:
426 -- reception of values in range 2-31 shall be treated as "continueTransaction"
427 -- reception of values greater than 31 shall be treated as "releaseTransaction"
428
429 GPRS-TriggerDetectionPoint ::= ENUMERATED {
430     attach                        (1),
431     attachChangeOfPosition        (2),
432     pdp-ContextEstablishment      (11),
433     pdp-ContextEstablishmentAcknowledgement (12),
434     pdp-ContextChangeOfPosition  (14),
435     ... }
436 -- exception handling:
437 -- For GPRS-CamelTDPData sequences containing this parameter with any
438 -- other value than the ones listed the receiver shall ignore the whole
439 -- GPRS-CamelTDPData sequence.
440
441 APN ::= OCTET STRING (SIZE (2..63))
442 -- Octets are coded according to TS GSM 03.03
443
444

```

```

445 PDP-Type ::= OCTET STRING (SIZE (2))
446 -- Octets are coded according to TS GSM 09.60
447
448 PDP-Address ::= OCTET STRING (SIZE (1..16))
449 -- Octets are coded according to TS GSM 09.60
450
451 -- The possible size values are:
452 -- 1-7 octets X.25 address type
453 -- 4 octets IPv4 address type
454 -- 16 octets Ipv6 address type
455
456 QoS-Subscribed ::= OCTET STRING (SIZE (3))
457 -- Octets are coded according to TS GSM 04.08.
458
459 LSAOnlyAccessIndicator ::= ENUMERATED {
460     accessOutsideLSAsAllowed (0),
461     accessOutsideLSAsRestricted (1)}
462
463 LSADataList ::= SEQUENCE SIZE (1..maxNumOfLSAs) OF
464     LSAData
465
466 maxNumOfLSAs INTEGER ::= 20
467
468 LSAData ::= SEQUENCE {
469     lsaIdentity [0] LSAIdentity,
470     lsaPriority [1] LSAPriority,
471     lsaActiveModeIndicator [2] NULL OPTIONAL,
472     lsaActiveModeSupportIndicator [3] NULL OPTIONAL,
473     extensionContainer [4] ExtensionContainer OPTIONAL,
474     ...}
475
476 LSAInformation ::= SEQUENCE {
477     completeDataListIncluded NULL OPTIONAL,
478
479     -- If segmentation is used, completeDataListIncluded may only be present in the
480     -- first segment.
481     lsaOnlyAccessIndicator [1] LSAOnlyAccessIndicator OPTIONAL,
482     lsaDataList [2] LSADataList OPTIONAL,
483     extensionContainer [3] ExtensionContainer OPTIONAL,
484     ...}
485
486 LSAIdentity ::= OCTET STRING (SIZE (3))
487 -- Octets are coded according to TS GSM 03.03
488
489 LSAPriority ::= OCTET STRING (SIZE (1))
490 -- Octets are coded according to TS GSM 08.08
491
492 SubscriberData ::= SEQUENCE {
493     msisdn [1] ISDN-AddressString OPTIONAL,
494     category [2] Category OPTIONAL,
495     subscriberStatus [3] SubscriberStatus OPTIONAL,
496     bearerServiceList [4] BearerServiceList OPTIONAL,
497     -- The exception handling for reception of unsupported / not allocated
498     -- bearerServiceCodes is defined in section 6.8.1
499     teleserviceList [6] TeleserviceList OPTIONAL,
500     -- The exception handling for reception of unsupported / not allocated
501     -- teleserviceCodes is defined in section 6.8.1
502     provisionedSS [7] Ext-SS-InfoList OPTIONAL,
503     odb-Data [8] ODB-Data OPTIONAL,
504     roamingRestrictionDueToUnsupportedFeature [9] NULL OPTIONAL,
505     regionalSubscriptionData [10] ZoneCodeList OPTIONAL,
506     vbsSubscriptionData [11] VBSDataList OPTIONAL,
507     vgcsSubscriptionData [12] VGCSDataList OPTIONAL,
508     vlrCamelSubscriptionInfo [13] VlrCamelSubscriptionInfo OPTIONAL,
509     }
510
511 Category ::= OCTET STRING (SIZE (1))
512 -- The internal structure is defined in CCITT Rec Q.763.
513
514 SubscriberStatus ::= ENUMERATED {
515     serviceGranted (0),
516     operatorDeterminedBarring (1)}
517
518 BearerServiceList ::= SEQUENCE SIZE (1..maxNumOfBearerServices) OF
519     Ext-BearerServiceCode
520
521 maxNumOfBearerServices INTEGER ::= 50

```

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```
TeleserviceList ::= SEQUENCE SIZE (1..maxNumOfTeleservices) OF
                    Ext-TeleserviceCode
```

```
maxNumOfTeleservices INTEGER ::= 20
```

```
ODB-Data ::= SEQUENCE {
    odb-GeneralData          ODB-GeneralData,
    odb-HPLMN-Data          ODB-HPLMN-Data          OPTIONAL,
    extensionContainer       ExtensionContainer       OPTIONAL,
    ...}
```

```
ODB-GeneralData ::= BIT STRING {
    allOG-CallsBarred (0),
    internationalOGCallsBarred (1),
    internationalOGCallsNotToHPLMN-CountryBarred (2),
    interzonalOGCallsBarred (6),
    interzonalOGCallsNotToHPLMN-CountryBarred (7),
    interzonalOGCallsAndInternationalOGCallsNotToHPLMN-CountryBarred (8),
    premiumRateInformationOGCallsBarred (3),
    premiumRateEntertainmentOGCallsBarred (4),
    ss-AccessBarred (5),
    allECT-Barred (9),
    chargeableECT-Barred (10),
    internationalECT-Barred (11),
    interzonalECT-Barred (12),
    doublyChargeableECT-Barred (13),
    multipleECT-Barred (14)} (SIZE (15..32))
-- exception handling: reception of unknown bit assignments in the
-- ODB-GeneralData type shall be treated like unsupported ODB-GeneralData
```

```
ODB-HPLMN-Data ::= BIT STRING {
    plmn-SpecificBarringType1 (0),
    plmn-SpecificBarringType2 (1),
    plmn-SpecificBarringType3 (2),
    plmn-SpecificBarringType4 (3)} (SIZE (4..32))
-- exception handling: reception of unknown bit assignments in the
-- ODB-HPLMN-Data type shall be treated like unsupported ODB-HPLMN-Data
```

```
Ext-SS-InfoList ::= SEQUENCE SIZE (1..maxNumOfSS) OF
                    Ext-SS-Info
```

```
Ext-SS-Info ::= CHOICE {
    forwardingInfo          [0] Ext-ForwInfo,
    callBarringInfo        [1] Ext-CallBarInfo,
    cug-Info                [2] CUG-Info,
    ss-Data                 [3] Ext-SS-Data,
    emlpp-Info              [4] EMLPP-Info}
```

```
Ext-ForwInfo ::= SEQUENCE {
    ss-Code                 SS-Code,
    forwardingFeatureList   Ext-ForwFeatureList,
    extensionContainer       [0] ExtensionContainer OPTIONAL,
    ...}
```

```
Ext-ForwFeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                    Ext-ForwFeature
```

```
Ext-ForwFeature ::= SEQUENCE {
    basicService            Ext-BasicServiceCode          OPTIONAL,
    ss-Status [4] Ext-SS-Status,
    forwardedToNumber       [5] ISDN-AddressString        OPTIONAL,
    -- When this data type is sent from an HLR which supports CAMEL Phase 2
    -- to a VLR that supports CAMEL Phase 2 the VLR shall not check the
    -- format of the number
    forwardedToSubaddress   [8] ISDN-SubaddressString     OPTIONAL,
    forwardingOptions        [6] Ext-ForwOptions           OPTIONAL,
    noReplyConditionTime    [7] Ext-NoRepCondTime         OPTIONAL,
    extensionContainer       [9] ExtensionContainer        OPTIONAL,
    ...}
```

```

594 Ext-SS-Status ::= OCTET STRING (SIZE (1..5))
595
596 -- OCTET 1:
597 --
598 -- bits 8765: 0000 (unused)
599 -- bits 4321: Used to convey the "P bit", "R bit", "A bit" and "Q bit",
600 -- representing supplementary service state information
601 -- as defined in TS GSM 03.11
602
603 -- bit 4: "Q bit"
604
605 -- bit 3: "P bit"
606
607 -- bit 2: "R bit"
608
609 -- bit 1: "A bit"
610
611 -- OCTETS 2-5: reserved for future use. They shall be discarded if
612 -- received and not understood.
613

```

```

615 Ext-ForwOptions ::= OCTET STRING (SIZE (1..5))
616
617 -- OCTET 1:
618 --
619 -- bit 8: notification to forwarding party
620 -- 0 no notification
621 -- 1 notification
622
623 -- bit7: redirecting presentation
624 -- 0 no presentation
625 -- 1 presentation
626
627 -- bit 6: notification to calling party
628 -- 0 no notification
629 -- 1 notification
630
631 -- bit 5: 0 (unused)
632
633 -- bits 43: forwarding reason
634 -- 00 ms not reachable
635 -- 01 ms busy
636 -- 10 no reply
637 -- 11 unconditional
638
639 -- bits 21: 00 (unused)
640
641 -- OCTETS 2-5: reserved for future use. They shall be discarded if
642 -- received and not understood.
643

```

```

644 Ext-NoRepCondTime ::= INTEGER (1..100)
645 -- Only values 5-30 are used.
646 -- Values in the ranges 1-4 and 31-100 are reserved for future use
647 -- If received:
648 -- values 1-4 shall be mapped on to value 5
649 -- values 31-100 shall be mapped on to value 30
650

```

```

651 Ext-CallBarInfo ::= SEQUENCE {
652     ss-Code                SS-Code,
653     callBarringFeatureList Ext-CallBarFeatureList,
654     extensionContainer     ExtensionContainer OPTIONAL,
655     ...}
656

```

```

657 Ext-CallBarFeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
658     Ext-CallBarringFeature
659

```

```

660 Ext-CallBarringFeature ::= SEQUENCE {
661     basicService                Ext-BasicServiceCode OPTIONAL,
662     ss-Status [4] Ext-SS-Status,
663     extensionContainer          ExtensionContainer OPTIONAL,
664     ...}
665

```

```

666 CUG-Info ::= SEQUENCE {
667     cug-SubscriptionList      CUG-SubscriptionList,
668     cug-FeatureList           CUG-FeatureList OPTIONAL,
669     extensionContainer        [0] ExtensionContainer OPTIONAL,
670     ...}
671

```

```

672 CUG-SubscriptionList ::= SEQUENCE SIZE (0..maxNumOfCUG) OF
673                               CUG-Subscription
674
675 CUG-Subscription ::= SEQUENCE {
676     cug-Index CUG-Index,
677     cug-Interlock                               CUG-Interlock,
678     intraCUG-Options                          IntraCUG-Options,
679     basicServiceGroupList                     Ext-BasicServiceGroupList    OPTIONAL,
680     extensionContainer                        [0] ExtensionContainer      OPTIONAL,
681     ...}
682
683 CUG-Index ::= INTEGER (0..32767)
684     -- The internal structure is defined in ETS 300 138.
685
686 CUG-Interlock ::= OCTET STRING (SIZE (4))
687
688 IntraCUG-Options ::= ENUMERATED {
689     noCUG-Restrictions (0),
690     cugIC-CallBarred (1),
691     cugOG-CallBarred (2)}
692
693 maxNumOfCUG INTEGER ::= 10
694
695 CUG-FeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
696                               CUG-Feature
697
698 Ext-BasicServiceGroupList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
699                               Ext-BasicServiceCode
700
701 maxNumOfExt-BasicServiceGroups INTEGER ::= 32
702
703 CUG-Feature ::= SEQUENCE {
704     basicService                               Ext-BasicServiceCode    OPTIONAL,
705     preferentialCUG-Indicator                 CUG-Index OPTIONAL,
706     interCUG-Restrictions                     InterCUG-Restrictions,
707     extensionContainer                         ExtensionContainer      OPTIONAL,
708     ...}
709
710 InterCUG-Restrictions ::= OCTET STRING (SIZE (1))
711
712     -- bits 876543: 000000 (unused)
713     -- Exception handling:
714     -- bits 876543 shall be ignored if received and not understood
715
716     -- bits 21
717     -- 00 CUG only facilities
718     -- 01 CUG with outgoing access
719     -- 10 CUG with incoming access
720     -- 11 CUG with both outgoing and incoming access
721
722 Ext-SS-Data ::= SEQUENCE {
723     ss-Code                               SS-Code,
724     ss-Status [4] Ext-SS-Status,
725     ss-SubscriptionOption                 SS-SubscriptionOption    OPTIONAL,
726     basicServiceGroupList                 Ext-BasicServiceGroupList OPTIONAL,
727     extensionContainer                     [5] ExtensionContainer    OPTIONAL,
728     ...}
729
730 LCS-PrivacyExceptionList ::= SEQUENCE SIZE (1..maxNumOfPrivacyClass) OF
731                               LCS-PrivacyClass
732
733 maxNumOfPrivacyClass INTEGER ::= 4

```

```

734
735 LCS-PrivacyClass ::= SEQUENCE {
736     ss-Code                SS-Code,
737     ss-Status              Ext-SS-Status,
738     externalClientList    [0] ExternalClientList OPTIONAL,
739     -- externalClientList is expected only for SS-code = callunrelated
740     plmnClientList        [1] PLMNClientList OPTIONAL,
741     -- plmnClientList is expected only for SS-code - plmn
742     extensionContainer    [2] ExtensionContainer OPTIONAL,
743     ...}
744
745 ExternalClientList ::= SEQUENCE SIZE (1..maxNumOfExternalClient) OF
746     ExternalClient
747
748 maxNumOfExternalClient INTEGER ::= 5
749
750 PLMNClientList ::= SEQUENCE SIZE (1..maxNumOfPLMNClient) OF
751     LCSCClientInternalID
752
753 maxNumOfPLMNClient INTEGER ::= 5
754
755 ExternalClient ::= SEQUENCE {
756     clientIdentity          LCSCClientExternalID,
757     gmlc-Restriction       [0] GMLC-Restriction OPTIONAL,
758     extensionContainer     [1] ExtensionContainer OPTIONAL,
759     ...}
760
761 GMLC-Restriction ::= ENUMERATED {
762     hplmn                   (0),
763     home-Country           (1)}
764
765 ZoneCodeList ::= SEQUENCE SIZE (1..maxNumOfZoneCodes)
766     OF ZoneCode
767
768 ZoneCode ::= OCTET STRING (SIZE (2))
769     -- internal structure is defined in TS GSM 03.03
770
771 maxNumOfZoneCodes INTEGER ::= 10
772
773 InsertSubscriberDataRes ::= SEQUENCE {
774     teleserviceList        [1] TeleserviceList OPTIONAL,
775     bearerServiceList     [2] BearerServiceList OPTIONAL,
776     ss-List                [3] SS-List OPTIONAL,
777     odb-GeneralData       [4] ODB-GeneralData OPTIONAL,
778     regionalSubscriptionResponse [5]
779         RegionalSubscriptionResponse OPTIONAL,
780     supportedCamelPhases  [6] SupportedCamelPhases OPTIONAL,
781     extensionContainer    [7] ExtensionContainer OPTIONAL,
782     ...}
783
784 RegionalSubscriptionResponse ::= ENUMERATED {
785     networkNode-AreaRestricted (0),
786     tooManyZoneCodes          (1),
787     zoneCodesConflict         (2),
788     regionalSubscNotSupported (3)}
789
790 DeleteSubscriberDataArg ::= SEQUENCE {
791     imsi                   [0] IMSI,
792     basicServiceList      [1] BasicServiceList OPTIONAL,
793     -- The exception handling for reception of unsupported/not allocated
794     -- basicServiceCodes is defined in section 6.8.2
795     ss-List                [2] SS-List OPTIONAL,
796     roamingRestrictionDueToUnsupportedFeature [4] NULL OPTIONAL,
797     regionalSubscriptionIdentifier [5] ZoneCode OPTIONAL,
798     vbsGroupIndication     [7] NULL OPTIONAL,
799     vgcsGroupIndication    [8] NULL OPTIONAL,
800     camelSubscriptionInfoWithdraw [9] NULL OPTIONAL,
801     extensionContainer     [6] ExtensionContainer OPTIONAL,
802     ...,
803     gprsSubscriptionDataWithdraw [10] GPRSSubscriptionDataWithdraw OPTIONAL,
804     roamingRestrictedInSgsnDueToUnsupportedFeature [11] NULL OPTIONAL,
805     lsaInformationWithdraw [12] LSAInformationWithdraw OPTIONAL,
806     istInformationWithdraw [13] NULL OPTIONAL}
807

```

```

808 GPRSSubscriptionDataWithdraw ::= CHOICE {
809     allGPRSData                NULL,
810     contextIdList              ContextIdList}
811
812 ContextIdList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
813     ContextId
814
815 LSAInformationWithdraw ::= CHOICE {
816     allLSAData                NULL,
817     lsaIdentityList           LSAIdentityList }
818
819 LSAIdentityList ::= SEQUENCE SIZE (1..maxNumOfLSAs) OF
820     LSAIdentity
821
822 BasicServiceList ::= SEQUENCE SIZE (1..maxNumOfBasicServices) OF
823     Ext-BasicServiceCode
824
825 maxNumOfBasicServices INTEGER ::= 70
826
827 DeleteSubscriberDataRes ::= SEQUENCE {
828     regionalSubscriptionResponse [0]
829     RegionalSubscriptionResponse OPTIONAL,
830     extensionContainer           ExtensionContainer OPTIONAL,
831     ...}
832
833 VlrCamelSubscriptionInfo ::= SEQUENCE {
834     o-CSI                        [0] O-CSI                OPTIONAL,
835     extensionContainer           [1] ExtensionContainer    OPTIONAL,
836     ...,
837     ss-CSI                       [2] SS-CSI                OPTIONAL,
838     o-BcsmCamelTDP-CriteriaList [4] O-BcsmCamelTDPCriteriaList OPTIONAL,
839     tif-CSI                       [3] NULL                OPTIONAL,
840     m-CSI                         [5] M-CSI                OPTIONAL,
841     sms-CSI                       [6] SMS-CSI                OPTIONAL,
842     vt-CSI                        [7] T-CSI                OPTIONAL,
843     t-BCSM-CAMEL-TDP-CriteriaList [8] T-BCSM-CAMEL-TDP-CriteriaList OPTIONAL,
844     d-CSI                         [9] D-CSI                OPTIONAL
845 }
846
847 D-CSI ::= SEQUENCE {
848     dp-AnalysedInfoCriteriaList DP-AnalysedInfoCriteriaList,
849     camelCapabilityHandling     CamelCapabilityHandling,
850     extensionContainer           ExtensionContainer          OPTIONAL,
851     ...}
852
853 DP-AnalysedInfoCriteriaList ::= SEQUENCE SIZE (1..maxNumOfDP-AnalysedInfoCriteria) OF
854     DP-AnalysedInfoCriterium
855
856 maxNumOfDP-AnalysedInfoCriteria INTEGER ::= 10
857
858 DP-AnalysedInfoCriterium ::= SEQUENCE {
859     dialledNumber               ISDN-AddressString,
860     serviceKey                  ServiceKey,
861     gsmSCF-Address              ISDN-AddressString,
862     defaultCallHandling         DefaultCallHandling,
863     extensionContainer           ExtensionContainer          OPTIONAL,
864     ...}
865
866 SS-CSI ::= SEQUENCE {
867     ss-CamelData                SS-CamelData,
868     extensionContainer           ExtensionContainer          OPTIONAL,
869     ...,
870     notificationToCSE           [0] NULL                OPTIONAL,
871     csiActive                   [1] NULL                OPTIONAL
872 }
873 -- notificationToCSE and csiActive shall not be present when SS-CSI is sent to VLR.
874 -- They may only be included in ATSI/ATM Ack message.
875
876 SS-CamelData ::= SEQUENCE {
877     ss-EventList                SS-EventList,
878     gsmSCF-Address              ISDN-AddressString,
879     extensionContainer           [0] ExtensionContainer    OPTIONAL,
880     ...
881 }
882

```

```

883 SS-EventList ::= SEQUENCE SIZE (1..maxNumOfCamelSSEvents) OF SS-Code
884 -- Actions for the following SS-Code values are defined in CAMEL Phase 3:
885 -- ect SS-Code ::= '00110001'B
886 -- multiPTY SS-Code ::= '01010001'B
887 -- cd SS-Code ::= '00100100'B
888 -- ccbs SS-Code ::= '01000100'B
889 -- all other SS codes shall be ignored
890
891 maxNumOfCamelSSEvents INTEGER ::= 10
892
893 O-CSI ::= SEQUENCE {
894 o-BcsmCamelTDPDataList O-BcsmCamelTDPDataList,
895 extensionContainer ExtensionContainer OPTIONAL,
896 ...,
897 camelCapabilityHandling [0] CamelCapabilityHandling OPTIONAL,
898 notificationToCSE [1] NULL OPTIONAL,
899 csiActive [2] NULL OPTIONAL
900 }
901 -- notificationToCSE and csiActive shall not be present when O-CSI is sent to VLR/GMSC.
902 -- They may only be included in ATSI/ATM Ack message.
903
904 O-BcsmCamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
905 O-BcsmCamelTDPData
906 -- O-BcsmCamelTDPDataList shall not contain more than one instance of
907 -- O-BcsmCamelTDPData containing the same value for o-BcsmTriggerDetectionPoint.
908 -- For CAMEL Phase 2, this means that only one instance of O-BcsmCamelTDPData is allowed
909 -- with o-BcsmTriggerDetectionPoint being equal to DP2.
910
911 maxNumOfCamelTDPData INTEGER ::= 10
912
913 O-BcsmCamelTDPData ::= SEQUENCE {
914 o-BcsmTriggerDetectionPoint O-BcsmTriggerDetectionPoint,
915 serviceKey ServiceKey,
916 gsmSCF-Address [0] ISDN-AddressString,
917 defaultCallHandling [1] DefaultCallHandling,
918 extensionContainer [2] ExtensionContainer OPTIONAL,
919 ...
920 }
921
922 ServiceKey ::= INTEGER (0..2147483647)
923
924 O-BcsmTriggerDetectionPoint ::= ENUMERATED {
925 collectedInfo (2),
926 ...,
927 routeSelectFailure (4) }
928 -- exception handling:
929 -- For O-BcsmCamelTDPData sequences containing this parameter with any
930 -- other value than the ones listed the receiver shall ignore the whole
931 -- O-BcsmCamelTDPData sequence.
932 -- For O-BcsmCamelTDP-Criteria sequences containing this parameter with any
933 -- other value than the ones listed the receiver shall ignore the whole
934 -- O-BcsmCamelTDP-Criteria sequence.
935
936 O-BcsmCamelTDPCriteriaList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
937 O-BcsmCamelTDP-Criteria
938
939 T-BCSM-CAMEL-TDP-CriteriaList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
940 T-BCSM-CAMEL-TDP-Criteria
941
942 O-BcsmCamelTDP-Criteria ::= SEQUENCE {
943 o-BcsmTriggerDetectionPoint O-BcsmTriggerDetectionPoint,
944 destinationNumberCriteria [0] DestinationNumberCriteria OPTIONAL,
945 basicServiceCriteria [1] BasicServiceCriteria OPTIONAL,
946 callTypeCriteria [2] CallTypeCriteria OPTIONAL,
947 ...,
948 o-CauseValueCriteria [3] O-CauseValueCriteria OPTIONAL,
949 extensionContainer [4] ExtensionContainer OPTIONAL }
950
951 T-BCSM-CAMEL-TDP-Criteria ::= SEQUENCE {
952 t-BCSM-TriggerDetectionPoint T-BcsmTriggerDetectionPoint,
953 basicServiceCriteria [0] BasicServiceCriteria OPTIONAL,
954 t-CauseValueCriteria [1] T-CauseValueCriteria OPTIONAL,
955 ... }
956

```

```

957 DestinationNumberCriteria ::= SEQUENCE {
958     matchType                [0] MatchType,
959     destinationNumberList     [1] DestinationNumberList     OPTIONAL,
960     destinationNumberLengthList [2] DestinationNumberLengthList OPTIONAL,
961     -- one or both of destinationNumberList and destinationNumberLengthList
962     -- shall be present
963     ... }
964
965 DestinationNumberList ::= SEQUENCE SIZE (1..maxNumOfCamelDestinationNumbers) OF
966     ISDN-AddressString
967 -- The receiving entity shall not check the format of a number in
968 -- the dialled number list
969
970 DestinationNumberLengthList ::= SEQUENCE SIZE (1..maxNumOfCamelDestinationNumberLengths) OF
971     INTEGER(1..maxNumOfISDN-AddressDigits)
972
973 BasicServiceCriteria ::= SEQUENCE SIZE(1..maxNumOfCamelBasicServiceCriteria) OF
974     Ext-BasicServiceCode
975
976 maxNumOfISDN-AddressDigits INTEGER ::= 15
977
978 maxNumOfCamelDestinationNumbers INTEGER ::= 10
979
980 maxNumOfCamelDestinationNumberLengths INTEGER ::= 3
981
982 maxNumOfCamelBasicServiceCriteria INTEGER ::= 5
983
984 CallTypeCriteria ::= ENUMERATED {
985     forwarded                (0),
986     notForwarded             (1)}
987
988 MatchType ::= ENUMERATED {
989     inhibiting                (0),
990     enabling                  (1)}
991
992 O-CauseValueCriteria ::= SEQUENCE SIZE(1..maxNumOfCAMEL-O-CauseValueCriteria) OF
993     CauseValue
994
995 T-CauseValueCriteria ::= SEQUENCE SIZE(1..maxNumOfCAMEL-T-CauseValueCriteria) OF
996     CauseValue
997
998 maxNumOfCAMEL-O-CauseValueCriteria INTEGER ::= 5
999
1000 maxNumOfCAMEL-T-CauseValueCriteria INTEGER ::= 5
1001
1002 CauseValue ::= OCTET STRING (SIZE(1))
1003 -- Type extracted from Cause parameter in ITU-T Recommendation Q.763.
1004 -- For the use of cause value refer to ITU-T Recommendation Q.850.
1005
1006 DefaultCallHandling ::= ENUMERATED {
1007     continueCall (0) ,
1008     releaseCall (1) ,
1009     ...}
1010 -- exception handling:
1011 -- reception of values in range 2-31 shall be treated as "continueCall"
1012 -- reception of values greater than 31 shall be treated as "releaseCall"
1013
1014 CamelCapabilityHandling ::= INTEGER(1..16)
1015 -- value 1 = CAMEL phase 1,
1016 -- value 2 = CAMEL phase 2,
1017 -- value 3 = CAMEL Phase 3:
1018 -- reception of values greater than 3 shall be treated as CAMEL phase 3.
1019
1020 SupportedCamelPhases ::= BIT STRING {
1021     phase1 (0),
1022     phase2 (1),
1023     phase3 (2) } (SIZE (1..16))
1024 -- A node shall mark in the BIT STRING all CAMEL Phases it supports.
1025 -- Other values than listed above shall be discarded.
1026

```

```

1027 SMS-CSI ::= SEQUENCE {
1028     sms-CAMEL-TDP-DataList          [0] SMS-CAMEL-TDP-DataList,
1029     camelCapabilityHandling         [1] CamelCapabilityHandling
1030     extensionContainer               [2] ExtensionContainer           OPTIONAL,
1031     notificationToCSE               [3] NULL                       OPTIONAL,
1032     csiActive                       [4] NULL                       OPTIONAL, ...}
1033 -- notificationToCSE and csiActive shall not be present when SMS-CSI is sent to VLR/SGSN.
1034 -- They may only be included in ATSI/ATM Ack message.
1035
1036 SMS-CAMEL-TDP-DataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
1037     SMS-CAMEL-TDP-Data
1038 -- SMS-CAMEL-TDP-DataList shall not contain more than one instance of
1039 -- SMS-CAMEL-TDP-Data containing the same value for sms-TriggerDetectionPoint.
1040
1041 SMS-CAMEL-TDP-Data ::= SEQUENCE {
1042     sms-TriggerDetectionPoint       [0] SMS-TriggerDetectionPoint,
1043     serviceKey                      [1] ServiceKey,
1044     gsmSCF-Address                 [2] ISDN-AddressString,
1045     defaultSMS-Handling            [3] DefaultSMS-Handling,
1046     extensionContainer              [4] ExtensionContainer           OPTIONAL,
1047     ...
1048 }
1049
1050 SMS-TriggerDetectionPoint ::= ENUMERATED {
1051     sms-CollectedInfo (1),
1052     ... }
1053 -- exception handling:
1054 -- For SMS-CAMEL-TDP-Data sequences containing this parameter with any
1055 -- other value than the ones listed the receiver shall ignore the whole
1056 -- SMS-CAMEL-TDP-Data sequence.
1057
1058 DefaultSMS-Handling ::= ENUMERATED {
1059     continueTransaction (0) ,
1060     releaseTransaction (1) ,
1061     ...}
1062 -- exception handling:
1063 -- reception of values in range 2-31 shall be treated as "continueTransaction"
1064 -- reception of values greater than 31 shall be treated as "releaseTransaction"
1065
1066 M-CSI ::= SEQUENCE {
1067     mobilityTriggers                MobilityTriggers,
1068     serviceKey                      ServiceKey,
1069     gsmSCF-Address                 [0] ISDN-AddressString,
1070     extensionContainer              [1] ExtensionContainer           OPTIONAL,
1071     notificationToCSE              [2] NULL                       OPTIONAL,
1072     csiActive                      [3] NULL                       OPTIONAL,
1073     ...}
1074 -- notificationToCSE and csiActive shall not be present when M-CSI is sent to VLR.
1075 -- They may only be included in ATSI/ATM Ack message.
1076
1077
1078 MobilityTriggers ::= SEQUENCE SIZE (1..maxNumOfMobilityTriggers) OF MM-Code
1079
1080 maxNumOfMobilityTriggers INTEGER ::= 10
1081
1082 MM-Code ::= OCTET STRING (SIZE (1))
1083 -- This type is used to indicate a Mobility Management event.
1084 -- Actions for the following M-Code values are defined in CAMEL Phase 3:
1085 --
1086 -- Location-update-in-same-VLR          MM-Code ::= '00000000'B
1087 -- Location-update-to-other-VLR        MM-Code ::= '00000001'B
1088 -- IMSI-Attach                          MM-Code ::= '00000010'B
1089 -- MS-initiated-IMSI-Detach             MM-Code ::= '00000011'B
1090 -- Network-initiated-IMSI-Detach        MM-Code ::= '00000100'B
1091 --
1092 -- If any other MM-code is received in M-CSI, then that MM-code shall be
1093 -- ignored.
1094
1095
1096 -- gprs location information retrieval types
1097
1098 SendRoutingInfoForGprsArg ::= SEQUENCE {
1099     imsi                            [0] IMSI,
1100     ggsn-Address                    [1] GSN-Address           OPTIONAL,
1101     extensionContainer              [2] ExtensionContainer           OPTIONAL,
1102     ...}
1103

```

```

1104 SendRoutingInfoForGprsRes ::= SEQUENCE {
1105     sgsn-Address          [0] GSN-Address,
1106     ggsn-Address          [1] GSN-Address          OPTIONAL,
1107     mobileNotReachableReason [2] AbsentSubscriberDiagnosticSM OPTIONAL,
1108     extensionContainer    [3] ExtensionContainer    OPTIONAL,
1109     ...}
1110
1111 -- failure report types
1112
1113 FailureReportArg ::= SEQUENCE {
1114     imsi                  [0] IMSI,
1115     ggsn-Number           [1] ISDN-AddressString    ,
1116     ggsn-Address          [2] GSN-Address          OPTIONAL,
1117     extensionContainer    [3] ExtensionContainer    OPTIONAL,
1118     ...}
1119
1120 FailureReportRes ::= SEQUENCE {
1121     ggsn-Address          [0] GSN-Address          OPTIONAL,
1122     extensionContainer    [1] ExtensionContainer    OPTIONAL,
1123     ...}
1124
1125 -- gprs notification types
1126
1127 NoteMsPresentForGprsArg ::= SEQUENCE {
1128     imsi                  [0] IMSI,
1129     sgsn-Address          [1] GSN-Address,
1130     ggsn-Address          [2] GSN-Address          OPTIONAL,
1131     extensionContainer    [3] ExtensionContainer    OPTIONAL,
1132     ...}
1133
1134 NoteMsPresentForGprsRes ::= SEQUENCE {
1135     extensionContainer    [0] ExtensionContainer    OPTIONAL,
1136     ...}
1137
1138
1139 -- fault recovery types
1140
1141 ResetArg ::= SEQUENCE {
1142     hlr-Number            ISDN-AddressString,
1143     hlr-List              HLR-List              OPTIONAL,
1144     ...}
1145
1146 RestoreDataArg ::= SEQUENCE {
1147     imsi                  IMSI,
1148     lmsi                  LMSI                  OPTIONAL,
1149     extensionContainer    ExtensionContainer    OPTIONAL,
1150     ... ,
1151     vlr-Capability        [6] VLR-Capability    OPTIONAL }
1152
1153 RestoreDataRes ::= SEQUENCE {
1154     hlr-Number            ISDN-AddressString,
1155     msNotReachable        NULL                  OPTIONAL,
1156     extensionContainer    ExtensionContainer    OPTIONAL,
1157     ...}
1158
1159 -- VBS/VGCS types
1160 VBSDataList ::= SEQUENCE SIZE (1..maxNumOfVBSGroupIds) OF
1161     VoiceBroadcastData
1162
1163 VGCSDataList ::= SEQUENCE SIZE (1..maxNumOfVGCSGroupIds) OF
1164     VoiceGroupCallData
1165
1166 maxNumOfVBSGroupIds INTEGER ::= 50
1167
1168 maxNumOfVGCSGroupIds INTEGER ::= 50
1169
1170 VoiceGroupCallData ::= SEQUENCE {
1171     groupId                GroupId,
1172     extensionContainer      ExtensionContainer    OPTIONAL,
1173     ...}
1174
1175 VoiceBroadcastData ::= SEQUENCE {
1176     groupid                GroupId,
1177     broadcastInitEntitlement NULL                  OPTIONAL,
1178     extensionContainer      ExtensionContainer    OPTIONAL,
1179     ...}
1180

```

```

1181 GroupId ::= OCTET STRING (SIZE (3))
1182 -- Refers to the Group Identification as specified in GSM TS 03.03
1183 -- and 03.68/ 03.69
1184
1185 -- provide subscriber info types
1186
1187 ProvideSubscriberInfoArg ::= SEQUENCE {
1188     imsi      [0] IMSI,
1189     lmsi      [1] LMSI                OPTIONAL,
1190     requestedInfo [2] RequestedInfo,
1191     extensionContainer [3] ExtensionContainer    OPTIONAL,
1192     ...}
1193
1194 ProvideSubscriberInfoRes ::= SEQUENCE {
1195     subscriberInfo      SubscriberInfo,
1196     extensionContainer  ExtensionContainer    OPTIONAL,
1197     ...}
1198
1199 SubscriberInfo ::= SEQUENCE {
1200     locationInformation [0] LocationInformation    OPTIONAL,
1201     subscriberState    [1] SubscriberState      OPTIONAL,
1202     extensionContainer [2] ExtensionContainer    OPTIONAL,
1203     ...}
1204
1205 RequestedInfo ::= SEQUENCE {
1206     locationInformation [0] NULL                OPTIONAL,
1207     subscriberState    [1] NULL                OPTIONAL,
1208     extensionContainer [2] ExtensionContainer    OPTIONAL,
1209     ...}
1210
1211 LocationInformation ::= SEQUENCE {
1212     ageOfLocationInformation AgeOfLocationInformation    OPTIONAL,
1213     geographicalInformation  [0] GeographicalInformation OPTIONAL,
1214     vlr-number              [1] ISDN-AddressString    OPTIONAL,
1215     locationNumber          [2] LocationNumber        OPTIONAL,
1216     cellIdOrLAI             [3] CellIdOrLAI          OPTIONAL,
1217     extensionContainer      [4] ExtensionContainer    OPTIONAL,
1218     ...,
1219     selectedLSA-Id          [5] LSAIdentity          OPTIONAL,
1220     msc-Number              [6] ISDN-AddressString    OPTIONAL,
1221     geodeticInformation     [7] GeodeticInformation   OPTIONAL }
1222
1223 GeographicalInformation ::= OCTET STRING (SIZE (8))
1224 -- Refers to geographical Information defined in GSM 03.32.
1225 -- Only the description of an ellipsoid point with uncertainty circle
1226 -- as specified in GSM 03.32 is allowed to be used
1227 -- The internal structure according to GSM 03.32 is as follows:
1228 --     Type of shape (ellipsoid point with uncertainty circle)      1 octet
1229 --     Degrees of Latitude                                          3 octets
1230 --     Degrees of Longitude                                        3 octets
1231 --     Uncertainty code                                           1 octet
1232
1233 GeodeticInformation ::= OCTET STRING (SIZE (10))
1234 -- Refers to Calling Geodetic Location defined in Q.763 (1999).
1235 -- Only the description of an ellipsoid point with uncertainty circle
1236 -- as specified in Q.763 (1999) is allowed to be used
1237 -- The internal structure according to Q.763 (1999) is as follows:
1238 --     Screening and presentation indicators                        1 octet
1239 --     Type of shape (ellipsoid point with uncertainty circle)    1 octet
1240 --     Degrees of Latitude                                        3 octets
1241 --     Degrees of Longitude                                    3 octets
1242 --     Uncertainty code                                         1 octet
1243 --     Confidence                                               1 octet
1244
1245 LocationNumber ::= OCTET STRING (SIZE (2..10))
1246 -- the internal structure is defined in CCITT Rec Q.763
1247
1248 SubscriberState ::= CHOICE {
1249     assumedIdle [0] NULL,
1250     camelBusy [1] NULL,
1251     netDetNotReachable NotReachableReason,
1252     notProvidedFromVLR [2] NULL}

```

```

1243 NotReachableReason ::= ENUMERATED {
1244     msPurged (0),
1245     imsiDetached (1),
1246     restrictedArea (2),
1247     notRegistered (3)}
1248
1249 -- any time interrogation info types
1250
1251 AnyTimeInterrogationArg ::= SEQUENCE {
1252     subscriberIdentity          [0] SubscriberIdentity,
1253     requestedInfo                [1] RequestedInfo,
1254     gsmSCF-Address              [3] ISDN-AddressString,
1255     extensionContainer          [2] ExtensionContainer          OPTIONAL,
1256     ...}
1257
1258 AnyTimeInterrogationRes ::= SEQUENCE {
1259     subscriberInfo              SubscriberInfo,
1260     extensionContainer          ExtensionContainer              OPTIONAL,
1261     ...}
1262
1263 -- any time information handling types
1264
1265 AnyTimeSubscriptionInterrogationArg ::= SEQUENCE {
1266     subscriberIdentity          [0] SubscriberIdentity,
1267     requestedSubscriptionInfo    [1] RequestedSubscriptionInfo,
1268     gsmSCF-Address              [2] ISDN-AddressString,
1269     extensionContainer          [3] ExtensionContainer          OPTIONAL,
1270     ...}
1271
1272 AnyTimeSubscriptionInterrogationRes ::= SEQUENCE {
1273     callForwardingData          [1] CallForwardingData          OPTIONAL,
1274     callBarringData            [2] CallBarringData            OPTIONAL,
1275     odb-Info                   [3] ODB-Info                   OPTIONAL,
1276     camel-SubscriptionInfo      [4] CAMEL-SubscriptionInfo      OPTIONAL,
1277     supportedVLR-CAMEL-Phases   [5] SupportedCamelPhases      OPTIONAL,
1278     supportedSGSN-CAMEL-Phases [6] SupportedCamelPhases      OPTIONAL,
1279     extensionContainer          [7] ExtensionContainer          OPTIONAL,
1280     ...}
1281
1282 RequestedSubscriptionInfo ::= SEQUENCE {
1283     requestedSS-Info            [1] SS-ForBS-Code              OPTIONAL,
1284     odb                         [2] NULL                      OPTIONAL,
1285     requestedCAMEL-SubscriptionInfo [3] RequestedCAMEL-SubscriptionInfo OPTIONAL,
1286     supportedVLR-CAMEL-Phases   [4] NULL                      OPTIONAL,
1287     supportedSGSN-CAMEL-Phases [5] NULL                      OPTIONAL,
1288     extensionContainer          [6] ExtensionContainer          OPTIONAL,
1289     ...}
1290
1291 RequestedCAMEL-SubscriptionInfo ::= ENUMERATED {
1292     o-CSI                       (0),
1293     t-CSI                       (1),
1294     vt-CSI                      (2),
1295     tif-CSI                     (3),
1296     gprs-CSI                    (4),
1297     sms-CSI                    (5),
1298     ss-CSI                     (6),
1299     m-CSI                      (7),
1300     d-csi                      (8)}
1301
1302 CallForwardingData ::= SEQUENCE {
1303     forwardingFeatureList       Ext-ForwFeatureList,
1304     notificationToCSE          NULL                      OPTIONAL,
1305     extensionContainer          [0] ExtensionContainer          OPTIONAL,
1306     ...}
1307
1308 CallBarringData ::= SEQUENCE {
1309     callBarringFeatureList      Ext-CallBarFeatureList,
1310     password                   Password,
1311     wrongPasswordAttemptsCounter WrongPassworAttemptsCounter,
1312     notificationToCSE          NULL                      OPTIONAL,
1313     extensionContainer          ExtensionContainer              OPTIONAL,
1314     ...}
1315
1316 WrongPasswordAttemptsCounter ::= INTEGER (0..4)
1317

```

```

1318 ODB-Info ::= SEQUENCE {
1319     odb-Data          ODB-Data,
1320     notificationToCSE NULL                OPTIONAL,
1321     extensionContainer ExtensionContainer  OPTIONAL,
1322     ...}
1323
1324 CAMEL-SubscriptionInfo ::= SEQUENCE {
1325     o-CSI              [0] O-CSI                OPTIONAL,
1326     o-BcsmCamelTDP-CriteriaList [1] O-BcsmCamelTDPCriteriaList  OPTIONAL,
1327     t-CSI              [2] T-CSI                OPTIONAL,
1328     t-BCSM-CAMEL-TDP-CriteriaList [3] T-BCSM-CAMEL-TDP-CriteriaList  OPTIONAL,
1329     vt-CSI             [4] T-CSI                OPTIONAL,
1330     vt-BCSM-CAMEL-TDP-CriteriaList [5] T-BCSM-CAMEL-TDP-CriteriaList  OPTIONAL,
1331     tif-CSI            [6] NULL                OPTIONAL,
1332     tif-CSI-NotificationToCSE [7] NULL                OPTIONAL,
1333     gprs-CSI           [8] GPRS-CSI            OPTIONAL,
1334     sms-CSI            [9] SMS-CSI            OPTIONAL,
1335     ss-CSI             [10] SS-CSI            OPTIONAL,
1336     m-CSI              [11] M-CSI            OPTIONAL,
1337     extensionContainer [12] ExtensionContainer  OPTIONAL,
1338     ...}
1339
1340 AnyTimeModificationArg ::= SEQUENCE {
1341     subscriberIdentity [0] SubscriberIdentity,
1342     gsmSCF-Address     [1] ISDN-AddressString,
1343     modificationRequestFor-SS-Info [2] ModificationRequestFor-SS-Info OPTIONAL,
1344     modificationRequestFor-CSI [3] ModificationRequestFor-CSI  OPTIONAL,
1345     extensionContainer [4] ExtensionContainer  OPTIONAL,
1346     ...}
1347
1348 AnyTimeModificationRes ::= SEQUENCE {
1349     ss-InfoFor-CSE [0] Ext-SS-InfoFor-CSE  OPTIONAL,
1350     camel-SubscriptionInfo [1] CAMEL-SubscriptionInfo  OPTIONAL,
1351     extensionContainer [2] ExtensionContainer  OPTIONAL,
1352     ...}
1353
1354 ModificationRequestFor-SS-Info ::= SEQUENCE {
1355     ss-Code [0] SS-Code,
1356     basicService [1] Ext-BasicServiceCode  OPTIONAL,
1357     ss-Status [2] Ext-SS-Status  OPTIONAL,
1358     forwardedToNumber [3] AddressString  OPTIONAL,
1359     forwardedToSubaddress [4] ISDN-SubaddressString  OPTIONAL,
1360     noReplyConditionTime [5] Ext-NoReplyConditionTime  OPTIONAL,
1361     modifyNotificationToCSE [6] ModificationInstruction  OPTIONAL,
1362     extensionContainer [7] ExtensionContainer  OPTIONAL,
1363     ...}
1364
1365 ModificationRequestFor-CSI ::= SEQUENCE {
1366     requestedCamelSubscriptionInfo [0] RequestedCamelSubscriptionInfo  OPTIONAL,
1367     modifyNotificationToCSE [1] ModificationInstruction  OPTIONAL,
1368     modifyCSI-State [2] ModificationInstruction  OPTIONAL,
1369     extensionContainer [3] ExtensionContainer  OPTIONAL,
1370     ...}
1371
1372 ModificationInstruction ::= ENUMERATED {
1373     Deactivate (0),
1374     Activate (1)}
1375
1376 -- subscriber data modification notification types
1377
1378 NoteSubscriberDataModifiedArg ::= SEQUENCE {
1379     imsi IMSI,
1380     msisdn ISDN-AddressString,
1381     typeOfModification TypeOfModification,
1382     extensionContainer ExtensionContainer  OPTIONAL,
1383     ...}
1384
1385 NoteSubscriberDataModifiedRes ::= SEQUENCE {
1386     extensionContainer ExtensionContainer  OPTIONAL,
1387     ...}
1388

```

```

1389 TypeOfModification ::= ENUMERATED {
1390     callForwardingSS-Data           (0),
1391     callBarringSS-Data             (1),
1392     operatorDeterminedBarringData  (2),
1393     camelSubscriptionInformation    (3),
1394     ...}
1395 -- exception handling:
1396 -- reception of other values shall be treated as unexpected data
1397
1398
1399 -- mobility management event notificatioon info types
1400
1401 NoteMM-EventArg::= SEQUENCE {
1402     serviceKey           ServiceKey,
1403     eventMet             [0] MM-Code,
1404     imsi                 [1] IMSI,
1405     msisdN               [2] ISDN-AddressString,
1406     locationInformation [3] LocationInformation OPTIONAL,
1407     lsaIdentity          [4] LSAIdentity        OPTIONAL,
1408     supportedCAMELPhases [5] SupportedCamelPhases OPTIONAL,
1409     extensionContainer   [6] ExtensionContainer OPTIONAL,
1410     ...}
1411
1412 NoteMM-EventRes ::= SEQUENCE {
1413     extensionContainer ExtensionContainer OPTIONAL,
1414     ...}
1415
1416 Ext-SS-InfoFor-CSE ::= CHOICE {
1417     forwardingInfoFor-CSE [0] Ext-ForwardingInfoFor-CSE,
1418     callBarringInfoFor-CSE [1] Ext-CallBarringInfoFor-CSE
1419 }
1420
1421 Ext-ForwardingInfoFor-CSE ::= SEQUENCE {
1422     ss-Code [0] SS-Code,
1423     forwardingFeatureList [1] Ext-ForwFeatureList,
1424     notificationToCSE [2] NULL,
1425     extensionContainer [3] ExtensionContainer OPTIONAL,
1426     ...}
1427
1428 Ext-CallBarringInfoFor-CSE ::= SEQUENCE {
1429     ss-Code [0] SS-Code,
1430     callBarringFeatureList [1] Ext-CallBarFeatureList,
1431     password [2] Password,
1432     wrongPasswordAttemptCounter [3] WrongPasswordAttemptCounter,
1433     notificationToCSE [4] NULL,
1434     extensionContainer [5] ExtensionContainer, OPTIONAL
1435     ...}
1436
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```

END

17.7.2 Operation and maintenance data types

```

1 MAP-OM-DataTypes {
2     ccitt identified-organization (4) etsi (0) mobileDomain (0)
3     gsm-Network (1) modules (3) map-OM-DataTypes (12) version6 (6)}
4
5 DEFINITIONS
6
7 IMPLICIT TAGS
8
9 ::=
10
11 BEGIN
12
13 EXPORTS
14     ActivateTraceModeArg,
15     ActivateTraceModeRes,
16     DeactivateTraceModeArg,
17     DeactivateTraceModeRes
18 ;
19
20 IMPORTS
21     AddressString,
22     IMSI
23 FROM MAP-CommonDataTypes {
24     ccitt identified-organization (4) etsi (0) mobileDomain (0)
25     gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}

```

```

26
27     ExtensionContainer
28 FROM MAP-ExtensionDataTypes {
29     ccitt identified-organization (4) etsi (0) mobileDomain (0)
30     gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
31
32
33 ;
34
35
36 ActivateTraceModeArg ::= SEQUENCE {
37     imsi                               [0] IMSI                               OPTIONAL,
38     traceReference                     [1] TraceReference,
39     traceType [2] TraceType,
40     omc-Id                             [3] AddressString                   OPTIONAL,
41     extensionContainer                 [4] ExtensionContainer                OPTIONAL,
42     ...}
43
44 TraceReference ::= OCTET STRING (SIZE (1..2))
45
46 TraceType ::= INTEGER
47     (0..255)
48     -- Trace types are fully defined in TS GSM 12.08.
49
50 ActivateTraceModeRes ::= SEQUENCE {
51     extensionContainer                 [0] ExtensionContainer                OPTIONAL,
52     ...}
53
54 DeactivateTraceModeArg ::= SEQUENCE {
55     imsi                               [0] IMSI                               OPTIONAL,
56     traceReference                     [1] TraceReference,
57     extensionContainer                 [2] ExtensionContainer                OPTIONAL,
58     ...}
59
60 DeactivateTraceModeRes ::= SEQUENCE {
61     extensionContainer                 [0] ExtensionContainer                OPTIONAL,
62     ...}
63
64 END

```

17.7.3 Call handling data types

```

1 MAP-CH-DataTypes {
2     ccitt identified-organization (4) etsi (0) mobileDomain (0)
3     gsm-Network (1) modules (3) map-CH-DataTypes (13) version6 (6)}
4
5 DEFINITIONS
6
7 IMPLICIT TAGS
8
9 ::=
10
11 BEGIN
12
13 EXPORTS
14     SendRoutingInfoArg,
15     SendRoutingInfoRes,
16     ProvideRoamingNumberArg,
17     ProvideRoamingNumberRes,
18     ResumeCallHandlingArg,
19     ResumeCallHandlingRes,
20     NumberOfForwarding,
21     SuppressionOfAnnouncement,
22     CallReferenceNumber,
23     ProvideSIWFSNumberArg,
24     ProvideSIWFSNumberRes,
25     SIWFSSignallingModifyArg,
26     SIWFSSignallingModifyRes,
27     SetReportingStateArg,
28     SetReportingStateRes,
29     StatusReportArg,
30     StatusReportRes,
31     RemoteUserFreeArg,
32     RemoteUserFreeRes,
33     IST-AlertArg,
34     IST-AlertRes,
35     IST-CommandArg,

```

```

36     IST-CommandRes
37     IST-SupportIndicator,
38     IST-AlertTimerValue,
39     T-CSI,
40     T-BcsmTriggerDetectionPoint
41
42 ;
43
44 IMPORTS
45     maxNumOfCamelTDPData,
46     SubscriberInfo,
47     ServiceKey,
48     DefaultCallHandling,
49     SupportedCamelPhases,
50     CamelCapabilityHandling,
51     BasicServiceCriteria,
52     CUG-Interlock,
53     O-CSI,
54     D-CSI,
55     O-BcsmCamelTDPCriteriaList,
56     T-BCSM-CAMEL-TDP-CriteriaList
57
58
59 FROM MAP-MS-DataTypes {
60     ccitt identified-organization (4) etsi (0) mobileDomain (0)
61     gsm-Network (1) modules (3) map-MS-DataTypes (11) version6 (6)}
62
63     ForwardingOptions,
64     SS-List,
65     CCBS-Feature
66 FROM MAP-SS-DataTypes {
67     ccitt identified-organization (4) etsi (0) mobileDomain (0)
68     gsm-Network (1) modules (3) map-SS-DataTypes (14) version6 (6)}
69
70     ISDN-AddressString,
71     ISDN-SubaddressString,
72     ExternalSignalInfo,
73     Ext-ExternalSignalInfo,
74     IMSI,
75     LMSI,
76     Ext-BasicServiceCode,
77     AlertingPattern,
78     NAEA-PreferredCI
79
80
81 FROM MAP-CommonDataTypes {
82     ccitt identified-organization (4) etsi (0) mobileDomain (0)
83     gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}
84
85     ExtensionContainer
86 FROM MAP-ExtensionDataTypes {
87     ccitt identified-organization (4) etsi (0) mobileDomain (0)
88     gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
89 ;
90
91
92 

|                                     |                    |                    |           |
|-------------------------------------|--------------------|--------------------|-----------|
| <b>CUG-CheckInfo</b> ::= SEQUENCE { | cug-Interlock      | CUG-Interlock,     |           |
|                                     | cug-OutgoingAccess | NULL               | OPTIONAL, |
|                                     | extensionContainer | ExtensionContainer | OPTIONAL, |
|                                     | ...                |                    |           |


97
98 

|                                              |
|----------------------------------------------|
| <b>NumberOfForwarding</b> ::= INTEGER (1..5) |
|----------------------------------------------|


99

```

```

100 SendRoutingInfoArg ::= SEQUENCE {
101     msisdn [0] ISDN-AddressString,
102     cug-CheckInfo [1] CUG-CheckInfo OPTIONAL,
103     numberOfForwarding [2] NumberOfForwarding OPTIONAL,
104     interrogationType [3] InterrogationType,
105     or-Interrogation [4] NULL OPTIONAL,
106     or-Capability [5] OR-Phase OPTIONAL,
107     gsmc-Address [6] ISDN-AddressString,
108     callReferenceNumber [7] CallReferenceNumber OPTIONAL,
109     forwardingReason [8] ForwardingReason OPTIONAL,
110     basicServiceGroup [9] Ext-BasicServiceCode OPTIONAL,
111     networkSignalInfo [10] ExternalSignalInfo OPTIONAL,
112     camelInfo [11] CamelInfo OPTIONAL,
113     suppressionOfAnnouncement [12] SuppressionOfAnnouncement OPTIONAL,
114     extensionContainer [13] ExtensionContainer OPTIONAL,
115     ...,
116     alertingPattern [14] AlertingPattern OPTIONAL,
117     ccbs-Call [15] NULL OPTIONAL,
118     supportedCCBS-Phase [16] SupportedCCBS-Phase OPTIONAL,
119     additionalSignalInfo [17] Ext-ExternalSignalInfo OPTIONAL,
120     istSupportIndicator [18] IST-SupportIndicator OPTIONAL,
121     pre-pagingSupported [19] NULL OPTIONAL,
122     callDiversionTreatmentIndicator [20] CallDiversionTreatmentIndicator OPTIONAL
123 }

```

```

125 SuppressionOfAnnouncement ::= NULL

```

```

127 InterrogationType ::= ENUMERATED {
128     basicCall (0),
129     forwarding (1)}

```

```

131 OR-Phase ::= INTEGER (1..127)

```

```

133 CallReferenceNumber ::= OCTET STRING (SIZE (1..8))

```

```

135 ForwardingReason ::= ENUMERATED {
136     notReachable (0),
137     busy (1),
138     noReply (2)}

```

```

140 SupportedCCBS-Phase ::= INTEGER (1..127)
141 -- exception handling:
142 -- Only value 1 is used.
143 -- Values in the ranges 2-127 are reserved for future use.
144 -- If received values 2-127 shall be mapped on to value 1.

```

```

146 CallDiversionTreatmentIndicator ::= OCTET STRING (SIZE(1))
147 -- callDiversionAllowed (xxxx xx01)
148 -- callDiversionNotAllowed (xxxx xx10)
149 -- network default is call diversion allowed

```

```

151 SendRoutingInfoRes ::= [3] SEQUENCE {
152     imsi [9] IMSI OPTIONAL,
153     -- IMSI must be present if SendRoutingInfoRes is not segmented.
154     -- If the TC-Result-NL segmentation option is taken the IMSI must be
155     -- present in one segmented transmission of SendRoutingInfoRes.
156     extendedRoutingInfo ExtendedRoutingInfo OPTIONAL,
157     cug-CheckInfo [3] CUG-CheckInfo OPTIONAL,
158     cugSubscriptionFlag [6] NULL OPTIONAL,
159     subscriberInfo [7] SubscriberInfo OPTIONAL,
160     ss-List [1] SS-List OPTIONAL,
161     basicService [5] Ext-BasicServiceCode OPTIONAL,
162     forwardingInterrogationRequired [4] NULL OPTIONAL,
163     vmsc-Address [2] ISDN-AddressString OPTIONAL,
164     extensionContainer [0] ExtensionContainer OPTIONAL,
165     ...,
166     naea-PreferredCI [10] NAEA-PreferredCI OPTIONAL,
167     -- naea-PreferredCI is included at the discretion of the HLR operator.
168     ccbs-Indicators [11] CCBS-Indicators OPTIONAL,
169     msisdn [12] ISDN-AddressString OPTIONAL,
170     numberPortabilityStatus [13] NumberPortabilityStatus OPTIONAL,
171     istAlertTimer [14] IST-AlertTimerValue OPTIONAL
172 }

```

```

173

```

```

174 NumberPortabilityStatus ::= ENUMERATED {
175     notKnownToBePorted           (0),
176     ownNumberPortedOut           (1),
177     foreignNumberPortedToForeignNetwork (2),
178     ...}
179 -- exception handling:
180 -- reception of other values than the ones listed the receiver shall ignore the
181 -- whole NumberPortabilityStatus
182
183 CCBS-Indicators ::= SEQUENCE {
184     ccbs-Possible                 [0] NULL                OPTIONAL,
185     keepCCBS-CallIndicator        [1] NULL                OPTIONAL,
186     extensionContainer            [2] ExtensionContainer    OPTIONAL,
187     ...}
188
189 RoutingInfo ::= CHOICE {
190     roamingNumber                 ISDN-AddressString,
191     forwardingData                ForwardingData}
192
193 ForwardingData ::= SEQUENCE {
194     forwardedToNumber             [5] ISDN-AddressString    OPTIONAL,
195     -- When this datatype is sent from an HLR which supports CAMEL Phase 2
196     -- to a GMSC which supports CAMEL Phase 2 the GMSC shall not check the
197     -- format of the number
198     forwardedToSubaddress         [4] ISDN-SubaddressString    OPTIONAL,
199     forwardingOptions             [6] ForwardingOptions        OPTIONAL,
200     extensionContainer            [7] ExtensionContainer        OPTIONAL,
201     ...}
202
203 ProvideRoamingNumberArg ::= SEQUENCE {
204     imsi                          [0] IMSI,
205     msc-Number                    [1] ISDN-AddressString,
206     msisdn                        [2] ISDN-AddressString        OPTIONAL,
207     lmsi                          [4] LMSI                    OPTIONAL,
208     gsm-BearerCapability          [5] ExternalSignalInfo      OPTIONAL,
209     networkSignalInfo            [6] ExternalSignalInfo      OPTIONAL,
210     suppressionOfAnnouncement     [7] SuppressionOfAnnouncement OPTIONAL,
211     gmsc-Address                  [8] ISDN-AddressString        OPTIONAL,
212     callReferenceNumber          [9] CallReferenceNumber        OPTIONAL,
213     or-Interrogation             [10] NULL                    OPTIONAL,
214     extensionContainer            [11] ExtensionContainer        OPTIONAL,
215     ... ,
216     alertingPattern              [12] AlertingPattern          OPTIONAL,
217     ccbs-Call                    [13] NULL                    OPTIONAL,
218     supportedCamelPhasesInGMSC   [15] SupportedCamelPhases    OPTIONAL,
219     additionalSignalInfo         [14] Ext-ExternalSignalInfo    OPTIONAL,
220     orNotSupportedInGMSC        [16] NULL                    OPTIONAL,
221     pre-pagingSupported          [17] NULL                    OPTIONAL }
222
223 ProvideRoamingNumberRes ::= SEQUENCE {
224     roamingNumber                 ISDN-AddressString,
225     extensionContainer            ExtensionContainer            OPTIONAL,
226     ...}
227
228 ResumeCallHandlingArg ::= SEQUENCE {
229     callReferenceNumber           [0] CallReferenceNumber      OPTIONAL,
230     basicServiceGroup            [1] Ext-BasicServiceCode      OPTIONAL,
231     forwardingData               [2] ForwardingData            OPTIONAL,
232     imsi                         [3] IMSI                    OPTIONAL,
233     cug-CheckInfo                [4] CUG-CheckInfo            OPTIONAL,
234     o-CSI                        [5] O-CSI                    OPTIONAL,
235     extensionContainer            [7] ExtensionContainer        OPTIONAL,
236     ccbs-Possible                [8] NULL                    OPTIONAL,
237     msisdn                       [9] ISDN-AddressString        OPTIONAL,
238     uu-Data                      [10] UU-Data                 OPTIONAL,
239     allInformationSent           [11] NULL                    OPTIONAL,
240     ...,
241     d-csi                        [12] D-CSI                    OPTIONAL}
242
243 UU-Data ::= SEQUENCE {
244     uuIndicator                  [0] UUIndicator              OPTIONAL,
245     uui                         [1] UUI                      OPTIONAL,
246     uusCFInteraction            [2] NULL                    OPTIONAL,
247     extensionContainer          [3] ExtensionContainer        OPTIONAL,
248     ...}
249
250 UUIndicator ::= OCTET STRING (SIZE (1))
251 -- Octets are coded according to ETS 300 356

```

```

252
253 UUI ::= OCTET STRING (SIZE (1..131))
254 -- Octets are coded according to ETS 300 356
255
256 ResumeCallHandlingRes ::= SEQUENCE {
257     extensionContainer          ExtensionContainer          OPTIONAL,
258     ...}
259
260 CamelInfo ::= SEQUENCE {
261     supportedCamelPhases        SupportedCamelPhases,
262     suppress-T-CSI              NULL                    OPTIONAL,
263     extensionContainer          ExtensionContainer          OPTIONAL,
264     ...}
265
266 ExtendedRoutingInfo ::= CHOICE {
267     routingInfo                 RoutingInfo,
268     camelRoutingInfo           [8] CamelRoutingInfo}
269
270 CamelRoutingInfo ::= SEQUENCE {
271     forwardingData              ForwardingData          OPTIONAL,
272     gmscCamelSubscriptionInfo   [0] GmscCamelSubscriptionInfo,
273     extensionContainer          [1] ExtensionContainer  OPTIONAL,
274     ...}
275
276 GmscCamelSubscriptionInfo ::= SEQUENCE {
277     t-CSI                       [0] T-CSI                OPTIONAL,
278     o-CSI                       [1] O-CSI                OPTIONAL,
279     extensionContainer           [2] ExtensionContainer  OPTIONAL,
280     ... ,
281     o-BcsmCamelTDP-CriteriaList [3] O-BcsmCamelTDPCriteriaList  OPTIONAL,
282     t-BCSM-CAMEL-TDP-CriteriaList [4] T-BCSM-CAMEL-TDP-CriteriaList  OPTIONAL,
283     d-csi                       [5] D-CSI                OPTIONAL
284 }
285
286 T-CSI ::= SEQUENCE {
287     t-BcsmCamelTDPDataList      T-BcsmCamelTDPDataList,
288     extensionContainer           ExtensionContainer          OPTIONAL,
289     ... ,
290     camelCapabilityHandling     [0] CamelCapabilityHandling  OPTIONAL,
291     notificationToCSE           [1] NULL                    OPTIONAL,
292     csi-Active                  [2] NULL                    OPTIONAL
293 }
294 -- notificationToCSE and csi-Active shall not be present when T-CSI is sent to VLR/GMSC.
295 -- They may only be included in ATSI/ATM Ack message.
296
297 T-BcsmCamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
298     T-BcsmCamelTDPData
299 --- T-BcsmCamelTDPDataList shall not contain more than one instance of
300 --- T-BcsmCamelTDPData containing the same value for t-BcsmTriggerDetectionPoint.
301 --- For CAMEL Phase 2, this means that only one instance of T-BcsmCamelTDPData is allowed
302 --- with t-BcsmTriggerDetectionPoint being equal to DP12.
303 --- For CAMEL Phase 3, more TDP's are allowed.
304
305 T-BcsmCamelTDPData ::= SEQUENCE {
306     t-BcsmTriggerDetectionPoint T-BcsmTriggerDetectionPoint,
307     serviceKey                  ServiceKey,
308     gsmSCF-Address              [0] ISDN-AddressString,
309     defaultCallHandling         [1] DefaultCallHandling,
310     extensionContainer           [2] ExtensionContainer  OPTIONAL,
311     ...}
312
313 T-BcsmTriggerDetectionPoint ::= ENUMERATED {
314     termAttemptAuthorized (12),
315     ... ,
316     tBusy (13),
317     tNoAnswer (14)}
318 -- exception handling:
319 -- For T-BcsmCamelTDPData sequences containing this parameter with any other
320 -- value than the ones listed above, the receiver shall ignore the whole
321 -- T-BcsmCamelTDPData sequence.
322

```

```

323 ProvideSIWFSNumberArg ::= SEQUENCE {
324     gsm-BearerCapability          [0] ExternalSignalInfo,
325     isdn-BearerCapability         [1] ExternalSignalInfo,
326     call-Direction               [2] CallDirection,
327     b-Subscriber-Address         [3] ISDN-AddressString,
328     chosenChannel                 [4] ExternalSignalInfo,
329     lowerLayerCompatibility       [5] ExternalSignalInfo          OPTIONAL,
330     highLayerCompatibility        [6] ExternalSignalInfo          OPTIONAL,
331     extensionContainer            [7] ExtensionContainer          OPTIONAL,
332     ...}
333
334 CallDirection ::= OCTET STRING (SIZE (1))
335     -- OCTET 1
336
337     -- bit 1 (direction of call)
338     -- 0 Mobile Originated Call (MOC)
339     -- 1 Mobile Terminated Call (MTC)
340
341
342 ProvideSIWFSNumberRes ::= SEQUENCE {
343     siWFSNumber                   [0] ISDN-AddressString,
344     extensionContainer             [1] ExtensionContainer          OPTIONAL,
345     ...}
346
347 SIWFSSignallingModifyArg ::= SEQUENCE {
348     channelType                   [0] ExternalSignalInfo          OPTIONAL,
349     chosenChannel                 [1] ExternalSignalInfo          OPTIONAL,
350     extensionContainer             [2] ExtensionContainer          OPTIONAL,
351     ...}
352
353 SIWFSSignallingModifyRes ::= SEQUENCE {
354     chosenChannel                 [0] ExternalSignalInfo          OPTIONAL,
355     extensionContainer             [1] ExtensionContainer          OPTIONAL,
356     ...}
357
358 SetReportingStateArg ::= SEQUENCE {
359     imsi                           [0] IMSI                      OPTIONAL,
360     lmsi                           [1] LMSI                      OPTIONAL,
361     ccbs-Monitoring                [2] ReportingState           OPTIONAL,
362     extensionContainer              [3] ExtensionContainer        OPTIONAL,
363     ...}
364
365 ReportingState ::= ENUMERATED {
366     stopMonitoring                 (0),
367     startMonitoring                (1),
368     ...}
369 -- exception handling:
370 -- reception of values 2-10 shall be mapped to 'stopMonitoring'
371 -- reception of values > 10 shall be mapped to 'startMonitoring'
372
373 SetReportingStateRes ::= SEQUENCE{
374     ccbs-SubscriberStatus          [0] CCBS-SubscriberStatus   OPTIONAL,
375     extensionContainer              [1] ExtensionContainer        OPTIONAL,
376     ...}
377
378 CCBS-SubscriberStatus ::= ENUMERATED {
379     ccbsNotIdle                    (0),
380     ccbsIdle (1),
381     ccbsNotReachable               (2),
382     ...}
383 -- exception handling:
384 -- reception of values 3-10 shall be mapped to 'ccbsNotIdle'
385 -- reception of values 11-20 shall be mapped to 'ccbsIdle'
386 -- reception of values > 20 shall be mapped to 'ccbsNotReachable'
387
388 StatusReportArg ::= SEQUENCE{
389     imsi                           [0] IMSI,
390     eventReportData                [1] EventReportData          OPTIONAL,
391     callReportdata                 [2] CallReportData           OPTIONAL,
392     extensionContainer              [3] ExtensionContainer        OPTIONAL,
393     ...}
394
395 EventReportData ::= SEQUENCE{
396     ccbs-SubscriberStatus          [0] CCBS-SubscriberStatus   OPTIONAL,
397     extensionContainer              [1] ExtensionContainer        OPTIONAL,
398     ...}
399

```

```

400 CallReportData ::= SEQUENCE{
401     monitoringMode                [0] MonitoringMode                OPTIONAL,
402     callOutcome                   [1] CallOutcome                   OPTIONAL,
403     extensionContainer             [2] ExtensionContainer             OPTIONAL,
404     ...}
405
406 MonitoringMode ::= ENUMERATED {
407     a-side                         (0),
408     b-side                         (1),
409     ...}
410 -- exception handling:
411 -- reception of values 2-10 shall be mapped 'a-side'
412 -- reception of values > 10 shall be mapped to 'b-side'
413
414 CallOutcome ::= ENUMERATED {
415     success                        (0),
416     failure                        (1),
417     busy                           (2),
418     ...}
419 -- exception handling:
420 -- reception of values 3-10 shall be mapped to 'success'
421 -- reception of values 11-20 shall be mapped to 'failure'
422 -- reception of values > 20 shall be mapped to 'busy'
423
424 StatusReportRes ::= SEQUENCE {
425     extensionContainer             [0] ExtensionContainer             OPTIONAL,
426     ...}
427
428 RemoteUserFreeArg ::= SEQUENCE{
429     imsi                          [0] IMSI,
430     callInfo                       [1] ExternalSignalInfo,
431     ccbs-Feature                   [2] CCBS-Feature,
432     translatedB-Number             [3] ISDN-AddressString,
433     replaceB-Number                [4] NULL                        OPTIONAL,
434     alertingPattern                [5] AlertingPattern             OPTIONAL,
435     extensionContainer             [6] ExtensionContainer             OPTIONAL,
436     ...}
437
438 RemoteUserFreeRes ::= SEQUENCE{
439     ruf-Outcome                    [0] RUF-Outcome,
440     extensionContainer             [1] ExtensionContainer             OPTIONAL,
441     ...}
442
443 RUF-Outcome ::= ENUMERATED{
444     accepted (0),
445     rejected (1),
446     noResponseFromFreeMS (2), -- T4 Expiry
447     noResponseFromBusyMS (3), -- T10 Expiry
448     udubFromFreeMS (4),
449     udubFromBusyMS (5),
450     ...}
451 -- exception handling:
452 -- reception of values 6-20 shall be mapped to 'accepted'
453 -- reception of values 21-30 shall be mapped to 'rejected'
454 -- reception of values 31-40 shall be mapped to 'noResponseFromFreeMS'
455 -- reception of values 41-50 shall be mapped to 'noResponseFromBusyMS'
456 -- reception of values 51-60 shall be mapped to 'udubFromFreeMS'
457 -- reception of values > 60 shall be mapped to 'udubFromBusyMS'
458
459 IST-AlertArg ::= SEQUENCE{
460     imsi                          [0] IMSI,
461     extensionContainer             [1] ExtensionContainer             OPTIONAL,
462     ...}
463
464 IST-AlertRes ::= SEQUENCE{
465     istAlertTimer                  [0] IST-AlertTimerValue             OPTIONAL,
466     istInformationWithdraw          [1] NULL                        OPTIONAL,
467     callTerminationIndicator       [2] CallTerminationIndicator     OPTIONAL,
468     extensionContainer             [3] ExtensionContainer             OPTIONAL,
469     ...}
470
471 IST-CommandArg ::= SEQUENCE{
472     imsi                          [0] IMSI,
473     extensionContainer             [1] ExtensionContainer             OPTIONAL,
474     ...}
475

```

```

476 IST-CommandRes ::= SEQUENCE{
477     extensionContainer          ExtensionContainer          OPTIONAL,
478     ...}
479
480 CallTerminationIndicator ::= ENUMERATED {
481     terminateCallActivityReferred      (0),
482     terminateAllCallActivities         (1),
483     ...}
484 -- exception handling:
485 -- reception of values 2-10 shall be mapped to ' terminateCallActivityReferred '
486 -- reception of values > 10 shall be mapped to ' terminateAllCallActivities '
487
488 -- In MSCs not supporting linkage of all call activities, any value received shall
489 -- be interpreted as ' terminateCallActivityReferred '
490
491 END

```

17.7.4 Supplementary service data types

```

1  MAP-SS-DataTypes {
2      ccitt identified-organization (4) etsi (0) mobileDomain (0)
3      gsm-Network (1) modules (3) map-SS-DataTypes (14) version6 (6)}
4
5  DEFINITIONS
6
7  IMPLICIT TAGS
8
9  ::=
10
11 BEGIN
12
13 EXPORTS
14     RegisterSS-Arg,
15     SS-Info,
16     SS-Status,
17     SS-SubscriptionOption,
18     SS-ForBS-Code,
19     InterrogateSS-Res,
20     USSD-Arg,
21     USSD-Res,
22     Password,
23     GuidanceInfo,
24     SS-List,
25     SS-InfoList,
26     OverrideCategory,
27     CliRestrictionOption,
28     NoReplyConditionTime,
29     ForwardingOptions,
30     maxNumOfSS,
31     SS-Data,
32     SS-InvocationNotificationArg,
33     SS-InvocationNotificationRes,
34     CCBS-Feature,
35     RegisterCC-EntryArg,
36     RegisterCC-EntryRes,
37     EraseCC-EntryArg,
38     EraseCC-EntryRes
39 ;
40
41 IMPORTS
42     AddressString,
43     ISDN-AddressString,
44     ISDN-SubaddressString,
45     IMSI,
46     BasicServiceCode,
47     AlertingPattern,
48     EMLPP-Priority,
49     ExternalSignalInfo
50
51 FROM MAP-CommonDataTypes {
52     ccitt identified-organization (4) etsi (0) mobileDomain (0)
53     gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}
54
55     ExtensionContainer
56 FROM MAP-ExtensionDataTypes {
57     ccitt identified-organization (4) etsi (0) mobileDomain (0)
58     gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
59

```

```

60     SS-Code
61 FROM MAP-SS-Code {
62     ccitt identified-organization (4) etsi (0) mobileDomain (0)
63     gsm-Network (1) modules (3) map-SS-Code (15) version6 (6)}
64 ;
65
66
67 RegisterSS-Arg ::= SEQUENCE{
68     ss-Code                SS-Code,
69     basicService           BasicServiceCode           OPTIONAL,
70     forwardedToNumber      [4] AddressString          OPTIONAL,
71     forwardedToSubaddress  [6] ISDN-SubaddressString  OPTIONAL,
72     noReplyConditionTime   [5] NoReplyConditionTime   OPTIONAL,
73     ...,
74     defaultPriority        [7] EMLPP-Priority          OPTIONAL }
75
76 NoReplyConditionTime ::= INTEGER (5..30)
77
78 SS-Info ::= CHOICE {
79     forwardingInfo         [0] ForwardingInfo,
80     callBarringInfo       [1] CallBarringInfo,
81     ss-Data                [3] SS-Data}
82
83 ForwardingInfo ::= SEQUENCE {
84     ss-Code                SS-Code                    OPTIONAL,
85     forwardingFeatureList  ForwardingFeatureList,
86     ...}
87
88 ForwardingFeatureList ::=
89     SEQUENCE SIZE (1..maxNumOfBasicServiceGroups) OF
90     ForwardingFeature
91
92 ForwardingFeature ::= SEQUENCE {
93     basicService           BasicServiceCode           OPTIONAL,
94     ss-Status [4] SS-Status  OPTIONAL,
95     forwardedToNumber      [5] ISDN-AddressString    OPTIONAL,
96     forwardedToSubaddress  [8] ISDN-SubaddressString  OPTIONAL,
97     forwardingOptions      [6] ForwardingOptions     OPTIONAL,
98     noReplyConditionTime   [7] NoReplyConditionTime   OPTIONAL,
99     ...}
100
101 SS-Status ::= OCTET STRING (SIZE (1))
102
103     -- bits 8765: 0000 (unused)
104     -- bits 4321: Used to convey the "P bit", "R bit", "A bit" and "Q bit",
105     --             representing supplementary service state information
106     --             as defined in TS GSM 03.11
107
108     -- bit 4: "Q bit"
109
110     -- bit 3: "P bit"
111
112     -- bit 2: "R bit"
113
114     -- bit 1: "A bit"
115

```

```

116 ForwardingOptions ::= OCTET STRING (SIZE (1))
117
118 -- bit 8: notification to forwarding party
119 -- 0 no notification
120 -- 1 notification
121
122 -- bit 7: redirecting presentation
123 -- 0 no presentation
124 -- 1 presentation
125
126 -- bit 6: notification to calling party
127 -- 0 no notification
128 -- 1 notification
129
130 -- bit 5: 0 (unused)
131
132 -- bits 43: forwarding reason
133 -- 00 ms not reachable
134 -- 01 ms busy
135 -- 10 no reply
136 -- 11 unconditional when used in a SRI Result,
137 -- or call deflection when used in a RCH Argument
138 -- bits 21: 00 (unused)
139
140 CallBarringInfo ::= SEQUENCE {
141     ss-Code SS-Code OPTIONAL,
142     callBarringFeatureList CallBarringFeatureList,
143     ...}
144
145 CallBarringFeatureList ::= SEQUENCE SIZE (1..maxNumOfBasicServiceGroups) OF
146     CallBarringFeature
147
148 CallBarringFeature ::= SEQUENCE {
149     basicService BasicServiceCode OPTIONAL,
150     ss-Status [4] SS-Status OPTIONAL,
151     ...}
152
153 SS-Data ::= SEQUENCE {
154     ss-Code SS-Code OPTIONAL,
155     ss-Status [4] SS-Status OPTIONAL,
156     ss-SubscriptionOption SS-SubscriptionOption OPTIONAL,
157     basicServiceGroupList BasicServiceGroupList OPTIONAL,
158     ...,
159     defaultPriority EMLPP-Priority OPTIONAL
160 }
161
162 SS-SubscriptionOption ::= CHOICE {
163     cliRestrictionOption [2] CliRestrictionOption,
164     overrideCategory [1] OverrideCategory}
165
166 CliRestrictionOption ::= ENUMERATED {
167     permanent (0),
168     temporaryDefaultRestricted (1),
169     temporaryDefaultAllowed (2)}
170
171 OverrideCategory ::= ENUMERATED {
172     overrideEnabled (0),
173     overrideDisabled (1)}
174
175 SS-ForBS-Code ::= SEQUENCE {
176     ss-Code SS-Code,
177     basicService BasicServiceCode OPTIONAL,
178     ...}
179
180 GenericServiceInfo ::= SEQUENCE {
181     ss-Status SS-Status,
182     cliRestrictionOption CliRestrictionOption OPTIONAL,
183     ...,
184     maximumEntitledPriority [0] EMLPP-Priority OPTIONAL,
185     defaultPriority [1] EMLPP-Priority OPTIONAL,
186     ccbs-FeatureList [2] CCBS-FeatureList OPTIONAL }
187
188 CCBS-FeatureList ::= SEQUENCE SIZE (1..maxNumOfCCBS-Requests) OF
189     CCBS-Feature
190
191 maxNumOfCCBS-Requests INTEGER ::= 5
192

```

```

193 CCBS-Feature ::= SEQUENCE {
194     ccbs-Index [0] CCBS-Index OPTIONAL,
195     b-subscriberNumber [1] ISDN-AddressString OPTIONAL,
196     b-subscriberSubaddress [2] ISDN-SubaddressString OPTIONAL,
197     basicServiceGroup [3] BasicServiceCode OPTIONAL,
198     ... }
199
200 CCBS-Index ::= INTEGER (1..maxNumOfCCBS-Requests)
201
202 InterrogateSS-Res ::= CHOICE {
203     ss-Status [0] SS-Status,
204     basicServiceGroupList [2] BasicServiceGroupList,
205     forwardingFeatureList [3] ForwardingFeatureList,
206     genericServiceInfo [4] GenericServiceInfo }
207
208 USSD-Arg ::= SEQUENCE {
209     ussd-DataCodingScheme USSD-DataCodingScheme,
210     ussd-String USSD-String,
211     ... ,
212     alertingPattern AlertingPattern OPTIONAL,
213     msisdn [0] ISDN-AddressString OPTIONAL }
214
215 USSD-Res ::= SEQUENCE {
216     ussd-DataCodingScheme USSD-DataCodingScheme,
217     ussd-String USSD-String,
218     ... }
219
220 USSD-DataCodingScheme ::= OCTET STRING (SIZE (1))
221 -- The structure of the USSD-DataCodingScheme is defined by
222 -- the Cell Broadcast Data Coding Scheme as described in
223 -- TS GSM 03.38
224
225 USSD-String ::= OCTET STRING (SIZE (1..maxUSSD-StringLength))
226 -- The structure of the contents of the USSD-String is dependent
227 -- on the USSD-DataCodingScheme as described in TS GSM 03.38.
228
229 maxUSSD-StringLength INTEGER ::= 160
230
231 Password ::= NumericString
232 (FROM ("0"|"1"|"2"|"3"|"4"|"5"|"6"|"7"|"8"|"9"))
233 (SIZE (4))
234
235 GuidanceInfo ::= ENUMERATED {
236     enterPW (0),
237     enterNewPW (1),
238     enterNewPW-Again (2)}
239 -- How this information is really delivered to the subscriber
240 -- (display, announcement, ...) is not part of this
241 -- specification.
242
243 SS-List ::= SEQUENCE SIZE (1..maxNumOfSS) OF
244     SS-Code
245
246 maxNumOfSS INTEGER ::= 30
247
248 SS-InfoList ::= SEQUENCE SIZE (1..maxNumOfSS) OF
249     SS-Info
250
251 BasicServiceGroupList ::= SEQUENCE SIZE (1..maxNumOfBasicServiceGroups) OF
252     BasicServiceCode
253
254 maxNumOfBasicServiceGroups INTEGER ::= 13
255
256 SS-InvocationNotificationArg ::= SEQUENCE {
257     imsi [0] IMSI,
258     msisdn [1] ISDN-AddressString,
259     ss-Event [2] SS-Code,
260     -- The following SS-Code values are allowed :
261     -- ect SS-Code ::= '00110001'B
262     -- multiPTY SS-Code ::= '01010001'B
263     -- cd SS-Code ::= '00100100'B
264     -- ccbs SS-Code ::= '01000100'B
265     ss-EventSpecification [3] SS-EventSpecification OPTIONAL,
266     extensionContainer [4] ExtensionContainer OPTIONAL,
267     ... }
268

```

```

269 SS-InvocationNotificationRes ::= SEQUENCE {
270     extensionContainer          ExtensionContainer          OPTIONAL,
271     ...
272 }
273
274 SS-EventSpecification ::= SEQUENCE SIZE (1..maxEventSpecification) OF
275     AddressString
276
277 maxEventSpecification INTEGER ::= 2
278
279 RegisterCC-EntryArg ::= SEQUENCE {
280     ss-Code                    [0] SS-Code,
281     ccbs-Data [1]              CCBS-Data OPTIONAL,
282     ...}
283
284 CCBS-Data ::= SEQUENCE {
285     ccbs-Feature              [0] CCBS-Feature,
286     translatedB-Number       [1] ISDN-AddressString,
287     serviceIndicator         [2] ServiceIndicator          OPTIONAL,
288     callInfo                 [3] ExternalSignalInfo,
289     networkSignalInfo       [4] ExternalSignalInfo,
290     ...}
291
292 ServiceIndicator ::= BIT STRING {
293     clir-invoked (0),
294     camel-invoked (1)} (SIZE(2..32))
295 -- exception handling:
296 -- bits 2 to 31 shall be ignored if received and not understood
297
298 RegisterCC-EntryRes ::= SEQUENCE {
299     ccbs-Feature              [0] CCBS-Feature          OPTIONAL,
300     ...}
301
302 EraseCC-EntryArg ::= SEQUENCE {
303     ss-Code                  [0] SS-Code,
304     ccbs-Index               [1] CCBS-Index          OPTIONAL,
305     ...}
306
307 EraseCC-EntryRes ::= SEQUENCE {
308     ss-Code                  [0] SS-Code,
309     ss-Status [1] SS-Status  OPTIONAL,
310     ...}
311
312 END

```

17.7.5 Supplementary service codes

```

1  MAP-SS-Code {
2    ccitt identified-organization (4) etsi (0) mobileDomain (0)
3    gsm-Network (1) modules (3) map-SS-Code (15) version6 (6)}
4
5  DEFINITIONS
6
7  ::=
8
9  BEGIN
10
11  SS-Code ::= OCTET STRING (SIZE (1))
12    -- This type is used to represent the code identifying a single
13    -- supplementary service, a group of supplementary services, or
14    -- all supplementary services. The services and abbreviations
15    -- used are defined in TS GSM 02.04. The internal structure is
16    -- defined as follows:
17    --
18    -- bits 87654321: group (bits 8765), and specific service
19    -- (bits 4321)
20
21  allss          SS-Code ::= '00000000'B
22    -- reserved for possible future use
23    -- all SS
24

```

```

25 allLineIdentificationSS          SS-Code ::= '00010000'B
26   -- reserved for possible future use
27   -- all line identification SS
28 clip                             SS-Code ::= '00010001'B
29   -- calling line identification presentation
30 clir                             SS-Code ::= '00010010'B
31   -- calling line identification restriction
32 colp                             SS-Code ::= '00010011'B
33   -- connected line identification presentation
34 colr                             SS-Code ::= '00010100'B
35   -- connected line identification restriction
36 mci                             SS-Code ::= '00010101'B
37   -- reserved for possible future use
38   -- malicious call identification
39
40 allNameIdentificationSS          SS-Code ::= '00011000'B
41   -- all name identification SS
42 cnap                             SS-Code ::= '00011001'B
43   -- calling name presentation
44
45   -- SS-Codes '00011010'B to '00011111'B are reserved for future
46   -- NameIdentification Supplementary Service use.
47
48 allForwardingSS                 SS-Code ::= '00100000'B
49   -- all forwarding SS
50 cfu                             SS-Code ::= '00100001'B
51   -- call forwarding unconditional
52 allCondForwardingSS            SS-Code ::= '00101000'B
53   -- all conditional forwarding SS
54 cfb                             SS-Code ::= '00101001'B
55   -- call forwarding on mobile subscriber busy
56 cfnry                           SS-Code ::= '00101010'B
57   -- call forwarding on no reply
58 cfnrc                           SS-Code ::= '00101011'B
59   -- call forwarding on mobile subscriber not reachable
60 cd                             SS-Code ::= '00100100'B
61   -- call deflection
62
63 allCallOfferingSS              SS-Code ::= '00110000'B
64   -- reserved for possible future use
65   -- all call offering SS includes also all forwarding SS
66 ect                             SS-Code ::= '00110001'B
67   -- explicit call transfer
68 mah                             SS-Code ::= '00110010'B
69   -- reserved for possible future use
70   -- mobile access hunting
71
72 allCallCompletionSS            SS-Code ::= '01000000'B
73   -- reserved for possible future use
74   -- all Call completion SS
75 cw                             SS-Code ::= '01000001'B
76   -- call waiting
77 hold                             SS-Code ::= '01000010'B
78   -- call hold
79 ccbs-A                          SS-Code ::= '01000011'B
80   -- completion of call to busy subscribers, originating side
81 ccbs-B                          SS-Code ::= '01000100'B
82   -- completion of call to busy subscribers, destination side
83   -- this SS-Code is used only in InsertSubscriberData
84
85 allMultiPartySS                SS-Code ::= '01010000'B
86   -- reserved for possible future use
87   -- all multiparty SS
88 multiPTY                       SS-Code ::= '01010001'B
89   -- multiparty
90
91 allCommunityOfInterest-SS      SS-Code ::= '01100000'B
92   -- reserved for possible future use
93   -- all community of interest SS
94 cug                             SS-Code ::= '01100001'B
95   -- closed user group
96

```

```

97 allChargingSS SS-Code ::= '01110000'B
98 -- reserved for possible future use
99 -- all charging SS
100 aoci SS-Code ::= '01110001'B
101 -- advice of charge information
102 aocc SS-Code ::= '01110010'B
103 -- advice of charge charging
104
105 allAdditionalInfoTransferSS SS-Code ::= '10000000'B
106 -- reserved for possible future use
107 -- all additional information transfer SS
108 uus1 SS-Code ::= '10000001'B
109 -- UUS1 user-to-user signalling
110 uus2 SS-Code ::= '10000010'B
111 -- UUS2 user-to-user signalling
112 uus3 SS-Code ::= '10000011'B
113 -- UUS3 user-to-user signalling
114
115 allBarringSS SS-Code ::= '10010000'B
116 -- all barring SS
117 barringOfOutgoingCalls SS-Code ::= '10010001'B
118 -- barring of outgoing calls
119 baoc SS-Code ::= '10010010'B
120 -- barring of all outgoing calls
121 boic SS-Code ::= '10010011'B
122 -- barring of outgoing international calls
123 boicExHC SS-Code ::= '10010100'B
124 -- barring of outgoing international calls except those directed
125 -- to the home PLMN
126 barringOfIncomingCalls SS-Code ::= '10011001'B
127 -- barring of incoming calls
128 baic SS-Code ::= '10011010'B
129 -- barring of all incoming calls
130 bicRoam SS-Code ::= '10011011'B
131 -- barring of incoming calls when roaming outside home PLMN
132 -- Country
133
134 allPLMN-specificSS SS-Code ::= '11110000'B
135 plmn-specificSS-1 SS-Code ::= '11110001'B
136 plmn-specificSS-2 SS-Code ::= '11110010'B
137 plmn-specificSS-3 SS-Code ::= '11110011'B
138 plmn-specificSS-4 SS-Code ::= '11110100'B
139 plmn-specificSS-5 SS-Code ::= '11110101'B
140 plmn-specificSS-6 SS-Code ::= '11110110'B
141 plmn-specificSS-7 SS-Code ::= '11110111'B
142 plmn-specificSS-8 SS-Code ::= '11111000'B
143 plmn-specificSS-9 SS-Code ::= '11111001'B
144 plmn-specificSS-A SS-Code ::= '11111010'B
145 plmn-specificSS-B SS-Code ::= '11111011'B
146 plmn-specificSS-C SS-Code ::= '11111100'B
147 plmn-specificSS-D SS-Code ::= '11111101'B
148 plmn-specificSS-E SS-Code ::= '11111110'B
149 plmn-specificSS-F SS-Code ::= '11111111'B
150
151 allCallPrioritySS SS-Code ::= '10100000'B
152 -- reserved for possible future use
153 -- all call priority SS
154 emlpp SS-Code ::= '10100001'B
155 -- enhanced Multilevel Precedence Pre-emption (EMLPP) service
156
157 allLCSPrivacyException SS-Code ::= '10110000'B
158 -- all LCS Privacy Exception Classes
159 universal SS-Code ::= '10110001'B
160 -- allow location by any LCS client
161 callrelated SS-Code ::= '10110010'B
162 -- allow location by any value added LCS client to which a call
163 -- is established from the target MS
164 callunrelated SS-Code ::= '10110011'B
165 -- allow location by designated external value added LCS clients
166 plmnoperator SS-Code ::= '10110100'B
167 -- allow location by designated PLMN operator LCS clients
168
169
170 END

```

17.7.6 Short message data types

```

1  MAP-SM-DataTypes {
2      ccitt identified-organization (4) etsi (0) mobileDomain (0)
3      gsm-Network (1) modules (3) map-SM-DataTypes (16) version6 (6)}
4
5  DEFINITIONS
6
7  IMPLICIT TAGS
8
9  ::=
10
11 BEGIN
12
13 EXPORTS
14     RoutingInfoForSM-Arg,
15     RoutingInfoForSM-Res,
16     MO-ForwardSM-Arg,
17     MO-ForwardSM-Res,
18     MT-ForwardSM-Arg,
19     MT-ForwardSM-Res,
20     ReportSM-DeliveryStatusArg,
21     ReportSM-DeliveryStatusRes,
22     AlertServiceCentreArg,
23     InformServiceCentreArg,
24     ReadyForSM-Arg,
25     ReadyForSM-Res,
26     SM-DeliveryOutcome,
27     AlertReason
28 ;
29
30 IMPORTS
31     AddressString,
32     ISDN-AddressString,
33     SignalInfo,
34     IMSI,
35     LMSI
36 FROM MAP-CommonDataTypes {
37     ccitt identified-organization (4) etsi (0) mobileDomain (0)
38     gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}
39
40     AbsentSubscriberDiagnosticSM
41 FROM MAP-ER-DataTypes {
42     ccitt identified-organization (4) etsi (0) mobileDomain (0)
43     gsm-Network (1) modules (3) map-ER-DataTypes (17) version6 (6)}
44
45     ExtensionContainer
46 FROM MAP-ExtensionDataTypes {
47     ccitt identified-organization (4) etsi (0) mobileDomain (0)
48     gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
49 ;
50
51

```

```

52 RoutingInfoForSM-Arg ::= SEQUENCE {
53     msisdn [0] ISDN-AddressString,
54     sm-RP-PRI [1] BOOLEAN,
55     serviceCentreAddress [2] AddressString,
56     extensionContainer [6] ExtensionContainer OPTIONAL,
57     ... ,
58     gprsSupportIndicator [7] NULL OPTIONAL,
59     -- gprsSupportIndicator is set only if the SMS-GMSC supports
60     -- receiving of two numbers from the HLR
61     sm-RP-MTI [8] SM-RP-MTI OPTIONAL,
62     sm-RP-SMEA [9] SM-RP-SMEA OPTIONAL }
63

```

```

64 SM-RP-MTI ::= INTEGER (0..10)
65     -- 0 SMS Deliver
66     -- 1 SMS Status Report
67     -- other values are reserved for future use and shall be discarded if
68     -- received
69

```

```

71 SM-RP-SMEA ::= OCTET STRING (SIZE (1..12))
72     -- this parameter contains an address field which is encoded
73     -- as defined in GSM 03.40. An address field contains 3 elements :
74     --     address-length
75     --     type-of-address
76     --     address-value
77

```

```

78

```

```

79 RoutingInfoForSM-Res ::= SEQUENCE {
80     imsi                IMSI,
81     locationInfoWithLMSI [0] LocationInfoWithLMSI,
82     extensionContainer  [4] ExtensionContainer    OPTIONAL,
83     ...}
84
85 LocationInfoWithLMSI ::= SEQUENCE {
86     networkNode-Number [1] ISDN-AddressString,
87     lmsi                LMSI                    OPTIONAL,
88     extensionContainer  ExtensionContainer      OPTIONAL,
89     ...,
90     gprsNodeIndicator  [5] NULL                OPTIONAL,
91     -- gprsNodeIndicator is set only if the SGSN number is sent as the
92     -- Network Node Number
93     additional-Number  [6] Additional-Number    OPTIONAL
94     -- NetworkNode-number can be either msc-number or sgsn-number
95 }
96
97 Additional-Number ::= CHOICE {
98     msc-Number          [0] ISDN-AddressString,
99     sgsn-Number         [1] ISDN-AddressString}
100 -- additional-number can be either msc-number or sgsn-number
101 -- if received networkNode-number is msc-number then the
102 -- additional number is sgsn-number
103 -- if received networkNode-number is sgsn-number then the
104 -- additional number is msc-number
105
106 MO-ForwardSM-Arg ::= SEQUENCE {
107     sm-RP-DA           SM-RP-DA,
108     sm-RP-OA           SM-RP-OA,
109     sm-RP-UI           SignalInfo,
110     extensionContainer ExtensionContainer      OPTIONAL,
111     ... ,
112     imsi              IMSI                    OPTIONAL }
113
114 MO-ForwardSM-Res ::= SEQUENCE {
115     sm-RP-UI           SignalInfo              OPTIONAL,
116     extensionContainer ExtensionContainer      OPTIONAL,
117     ...}
118
119 MT-ForwardSM-Arg ::= SEQUENCE {
120     sm-RP-DA           SM-RP-DA,
121     sm-RP-OA           SM-RP-OA,
122     sm-RP-UI           SignalInfo,
123     moreMessagesToSend NULL                  OPTIONAL,
124     extensionContainer ExtensionContainer      OPTIONAL,
125     ...}
126
127 MT-ForwardSM-Res ::= SEQUENCE {
128     sm-RP-UI           SignalInfo              OPTIONAL,
129     extensionContainer ExtensionContainer      OPTIONAL,
130     ...}
131
132 SM-RP-DA ::= CHOICE {
133     imsi                [0] IMSI,
134     lmsi                [1] LMSI,
135     serviceCentreAddressDA [4] AddressString,
136     noSM-RP-DA         [5] NULL}
137
138 SM-RP-OA ::= CHOICE {
139     msisdn              [2] ISDN-AddressString,
140     serviceCentreAddressOA [4] AddressString,
141     noSM-RP-OA         [5] NULL}
142

```

```

143 ReportSM-DeliveryStatusArg ::= SEQUENCE {
144     msisdn                ISDN-AddressString,
145     serviceCentreAddress  AddressString,
146     sm-DeliveryOutcome    SM-DeliveryOutcome,
147     absentSubscriberDiagnosticSM [0] AbsentSubscriberDiagnosticSM
148
149     extensionContainer     [1] ExtensionContainer           OPTIONAL,
150     ...,
151     gprsSupportIndicator   [2] NULL                       OPTIONAL,
152     -- gprsSupportIndicator is set only if the SMS-GMSC supports
153     -- handling of two delivery outcomes
154     deliveryOutcomeIndicator [3] NULL                     OPTIONAL,
155     -- DeliveryOutcomeIndicator is set when the SM-DeliveryOutcome
156     -- is for GPRS
157     additionalSM-DeliveryOutcome [4] SM-DeliveryOutcome   OPTIONAL,
158     -- If received, additionalSM-DeliveryOutcome is for GPRS
159     additionalAbsentSubscriberDiagnosticSM [5] AbsentSubscriberDiagnosticSM OPTIONAL
160     -- If received additionalAbsentSubscriberDiagnosticSM is for GPRS
161 }
162
163 SM-DeliveryOutcome ::= ENUMERATED {
164     memoryCapacityExceeded (0),
165     absentSubscriber (1),
166     successfulTransfer (2)}
167
168 ReportSM-DeliveryStatusRes ::= SEQUENCE {
169     storedMSISDN          ISDN-AddressString           OPTIONAL,
170     extensionContainer    ExtensionContainer           OPTIONAL,
171     ...}
172
173
174 AlertServiceCentreArg ::= SEQUENCE {
175     msisdn                ISDN-AddressString,
176     serviceCentreAddress  AddressString,
177     ...}
178
179 InformServiceCentreArg ::= SEQUENCE {
180     storedMSISDN          ISDN-AddressString           OPTIONAL,
181     mw-Status MW-Status   OPTIONAL,
182     extensionContainer    ExtensionContainer           OPTIONAL,
183     ...}
184
185 MW-Status ::= BIT STRING {
186     sc-AddressNotIncluded (0),
187     mnrf-Set (1),
188     mcef-Set (2),
189     mnrg-Set (3)} (SIZE (6..16))
190 -- exception handling:
191 -- bits 4 to 15 shall be ignored if received and not understood
192
193 ReadyForSM-Arg ::= SEQUENCE {
194     imsi                [0] IMSI,
195     alertReason          AlertReason,
196     alertReasonIndicator NULL                       OPTIONAL,
197     -- alertReasonIndicator is set only when the alertReason
198     -- sent to HLR is for GPRS
199     extensionContainer   ExtensionContainer           OPTIONAL,
200     ...}
201
202 ReadyForSM-Res ::= SEQUENCE {
203     extensionContainer   ExtensionContainer           OPTIONAL,
204     ...}
205
206
207 AlertReason ::= ENUMERATED {
208     ms-Present (0),
209     memoryAvailable (1)}
210
211 END

```

17.7.7 Error data types

```

1 MAP-ER-DataTypes {
2     ccitt identified-organization (4) etsi (0) mobileDomain (0)
3     gsm-Network (1) modules (3) map-ER-DataTypes (17) version6 (6)}
4
5 DEFINITIONS

```

```

6
7 IMPLICIT TAGS
8
9 ::=
10
11 BEGIN
12
13 EXPORTS
14     RoamingNotAllowedParam,
15     CallBarredParam,
16     CUG-RejectParam,
17     SS-IncompatibilityCause,
18     PW-RegistrationFailureCause,
19     SM-DeliveryFailureCause,
20     SystemFailureParam,
21     DataMissingParam,
22     UnexpectedDataParam,
23     FacilityNotSupParam,
24     OR-NotAllowedParam,
25     UnknownSubscriberParam,
26     NumberChangedParam,
27     UnidentifiedSubParam,
28     IllegalSubscriberParam,
29     IllegalEquipmentParam,
30     BearerServNotProvParam,
31     TeleservNotProvParam,
32     TracingBufferFullParam,
33     NoRoamingNbParam,
34     AbsentSubscriberParam,
35     BusySubscriberParam,
36     NoSubscriberReplyParam,
37     ForwardingViolationParam,
38     ForwardingFailedParam,
39     ATI-NotAllowedParam,
40     SubBusyForMT-SMS-Param,
41     MessageWaitListFullParam,
42     AbsentSubscriberSM-Param,
43     AbsentSubscriberDiagnosticSM,
44     ResourceLimitationParam,
45     NoGroupCallNbParam,
46     IncompatibleTerminalParam,
47     ShortTermDenialParam,
48     LongTermDenialParam,
49     UnauthorizedRequestingNetwork-Param,
50     UnauthorizedLCSCClient-Param,
51     PositionMethodFailure-Param,
52     PositionMethodFailureWithRestart-Param,
53     LMUUnknownOrOffline-Param,
54     TrafficChannelEstablishmentFailure-Param,
55     UnknownOrUnreachableLCSCClient-Param,
56     MM-EventNotSupported-Param,
57     ATSI-NotAllowedParam,
58     ATM-NotAllowedParam,
59     IllegalSS-OperationParam,
60     SS-NotAvailableParam,
61     SS-SubscriptionViolationParam,
62     InformationNotAvailableParam
63
64
65
66 ;
67
68 IMPORTS
69     SS-Status
70 FROM MAP-SS-DataTypes {
71     ccitt identified-organization (4) etsi (0) mobileDomain (0)
72     gsm-Network (1) modules (3) map-SS-DataTypes (14) version6 (6)}
73
74     SignalInfo,
75     BasicServiceCode,
76     NetworkResource
77 FROM MAP-CommonDataTypes {
78     ccitt identified-organization (4) etsi (0) mobileDomain (0)
79     gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}
80
81     SS-Code
82 FROM MAP-SS-Code {
83     ccitt identified-organization (4) etsi (0) mobileDomain (0)
84     gsm-Network (1) modules (3) map-SS-Code (15) version6 (6)}

```

```

85
86     ExtensionContainer
87 FROM MAP-ExtensionDataTypes {
88     ccitt identified-organization (4) etsi (0) mobileDomain (0)
89     gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
90 ;
91
92 RoamingNotAllowedParam ::= SEQUENCE {
93     roamingNotAllowedCause          RoamingNotAllowedCause,
94     extensionContainer              ExtensionContainer          OPTIONAL,
95     ...}
96
97 RoamingNotAllowedCause ::= ENUMERATED {
98     plmnRoamingNotAllowed (0),
99     operatorDeterminedBarring (3)}
100
101 CallBarredParam ::= CHOICE {
102     callBarringCause              CallBarringCause,
103     -- call BarringCause must not be used in version 3
104     extensibleCallBarredParam     ExtensibleCallBarredParam
105     -- extensibleCallBarredParam must not be used in version <3
106 }
107
108 CallBarringCause ::= ENUMERATED {
109     barringServiceActive (0),
110     operatorBarring (1)}
111
112 ExtensibleCallBarredParam ::= SEQUENCE {
113     callBarringCause              CallBarringCause          OPTIONAL,
114     extensionContainer            ExtensionContainer          OPTIONAL,
115     ... ,
116     unauthorisedMessageOriginator [1] NULL                 OPTIONAL }
117
118 CUG-RejectParam ::= SEQUENCE {
119     cug-RejectCause              CUG-RejectCause          OPTIONAL,
120     extensionContainer            ExtensionContainer          OPTIONAL,
121     ...}
122
123 CUG-RejectCause ::= ENUMERATED {
124     incomingCallsBarredWithinCUG (0),
125     subscriberNotMemberOfCUG (1),
126     requestedBasicServiceViolatesCUG-Constraints (5),
127     calledPartySS-InteractionViolation (7)}
128
129 SS-IncompatibilityCause ::= SEQUENCE {
130     ss-Code                      [1] SS-Code                OPTIONAL,
131     basicService                 BasicServiceCode          OPTIONAL,
132     ss-Status [4] SS-Status      OPTIONAL,
133     ...}
134
135 PW-RegistrationFailureCause ::= ENUMERATED {
136     undetermined (0),
137     invalidFormat (1),
138     newPasswordsMismatch (2)}
139
140
141 SM-EnumeratedDeliveryFailureCause ::= ENUMERATED {
142     memoryCapacityExceeded (0),
143     equipmentProtocolError (1),
144     equipmentNotSM-Equipped (2),
145     unknownServiceCentre (3),
146     sc-Congestion (4),
147     invalidSME-Address (5),
148     subscriberNotSC-Subscriber (6)}
149
150 SM-DeliveryFailureCause ::= SEQUENCE {
151     sm-EnumeratedDeliveryFailureCause SM-EnumeratedDeliveryFailureCause,
152     diagnosticInfo                   SignalInfo          OPTIONAL,
153     extensionContainer                ExtensionContainer    OPTIONAL,
154     ...}
155

```

```

156 AbsentSubscriberSM-Param ::= SEQUENCE {
157     absentSubscriberDiagnosticSM      AbsentSubscriberDiagnosticSM      OPTIONAL,
158     -- AbsentSubscriberDiagnosticSM can be either for non-GPRS
159     -- or for GPRS
160     extensionContainer                ExtensionContainer                OPTIONAL,
161     ...,
162     additionalAbsentSubscriberDiagnosticSM [0] AbsentSubscriberDiagnosticSM OPTIONAL }
163 -- if received, additionalAbsentSubscriberDiagnosticSM
164 -- is for GPRS and absentSubscriberDiagnosticSM is
165 -- for non-GPRS
166
167 AbsentSubscriberDiagnosticSM ::= INTEGER (0..255)
168 -- AbsentSubscriberDiagnosticSM values are defined in ETS 300 536 (GSM 03.40)
169
170 SystemFailureParam ::= CHOICE {
171     networkResource                    NetworkResource,
172     -- networkResource must not be used in version 3
173     extensibleSystemFailureParam      ExtensibleSystemFailureParam
174     -- extensibleSystemFailureParam must not be used in version <3
175 }
176
177 ExtensibleSystemFailureParam ::= SEQUENCE {
178     networkResource                    NetworkResource                    OPTIONAL,
179     extensionContainer                ExtensionContainer                OPTIONAL,
180     ...}
181
182 DataMissingParam ::= SEQUENCE {
183     extensionContainer                ExtensionContainer                OPTIONAL,
184     ...}
185
186 UnexpectedDataParam ::= SEQUENCE {
187     extensionContainer                ExtensionContainer                OPTIONAL,
188     ...}
189
190 FacilityNotSupParam ::= SEQUENCE {
191     extensionContainer                ExtensionContainer                OPTIONAL,
192     ...}
193
194 OR-NotAllowedParam ::= SEQUENCE {
195     extensionContainer                ExtensionContainer                OPTIONAL,
196     ...}
197
198 UnknownSubscriberParam ::= SEQUENCE {
199     extensionContainer                ExtensionContainer                OPTIONAL,
200     ...,
201     unknownSubscriberDiagnostic      UnknownSubscriberDiagnostic      OPTIONAL}
202
203 UnknownSubscriberDiagnostic ::= ENUMERATED {
204     imsiUnknown (0),
205     gprsSubscriptionUnknown (1),
206     ...}
207 -- if unknown values are received in
208 -- unknownSubscriberDiagnostic they shall be discarded
209
210
211 NumberChangedParam ::= SEQUENCE {
212     extensionContainer                ExtensionContainer                OPTIONAL,
213     ...}
214
215 UnidentifiedSubParam ::= SEQUENCE {
216     extensionContainer                ExtensionContainer                OPTIONAL,
217     ...}
218
219 IllegalSubscriberParam ::= SEQUENCE {
220     extensionContainer                ExtensionContainer                OPTIONAL,
221     ...}
222
223 IllegalEquipmentParam ::= SEQUENCE {
224     extensionContainer                ExtensionContainer                OPTIONAL,
225     ...}
226
227 BearerServNotProvParam ::= SEQUENCE {
228     extensionContainer                ExtensionContainer                OPTIONAL,
229     ...}
230

```

231 **TeleservNotProvParam** ::= SEQUENCE {
232 extensionContainer ExtensionContainer OPTIONAL,
233 ...}

234

235 **TracingBufferFullParam** ::= SEQUENCE {
236 extensionContainer ExtensionContainer OPTIONAL,
237 ...}

238

239 **NoRoamingNbParam** ::= SEQUENCE {
240 extensionContainer ExtensionContainer OPTIONAL,
241 ...}

242

243 **AbsentSubscriberParam** ::= SEQUENCE {
244 extensionContainer ExtensionContainer OPTIONAL,
245 ...,
246 absentSubscriberReason [0] AbsentSubscriberReason OPTIONAL}

247

248 **AbsentSubscriberReason** ::= ENUMERATED {
249 imsiDetach (0),
250 restrictedArea (1),
251 noPageResponse (2),
252 ...}
253 *-- exception handling: at reception of other values than the ones listed the*
254 *-- AbsentSubscriberReason shall be ignored.*

255

256 **BusySubscriberParam** ::= SEQUENCE {
257 extensionContainer ExtensionContainer OPTIONAL,
258 ...,
259 ccbs-Possible [0] NULL OPTIONAL,
260 ccbs-Busy [1] NULL OPTIONAL}

261

262 **NoSubscriberReplyParam** ::= SEQUENCE {
263 extensionContainer ExtensionContainer OPTIONAL,
264 ...}

265

266 **ForwardingViolationParam** ::= SEQUENCE {
267 extensionContainer ExtensionContainer OPTIONAL,
268 ...}

269

270 **ForwardingFailedParam** ::= SEQUENCE {
271 extensionContainer ExtensionContainer OPTIONAL,
272 ...}

273

274 **ATI-NotAllowedParam** ::= SEQUENCE {
275 extensionContainer ExtensionContainer OPTIONAL,
276 ...}

277

278 **ATSI-NotAllowedParam** ::= SEQUENCE {
279 extensionContainer ExtensionContainer OPTIONAL,
280 ...}

281

282 **ATM-NotAllowedParam** ::= SEQUENCE {
283 extensionContainer ExtensionContainer OPTIONAL,
284 ...}

285

286 **IllegalSS-OperationParam** ::= SEQUENCE {
287 extensionContainer ExtensionContainer OPTIONAL,
288 ...}

289

290 **SS-NotAvailableParam** ::= SEQUENCE {
291 extensionContainer ExtensionContainer OPTIONAL,
292 ...}

293

294 **SS-SubscriptionViolationParam** ::= SEQUENCE {
295 extensionContainer ExtensionContainer OPTIONAL,
296 ...}

297

298 **InformationNotAvailableParam** ::= SEQUENCE {
299 extensionContainer ExtensionContainer OPTIONAL,
300 ...}

301

```

302 SubBusyForMT-SMS-Param ::= SEQUENCE {
303     extensionContainer          ExtensionContainer          OPTIONAL,
304     ... ,
305     gprsConnectionSuspended    NULL                    OPTIONAL }
306 -- If GprsConnectionSuspended is not understood it shall
307 -- be discarded
308
309 MessageWaitListFullParam ::= SEQUENCE {
310     extensionContainer          ExtensionContainer          OPTIONAL,
311     ... }
312
313 ResourceLimitationParam ::= SEQUENCE {
314     extensionContainer          ExtensionContainer          OPTIONAL,
315     ... }
316
317 NoGroupCallNbParam ::= SEQUENCE {
318     extensionContainer          ExtensionContainer          OPTIONAL,
319     ... }
320
321 IncompatibleTerminalParam ::= SEQUENCE {
322     extensionContainer          ExtensionContainer          OPTIONAL,
323     ... }
324
325 ShortTermDenialParam ::= SEQUENCE {
326     ... }
327
328 LongTermDenialParam ::= SEQUENCE {
329     ... }
330
331 UnauthorizedRequestingNetwork-Param ::= SEQUENCE {
332     extensionContainer          ExtensionContainer          OPTIONAL,
333     ... }
334
335 UnauthorizedLCSCClient-Param ::= SEQUENCE {
336     unauthorizedLCSCClient-Diagnostic [0] UnauthorizedLCSCClient-Diagnostic OPTIONAL,
337     extensionContainer                [1] ExtensionContainer          OPTIONAL,
338     ... }
339
340 UnauthorizedLCSCClient-Diagnostic ::= ENUMERATED {
341     noAdditionalInformation (0),
342     clientNotInMSPrivacyExceptionList (1),
343     callToClientNotSetup (2),
344     privacyOverrideNotApplicable (3),
345     disallowedByLocalRegulatoryRequirements (4),
346     ... }
347 -- exception handling:
348 -- any unrecognized value shall be ignored
349
350 PositionMethodFailure-Param ::= SEQUENCE {
351     positionMethodFailure-Diagnostic [0] PositionMethodFailure-Diagnostic OPTIONAL,
352     extensionContainer                [1] ExtensionContainer          OPTIONAL,
353     ... }
354
355 PositionMethodFailure-Diagnostic ::= ENUMERATED {
356     congestion (0),
357     insufficientResources (1),
358     insufficientMeasurementData (2),
359     inconsistentMeasurementData (3),
360     locationProcedureNotCompleted (4),
361     locationProcedureNotSupportedByTargetMS (5),
362     qosNotAttainable (6),
363     ... }
364 -- exception handling:
365 -- any unrecognized value shall be ignored
366
367 PositionMethodFailureWithRestart-Param ::= SEQUENCE {
368     extensionContainer          ExtensionContainer          OPTIONAL,
369     ... }
370
371 LMUUnknownOrOffline-Param ::= SEQUENCE {
372     extensionContainer          ExtensionContainer          OPTIONAL,
373     ... }
374

```

```

375 TrafficChannelEstablishmentFailure-Param ::= SEQUENCE {
376     extensionContainer          ExtensionContainer          OPTIONAL,
377     ...}
378
379 UnknownOrUnreachableLCSClient-Param ::= SEQUENCE {
380     extensionContainer          ExtensionContainer          OPTIONAL,
381     ...}
382
383 MM-EventNotSupported-Param ::= SEQUENCE {
384     extensionContainer          ExtensionContainer          OPTIONAL,
385     ...}
386
387 END

```

17.7.8 Common data types

```

1  MAP-CommonDataTypes {
2      ccitt identified-organization (4) etsi (0) mobileDomain (0)
3      gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}
4
5  DEFINITIONS
6
7  IMPLICIT TAGS
8
9  ::=
10
11 BEGIN
12
13 EXPORTS
14
15     -- general data types and values
16     AddressString,
17     ISDN-AddressString,
18     maxISDN-AddressLength,
19     ISDN-SubaddressString,
20     ExternalSignalInfo,
21     Ext-ExternalSignalInfo,
22     SignalInfo,
23     maxSignalInfoLength,
24     AlertingPattern,
25
26     -- data types for numbering and identification
27     IMSI,
28     TMSI,
29     Identity,
30     SubscriberId,
31     IMEI,
32     HLR-List,
33     LMSI,
34     GlobalCellId,
35     NetworkResource,
36     NAEA-PreferredCI,
37     NAEA-CIC,
38     ASCI-CallReference,
39     SubscriberIdentity,
40
41     -- data types for CAMEL
42     CellIdOrLAI,
43
44     -- data types for subscriber management
45     BasicServiceCode,
46     Ext-BasicServiceCode,
47     EMLPP-Info,
48     EMLPP-Priority,
49
50     -- data types for geographic location
51     AgeOfLocationInformation,
52     LCSClientExternalID,
53     LCSClientInternalID
54 ;
55
56 IMPORTS
57     TeleserviceCode,
58     Ext-TeleserviceCode
59 FROM MAP-TS-Code {
60     ccitt identified-organization (4) etsi (0) mobileDomain (0)
61     gsm-Network (1) modules (3) map-TS-Code (19) version6 (6)}
62

```

```

63     BearerServiceCode,
64     Ext-BearerServiceCode
65 FROM MAP-BS-Code {
66     ccitt identified-organization (4) etsi (0) mobileDomain (0)
67     gsm-Network (1) modules (3) map-BS-Code (20) version6 (6)}
68
69     ExtensionContainer
70 FROM MAP-ExtensionDataTypes {
71     ccitt identified-organization (4) etsi (0) mobileDomain (0)
72     gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
73 ;
74
75 -- general data types
76
77

```

```

78 TBCD-STRING ::= OCTET STRING
79
80 -- This type (Telephony Binary Coded Decimal String) is used to
81 -- represent several digits from 0 through 9, *, #, a, b, c, two
82 -- digits per octet, each digit encoded 0000 to 1001 (0 to 9),
83 -- 1010 (*), 1011 (#), 1100 (a), 1101 (b) or 1110 (c); 1111 used
84 -- as filler when there is an odd number of digits.
85
86 -- bits 8765 of octet n encoding digit 2n
87 -- bits 4321 of octet n encoding digit 2(n-1) +1
88

```

```

89 AddressString ::= OCTET STRING (SIZE (1..maxAddressLength))
90 -- This type is used to represent a number for addressing
91 -- purposes. It is composed of
92 -- a) one octet for nature of address, and numbering plan
93 -- indicator.
94 -- b) digits of an address encoded as TBCD-String.
95
96 -- a) The first octet includes a one bit extension indicator, a
97 -- 3 bits nature of address indicator and a 4 bits numbering
98 -- plan indicator, encoded as follows:
99
100 -- bit 8: 1 (no extension)
101
102 -- bits 765: nature of address indicator
103 -- 000 unknown
104 -- 001 international number
105 -- 010 national significant number
106 -- 011 network specific number
107 -- 100 subscriber number
108 -- 101 reserved
109 -- 110 abbreviated number
110 -- 111 reserved for extension
111
112 -- bits 4321: numbering plan indicator
113 -- 0000 unknown
114 -- 0001 ISDN/Telephony Numbering Plan (Rec CCITT E.164)
115 -- 0010 spare
116 -- 0011 data numbering plan (CCITT Rec X.121)
117 -- 0100 telex numbering plan (CCITT Rec F.69)
118 -- 0101 spare
119 -- 0110 land mobile numbering plan (CCITT Rec E.212)
120 -- 0111 spare
121 -- 1000 national numbering plan
122 -- 1001 private numbering plan
123 -- 1111 reserved for extension
124
125 -- all other values are reserved.
126
127 -- b) The following octets representing digits of an address
128 -- encoded as a TBCD-STRING.
129

```

```

129 maxAddressLength INTEGER ::= 20
130

```

```

131 ISDN-AddressString ::=
132     AddressString (SIZE (1..maxISDN-AddressLength))
133 -- This type is used to represent ISDN numbers.
134

```

```

135 maxISDN-AddressLength INTEGER ::= 9
136

```

```

137 ISDN-SubaddressString ::=
138     OCTET STRING (SIZE (1..maxISDN-SubaddressLength))
139     -- This type is used to represent ISDN subaddresses.
140     -- It is composed of
141     -- a) one octet for type of subaddress and odd/even indicator.
142     -- b) 20 octets for subaddress information.
143
144     -- a) The first octet includes a one bit extension indicator, a
145     --     3 bits type of subaddress and a one bit odd/even indicator,
146     --     encoded as follows:
147
148     -- bit 8: 1 (no extension)
149
150     -- bits 765: type of subaddress
151     --     000 NSAP (X.213/ISO 8348 AD2)
152     --     010 User Specified
153     --     All other values are reserved
154
155     -- bit 4: odd/even indicator
156     --     0 even number of address signals
157     --     1 odd number of address signals
158     --     The odd/even indicator is used when the type of subaddress
159     --     is "user specified" and the coding is BCD.
160
161     -- bits 321: 000 (unused)
162
163     -- b) Subaddress information.
164     -- The NSAP X.213/ISO8348AD2 address shall be formatted as specified
165     -- by octet 4 which contains the Authority and Format Identifier
166     -- (AFI). The encoding is made according to the "preferred binary
167     -- encoding" as defined in X.213/ISO834AD2. For the definition
168     -- of this type of subaddress, see CCITT Rec I.334.
169
170     -- For User-specific subaddress, this field is encoded according
171     -- to the user specification, subject to a maximum length of 20
172     -- octets. When interworking with X.25 networks BCD coding should
173     -- be applied.

```

```

175 maxISDN-SubaddressLength INTEGER ::= 21

```

```

177 ExternalSignalInfo ::= SEQUENCE {
178     protocolId          ProtocolId,
179     signalInfo          SignalInfo,
180     -- Information about the internal structure is given in
181     -- subclause 7.6.9.
182     extensionContainer  ExtensionContainer OPTIONAL,
183     -- extensionContainer must not be used in version 2
184     ...}

```

```

186 SignalInfo ::= OCTET STRING (SIZE (1..maxSignalInfoLength))

```

```

188 maxSignalInfoLength INTEGER ::= 200
189 -- This NamedValue represents the theoretical maximum number of
190 -- octets which are available to carry a single data type,
191 -- without requiring segmentation to cope with the network layer
192 -- service. However, the actual maximum size available for a data
193 -- type may be lower, especially when other information elements
194 -- have to be included in the same component.

```

```

196 ProtocolId ::= ENUMERATED {
197     gsm-0408 (1),
198     gsm-0806 (2),
199     gsm-BSSMAP (3),
200     -- Value 3 is reserved and must not be used
201     ets-300102-1 (4)}

```

```

203 Ext-ExternalSignalInfo ::= SEQUENCE {
204     ext-ProtocolId      Ext-ProtocolId,
205     signalInfo          SignalInfo,
206     -- Information about the internal structure is given in
207     -- subclause 7.6.9.10
208     extensionContainer  ExtensionContainer OPTIONAL,
209     ...}

```

210

```

211 Ext-ProtocolId ::= ENUMERATED {
212     ets-300356 (1),
213     ... ,
214     gsm-0471 (2),
215     -- Value 2 refers to the smlc-lmu messages defined in GSM 04.71
216     gsm-0871 (3)
217     -- Value 3 refers to the SMLC-BSC messages defined in GSM 08.71
218 }
219 -- exception handling:
220 -- For Ext-ExternalSignalInfo sequences containing this parameter with any
221 -- other value than the ones listed the receiver shall ignore the whole
222 -- Ext-ExternalSignalInfo sequence.
223
224 AlertingPattern ::= OCTET STRING (SIZE (1) )
225 -- This type is used to represent Alerting Pattern
226
227 -- bits 8765 : 0000 (unused)
228
229 -- bits 43 : type of Pattern
230 --     00 level
231 --     01 category
232 --     10 category
233 --     all other values are reserved.
234
235 -- bits 21 : type of alerting
236
237 alertingLevel-0 AlertingPattern ::= '00000000'B
238 alertingLevel-1 AlertingPattern ::= '00000001'B
239 alertingLevel-2 AlertingPattern ::= '00000010'B
240 -- all other values of Alerting level are reserved
241 -- Alerting Levels are defined in GSM 02.07
242
243 alertingCategory-1 AlertingPattern ::= '00000100'B
244 alertingCategory-2 AlertingPattern ::= '00000101'B
245 alertingCategory-3 AlertingPattern ::= '00000110'B
246 alertingCategory-4 AlertingPattern ::= '00000111'B
247 alertingCategory-5 AlertingPattern ::= '00001000'B
248 -- all other values of Alerting Category are reserved
249 -- Alerting categories are defined in GSM 02.07
250
251
252 -- data types for numbering and identification
253
254 IMSI ::= TBCD-STRING (SIZE (3..8))
255 -- digits of MCC, MNC, MSIN are concatenated in this order.
256
257 Identity ::= CHOICE {
258     imsi                               IMSI,
259     imsi-WithLMSI                      IMSI-WithLMSI}
260
261 IMSI-WithLMSI ::= SEQUENCE {
262     imsi                               IMSI,
263     lmsi                               LMSI,
264     -- a special value 00000000 indicates that the LMSI is not in use
265     ...}
266
267 ASCII-CallReference ::= TBCD-STRING (SIZE (1..8))
268 -- digits of VGCS/VBC-area,Group-ID are concatenated in this order.
269
270
271 TMSI ::= OCTET STRING (SIZE (1..4))
272
273 SubscriberId ::= CHOICE {
274     imsi                               [0] IMSI,
275     tmsi                               [1] TMSI}
276
277 IMEI ::= TBCD-STRING (SIZE (8))
278 -- Refers to International Mobile Station Equipment Identity
279 -- and Software Version Number (SVN) defined in TS GSM 03.03.
280 -- If the SVN is not present the last octet shall contain the
281 -- digit 0 and a filler.
282 -- If present the SVN shall be included in the last octet.
283
284 HLR-Id ::= IMSI
285 -- leading digits of IMSI, i.e. (MCC, MNC, leading digits of
286 -- MSIN) forming HLR Id defined in TS GSM 03.03.
287

```

```

288 HLR-List ::= SEQUENCE SIZE (1..maxNumOfHLR-Id) OF
289           HLR-Id
290
291 maxNumOfHLR-Id  INTEGER ::= 50
292
293 IMSI ::= OCTET STRING (SIZE (4))
294
295 GlobalCellId ::= OCTET STRING (SIZE (5..7))
296   -- Refers to Cell Global Identification defined in TS GSM 03.03.
297   -- The internal structure is defined as follows:
298   -- octet 1 bits 4321      Mobile Country Code 1st digit
299   --           bits 8765      Mobile Country Code 2nd digit
300   -- octet 2 bits 4321      Mobile Country Code 3rd digit
301   --           bits 8765      Mobile Network Code 3rd digit
302   --                               or filler (1111) for 2 digit MNCs
303   -- octet 3 bits 4321      Mobile Network Code 1st digit
304   --           bits 8765      Mobile Network Code 2nd digit
305   -- octets 4 and 5        Location Area Code according to TS GSM 04.08
306   -- octets 6 and 7        Cell Identity (CI) according to TS GSM 04.08
307
308 NetworkResource ::= ENUMERATED {
309   plmn (0),
310   hlr (1),
311   vlr (2),
312   pvlr (3),
313   controllingMSC (4),
314   vmsc (5),
315   eir (6),
316   rss (7)}
317
318 NAEA-PreferredCI ::= SEQUENCE {
319   naea-PreferredCIC [0] NAEA-CIC,
320   extensionContainer [1] ExtensionContainer OPTIONAL,
321   ...}
322
323 NAEA-CIC ::= OCTET STRING (SIZE (3))
324   -- The internal structure is defined by the Carrier Identification
325   -- parameter in ANSI T1.113.3. Carrier codes between "000" and "999" may
326   -- be encoded as 3 digits using "000" to "999" or as 4 digits using
327   -- "0000" to "0999". Carrier codes between "1000" and "9999" are encoded
328   -- using 4 digits.
329
330 SubscriberIdentity ::= CHOICE {
331   imsi [0] IMSI,
332   msisdn [1] ISDN-AddressString
333   }
334
335 LCSCClientExternalID ::= SEQUENCE {
336   externalAddress [0] AddressString OPTIONAL,
337   extensionContainer [1] ExtensionContainer OPTIONAL,
338   ... }
339
340 LCSCClientInternalID ::= ENUMERATED {
341   broadcastService (0),
342   o-andM-HPLMN (1),
343   o-andM-VPLMN (2),
344   anonymousLocation (3),
345   targetMSSubscribedService (4),
346   ... }
347
348
349 -- data types for CAMEL
350
351 CellIdOrLAI ::= CHOICE {
352   cellIdFixedLength [0] CellIdFixedLength,
353   laiFixedLength [1] LAIFixedLength}
354

```

```

355 CellIdFixedLength ::= OCTET STRING (SIZE (7))
356 -- Refers to Cell Global Identification defined in TS GSM 03.03.
357 -- The internal structure is defined as follows:
358 -- octet 1 bits 4321      Mobile Country Code 1st digit
359 --           bits 8765      Mobile Country Code 2nd digit
360 -- octet 2 bits 4321      Mobile Country Code 3rd digit
361 --           bits 8765      Mobile Network Code 3rd digit
362 --                               or filler (1111) for 2 digit MNCs
363 -- octet 3 bits 4321      Mobile Network Code 1st digit
364 --           bits 8765      Mobile Network Code 2nd digit
365 -- octets 4 and 5        Location Area Code according to TS GSM 04.08
366 -- octets 6 and 7        Cell Identity (CI) according to TS GSM 04.08
367

```

```

368 LAIFixedLength ::= OCTET STRING (SIZE (5))
369 -- Refers to Location Area Identification defined in TS GSM 03.03.
370 -- The internal structure is defined as follows:
371 -- octet 1 bits 4321      Mobile Country Code 1st digit
372 --           bits 8765      Mobile Country Code 2nd digit
373 -- octet 2 bits 4321      Mobile Country Code 3rd digit
374 --           bits 8765      Mobile Network Code 3rd digit
375 --                               or filler (1111) for 2 digit MNCs
376 -- octet 3 bits 4321      Mobile Network Code 1st digit
377 --           bits 8765      Mobile Network Code 2nd digit
378 -- octets 4 and 5        Location Area Code according to TS GSM 04.08
379

```

```

380 -- data types for subscriber management
381
382

```

```

383 BasicServiceCode ::= CHOICE {
384     bearerService      [2] BearerServiceCode,
385     teleservice        [3] TeleserviceCode}
386

```

```

387 Ext-BasicServiceCode ::= CHOICE {
388     ext-BearerService  [2] Ext-BearerServiceCode,
389     ext-Teleservice    [3] Ext-TeleserviceCode}
390

```

```

391 EMLPP-Info ::= SEQUENCE {
392     maximumentitledPriority  EMLPP-Priority,
393     defaultPriority          EMLPP-Priority,
394     extensionContainer       ExtensionContainer          OPTIONAL,
395     ...}
396

```

```

397 EMLPP-Priority ::= INTEGER (0..15)
398 -- The mapping from the values A,B,0,1,2,3,4 to the integer-value is
399 -- specified as follows where A is the highest and 4 is the lowest
400 -- priority level
401 -- the integer values 7-15 are spare and shall be mapped to value 4
402

```

```

403 priorityLevelA      EMLPP-Priority ::= 6
404 priorityLevelB      EMLPP-Priority ::= 5
405 priorityLevel0      EMLPP-Priority ::= 0
406 priorityLevel1      EMLPP-Priority ::= 1
407 priorityLevel2      EMLPP-Priority ::= 2
408 priorityLevel3      EMLPP-Priority ::= 3
409 priorityLevel4      EMLPP-Priority ::= 4
410

```

```

411 -- data types for geographic location
412
413

```

```

414 AgeOfLocationInformation ::= INTEGER (0..32767)
415 -- the value represents the elapsed time in minutes since the last
416 -- network contact of the mobile station (i.e. the actuality of the
417 -- location information).
418 -- value "0" indicates that the MS is currently in contact with the
419 -- network
420 -- value "32767" indicates that the location information is at least
421 -- 32767 minutes old
422

```

```

423 END

```

17.7.9 Teleservice Codes

```

1  MAP-TS-Code {
2     ccitt identified-organization (4) etsi (0) mobileDomain (0)
3     gsm-Network (1) modules (3) map-TS-Code (19) version6 (6)}
4
5  DEFINITIONS

```

```

6
7 ::=
8
9 BEGIN
10
11 TeleserviceCode ::= OCTET STRING (SIZE (1))
12 -- This type is used to represent the code identifying a single
13 -- teleservice, a group of teleservices, or all teleservices. The
14 -- services are defined in TS GSM 02.03.
15 -- The internal structure is defined as follows:
16
17 -- bits 87654321: group (bits 8765) and specific service
18 -- (bits 4321)
19
20 Ext-TeleserviceCode ::= OCTET STRING (SIZE (1..5))
21 -- This type is used to represent the code identifying a single
22 -- teleservice, a group of teleservices, or all teleservices. The
23 -- services are defined in TS GSM 02.03.
24 -- The internal structure is defined as follows:
25
26 -- OCTET 1:
27 -- bits 87654321: group (bits 8765) and specific service
28 -- (bits 4321)
29
30 -- OCTETS 2-5: reserved for future use. If received the
31 -- Ext-TeleserviceCode shall be
32 -- treated according to the exception handling defined for the
33 -- operation that uses this type.
34
35 -- Ext-TeleserviceCode includes all values defined for TeleserviceCode.
36
37
38 allTeleservices TeleserviceCode ::= '00000000'B
39
40 allSpeechTransmissionServices TeleserviceCode ::= '00010000'B
41 telephony TeleserviceCode ::= '00010001'B
42 emergencyCalls TeleserviceCode ::= '00010010'B
43
44 allShortMessageServices TeleserviceCode ::= '00100000'B
45 shortMessageMT-PP TeleserviceCode ::= '00100001'B
46 shortMessageMO-PP TeleserviceCode ::= '00100010'B
47
48 allFacsimileTransmissionServices TeleserviceCode ::= '01100000'B
49 facsimileGroup3AndAlterSpeech TeleserviceCode ::= '01100001'B
50 automaticFacsimileGroup3 TeleserviceCode ::= '01100010'B
51 facsimileGroup4 TeleserviceCode ::= '01100011'B
52
53 -- The following non-hierarchical Compound Teleservice Groups
54 -- are defined in TS GSM 02.30:
55 allDataTeleservices TeleserviceCode ::= '01110000'B
56 -- covers Teleservice Groups 'allFacsimileTransmissionServices'
57 -- and 'allShortMessageServices'
58 allTeleservices-ExeptSMS TeleserviceCode ::= '10000000'B
59 -- covers Teleservice Groups 'allSpeechTransmissionServices' and
60 -- 'allFacsimileTransmissionServices'
61 --
62 -- Compound Teleservice Group Codes are only used in call
63 -- independent supplementary service operations, i.e. they
64 -- are not used in InsertSubscriberData or in
65 -- DeleteSubscriberData messages.
66
67 allVoiceGroupCallServices TeleserviceCode ::= '10010000'B
68
69 voiceGroupCall TeleserviceCode ::= '10010001'B
70 voiceBroadcastCall TeleserviceCode ::= '10010010'B
71

```

```

72 allPLMN-specificTS      TeleserviceCode ::= '11010000'B
73 plmn-specificTS-1      TeleserviceCode ::= '11010001'B
74 plmn-specificTS-2      TeleserviceCode ::= '11010010'B
75 plmn-specificTS-3      TeleserviceCode ::= '11010011'B
76 plmn-specificTS-4      TeleserviceCode ::= '11010100'B
77 plmn-specificTS-5      TeleserviceCode ::= '11010101'B
78 plmn-specificTS-6      TeleserviceCode ::= '11010110'B
79 plmn-specificTS-7      TeleserviceCode ::= '11010111'B
80 plmn-specificTS-8      TeleserviceCode ::= '11011000'B
81 plmn-specificTS-9      TeleserviceCode ::= '11011001'B
82 plmn-specificTS-A      TeleserviceCode ::= '11011010'B
83 plmn-specificTS-B      TeleserviceCode ::= '11011011'B
84 plmn-specificTS-C      TeleserviceCode ::= '11011100'B
85 plmn-specificTS-D      TeleserviceCode ::= '11011101'B
86 plmn-specificTS-E      TeleserviceCode ::= '11011110'B
87 plmn-specificTS-F      TeleserviceCode ::= '11011111'B
88
89 END

```

17.7.10 Bearer Service Codes

```

1  MAP-BS-Code {
2    ccitt identified-organization (4) etsi (0) mobileDomain (0)
3    gsm-Network (1) modules (3) map-BS-Code (20) version6 (6)}
4
5  DEFINITIONS
6
7  ::=
8
9  BEGIN
10
11  BearerServiceCode ::= OCTET STRING (SIZE (1))
12    -- This type is used to represent the code identifying a single
13    -- bearer service, a group of bearer services, or all bearer
14    -- services. The services are defined in TS GSM 02.02.
15    -- The internal structure is defined as follows:
16    --
17    -- plmn-specific bearer services:
18    -- bits 87654321: defined by the HPLMN operator
19
20    -- rest of bearer services:
21    -- bit 8: 0 (unused)
22    -- bits 7654321: group (bits 7654), and rate, if applicable
23    -- (bits 321)
24
25  Ext-BearerServiceCode ::= OCTET STRING (SIZE (1..5))
26    -- This type is used to represent the code identifying a single
27    -- bearer service, a group of bearer services, or all bearer
28    -- services. The services are defined in TS GSM 02.02.
29    -- The internal structure is defined as follows:
30    --
31    -- OCTET 1:
32    -- plmn-specific bearer services:
33    -- bits 87654321: defined by the HPLMN operator
34    --
35    -- rest of bearer services:
36    -- bit 8: 0 (unused)
37    -- bits 7654321: group (bits 7654), and rate, if applicable
38    -- (bits 321)
39
40    -- OCTETS 2-5: reserved for future use. If received the
41    -- Ext-TeleserviceCode shall be
42    -- treated according to the exception handling defined for the
43    -- operation that uses this type.
44
45
46    -- Ext-BearerServiceCode includes all values defined for BearerServiceCode.
47
48
49  allBearerServices      BearerServiceCode ::= '00000000'B
50

```

```

51 allDataCDA-Services BearerServiceCode ::= '00010000'B
52 dataCDA-300bps BearerServiceCode ::= '00010001'B
53 dataCDA-1200bps BearerServiceCode ::= '00010010'B
54 dataCDA-1200-75bps BearerServiceCode ::= '00010011'B
55 dataCDA-2400bps BearerServiceCode ::= '00010100'B
56 dataCDA-4800bps BearerServiceCode ::= '00010101'B
57 dataCDA-9600bps BearerServiceCode ::= '00010110'B
58 general-dataCDA BearerServiceCode ::= '00010111'B
59
60 allDataCDS-Services BearerServiceCode ::= '00011000'B
61 dataCDS-1200bps BearerServiceCode ::= '00011010'B
62 dataCDS-2400bps BearerServiceCode ::= '00011100'B
63 dataCDS-4800bps BearerServiceCode ::= '00011101'B
64 dataCDS-9600bps BearerServiceCode ::= '00011110'B
65 general-dataCDS BearerServiceCode ::= '00011111'B
66
67 allPadAccessCA-Services BearerServiceCode ::= '00100000'B
68 padAccessCA-300bps BearerServiceCode ::= '00100001'B
69 padAccessCA-1200bps BearerServiceCode ::= '00100010'B
70 padAccessCA-1200-75bps BearerServiceCode ::= '00100011'B
71 padAccessCA-2400bps BearerServiceCode ::= '00100100'B
72 padAccessCA-4800bps BearerServiceCode ::= '00100101'B
73 padAccessCA-9600bps BearerServiceCode ::= '00100110'B
74 general-padAccessCA BearerServiceCode ::= '00100111'B
75
76 allDataPDS-Services BearerServiceCode ::= '00101000'B
77 dataPDS-2400bps BearerServiceCode ::= '00101100'B
78 dataPDS-4800bps BearerServiceCode ::= '00101101'B
79 dataPDS-9600bps BearerServiceCode ::= '00101110'B
80 general-dataPDS BearerServiceCode ::= '00101111'B
81
82 allAlternateSpeech-DataCDA BearerServiceCode ::= '00110000'B
83
84 allAlternateSpeech-DataCDS BearerServiceCode ::= '00111000'B
85
86 allSpeechFollowedByDataCDA BearerServiceCode ::= '01000000'B
87
88 allSpeechFollowedByDataCDS BearerServiceCode ::= '01001000'B
89
90 -- The following non-hierarchical Compound Bearer Service
91 -- Groups are defined in TS GSM 02.30:
92 allDataCircuitAsynchronous BearerServiceCode ::= '01010000'B
93 -- covers "allDataCDA-Services", "allAlternateSpeech-DataCDA" and
94 -- "allSpeechFollowedByDataCDA"
95 allAsynchronousServices BearerServiceCode ::= '01100000'B
96 -- covers "allDataCDA-Services", "allAlternateSpeech-DataCDA",
97 -- "allSpeechFollowedByDataCDA" and "allPadAccessCA-Services"
98 allDataCircuitSynchronous BearerServiceCode ::= '01011000'B
99 -- covers "allDataCDS-Services", "allAlternateSpeech-DataCDS" and
100 -- "allSpeechFollowedByDataCDS"
101 allSynchronousServices BearerServiceCode ::= '01101000'B
102 -- covers "allDataCDS-Services", "allAlternateSpeech-DataCDS",
103 -- "allSpeechFollowedByDataCDS" and "allDataPDS-Services"
104 --
105 -- Compound Bearer Service Group Codes are only used in call
106 -- independent supplementary service operations, i.e. they
107 -- are not used in InsertSubscriberData or in
108 -- DeleteSubscriberData messages.
109
110 allPLMN-specificBS BearerServiceCode ::= '11010000'B
111 plmn-specificBS-1 BearerServiceCode ::= '11010001'B
112 plmn-specificBS-2 BearerServiceCode ::= '11010010'B
113 plmn-specificBS-3 BearerServiceCode ::= '11010011'B
114 plmn-specificBS-4 BearerServiceCode ::= '11010100'B
115 plmn-specificBS-5 BearerServiceCode ::= '11010101'B
116 plmn-specificBS-6 BearerServiceCode ::= '11010110'B
117 plmn-specificBS-7 BearerServiceCode ::= '11010111'B
118 plmn-specificBS-8 BearerServiceCode ::= '11011000'B
119 plmn-specificBS-9 BearerServiceCode ::= '11011001'B
120 plmn-specificBS-A BearerServiceCode ::= '11011010'B
121 plmn-specificBS-B BearerServiceCode ::= '11011011'B
122 plmn-specificBS-C BearerServiceCode ::= '11011100'B
123 plmn-specificBS-D BearerServiceCode ::= '11011101'B
124 plmn-specificBS-E BearerServiceCode ::= '11011110'B
125 plmn-specificBS-F BearerServiceCode ::= '11011111'B
126
127 END

```

17.7.11 Extension data types

```
1  MAP-ExtensionDataTypes {
2    ccitt identified-organization (4) etsi (0) mobileDomain (0)
3    gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
4
5  DEFINITIONS
6
7  IMPLICIT TAGS
8
9  ::=
10 BEGIN
11
12 EXPORTS
13
14     PrivateExtension,
15     ExtensionContainer;
16
17
18 -- IOC for private MAP extensions
19
20
21
22 MAP-EXTENSION ::= CLASS {
23     &ExtensionType                                OPTIONAL,
24     &extensionId                                OBJECT IDENTIFIER }
25     -- The length of the Object Identifier shall not exceed 16 octets and the
26     -- number of components of the Object Identifier shall not exceed 16
27
28
29
30 -- data types
31
32 ExtensionContainer ::= SEQUENCE {
33     privateExtensionList                [0]PrivateExtensionList    OPTIONAL,
34     pcs-Extensions                    [1]PCS-Extensions            OPTIONAL,
35     ...}
36
37 PrivateExtensionList ::= SEQUENCE SIZE (1..maxNumOfPrivateExtensions) OF
38     PrivateExtension
39
40 PrivateExtension ::= SEQUENCE {
41     extId                                MAP-EXTENSION.&extensionId
42     ({ExtensionSet}),
43     extType                              MAP-EXTENSION.&ExtensionType
44     ({ExtensionSet}@extId)              OPTIONAL}
45
46 maxNumOfPrivateExtensions INTEGER ::= 10
47
48 ExtensionSet                                MAP-EXTENSION ::=
49     {...
50     -- ExtensionSet is the set of all defined private extensions
51     }
52
53     -- Unsupported private extensions shall be discarded if received.
54
55
56 PCS-Extensions ::= SEQUENCE {
57     ...}
58
59 END
60
```

17.7.12 Group Call data types

```
1  MAP-GR-DataTypes {
2    ccitt identified-organization (4) etsi (0) mobileDomain (0)
3    gsm-Network (1) modules (3) map-GR-DataTypes (23) version6 (6)}
4
5  DEFINITIONS
6
7  IMPLICIT TAGS
8
9  ::=
10 BEGIN
11
```

```

12
13 EXPORTS
14   PrepareGroupCallArg,
15   PrepareGroupCallRes,
16   SendGroupCallEndSignalArg,
17   SendGroupCallEndSignalRes,
18   ForwardGroupCallSignallingArg,
19   ProcessGroupCallSignallingArg
20 ;
21
22 IMPORTS
23   ISDN-AddressString,
24   IMSI,
25   EMLPP-Priority,
26   ASCII-CallReference
27 FROM MAP-CommonDataTypes {
28   ccitt identified-organization (4) etsi (0) mobileDomain (0)
29   gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}
30
31   Ext-TeleserviceCode
32 FROM MAP-TS-Code {
33   ccitt identified-organization (4) etsi (0) mobileDomain (0)
34   gsm-Network (1) modules (3) map-TS-Code (19) version6 (6)}
35
36   Kc
37 FROM MAP-MS-DataTypes {
38   ccitt identified-organization (4) etsi (0) mobileDomain (0)
39   gsm-Network (1) modules (3) map-MS-DataTypes (11) version6 (6)}
40
41
42   ExtensionContainer
43 FROM MAP-ExtensionDataTypes {
44   ccitt identified-organization (4) etsi (0) mobileDomain (0)
45   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
46 ;
47
48

```

<pre> 49 PrepareGroupCallArg ::= SEQUENCE { 50 teleservice 51 asciiCallReference 52 codec-Info 53 cipheringAlgorithm 54 groupKeyNumber 55 groupKey 56 priority 57 uplinkFree 58 extensionContainer 59 ...} </pre>	<pre> Ext-TeleserviceCode, ASCII-CallReference, CODEC-Info, CipheringAlgorithm, [0]GroupKeyNumber [1]Kc [2]EMLPP-Priority [3] NULL [4] ExtensionContainer </pre>	<pre> OPTIONAL, OPTIONAL, OPTIONAL, OPTIONAL, OPTIONAL, OPTIONAL, OPTIONAL, OPTIONAL, </pre>
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------

<pre> 61 PrepareGroupCallRes ::= SEQUENCE { 62 groupCallNumber 63 extensionContainer 64 ...} </pre>	<pre> ISDN-AddressString, ExtensionContainer </pre>	<pre> OPTIONAL, </pre>
-----------------------------------------------------------------------------------------------------------	-----------------------------------------------------	------------------------

<pre> 66 SendGroupCallEndSignalArg ::= SEQUENCE { 67 imsi 68 extensionContainer 69 ...} </pre>	<pre> IMSI ExtensionContainer </pre>	<pre> OPTIONAL, OPTIONAL, </pre>
------------------------------------------------------------------------------------------------------	--------------------------------------	----------------------------------

<pre> 71 SendGroupCallEndSignalRes ::= SEQUENCE { 72 extensionContainer 73 ...} </pre>	<pre> ExtensionContainer </pre>	<pre> OPTIONAL, </pre>
--------------------------------------------------------------------------------------------	---------------------------------	------------------------

<pre> 75 ForwardGroupCallSignallingArg ::= SEQUENCE { 76 imsi 77 uplinkRequestAck 78 uplinkReleaseIndication 79 uplinkRejectCommand 80 uplinkSeizedCommand 81 uplinkReleaseCommand 82 extensionContainer 83 ...} </pre>	<pre> IMSI [0] NULL [1] NULL [2] NULL [3] NULL [4] NULL ExtensionContainer </pre>	<pre> OPTIONAL, OPTIONAL, OPTIONAL, OPTIONAL, OPTIONAL, OPTIONAL, OPTIONAL, OPTIONAL, </pre>
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------

84

```

85 ProcessGroupCallSignallingArg ::= SEQUENCE {
86     uplinkRequest          [0] NULL          OPTIONAL,
87     uplinkReleaseIndication [1] NULL          OPTIONAL,
88     releaseGroupCall       [2] NULL          OPTIONAL,
89     extensionContainer     ExtensionContainer OPTIONAL,
90     ...}
91
92 GroupKeyNumber ::= INTEGER (0..15)
93
94 CODEC-Info ::= OCTET STRING (SIZE (5..10))
95     -- Refers to channel type
96     -- coded according to GSM 08.08
97
98
99 CipheringAlgorithm ::= OCTET STRING (SIZE (1))
100     -- Refers to 'permitted algorithms' in 'encryption information'
101     -- coded according to GSM 08.08:
102
103     -- Bits 8-1
104     -- 8765 4321
105     -- 0000 0001          No encryption
106     -- 0000 0010          GSM A5/1
107     -- 0000 0100          GSM A5/2
108     -- 0000 1000          GSM A5/3
109     -- 0001 0000          GSM A5/4
110     -- 0010 0000          GSM A5/5
111     -- 0100 0000          GSM A5/6
112     -- 1000 0000          GSM A5/7
113
114
115
116
117
118
119 END

```

17.7.13 Location service data types

```

1 MAP-LCS-DataTypes {
2     ccitt identified-organization (4) etsi (0) mobileDomain (0)
3     gsm-Network (1) modules (3) map-LCS-DataTypes (25) version6 (6)}
4
5 DEFINITIONS
6 IMPLICIT TAGS
7 ::=
8 BEGIN
9
10 EXPORTS
11     RoutingInfoForLCS-Arg,
12     RoutingInfoForLCS-Res,
13     ProvideSubscriberLocation-Arg,
14     ProvideSubscriberLocation-Res,
15     SubscriberLocationReport-Arg,
16     SubscriberLocationReport-Res,
17     PerformLocation-Arg,
18     PerformLocation-Res,
19     LCSRegistration-Arg,
20     LCSRegistration-Res,
21     LCSInformationRequest-Arg,
22     LCSInformationReport-Arg,
23     LCSReset-Arg,
24     LCSAssignTrafficChannel-Arg,
25     LCSAssignTrafficChannel-Res
26 ;
27

```

```

28 IMPORTS
29   AddressString,
30   ISDN-AddressString,
31   IMEI,
32   IMSI,
33   LMSI,
34   Identity,
35   SubscriberIdentity,
36   GlobalCellId,
37   Ext-ExternalSignalInfo,
38   AgeOfLocationInformation, LCSCClientExternalID,
39   LCSCClientInternalID
40 FROM MAP-CommonDataTypes {
41   ccitt identified-organization (4) etsi (0) mobileDomain (0)
42   gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}
43
44   ExtensionContainer
45 FROM MAP-ExtensionDataTypes {
46   ccitt identified-organization (4) etsi (0) mobileDomain (0)
47   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
48 ;
49
50

```

```

51 RoutingInfoForLCS-Arg ::= SEQUENCE {
52   mlcNumber                [0] ISDN-AddressString,
53   targetMS                 [1] SubscriberIdentity,
54   extensionContainer       [2] ExtensionContainer           OPTIONAL,
55   ...}
56

```

```

57 RoutingInfoForLCS-Res ::= SEQUENCE {
58   targetMS                 [0] SubscriberIdentity,
59   lcsLocationInfo         [1] LCSLocationInfo,
60   extensionContainer       [2] ExtensionContainer           OPTIONAL,
61   ...}
62

```

```

63 LCSLocationInfo ::= SEQUENCE {
64   msc-Number              ISDN-AddressString,
65   lmsi                    [0] LMSI                       OPTIONAL,
66   extensionContainer       [1] ExtensionContainer           OPTIONAL,
67   ...}
68

```

```

69 ProvideSubscriberLocation-Arg ::= SEQUENCE {
70   locationType             LocationType,
71   mlc-Number              ISDN-AddressString,
72   lcs-ClientID            [0] LCS-ClientID                 OPTIONAL,
73   privacyOverride         [1] NULL                       OPTIONAL,
74   imsi                    [2] IMSI                       OPTIONAL,
75   msisdn                  [3] ISDN-AddressString          OPTIONAL,
76   lmsi                    [4] LMSI                       OPTIONAL,
77   imei                    [5] IMEI                       OPTIONAL,
78   na-ESRK                 [6] ISDN-AddressString          OPTIONAL,
79   lcs-Priority            [7] LCS-Priority                OPTIONAL,
80   lcs-QoS                 [8] LCS-QoS                     OPTIONAL,
81   extensionContainer       [9] ExtensionContainer           OPTIONAL,
82   ...}
83

```

```

84 -- one of imsi, msisdn or na-ESRK is mandatory
85 -- na-ESRK is applicable only to North American PLMNs
86

```

```

87 LocationType ::= ENUMERATED {
88   currentLocation          (0),
89   currentOrLastKnownLocation (1),
90   initialLocation         (2),
91   ... }
92 -- exception handling:
93 -- a ProvideSubscriberLocation-Arg containing an unrecognized LocationType
94 -- shall be rejected by the receiver with a return error cause of unexpected data value
95

```

```

96 LCS-ClientID ::= SEQUENCE {
97   lcsClientType           [0] LCSClientType,
98   lcsClientExternalID     [1] LCSClientExternalID         OPTIONAL,
99   lcsClientDialedByMS     [2] AddressString               OPTIONAL,
100  lcsClientInternalID     [3] LCSClientInternalID         OPTIONAL,
101  ... }
102

```

```

103 LCSCliientType ::= ENUMERATED {
104     emergencyServices           (0),
105     valueAddedServices         (1),
106     plmnOperatorServices       (2),
107     lawfulInterceptServices    (3),
108     ... }
109 -- exception handling:
110 -- unrecognized values may be ignored if the LCS client uses the privacy override
111 -- otherwise, an unrecognized value shall be treated as unexpected data by a receiver
112 -- a return error shall then be returned if received in a MAP invoke
113
114 LCS-Priority ::= OCTET STRING (SIZE (1))
115     -- 0 = highest priority
116     -- 1 = normal priority
117     -- all other values treated as 1
118
119 LCS-QoS ::= SEQUENCE {
120     horizontal-accuracy         [0] Horizontal-Accuracy           OPTIONAL,
121     responseTime                [1] ResponseTime                OPTIONAL,
122     extensionContainer          [2] ExtensionContainer           OPTIONAL,
123     ... }
124
125 Horizontal-Accuracy ::= OCTET STRING (SIZE (1))
126     -- bit 8 = 0
127     -- bits 7-1 = 7 bit Uncertainty Code defined in GSM 03.32
128
129 ResponseTime ::= ENUMERATED {
130     nodelay (0),
131     lowdelay (1),
132     delaytolerant (2),
133     ... }
134 -- exception handling:
135 -- an unrecognized value shall be treated the same as value 2 (delaytolerant)
136
137 ProvidesSubscriberLocation-Res ::= SEQUENCE {
138     locationEstimate            Ext-GeographicalInformation,
139     ageOfLocationEstimate      [0] AgeOfLocationInformation     OPTIONAL,
140     extensionContainer          [1] ExtensionContainer           OPTIONAL,
141     ... }
142
143 Ext-GeographicalInformation ::= OCTET STRING (SIZE (1..maxExt-GeographicalInformation))
144 -- Refers to geographical Information defined in GSM 03.32.
145 -- This is composed of 1 or more octets with an internal structure according to GSM 03.32
146 -- Octet 1: Type of shape, only the following shapes in GSM 03.32 are allowed:
147 --     (a) Ellipsoid point with uncertainty circle
148 --     (b) Ellipsoid point with uncertainty ellipse
149 -- Any other value in octet 1 shall be treated as invalid
150 -- Octets 2 to 8 for case (a) - Ellipsoid point with uncertainty circle
151 --     Degrees of Latitude           3 octets
152 --     Degrees of Longitude         3 octets
153 --     Uncertainty code              1 octet
154 -- Octets 2 to 10 for case (b) - Ellipsoid point with uncertainty ellipse:
155 --     Degrees of Latitude           3 octets
156 --     Degrees of Longitude         3 octets
157 --     Uncertainty semi-major axis  1 octet
158 --     Uncertainty semi-minor axis  1 octet
159 --     Angle of major axis          1 octet
160 --
161 -- An Ext-GeogrphicalInformation parameter containing any other shape or an incorrect number
162 -- of octets or coding according to GSM 03.32 shall be treated as invalid data by a receiver
163
164 maxExt-GeographicalInformation INTEGER ::= 20
165 -- the maximum length allows for further shapes in GSM 03.32 to be included in later versions
166 -- of GSM 09.02
167

```

```

168 SubscriberLocationReport-Arg ::= SEQUENCE {
169     lcs-Event                LCS-Event,
170     lcs-ClientID             LCS-ClientID,
171     msisdn                   [0] ISDN-AddressString           OPTIONAL,
172     imsi                     [1] IMSI                       OPTIONAL,
173     imei                     [2] IMEI                       OPTIONAL,
174     na-ESRD                  [3] ISDN-AddressString           OPTIONAL,
175     na-ESRK                  [4] ISDN-AddressString           OPTIONAL,
176     locationEstimate         [5] Ext-GeographicalInformation  OPTIONAL,
177     ageOfLocationEstimate    [6] AgeOfLocationInformation  OPTIONAL,
178     extensionContainer       [7] ExtensionContainer           OPTIONAL,
179     ...}
180
181 -- one of msisdn, imsi, or na-ESRK is mandatory
182 -- in North America, the na-ESRD is mandatory
183
184 LCS-Event ::= ENUMERATED {
185     emergencyCallOrigination (0),
186     emergencyCallRelease (1),
187     ... }
188 -- exception handling:
189 -- a SubscriberLocationReport-Arg containing an unrecognized LCS-Event
190 -- shall be rejected by a receiver with a return error cause of unexpected data value
191
192 SubscriberLocationReport-Res ::= SEQUENCE {
193     extensionContainer       ExtensionContainer           OPTIONAL,
194     ...}
195
196 PerformLocation-Arg ::= SEQUENCE {
197     globalCellId             GlobalCellId,
198     radioChannelType         [0] RadioChannelType           OPTIONAL,
199     lcs-Priority             [1] LCS-Priority               OPTIONAL,
200     lcs-QoS                  [2] LCS-QoS                   OPTIONAL,
201     lcs-APDU                 [3] Ext-ExternalSignalInfo     OPTIONAL,
202     extensionContainer       [4] ExtensionContainer           OPTIONAL,
203     ...}
204
205 RadioChannelType ::= ENUMERATED {
206     sdcch (0),
207     tch-fr (1),
208     tch-hr (2),
209     ... }
210 -- exception handling
211 -- an unrecognized value shall be treated as unexpected data
212 -- a return error shall be returned if received in a MAP invoke
213
214 PerformLocation-Res ::= SEQUENCE {
215     locationEstimate         Ext-GeographicalInformation,
216     positioningData          [0] PositioningDataList         OPTIONAL,
217     extensionContainer       [1] ExtensionContainer           OPTIONAL,
218     ... }
219
220 PositioningDataList ::= SEQUENCE SIZE (1..maxNumOfPositionAttempts) OF
221     PositioningData
222     -- list of positioning data for each positioning attempt
223     -- first in list = first attempt, last in list = last attempt
224
225 maxNumOfPositionAttempts INTEGER ::= 5
226
227 PositioningData ::= SEQUENCE {
228     positionMethod           PositionMethod,
229     positionResult           PositionResult,
230     duration                 [0] Duration                   OPTIONAL,
231     toa-LMU-data             [1] TOA-LMU-Data                 OPTIONAL,
232     extensionContainer       [2] ExtensionContainer           OPTIONAL,
233     ...}
234
235 -- Positioning data need not be provided to an LCS client but may be useful to the PLMN
236 -- for billing, accounting and statistical purposes
237

```

```

238 PositionMethod ::= ENUMERATED {
239     timingAdvance (0),
240     toa (1),
241     ... }
242 -- exception handling:
243 -- an unrecognized value may be stored in billing or accounting records
244 -- an unrecognized value shall not cause rejection of any associated location estimate
245
246 PositionResult ::= ENUMERATED {
247     failure (0),
248     success-NoDeliveryToClient (1),
249     success-DeliveryToClient (2) }
250
251 Duration ::= INTEGER (0..250)
252 -- duration of location attempt in units of 100ms
253 -- 250 : duration >= 25 seconds
254
255 TOA-LMU-Data ::= SEQUENCE {
256     numberOfAssignedLMUs          INTEGER (0..12),
257     numberOfLMUsWithValidMeasurements  INTEGER (0..12),
258     extensionContainer             [0] ExtensionContainer          OPTIONAL,
259     ... }
260
261 LCSRegistration-Arg ::= SEQUENCE {
262     lmuIdentity                    Identity,
263     registrationType               RegistrationType,
264     mscNumber                       [0] ISDN-AddressString        OPTIONAL,
265     extensionContainer              [1] ExtensionContainer          OPTIONAL,
266     ... }
267
268 RegistrationType ::= ENUMERATED {
269     registration                    (0),
270     deRegistration                  (1) }
271
272 LCSRegistration-Res ::= SEQUENCE {
273     extensionContainer              ExtensionContainer          OPTIONAL,
274     ... }
275
276 LCSInformationRequest-Arg ::= SEQUENCE {
277     lcs-Entity                     LCS-Entity,
278     mlcNumber                       [0] ISDN-AddressString        OPTIONAL,
279     release-forbidden               [1] NULL                      OPTIONAL,
280     reportError-request             [2] NULL                      OPTIONAL,
281     lcs-apdu                        [3] Ext-ExternalSignalInfo    OPTIONAL,
282     -- lcs-apdu carries either the Facility Information Element defined in GSM 04.71
283     -- or the Location Information parameter defined in GSM 08.71
284     extensionContainer              [4] ExtensionContainer          OPTIONAL,
285     ... }
286
287 LCS-Entity ::= SEQUENCE {
288     entityType                      EntityType,
289     entityIdentity                  [0] EntityIdentity          OPTIONAL,
290     ... }
291
292 EntityType ::= ENUMERATED {
293     lmu (0),
294     serving-BSC (1),
295     ... }
296 -- Exception handling:
297 -- an unrecognized value for the Entity Type shall cause any associated LCS APDU to be
298 -- discarded; the Report Error procedure in GSM 03.71 may also be invoked if requested in
299 -- an LCSInformationRequest-Arg.
300
301 EntityIdentity ::= SEQUENCE {
302     lmuIdentity                    Identity                    OPTIONAL,
303     ... }
304

```

```

305 LCSInformationReport-Arg ::= SEQUENCE {
306     lcs-Entity                LCS-Entity,
307     lcsCause                   [0] LCSCause                OPTIONAL,
308     -- lcsCause is included if and only if the MSC is returning an lcs-apdu to the SMLC
309     -- that could not be successfully transferred to its destination LCS entity.
310     lcs-apdu                   [1] Ext-ExternalSignalInfo    OPTIONAL,
311     -- lcs-apdu carries either the Facility Information Element defined in GSM 04.71
312     -- or the Location Information parameter defined in GSM 08.71
313     extensionContainer         [2] ExtensionContainer        OPTIONAL,
314     ...}
315
316 LCSCause ::= ENUMERATED {
317     undefined                   (0),
318     unknownLCSEntity           (1),
319     noPagingResponse           (2),
320     errorInAuthentication      (3),
321     errorInServingMSC          (4),
322     ...}
323 -- exception handling:
324 -- an unrecognized value shall be treated the same as value 0 (undefined)
325
326 LCSReset-Arg ::= SEQUENCE {
327     mlcNumber                   ISDN-AddressString,
328     lmu-List                    [0] LMU-List                OPTIONAL,
329     extensionContainer         [1] ExtensionContainer        OPTIONAL,
330     ...}
331
332 LMU-Id ::= IMSI
333 -- leading digits of IMSI, i.e. (MCC, MNC, leading digits of
334 -- MSIN) defining a set of LMUs sharing the same SMLC
335
336 LMU-List ::= SEQUENCE SIZE (1..maxNumOfLMU-Id) OF
337     LMU-Id
338
339 maxNumOfLMU-Id INTEGER ::= 10
340
341 LCSAssignTrafficChannel-Arg ::= SEQUENCE {
342     radioChannelType           RadioChannelType,
343     extensionContainer         [0] ExtensionContainer        OPTIONAL,
344     ...}
345
346 LCSAssignTrafficChannel-Res ::= SEQUENCE {
347     extensionContainer         ExtensionContainer            OPTIONAL,
348     ...}
349
350
351
352 END
353

```

18 General on MAP user procedures

18.1 Introduction

Clauses 18 to 25 describe the use of MAP services for GSM signalling procedures. GSM signalling procedures may involve one or several interfaces running one or several application protocols. The present document addresses only the signalling procedures which require at least the use of one MAP service.

When a signalling procedure takes place in the network, an application process invocation is created in each system component involved. Part of the application process invocation acts as a MAP user and handles one or several MAP dialogues. For each dialogue it employs an instance of the MAP service provider. It may also use other communication services to exchange information on other interfaces, but detailed description of these aspects is outside the scope of the present document.

18.2 Common aspects of user procedure descriptions

18.2.1 General conventions

For each signalling procedure the present document provides a brief textual overview accompanied by a flow diagram which represent the functional interactions between system components. Functional interactions are labelled using the MAP service name when the interaction results from a service request or by this service name followed by the symbol "ack" when this interaction results from a service response.

For each of the system components involved, the present document also provides a detailed textual description of the application process behaviour as well as an SDL diagram. SDL diagrams describe the sequence of events, as seen by the MAP-User, which occurs at MAP service provider boundaries as well as external events which occur at other interfaces and which impact on the previous sequence.

External events do not necessarily correspond to the messages of other protocols used in the system component. The MAP-user procedures are described as if a set of interworking functions (IWF) between the MAP-user and the other protocol entities was implemented (see figure 18.2/1). Such interworking functions are assumed to perform either an identity mapping or some processing or translation as required to eliminate information irrelevant to the MAP-user.

The mapping of service primitives on to protocol elements is described in clauses 14 to 17.

GSM signalling procedures are built from one or more sub-procedures (e.g. authentication, ciphering, ...). Sub-procedures from which signalling procedures are built are represented using SDL MACRO descriptions.

In case of any discrepancy between the textual descriptions and the SDL descriptions, the latter take precedence.

18.2.2 Naming conventions

Events related to MAP are represented by MAP service primitives. The signal names used in the SDL diagrams are derived from the service primitive names defined in clauses 7 to 12, with some lexical transformations for readability and parsability purposes (blanks between words are replaced by underscores, the first letter of each word is capitalized).

Events received and sent on other interfaces are named by appending the message or signal name to a symbol representing the interface type, with some lexical transformations for readability and parsability purposes (blanks between words are replaced by underscores, the first letter of each word is capitalized).

The following symbols are used to represent the interface types:

"I": For interfaces to the fixed network. "I" stands for ISUP interface.

"A": For interfaces to BSS (i.e. A-interfaces);

"OM": For network management interfaces (communication with OMC, MML interface, ...);

"SC": For interfaces to a Service Centre;

"HO_CA": For internal interfaces to the Handover Control Application.

"US": For a local USSD application.

These naming conventions can be summarized by the following BNF description:

```

<Event_Name> ::= <MAP_Primitive> | <External_Event>
<MAP_Primitive> ::= <MAP_Open> | <MAP_Close> | <MAP_U_Abort> | <MAP_P_Abort> |
    <MAP_Specific> | <MAP_Notice>
<MAP_Open> ::= MAP_Open_Req | MAP_Open_Ind | MAP_Open_Rsp | MAP_Open_Cnf
<MAP_Close> ::= MAP_Close_Req | MAP_Close_Ind
<MAP_U_Abort> ::= MAP_U_Abort_Req | MAP_U_Abort_Ind
<MAP_P_Abort> ::= MAP_P_Abort_Ind
<MAP_Notice> ::= MAP_Notice_Ind
<MAP_Specific> ::= <MAP_Req> | <MAP_Ind> | <MAP_Rsp> | <MAP_Cnf>
<MAP_Req> ::= MAP_<Service_Name>_Req
<MAP_Ind> ::= MAP_<Service_Name>_Ind
<MAP_Rsp> ::= MAP_<Service_Name>_Rsp
<MAP_Cnf> ::= MAP_<Service_Name>_Cnf
<External_Event> ::= <Interface_Type>_<External_Signal>
<Interface_Type> ::= I | A | OM | SC | HO AC | US
<External_Signal> ::= <Lexical_Unit>
<Service_Name> ::= <Lexical_Unit>
<Lexical_Unit> ::= <Lexical_Component> | <Lexical_Unit>_<Lexical_Component>
<Lexical_Component> ::= <Upper_Case_Letter><Letter_Or_Digit_List>
<Letter_Or_Digit_List> ::= <Letter_Or_Digit> | <Letter_Or_Digit_List><Letter_Or_Digit>
<Letter_Or_Digit> ::= <Letter> | <Digit>
<Letter> ::= <Lower_Case_Letter> | <Upper_Case_Letter>
<Upper_Case_Letter> ::= A|B|C|D|E|F|G|H|I|J|K|L|M|N|O|P|Q|R|S|T|U|V|W|X|Y|Z
<Lower_Case_Letter> ::= a|b|c|d|e|f|g|h|i|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|y|z
<Digit> ::= 1|2|3|4|5|6|7|8|9|0

```

Figure 18.2/1: Interfaces applicable to the MAP-User

18.2.3 Convention on primitives parameters

18.2.3.1 Open service

When the originating and destination reference parameters shall be included in the MAP-OPEN request primitive, their value are indicated as a comment to the signal which represents this primitive.

18.2.3.2 Close service

When a pre-arranged release is requested, a comment is attached to the signal which represents the MAP-CLOSE request primitive. In the absence of comment, a normal release is assumed.

18.2.4 Version handling at dialogue establishment

Unless explicitly indicated in subsequent subclauses, the following principles regarding version handling procedures at dialogue establishment are applied by the MAP-user:

18.2.4.1 Behaviour at the initiating side

When a MAP user signalling procedure has to be executed, the MAP-user issues a MAP-OPEN request primitive with an appropriate application-context-name. If several names are supported (i.e. several versions) a suitable one is selected using the procedures described in clause 5.

If version 2 is selected and a MAP-CLOSE Confirm primitive in response to the MAP-OPEN request is received with a result parameter set to "refused" and a diagnostic parameter indicating "application-context-not-supported" or "potential incompatibility problem", the MAP-User issues a new MAP-OPEN request primitive with the equivalent version one context. This is informally represented in the SDL diagrams by a task symbol indicating "Perform Vr procedure".

If version 3 is selected and a MAP-CLOSE Confirm primitive in response to the MAP-OPEN request is received with a result parameter set to "refused" and a diagnostic parameter indicating "application-context-not-supported" or "potential incompatibility problem", the MAP-User issues a new MAP-OPEN request primitive with the equivalent version one or version two context. This is informally represented in the SDL diagrams by task symbols indicating "Perform Vr procedure" .

18.2.4.2 Behaviour at the responding side

On receipt of a MAP-OPEN indication primitive, the MAP-User analyses the application-context-name.

If it refers to a version one context, the associated V1 procedure is executed; if it refers to a version two context, the associated V2 procedure is executed, otherwise the associated V3 procedure is executed.

18.2.5 Abort Handling

Unless explicitly indicated in subsequent subclauses, the following principles are applied by the MAP-user regarding abort handling procedures:

On receipt of a MAP-P-ABORT indication or MAP-U-ABORT Indication primitive from any MAP-provider invocation, the MAP-User issues a MAP-U-ABORT Request primitive to each MAP-provider invocation associated with the same user procedure.

If applicable a decision is made to decide if the affected user procedure has to be retried or not.

18.2.6 SDL conventions

The MAP SDLs make use of a number of SDL concepts and conventions, where not all of them may be widely known. Therefore, this subclause outlines the use of a few concepts and conventions to improve understanding of the MAP SDLs.

The MAP User SDLs make use of SDL Processes, Procedures and Macros. Processes are independent from each other even if one process starts another one: The actions of both of them have no ordering in time. SDL Procedures and Macros are just used to ease writing of the specification: They contain parts of a behaviour used in several places, and the corresponding Procedure/Macro definition has to be expanded at the position of the Procedure/Macro call.

All Processes are started at system initialization and live forever, unless process creation/termination is indicated explicitly (i.e. a process is created by some other process).

The direction of Input/Output Signals in the SDL graphs is used to indicate the entity to which/from which communication is directed. If a process A communicates in parallel with processes B and C, all Inputs/Outputs to/from B are directed to one side, whereas communication with C is directed to the other side. However, there has been no formal convention used that communication to a certain entity (e.g. a HLR) will always be directed to a certain side (e.g. right).

In each state all those Input Signals are listed, which result in an action and/or state change. If an Input Signal is not listed in a state, receipt of this input should lead to an implicit consumption without any action or state change (according to the SDL rules). This implicit consumption is mainly used for receipt of the MAP DELIMITER indication and for receipt of a MAP CLOSE indication, except for a premature MAP CLOSE.

18.3 Interaction between MAP Provider and MAP Users

Each MAP User is defined by at least one SDL process. On the dialogue initiating side the MAP User will create a new instance of a MAP Provider implicit by issuing a MAP-OPEN request. This instance corresponds to a TC Dialogue and lives as long as the dialogue exists (see also subclause 14.3). There is a fix relation between MAP User and this Provider instance, i.e. all MAP service primitives from the MAP User for this dialogue are sent to this instance and all TC components received by this MAP Provider are mapped onto service primitives sent to this MAP User.

On the receiving side a MAP Provider instance is created implicit by receipt of a TC BEGIN indication. The corresponding MAP User is determined by the Application Context name included in this primitive, i.e. each Application Context is associated with one and only one MAP User. An instance of this User will be created implicit by receiving a MAP-OPEN indication. Note that in some cases there exist several SDL Processes for one MAP User (Application Context), e.g. the processes Register_SS_HLR, Erase_SS_HLR, Activate_SS_HLR, Deactivate_SS_HLR, Interrogate_SS_HLR, and Register_Password for the AC Network_Functional_SS_Handling. In these cases, a coordinator process is introduced acting as a MAP User, which in turn starts a sub-process depending on the first MAP service primitive received.

19 Mobility procedures

19.1 Location management Procedures

For non-GPRS subscribers, this subclause comprises a number of processes to handle the mobile nature of the subscriber. The processes will be addressed by SCCP Sub-System Number (MSC, VLR or HLR) and the Application Context. The following processes are defined in this subclause:

Process Update Location Area:

Initiator: Update_Location_Area_MSC, subclause 19.1.1.2;

Responder: Update_Location_Area_VLR, subclause 19.1.1.3;

Process Update Location:

Initiator: Update_Location_Area_VLR, subclause 19.1.1.3, or

Update_Location_VLR, subclause 19.1.1.6;

Responder: Update_Location_HLR, subclause 19.1.1.4;

Process Send Identification:

Initiator: Update_Location_Area_VLR, subclause 19.1.1.3;

Responder: Send_Identification_VLR, subclause 19.1.1.5;

Process Subscriber Present HLR:

Initiator: Subscriber_Present_HLR, subclause 19.1.1.7;

Responder: Short_Message_Alert_IW MSC, subclause 23.4.3;

Process Cancel Location:

Initiator: Cancel_Location_HLR, subclause 19.1.2.2;

Responder: Cancel_Location_VLR, subclause 19.1.2.3;

Process Detach IMSI:

Initiator: Detach_IMSI_MSC, subclause 19.1.3.2;

Responder: Detach_IMSI_VLR, subclause 19.1.3.3.

Process Purge MS:

Initiator: Purge_MS_VLR, subclause 19.1.4.2;

Responder: Purge_MS_HLR, subclause 19.1.4.3.

As both the Update Location Area and the Detach IMSI processes use the same application context name, the MAP Provider cannot distinguish between them. Therefore, a Location Management Coordinator Process will act as one user for this application context. This process (one in MSC, one in VLR) will create the Update Location Area or the Detach IMSI process, depending on the first service primitive received in the respective dialogue.

Additionally, a Location Management Coordinator process in the HLR coordinates the two application processes "Update Location HLR" (subclause 19.1.1.4) and "RESTORE_DATA_HLR" (subclause 19.3.3) that are addressed by the same application context.

Location Management Coordinator MSC

On receipt of a request for location updating from the A-interface, the Location Management Coordinator in the MSC will:

- create the process Update_Location_Area_MSC in case the updating type indicated in the A-interface primitive indicates normal updating, periodic updating or IMSI Attach;
- create the process Detach_IMSI_MSC in case the updating type indicated in the A-interface primitive indicates IMSI Detach.

The respective primitive is then forwarded to the created process. Henceforth, the coordinator will relay all service primitives from provider to the user and vice versa, until a request or indication for dialogue termination is received. This last primitive will be relayed, too, before the Coordinator process returns to idle state.

Location Management Coordinator VLR

On receipt of a dialogue request for the Location Management Application Context (see Receive_Open_Ind macro in subclause 25.1), the Location_Management_Coordinator will:

- terminate the procedure in case of parameter problems or if the MSC indicated version Vr protocol; or
- continue as below, if the dialogue is accepted.

Depending on the first service primitive received from the MAP Provider in this dialogue, the user process is created:

- Update_Location_Area_VLR in case the primitive is a MAP_UPDATE_LOCATION_AREA indication;
- Detach_IMSI_VLR in case the primitive is a MAP_DETACH_IMSI indication.

In case a MAP_U_ABORT, MAP_P_ABORT or a premature MAP_CLOSE indication is received instead, the process returns to idle state. If a MAP_NOTICE indication is received, the dialogue towards the MSC is aborted and the process returns to idle state.

After creation of the user process the service primitive received from the provider is passed to the user process. Henceforth, the coordinator will relay all service primitives from provider to the user and vice versa, until a request or indication for dialogue termination is received. This last primitive will be relayed, too, before the Coordinator process returns to idle state.

Location Management Coordinator HLR

On receipt of a dialogue request for the Location Management Application Context (see Receive_Open_Ind macro in subclause 25.1), the Location_Management_Coordinator will:

- terminate the process in case of parameter problems; or
- revert to MAP version Vr protocol if the VLR requests version Vr protocol; or
- continue as described in the following, if the dialogue is accepted.

The user process is created depending on the first service primitive received from the MAP service provider within this dialogue:

- Update_Location_HLR if the primitive is a MAP_UPDATE_LOCATION indication;
- RESTORE_DATA_HLR if the primitive is a MAP_RESTORE_DATA indication.

If a MAP_NOTICE indication is received instead, the dialogue towards the MSC is terminated and the process returns to idle state.

After creation of the user process the service primitive received from the MAP service-provider is passed to the user process. Henceforth, the coordinator will relay all service primitives from MAP service-provider to the MAP service-user and vice versa, until a request or indication for dialogue termination is received. This last primitive will be relayed, too, before the Coordinator process returns to idle state.

For GPRS subscribers, this subclause comprises a number of other processes to handle the mobile nature of the subscriber. The processes will be addressed by SCCP Sub-System Number (SGSN or HLR) and the Application Context. The following processes are defined in this subclause:

Process GPRS Update Location:

Initiator: GPRS_Update_Location_Area_VLR, subclause 19.1.1.3, or

SGSN_Update_HLR, subclause 19.1.1.8,

Responder: Update_GPRS_Location_HLR, subclause 19.1.1.4;

Process Cancel Location:

Initiator: Cancel_GPRS_Location_HLR, subclause 19.1.2.2;

Responder: Cancel_Location_SGSN, subclause 19.1.2.4;

Process Purge MS:

Initiator: Purge_MS_SGSN, subclause 19.1.4.4;

Responder: Purge_MS_HLR, subclause 19.1.4.3.

The following existing process is also used for GPRS subscribers :

Process Subscriber Present HLR:

Initiator: Subscriber_Present_HLR, subclause 19.1.1.7;

Responder: Short_Message_Alert_IW MSC, subclause 23.4.3;

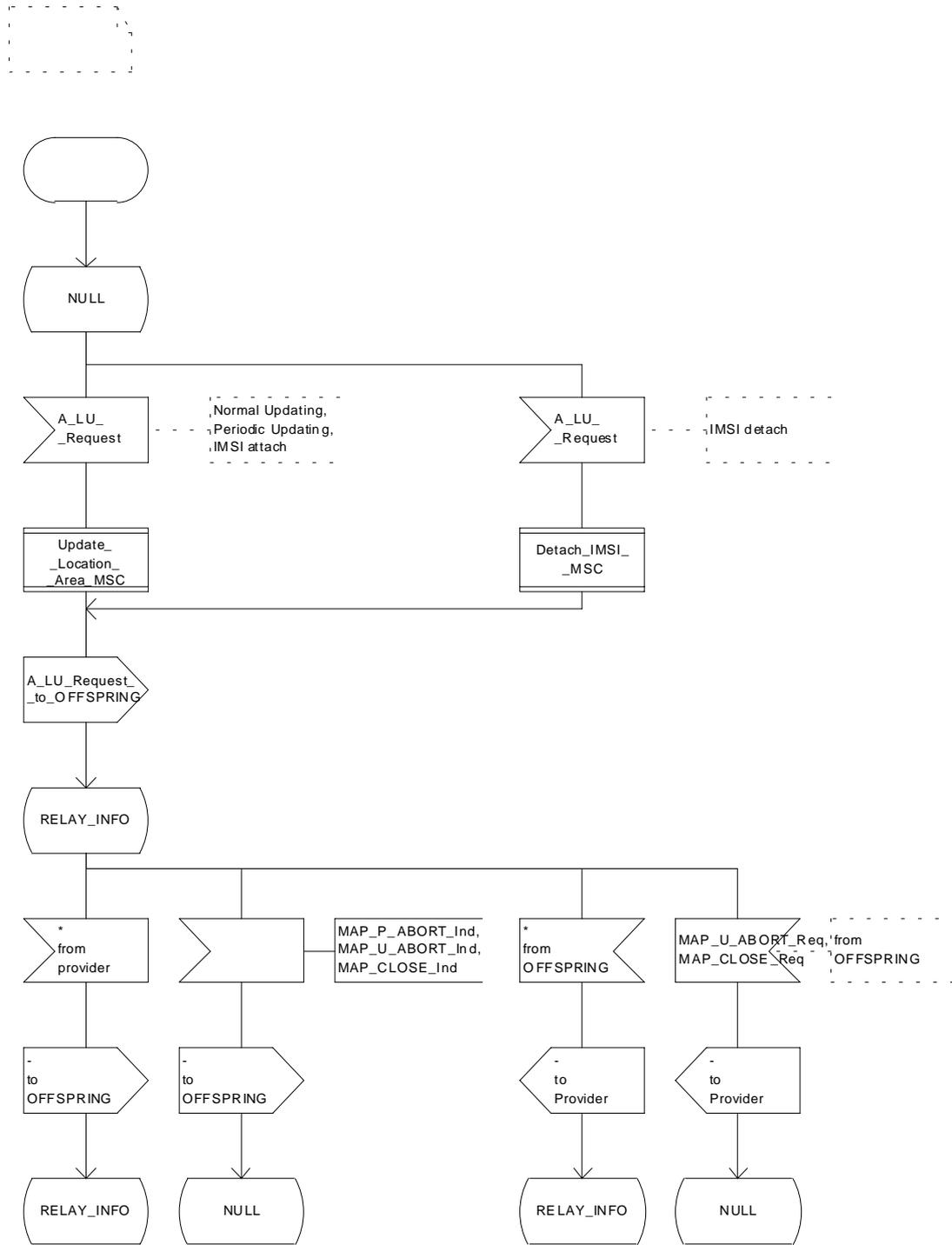


Figure 16.1/1

Figure 19.1/1: Process Location_Management_Coordinator_MSC

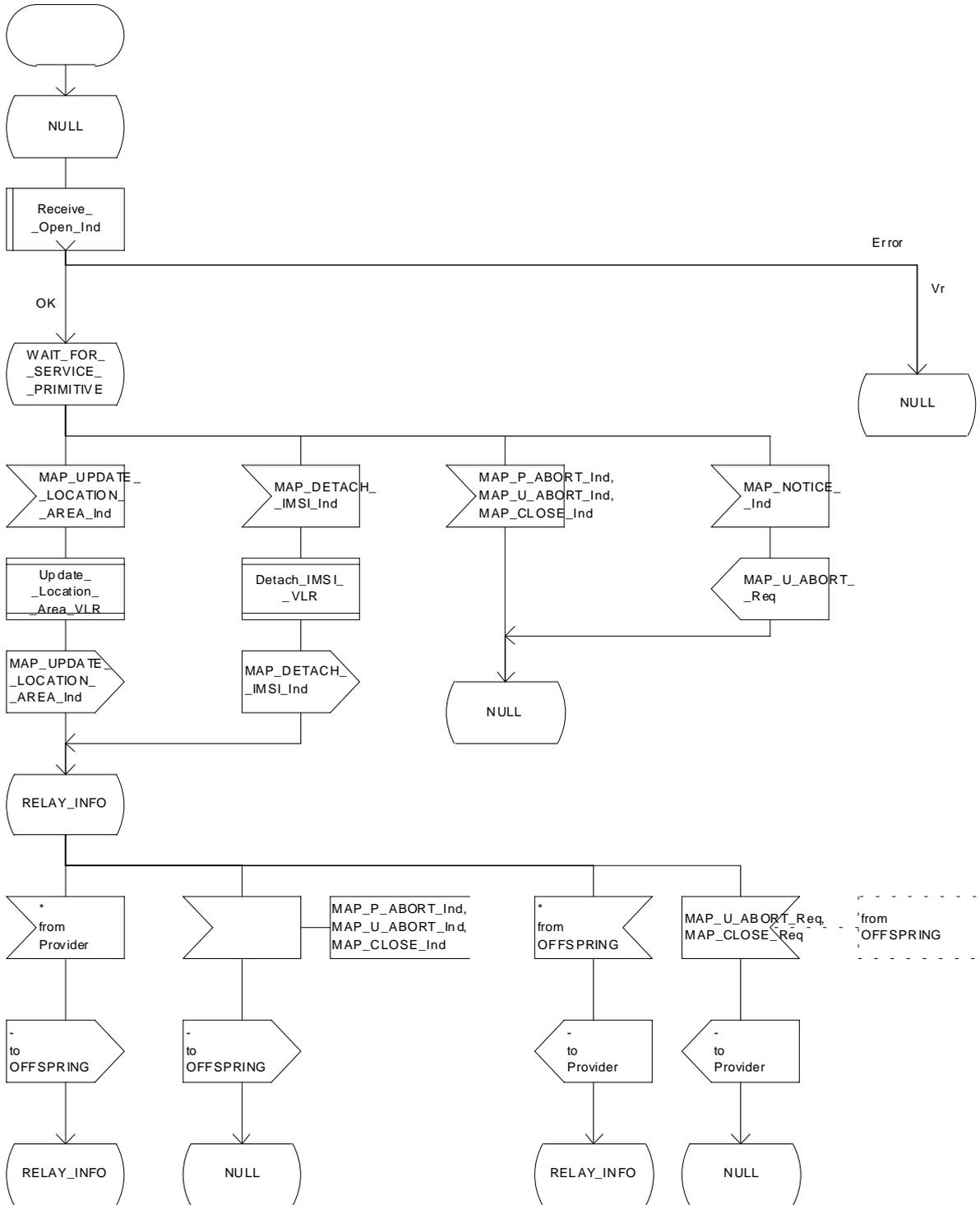


Figure 19.1/2: Process Location_Management_Coordinator_VLR

Figure 19.1/3
Location management coordination process in the HLR

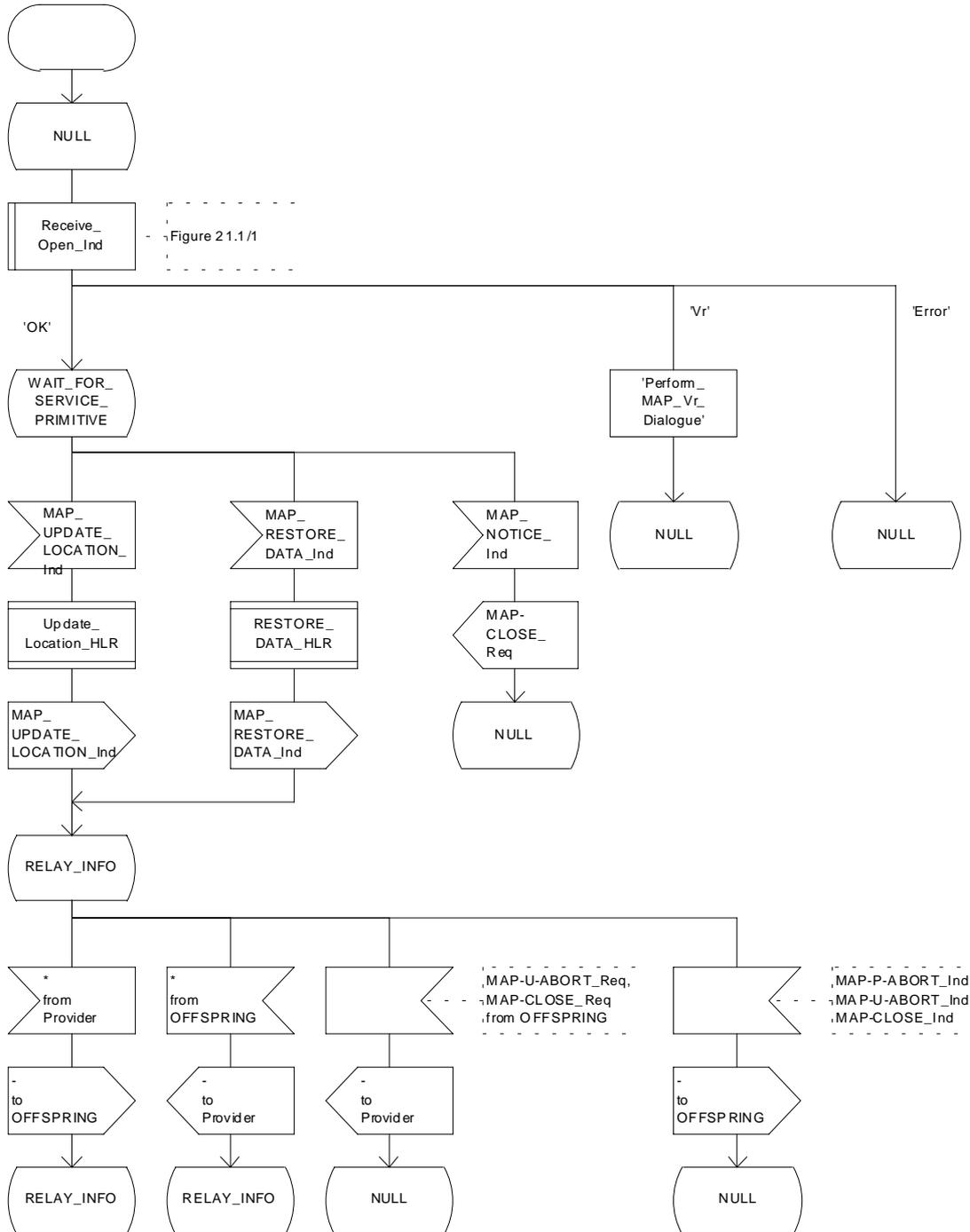


Figure 19.1/3: Process Location_Management_Coordinator_HLR

19.1.1 Location updating

19.1.1.1 General

The location updating procedure is used to update the location information held in the network. For GPRS subscribers, this procedure describes also updating of the SGSN and, if Gs interface is installed, updating of the VLR in combination with an attach/routing area updating in the SGSN. This location information is used to route incoming calls, packet data, short messages and unstructured supplementary service data to the roaming subscriber. Additionally, this procedure is used to provide the VLR and/or the SGSN with the information that a subscriber already registered, but being detached, is reachable again (IMSI Attach and/or GPRS Attach, see GSM 03.12 and GSM 03.60). The use of the IMSI Detach / Attach feature is optional for the network operator.

To minimize the updates of the subscriber's HLR, the HLR holds only information about the VLR and MSC the subscriber is attached to and, for GPRS subscribers, the SGSN the subscriber is attached to. The VLR and the SGSN contain more detailed location information, i.e. the location area the subscriber is actually roaming in (for the VLR) and the routing area (RA) where the GPRS subscriber is located (for SGSN). Therefore, the VLR needs to be updated at each location area change (see figure 19.1.1/1 for this procedure) and the SGSN needs to be updated at each routing area change. The HLR needs updating only in the following cases:

- when the subscriber registers in a new VLR or SGSN, i.e. the VLR or SGSN has no data for that subscriber;
- when the subscriber registers in a new location area of the same VLR and new routing information is to be provided to the HLR (change of MSC area);
- if the indicator "Confirmed by HLR" or the indicator "Location Information Confirmed in HLR" is set to "Not Confirmed" because of HLR, VLR or SGSN restoration, and the VLR or SGSN receives an indication that the subscriber is present.

If a mobile subscriber registers in a visitor location register (VLR) not holding any information about this subscriber and is identified by a temporary mobile subscriber identity (TMSI) allocated by a previous visitor location register (PVLR), if the PVLR identity can be derived from LAI the new VLR must obtain the IMSI from PVLR to identify the HLR to be updated (see figure 19.1.1/2). If the IMSI cannot be retrieved from PVLR, it is requested from the MS (see figure 19.1.1/3).

The stage 2 specification for GPRS is in GSM 03.60. The interworking between the MAP signalling procedures and the GPRS procedures in the SGSN is shown by the transfer of signals between these procedures (see subclause 19.1.1.8).

The message flow for successful GPRS Attach/ RA update procedure (with Gs interface not installed) is shown in figure 19.1.1/4.

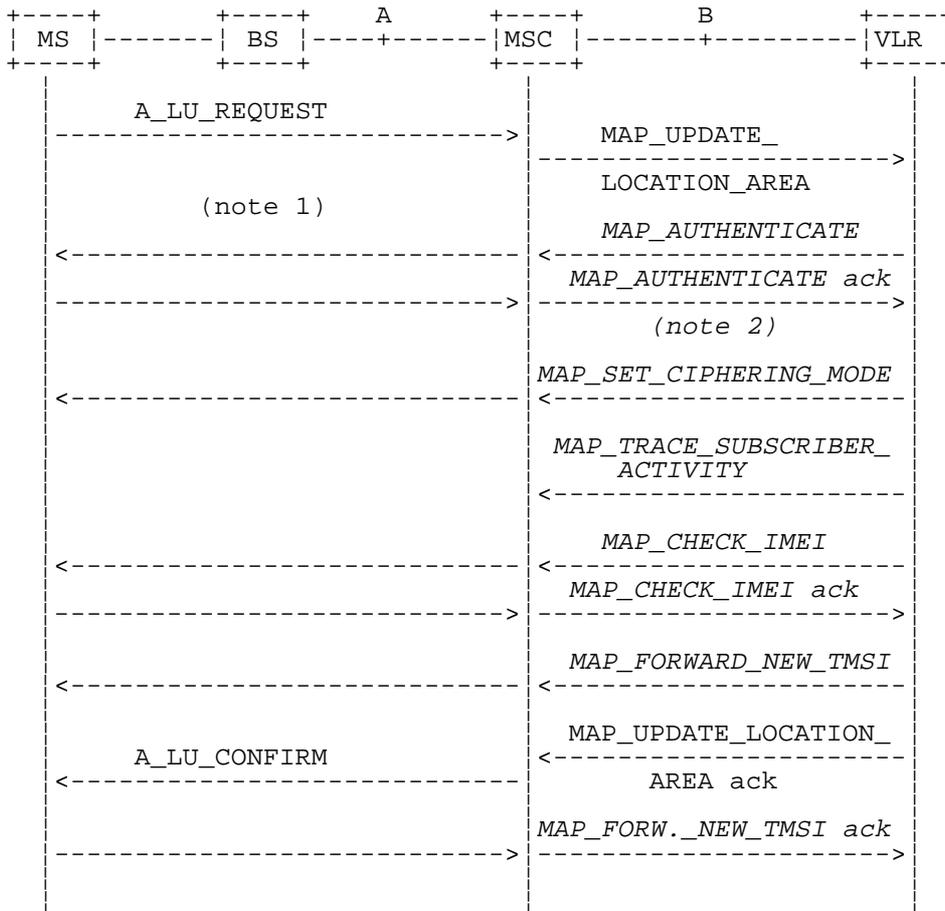
The message flow for successful GPRS Attach/ RA update procedure combined with a successful VLR location updating (Gs interface installed) is shown in figure 19.1.1/5.

The following MAP services are invoked by the location update procedure:

MAP_UPDATE_LOCATION_AREA (see subclause 8.1);(**)
MAP_UPDATE_LOCATION (see subclause 8.1);(**)
MAP_UPDATE_GPRS_LOCATION (see subclause 8.1) (*);
MAP_CANCEL_LOCATION (see subclause 8.1);
MAP_INSERT_SUBSCRIBER_DATA (see subclause 8.8);
MAP_SEND_IDENTIFICATION (see subclause 8.1) (**);
MAP_PROVIDE_IMSI (see subclause 8.9) (**);
MAP_AUTHENTICATE (see subclause 8.5) (**);
MAP_SET_CIPHERING_MODE (see subclause 8.6) (**);
MAP_FORWARD_NEW_TMSI (see subclause 8.9) (**);
MAP_CHECK_IMEI (see subclause 8.7) (**);
MAP_ACTIVATE_TRACE_MODE (see subclause 9.2);
MAP_TRACE_SUBSCRIBER_ACTIVITY (see subclause 9.2) (**).

(*): only used in SGSN and HLR for GPRS

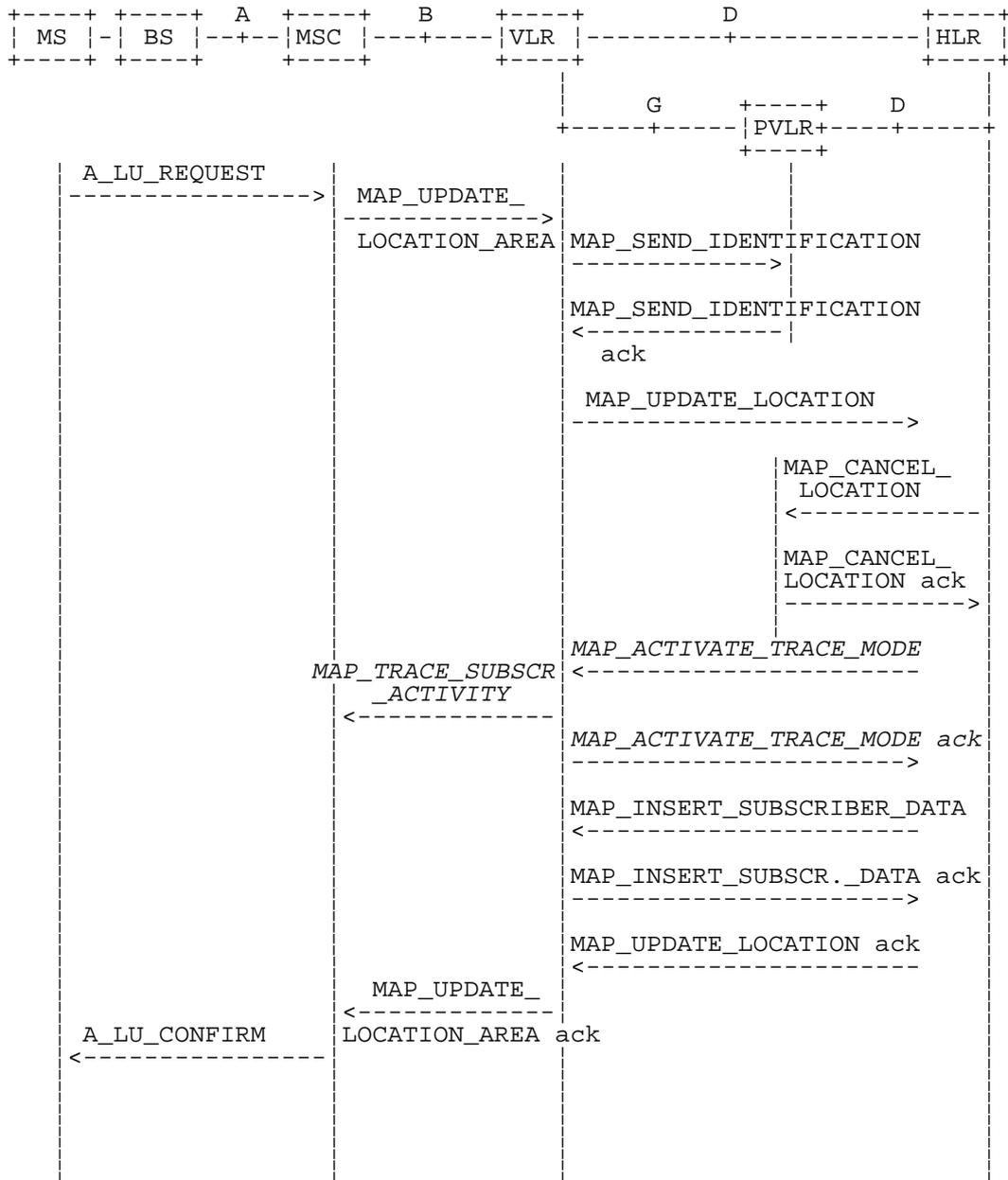
(**): not used in SGSN



NOTE 1: For details of the procedure on the radio path, see GSM 04.08. The services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

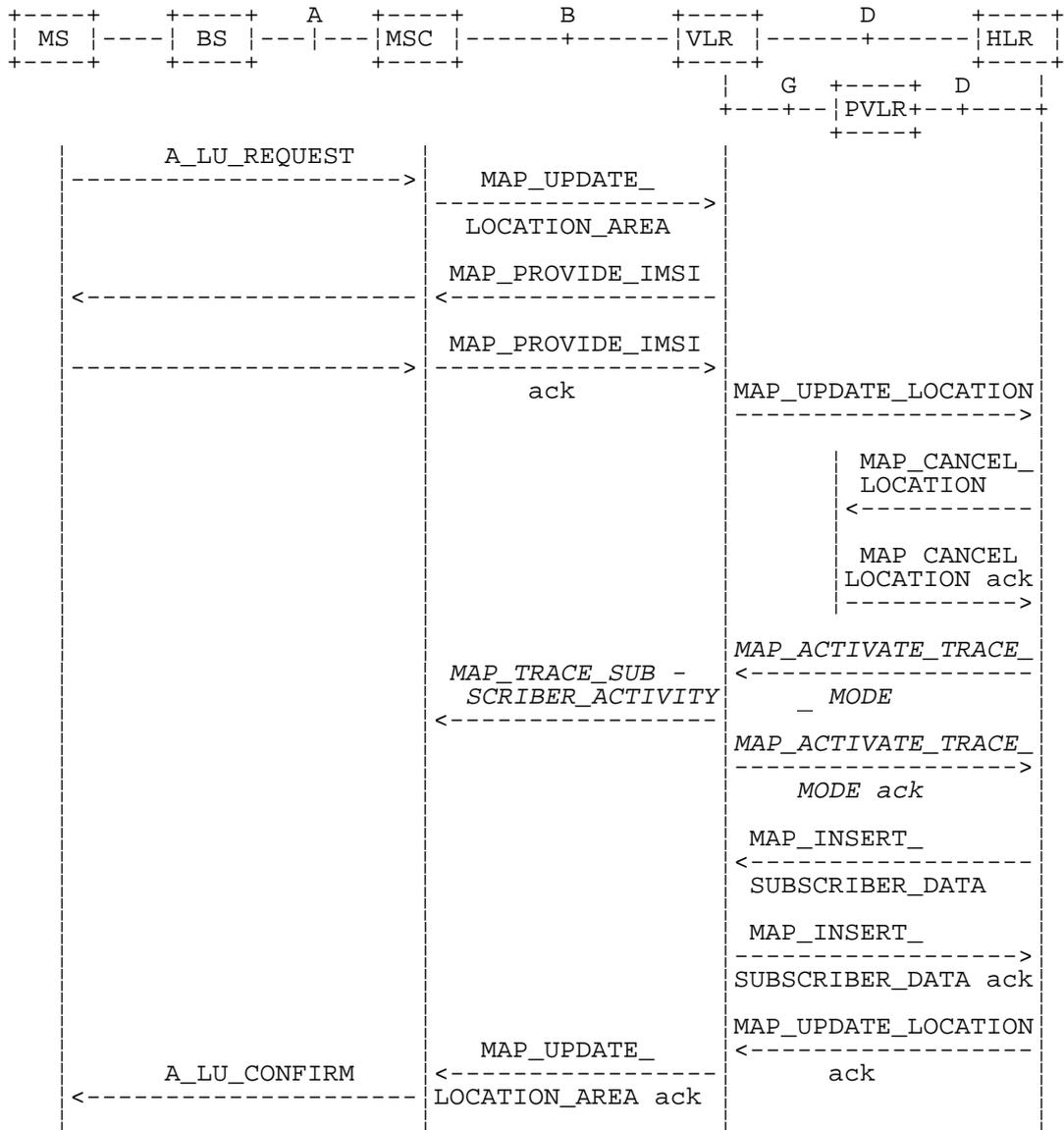
NOTE 2: Optional services are printed in *italics*.

Figure 19.1.1/1: Interface and services for location updating when roaming within an visitor location registers area (without need to update HLR)



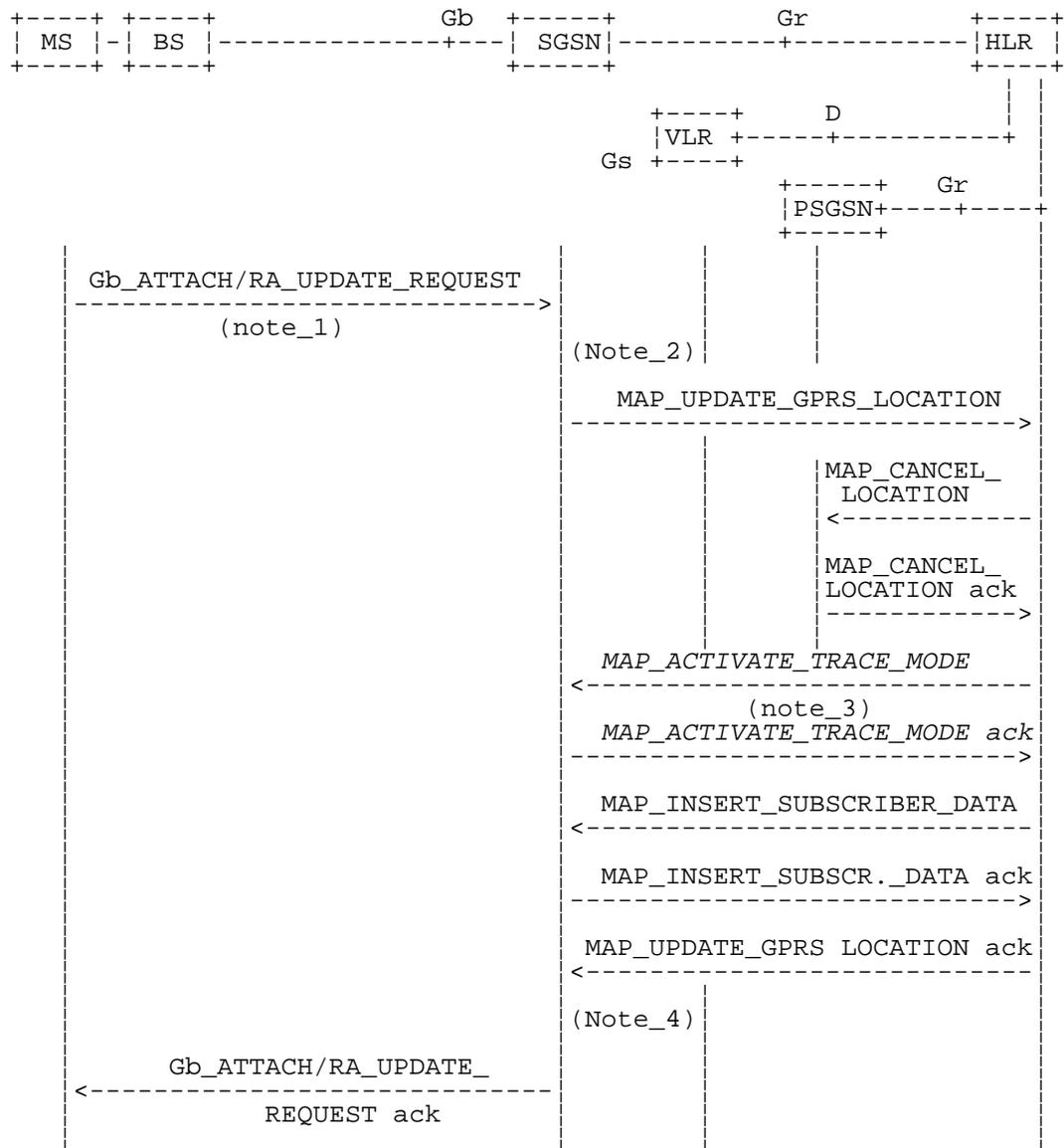
NOTE: The optional procedures in figure 19.1.1/1 apply here respectively.

Figure 19.1.1/2: Interface and services for location updating when changing the VLR area



NOTE: The optional procedures in figure 19.1.1/1 apply here respectively.

Figure 19.1.1/3: Interface and services for location updating involving both a VLR and an HLR, when IMSI can not be retrieved from the previous VLR



PSGSN = Previous SGSN

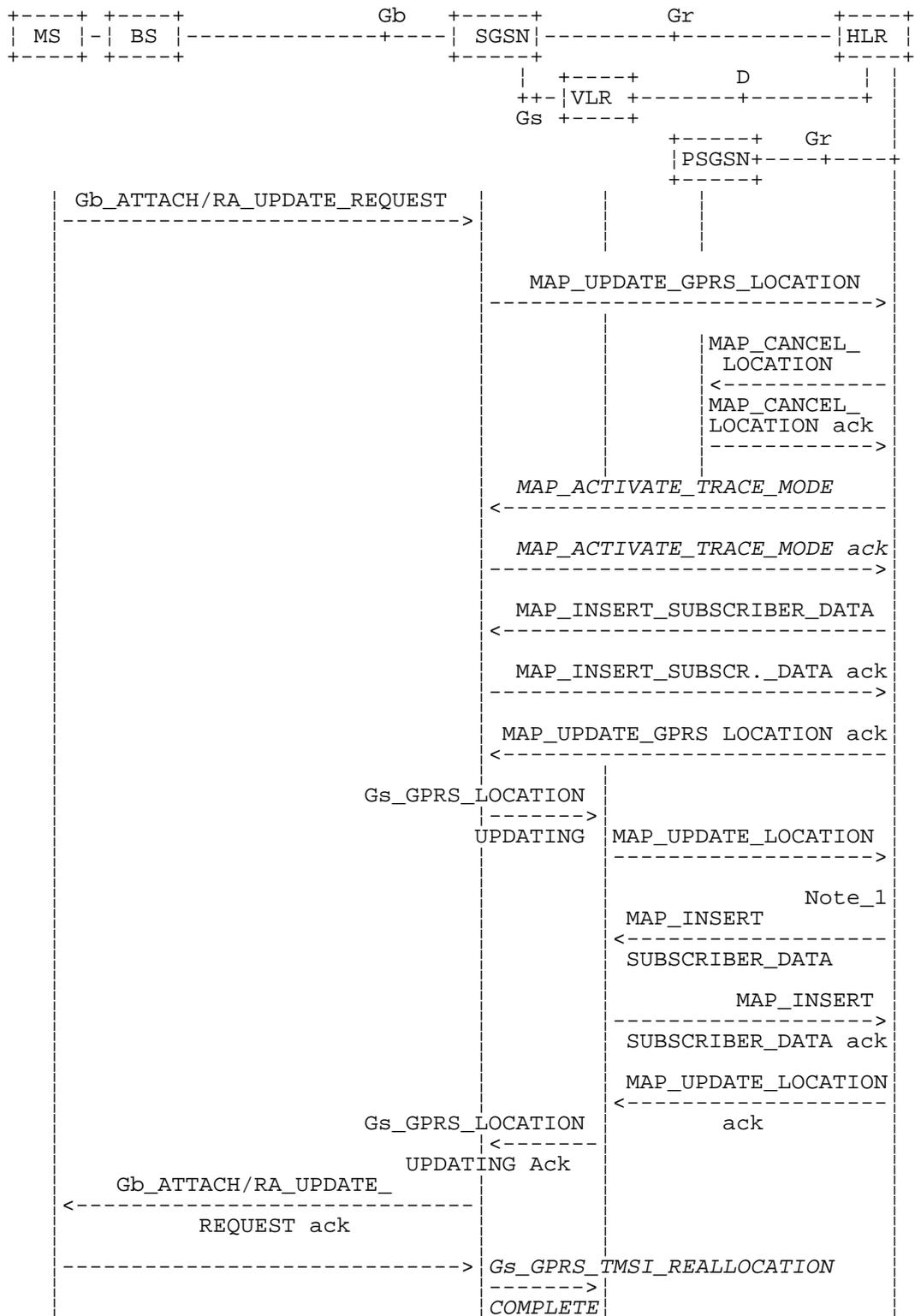
NOTE 1: For details of the procedure on the radio path, see GSM 08.18. The services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For security functions (authentication, ciphering, IMEI check) triggering refer to GSM 03.60. MAP processes invoked for those procedures are described in section 25.

NOTE 3: Optional services are printed in *italics*.

NOTE 4: Refer to GSM 03.60 for termination of the procedure and triggering of the signalling on the Gb interface.

Figure 19.1.1/14: Interface and services for GPRS location updating (Gs-interface not installed)



NOTE: The optional procedures in figure 19.1.1/14 apply here respectively. For details of the procedure on the Gs-interface, see GSM 09.18.

NOTE 1: Location Cancellation procedure toward the old VLR and optional tracing activation toward the new VLR are not represented on this figure.

Figure 19.1.1/15: Interface and services for GPRS location updating (Gs-interface installed)

19.1.1.2 Detailed procedure in the MSC

Figure 19.1.1/4 shows the MSC process for location register updating, containing macro calls for:

Receive_Open_Cnf	subclause 25.1;
Authenticate_MSC	subclause 25.5;
Check_IMEI_MSC	subclause 25.6;
Obtain_IMSI_MSC	subclause 25.8;
Trace_Subscriber_Activity_MSC	subclause 25.9.

For structuring purposes, the second part of the process is placed into the macro Update Location Completion MSC, which is specific to this process (see figure 19.1.1/5).

When the MSC receives an A_LU_REQUEST (normal location updating, periodic location updating or IMSI attach) for a subscriber via the radio path, the MSC opens a dialogue to the VLR (MAP_OPEN request without any user specific parameters) and sends a MAP_UPDATE_LOCATION_AREA request, containing the parameters provided in the A_LU_REQUEST by the MS or BSS (for the parameter mapping see GSM 09.10).

If the dialogue is rejected or the VLR indicates a fallback to the version V_r procedure (see Receive_Open_Cnf macro in subclause 25.1), the MSC will send an A_LU_Rej towards the MS and terminate the procedure.

If the dialogue is accepted, the VLR will process this updating request, invoking optionally the MAP_PROVIDE_IMSI, MAP_TRACE_SUBSCRIBER_ACTIVITY, MAP_CHECK_IMEI or the MAP_AUTHENTICATE services first (see subclause 19.1.1.3 for initiation conditions, clause 25 for macros defining the handling of services in the MSC). For these macros there are two possible outcomes:

- a positive outcome, in which case the process continues waiting for the MAP_UPDATE_LOCATION_AREA confirmation; or
- an error is reported, in which case the process terminates (not applicable for Trace_Subscriber_Activity_MSC, which has only a positive outcome).

After receiving the MAP_UPDATE_LOCATION_AREA indication and handling these optional services, the VLR will decide whether a new TMSI need to be allocated to the subscriber or not.

Updating without TMSI reallocation

If the VLR does not reallocate the TMSI, the MSC will receive a MAP_UPDATE_LOCATION_AREA confirmation next (figure 19.1.1/4).

- if there are no parameters with this primitive, updating was successful and a confirmation will be sent to the MS;
- if there is an error cause contained in the received primitive, this cause will be mapped to the corresponding cause in the confirmation sent to the MS (see GSM 09.10 for the mapping of messages and causes).

Updating including TMSI reallocation

This case is covered by the macro Update Location Completion MSC given in figure 19.1.1/5. The MSC will upon receipt of a MAP_SET_CIPHERING_MODE request send a ciphering command towards BSS/MS. Thereafter, the MAP_FORWARD_NEW_TMSI indication and the MAP_UPDATE_LOCATION_AREA confirmation are received in arbitrary order, causing a confirmation on the radio path containing both new LAI and new TMSI. If the MAP_UPDATE_LOCATION_AREA confirmation contains any error, the updating request is rejected towards the MS:

- the MS will confirm receipt of the new TMSI, resulting in an empty MAP_FORWARD_NEW_TMSI response terminating the dialogue;
- if there is no confirmation received from the A-interface, the dialogue is terminated locally.

Before receiving a MAP_UPDATE_LOCATION_AREA confirmation, the MSC may receive a MAP_CHECK_IMEI indication. Handling of this indication, comprising IMEI request towards the MS and IMEI checking request towards the EIR, is given in the macro description in subclause 25.6. The result may either be to return to the state Wait for TMSI or to return to terminate.

Forwarding the Check SS Indication

When the VLR receives a MAP_FORWARD_CHECK_SS_INDICATION_Ind during the Update LOCATION Area process, this indication is relayed to the MS (see GSM 09.11 for detailed interworking) and the MSC remains in the current state.

Abort handling

If the VLR receives a MAP_U_ABORT, a MAP_P_ABORT or a premature MAP_CLOSE indication from the VLR during the location update process, the MSC terminates the process by sending an A_LU_CONFIRM containing the error cause Updating Failure to the MS. If the MSC had already confirmed the location update towards the MS, the process terminates without notification towards the A-interface.

If the MSC receives a MAP_NOTICE indication, it issues a MAP_CLOSE and terminates the A-interface dialogue, and the process terminates.

When the procedure is terminated abnormally on the radio path, the dialogue towards the VLR is aborted with the appropriate diagnostic information, and the procedure terminates.

Process Update_Location_Area_MSC

19.1.1_4(1)

Figure 19.1.1/4: Location Updating in MSC

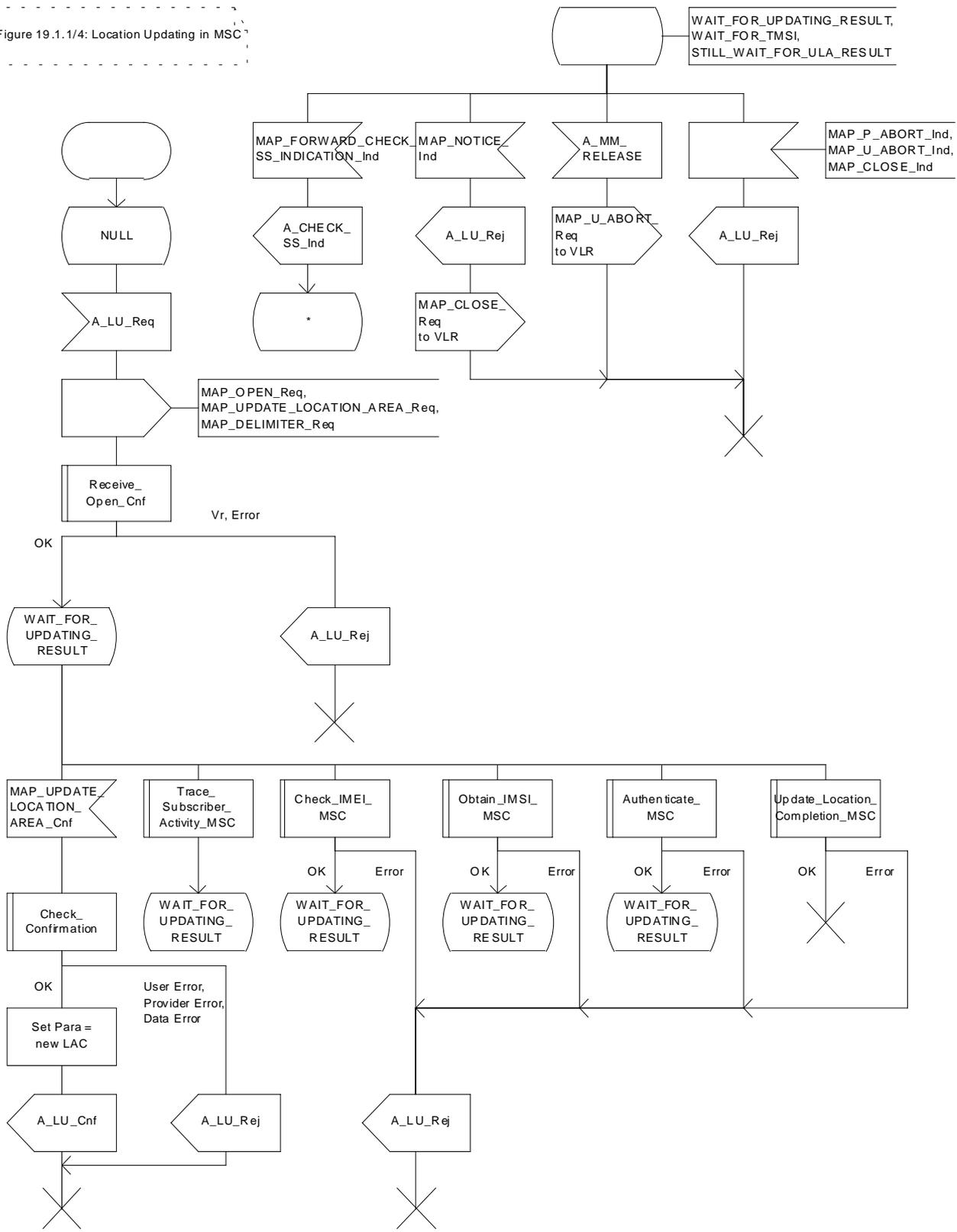


Figure 19.1.1/4: Process Update_Location_Area_MSC

Macrodefinition Update_Location_Completion_MSC

19.1.1_5(1)

Figure 19.1.1/5: Macro used for Location Updating in MSC

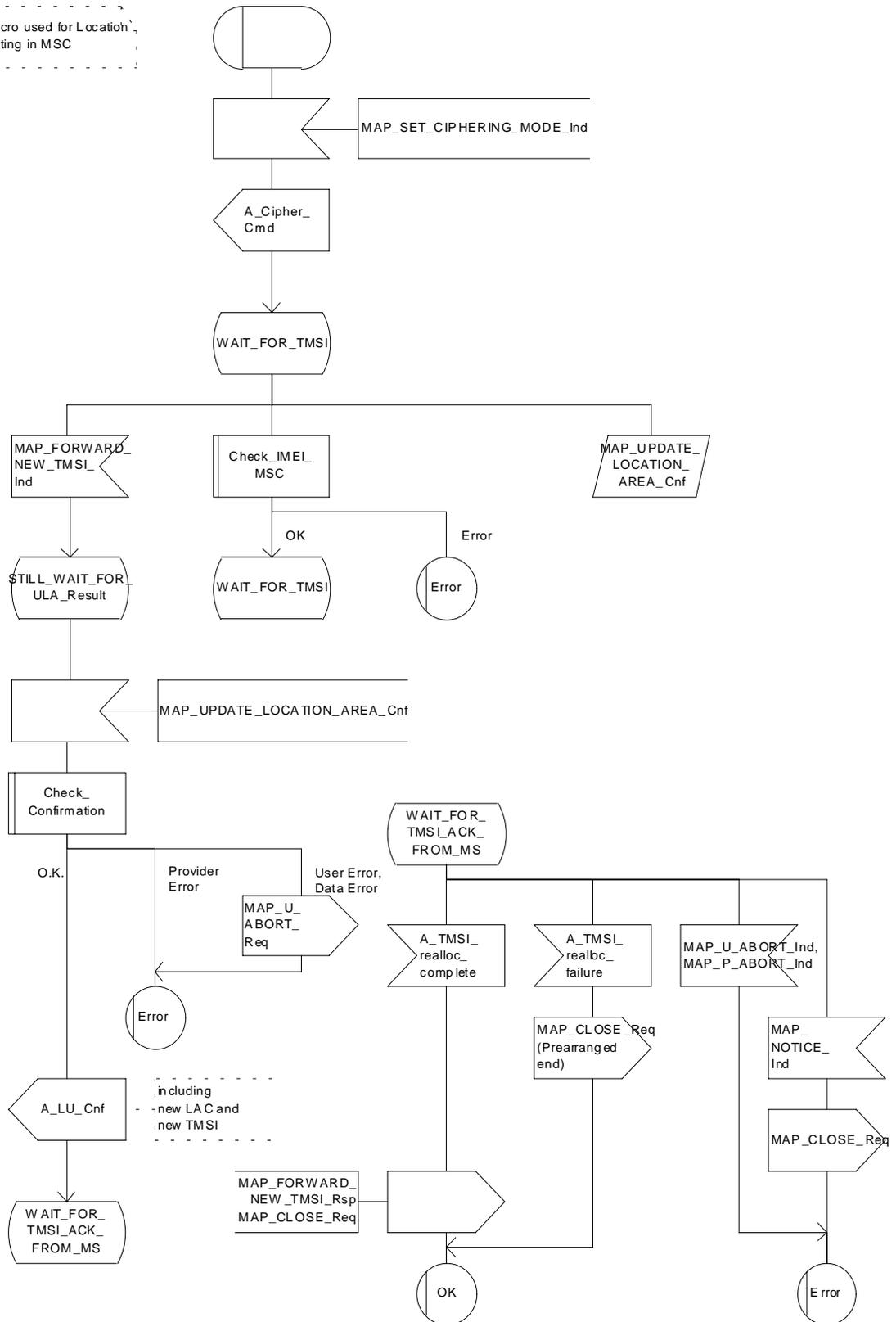


Figure 19.1.1/5: Macro Update_Location_Completion_MSC

19.1.1.3 Detailed procedure in the VLR

Figure 19.1.1/6 shows the process for location updating in the VLR. The following general macros are used:

Receive_Open_Ind	subclause 25.1;
Receive_Open_Cnf	subclause 25.1;
Authenticate_VLR	subclause 25.5;
Check_IMEI_VLR	subclause 25.6;
Insert_Subscriber_Data_VLR	subclause 25.7;
Obtain_IMSI_VLR to request the IMSI for the subscriber	subclause 25.8;
Activate_Tracing_VLR and Trace_Subscriber_Activity_VLR	subclause 25.9,
Subscriber_Present_VLR	subclause 25.10.

Additionally, the process specific macro

Location_Update_Completion_VLR, for optional initiation of Cipherring and TMSI reallocation as for acknowledgement of the MAP_UPDATE_LOCATION_AREA service, see figure 19.1.1/7,

and the optional process specific macro

VLR_Update_HLR to update the HLR and download subscriber data from there, see figure 19.1.1/8,

are invoked by this process.

Process Initiation

The location area updating process will be activated by receiving a MAP_UPDATE_LOCATION_AREA indication from the MSC. If there are parameter errors in the indication, the process is terminated with the appropriate error sent in the MAP_UPDATE_LOCATION_AREA response to the MSC. Else, The behaviour will depend on the subscriber identity received, either an IMSI or an TMSI.

Updating using IMSI

If the subscriber identity is an IMSI, the VLR checks whether the subscriber is unknown (i.e. no IMSI record). If so, the indicator "Location Information Confirmed in HLR" is set to "Not Confirmed" to initiate HLR updating later on. If the IMSI is known, the VLR checks whether the previous location area identification (LAI) provided in the primitive received from the MSC belongs to this VLR. If it does not, the indicator "Location Information Confirmed in HLR" is set to "Not Confirmed" to initiate HLR updating later on. The process may continue in both cases with the authentication check (see below).

Updating using TMSI

If the subscriber identity is a TMSI, the VLR checks whether the previous location area identification (LAI) provided in the primitive received from MSC belongs to an area of this VLR:

- if so, the TMSI will be checked. In case of location area change within a VLR, the TMSI should be known and the process may continue with the authentication check. Additionally, the indicator "Location Information Confirmed in HLR" is set to "Not confirmed" and the trace activity status is checked in case the target Location Area Id belongs to a new MSC.
- if the TMSI is not known or the subscriber data stored are incomplete, e.g. because the new LA belongs to a different VLR or due to VLR restoration, the indicator "Confirmed by VLR" is set to "Not Confirmed" to initiate HLR updating later on.

If the subscriber has not already been registered in the VLR, i.e. the previous LAI belongs to a different VLR, the indicators "Confirmed by HLR" and "Location Information Confirmed in HLR" are set to "Not Confirmed" and the VLR checks whether the identity of the Previous VLR (PVLR) is derivable from the previous LAI:

- if so, the IMSI and authentication parameters are requested from that VLR using the MAP_SEND_IDENTIFICATION service (see sheet 3 of figure 19.1.1/6), containing the subscriber's TMSI.
- if the dialogue is rejected by the PVLR, the process continues requesting the IMSI from the MS. In case the PVLR reverts to the MAP version Vr dialogue, the VLR will perform the respective procedure of version Vr, too, with outcomes as for the current MAP version dialogue. Else, the process waits for the respective MAP_SEND_IDENTIFICATION response from the PVLR:
 - if the IMSI is received in that primitive, the process continues with the authentication check;
 - if the IMSI is not received from the previous VLR for any reason, the dialogue to the PVLR is terminated and the IMSI will be requested from the MS;
 - if a MAP_NOTICE indication is received from the PVLR, the dialogue will be terminated by sending a MAP_CLOSE indication, and the process continues requesting the IMSI from the MS;
 - if a MAP_P_ABORT or MAP_U_ABORT indication is received from the MSC while waiting for the MAP_SEND_IDENTIFICATION response, the process is terminated;
 - if a MAP_NOTICE indication is received from the MSC while waiting for the MAP_SEND_IDENTIFICATION response, the dialogue with the PVLR will be aborted by sending a MAP_U_ABORT indication (Remote Operations Failure), the dialogue with the MSC will be terminated by sending a MAP_CLOSE and the process terminates;
- if the identity of the previous VLR cannot be derived, the process continues by requesting the IMSI from the MS.

Requesting IMSI from the MS

For requesting the IMSI from the MS, the macro Obtain_IMSI_VLR described in subclause 25.8 is invoked (see figure 19.1.1/6 sheet 3). The outcome will be:

- OK, i.e. receipt of IMSI, in which case the process continues with the authentication check described below; or
- receipt of an Absent Subscriber error, indicating that the MS did not respond. In this case the System Failure error is reported in the MAP_UPDATE_LOCATION_AREA response towards the MSC and the updating process is terminated;
- aborted, i.e. the MSC dialogue has been released while waiting for the IMSI. In this case the updating process is terminated, too.

Authentication check

After a subscriber identity has been received, either in the service indication or by an explicit request procedure, the VLR checks whether authentication of this identity is required (see figure 19.1.1/6 sheet 2). If so, the authentication macro described in subclause 25.5 is invoked. The outcome of this macro can be:

- OK, i.e. the subscriber has been authenticated successfully, in which case the process is continued by setting the indicator "Confirmed by Radio Contact" to "Confirmed" and updating the location information held in the register. Thereafter,
 - if one or both of the indicators "Confirmed by HLR" and "Location Information Confirmed in HLR" is set to "Not Confirmed", HLR updating is invoked first;
 - otherwise the process continues with the Location Update Completion VLR macro described below, and the register is updated after successful completion of this macro.

- Illegal subscriber, i.e. there was a mismatch between expected and received SRES. The VLR checks whether authentication had been performed using the TMSI, in which case a new authentication attempt with IMSI may be started (VLR operator option).
 - if so, the process continues by requesting the IMSI from the MS;
 - else, the Illegal Subscriber error is reported in the MAP_UPDATE_LOCATION_AREA response.
- Unknown Subscriber, i.e. the IMSI given is unknown in the HLR. In this case, the subscriber data are deleted in the VLR and the same error is returned in the MAP_UPDATE_LOCATION_AREA response.
- Procedure error, i.e. the authentication process was unsuccessful for some other reason, e.g. because of a failure while requesting authentication information from the HLR. In this case the System Failure error is reported in the MAP_UPDATE_LOCATION_AREA response.
- Null, indicating impossible dialogue continuation (e.g. termination of the radio path), and leading to procedure termination without any further action.

Updating the HLR

If the HLR is to be updated, the VLR_Update_HLR macro described below is performed, with one of the following results (see sheet 4 of figure 19.1.1/6):

- OK, if HLR updating has been completed successfully. The response will contain the HLR number as parameter. Next, the Location_Update_Completion VLR macro is invoked (checking amongst others the roaming restrictions and regional subscription data), and upon successful outcome of this macro the register is updated and the process terminates.
- Roaming Not Allowed, qualified by PLMN Roaming Not Allowed if the location information indicates a PLMN for which the subscriber has no subscription or if the subscribers HLR cannot be reached (e.g. SS7 links to the subscribers HPLMN do not yet exist). In this case, the error Roaming Not Allowed qualified by PLMN Roaming Not Allowed is sent in the MAP_UPDATE_LOCATION_AREA response. The Subscriber Data are deleted in the VLR.
- if Roaming Not Allowed was qualified by the parameter Operator Determined Barring, the same value is sent in the MAP_UPDATE_LOCATION_AREA response to the MSC. The subscriber data are deleted in the VLR.
- Unknown Subscriber, if the subscriber is not known in the HLR. In this case, the subscriber data are deleted in the VLR, and the same error is sent in the MAP_UPDATE_LOCATION_AREA response.
- Procedure error, if there occurs some other error during HLR updating (e.g. abort of the connection to HLR):
 - if the VLR can proceed in stand alone mode (VLR operator option), the Location Update Completion VLR macro is invoked to complete the VLR updating, and the indicator "Confirmed by HLR" remains unchanged;
 - otherwise, the System Failure error is sent in the MAP_UPDATE_LOCATION_AREA response.
- Aborted, indicating that during HLR updating the MSC dialogue has been terminated. In this case, the updating process terminates without any further action.

The macro Location Update Completion VLR

This macro completes the VLR updating process. First, the VLR checks whether there is a roaming restriction for the subscriber (see figure 19.1.1/7):

- if the target LA is not allowed for the subscriber due to national roaming restrictions, the error Roaming Not Allowed with cause National Roaming Not Allowed is returned in the MAP_UPDATE_LOCATION_AREA response towards the MSC.

The subscriber data are not deleted from VLR, to avoid unnecessary HLR updating when roaming into other LAs of the same MSC. An indication that the subscriber is not allowed to roam is set in the VLR (LA Not Allowed Flag set to not allowed). As a consequence the subscriber is not reachable (checked for MTC, SMS and MT USSD) and cannot perform outgoing actions (checked in Access Management).

- if the target LA is not allowed for the subscriber because of Roaming Restriction Due To Unsupported Feature stored in the VLR, the error Roaming Not Allowed with cause National Roaming Not Allowed is returned towards the MSC in the MAP_UPDATE_LOCATION_AREA response.

Also in this case the subscriber data are not deleted from VLR, to avoid unnecessary HLR updating when roaming into other LAs of the same MSC. The LA Not Allowed Flag is set to not allowed in the VLR.

- if the target LA is not allowed for the subscriber because of regional subscription data (Zone Code List) stored in the VLR, the error Roaming Not Allowed with cause Location Area Not Allowed is returned towards the MSC in the MAP_UPDATE_LOCATION_AREA response.

Also in this case the subscriber data are not deleted from VLR, to avoid unnecessary HLR updating when roaming into other LAs of the same MSC. The LA Not Allowed Flag is set to not allowed in the VLR.

- if, after check of possible roaming restrictions, the subscriber is allowed to roam in the target LA, the LA Not Allowed Flag is set to allowed (if necessary), the IMSI Detached Flag is set to attached and the process SUBSCRIBER_PRESENT_VLR is started; this may inform the HLR that the subscriber is present again to retry an SMS delivery (see subclause 19.1.1.7). Thereafter, the VLR checks whether TMSI reallocation is required.
 - if so, the VLR sends a MAP_SET_CIPHERING_MODE request containing:
 - Ciphering Mode (version 1 GSM); and
 - Kc, the cipher key to be used.
- if IMEI checking is required by the operator, the VLR will invoke the CHECK_IMEI_VLR macro (see subclause 25.6) to initiate both requesting IMEI from the MS and checking of this IMEI towards the EIR. As result either the service is granted, with process continuation as given below, or the service is rejected, in which case the VLR marks the subscriber as detached and returns an Illegal Equipment error in the MAP_UPDATE_LOCATION_AREA response before the process terminates.
 - the VLR then sends a MAP_FORWARD_NEW_TMSI request containing the new TMSI, and the MAP_UPDATE_LOCATION_AREA response containing no parameters. The process will thereafter wait for the MAP_FORWARD_NEW_TMSI confirm. If this indicates a negative outcome, or if a MAP_P_ABORT or a MAP_U_ABORT primitive is received, the old TMSI is frozen. Subsequent accesses of the MS shall be accepted with both old or new TMSI.
- if TMSI reallocation is not required, the VLR invokes the CHECK_IMEI_VLR macro (see subclause 25.6) to initiate both requesting IMEI from the MS and checking of this IMEI towards the EIR, if IMEI Checking is required by the operator. As a result, either the service is granted, in which case the MAP_UPDATE_LOCATION_AREA response is sent without any parameters, or the service is rejected, in which case an Illegal Equipment error is returned in the MAP_UPDATE_LOCATION_AREA response, before the process terminates.

In all cases where the VLR sends a MAP_UPDATE_LOCATION_AREA response to the MSC, the dialogue towards the MSC is terminated by a MAP_CLOSE request with parameter Release Method indicating Normal Release.

The macro VLR Update HLR

This macro is invoked by the VLR process for location updating or by some other process handling the first subscriber access to the network after a register failure in order to perform HLR updating. If the VLR does not know the subscribers HLR (e.g. no IMSI translation exists as there are not yet any SS7 links to the subscribers HPLMN), the error Roaming Not Allowed with cause PLMN Roaming Not Allowed is returned.

If the subscribers HLR can be reached, the VLR opens a dialogue towards the HLR (see figure 19.1.1/8) by sending a MAP_OPEN request without any user specific parameters, together with a MAP_UPDATE_LOCATION request containing the parameters

- IMSI, identifying the subscriber;
- Location Info, containing the MSC number;

- VLR Number, the E.164 address of the VLR, to be used by the HLR when addressing the VLR henceforth (e.g. when requesting an MSRN);
- the LMSI as an VLR operator option; this is a subscriber identification local to the VLR, used for fast data base access.

In case the HLR rejects dialogue opening (see subclause 25.1), the VLR will terminate the procedure indicating procedure error. If the HLR indicates version Vr protocol to be used, the VLR will revert to the version Vr procedure concerning the dialogue with the HLR, with outcomes as for the current MAP version procedure.

If the HLR accepts the dialogue, the HLR will respond with:

- a MAP_INSERT_SUBSCRIBER_DATA indication, handled by the macro Insert_Sub_Data_VLR defined in subclause 25.7;

NOTE: The HLR may repeat this service several times depending on the amount of data to be transferred to the VLR and to replace subscription data in case they are not supported by the VLR.

- a MAP_ACTIVATE_TRACE_MODE indication, handled by the macro Activate_Tracing_VLR defined in subclause 25.9;
- a MAP_FORWARD_CHECK_SS_INDICATION_ind. This indication will be relayed to the MSC without any change of the current state.
- the MAP_UPDATE_LOCATION confirmation:
 - if this confirmation contains the HLR Number, this indicates that the HLR has passed all information and that updating has been successfully completed. The VLR is updated using the parameters provided in the service and needed by the VLR. If certain parameters are not needed in the VLR, e.g. because some service is not supported, the corresponding data may be discarded. The VLR sets the "Confirmed by HLR" and "Location information confirmed in HLR" indicators to "Confirmed" to indicate successful subscriber data updating;
 - if the confirmation contains an User error cause (Unknown Subscriber, Roaming Not Allowed or some other), the process calling the macro continues accordingly. In the last case, the subscriber data are marked as incomplete by setting the indicators "Confirmed by HLR" and "Location information confirmed in HLR" to "Not Confirmed". The same holds if there is a Provider error or a Data error in the confirmation;
- a MAP_P_ABORT, MAP_U_ABORT, or MAP_CLOSE indication. In these cases, the subscriber data are marked to be incomplete and the process continues as in the case of an error reported by the HLR;
- a MAP_NOTICE indication. Then, the dialogue towards the HLR is terminated, the subscriber data are marked to be incomplete and the process continues as in the case of an error reported by the HLR;
- if during HLR updating the VLR receives a MAP_P_ABORT, MAP_U_ABORT or a MAP_CLOSE indication concerning the MSC dialogue, the process is terminated by sending a MAP_U_ABORT request towards the HLR, and subscriber data are marked to be incomplete;
- if during HLR updating the VLR receives a MAP_NOTICE indication concerning the MSC dialogue, the dialogue with the MSC is terminated by sending a MAP_CLOSE, the dialogue with the HLR is terminated by sending a MAP_U_ABORT, subscriber data are marked to be incomplete and the process is terminated.

Abort Handling

If the VLR receives a MAP_NOTICE indication from the MSC while waiting for a MAP service primitive, the VLR will terminate the MSC dialogue by sending a MAP_CLOSE and any pending HLR dialogue by sending a MAP_U_ABORT (Remote Operations Failure), and the process is terminated.

Updating request via the Gs interface (optional for GPRS)

If Gs-interface is installed, the VLR may receive the Gs_GPRS_LOCATION_UPDATING_Request message from the SGSN for triggering an IMSI Attach or Location Updating procedure (see GSM 03.60 and 09.18).

Figure 19.1.1/16 shows the process for handling this Gs interface message.

The process specific macro

« GPRS_Location_Update_Completion_VLR » for optional initiation of TMSI reallocation as for acknowledgement of the Gs_GPRS_LOCATION_UPDATING_Request message (see figure 19.1.1/17),

and the optional process specific macro

« VLR_Update_GPRS_HLR » to update the HLR and download subscriber data from there (see figure 19.1.1/18), are invoked by this process.

On receipt of the Gs_GPRS_LOCATION_UPDATING_Request message, the VLR checks whether the subscriber is unknown (i.e. no IMSI record). If so, the indicator "Location Information Confirmed in HLR" is set to "Not Confirmed" to initiate HLR updating later on. The indicator "Confirmed by Radio Contact" is set to "Confirmed" and the location information held in the register is updated. If no VLR/SGSN association exists it is created (storage of SGSN address received) otherwise it is updated.

If the HLR is to be updated, the VLR_Update_GPRS_HLR macro described below is performed, with one of the following results (see sheet 2 of figure 19.1.1/18):

- OK, if HLR updating has been completed successfully. The response will contain the HLR number as parameter. Next, the GPRS_Location_Update_Completion_VLR macro is invoked (checking amongst others the roaming restrictions and regional subscription data), and upon successful outcome of this macro the register is updated and the process terminates.
- Roaming Not Allowed, qualified by PLMN Roaming Not Allowed if the location information indicates a PLMN for which the subscriber has no subscription or if the subscribers HLR cannot be reached (e.g. SS7 links to the subscribers HPLMN do not yet exist). In this case, the appropriate error (see GSM 09.18) is sent to the SGSN in the Gs_GPRS_LOCATION_UPDATING Reject. The Subscriber Data are deleted in the VLR.
- if Roaming Not Allowed was qualified by the parameter Operator Determined Barring, the appropriate error (see GSM 09.18) is sent in the Gs_GPRS_LOCATION_UPDATING Reject to the SGSN. The subscriber data are deleted in the VLR.
- Unknown Subscriber, if the subscriber is not known in the HLR. In this case, the subscriber data are deleted in the VLR, and the appropriate error (see GSM 09.18) is sent in the Gs_GPRS_LOCATION_UPDATING Reject.
- Procedure error, if there occurs some other error during HLR updating (e.g. abort of the connection to HLR). In this case the appropriate error (see GSM 09.18) is sent in the Gs_GPRS_LOCATION_UPDATING Reject.

The macro GPRS Location Update Completion VLR

This macro completes the VLR updating process. First, the VLR checks whether there is a roaming restriction for the subscriber (see figure 19.1.1/17):

- if the target LA is not allowed for the subscriber due to national roaming restrictions, the appropriate error (see GSM 09.18) is sent in the Gs_GPRS_LOCATION_UPDATING Reject towards the SGSN.

The subscriber data are not deleted from VLR, to avoid unnecessary HLR updating when roaming into other LAs of the same MSC/VLR. An indication that the subscriber is not allowed to roam is set in the VLR (LA Not Allowed Flag set to not allowed). As a consequence the subscriber is not reachable (checked for MTC, SMS and MT USSD) and cannot perform outgoing actions (checked in Access Management).

- if the target LA is not allowed for the subscriber because of regional subscription data (Zone Code List) or Roaming Restriction Due To Unsupported Feature stored in the VLR, the appropriate error (see GSM 09.18) is returned to the SGSN in the Gs_GPRS_LOCATION_UPDATING Reject.

Also in this case the subscriber data are not deleted from VLR, to avoid unnecessary HLR updating when roaming into other LAs of the same MSC. The LA Not Allowed Flag is set to not allowed in the VLR.

- if, after check of possible roaming restrictions, the subscriber is allowed to roam in the target LA, the LA Not Allowed Flag is set to allowed (if necessary), the IMSI Detached Flag is set to attached and the process SUBSCRIBER_PRESENT_VLR is started; this may inform the HLR that the subscriber is present again to retry an SMS delivery (see subclause 19.1.1.7). Thereafter, the VLR checks whether TMSI reallocation is required.
- if so, the VLR sends the TMSI within the Gs_GPRS_LOCATION_UPDATING Accept message and Gs_GPRS_TMSI_REALLOCATION_Complete is expected.
- if TMSI reallocation is not required, the VLR sends the Gs_GPRS_LOCATION_UPDATING Accept message to the SGSN.

The macro VLR Update GPRS HLR

This macro is invoked by the VLR process for location updating (see GSM 03.60). If the VLR does not know the subscribers HLR (e.g. no IMSI translation exists as there are not yet any SS7 links to the subscribers HPLMN), the error Roaming Not Allowed with cause PLMN Roaming Not Allowed is returned.

If the subscribers HLR can be reached, the VLR opens a dialogue towards the HLR (see figure 19.1.1/18) by sending a MAP_OPEN request without any user specific parameters, together with a MAP_UPDATE_LOCATION request containing the parameters

- IMSI, identifying the subscriber;
- Location Info, containing the MSC number;
- VLR Number, the E.164 address of the VLR, to be used by the HLR when addressing the VLR henceforth (e.g. when requesting an MSRN);
- the LMSI as an VLR operator option; this is a subscriber identification local to the VLR, used for fast data base access.

In case the HLR rejects dialogue opening (see subclause 25.1), the VLR will terminate the procedure indicating procedure error. If the HLR indicates version Vr protocol to be used, the VLR will revert to the version Vr procedure concerning the dialogue with the HLR, with outcomes as for the current MAP version procedure.

If the HLR accepts the dialogue, the HLR will respond with:

- a MAP_INSERT_SUBSCRIBER_DATA indication, handled by the macro Insert_Subs_Data_VLR defined in subclause 25.7;

NOTE: The HLR may repeat this service several times depending on the amount of data to be transferred to the VLR and to replace subscription data in case they are not supported by the VLR.

- a MAP_ACTIVATE_TRACE_MODE indication, handled by the macro Activate_Tracing_VLR defined in subclause 25.9;
- a MAP_FORWARD_CHECK_SS_INDICATION_ind. This indication will not be relayed to the SGSN.
- the MAP_UPDATE_LOCATION confirmation:
 - if this confirmation contains the HLR Number, this indicates that the HLR has passed all information and that updating has been successfully completed. The VLR is updated using the parameters provided in the service and needed by the VLR. If certain parameters are not needed in the VLR, e.g. because some service is not supported, the corresponding data may be discarded. The VLR sets the "Confirmed by HLR" and "Location information confirmed in HLR" indicators to "Confirmed" to indicate successful subscriber data updating;
 - if the confirmation contains an User error cause (Unknown Subscriber, Roaming Not Allowed or some other), the process calling the macro continues accordingly. In the last case, the subscriber data are marked as incomplete by setting the indicators "Confirmed by HLR" and "Location information confirmed in HLR" to "Not Confirmed". The same holds if there is a Provider error or a Data error in the confirmation;
- a MAP_P_ABORT, MAP_U_ABORT, or MAP_CLOSE indication. In these cases, the subscriber data are marked to be incomplete and the process continues as in the case of an error reported by the HLR;

- a MAP_NOTICE indication. Then, the dialogue towards the HLR is terminated, the subscriber data are marked to be incomplete and the process continues as in the case of an error reported by the HLR.

Process Update_Location_Area_VLR

19.1.1_6.1(4)

Figure 19.1.1/6: Location updating in VLR

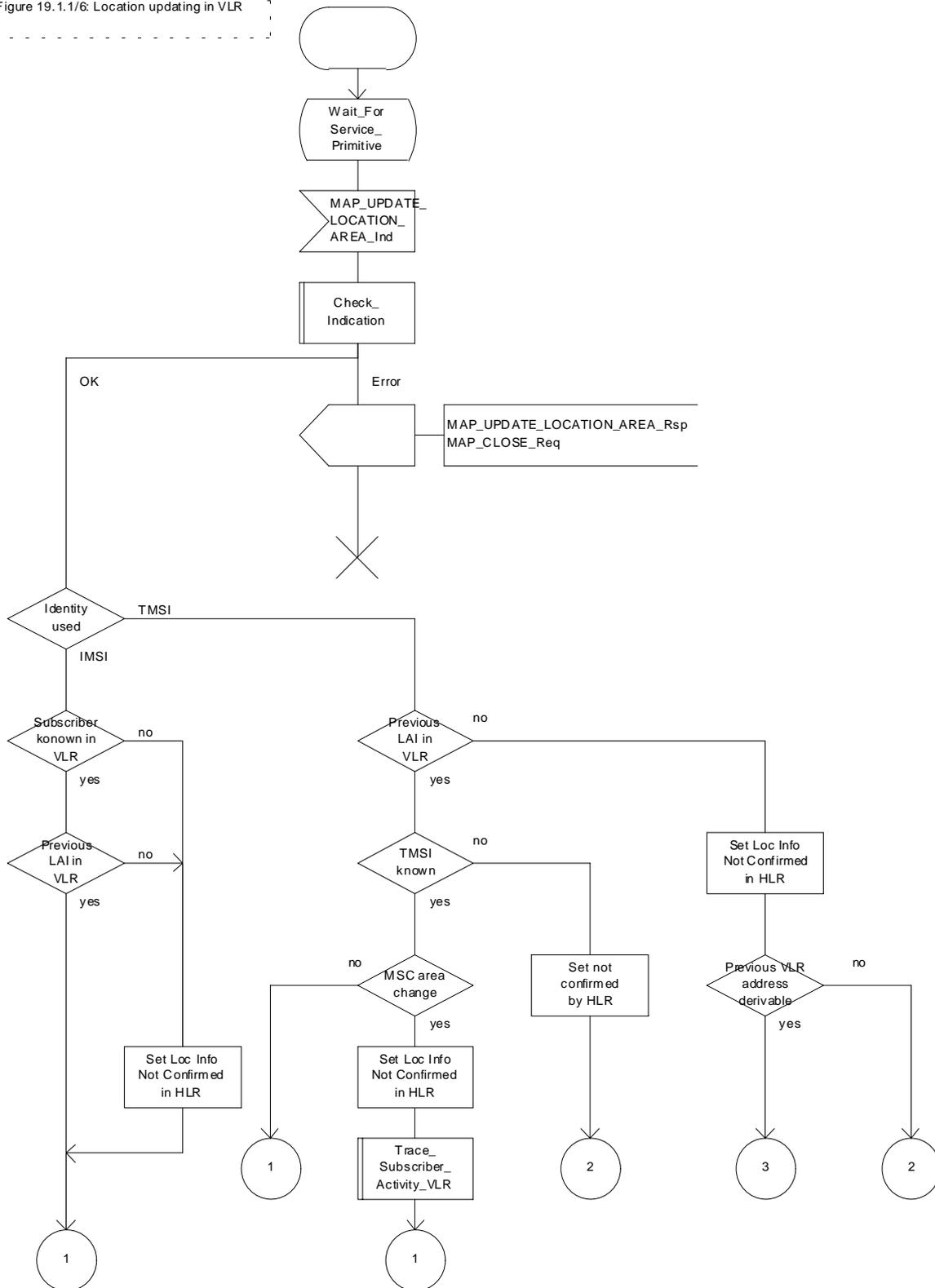


Figure 19.1.1/6 (sheet 1 of 4): Process Update_Location_Area_VLR

Figure 19.1.1/6: Location updating in VLR

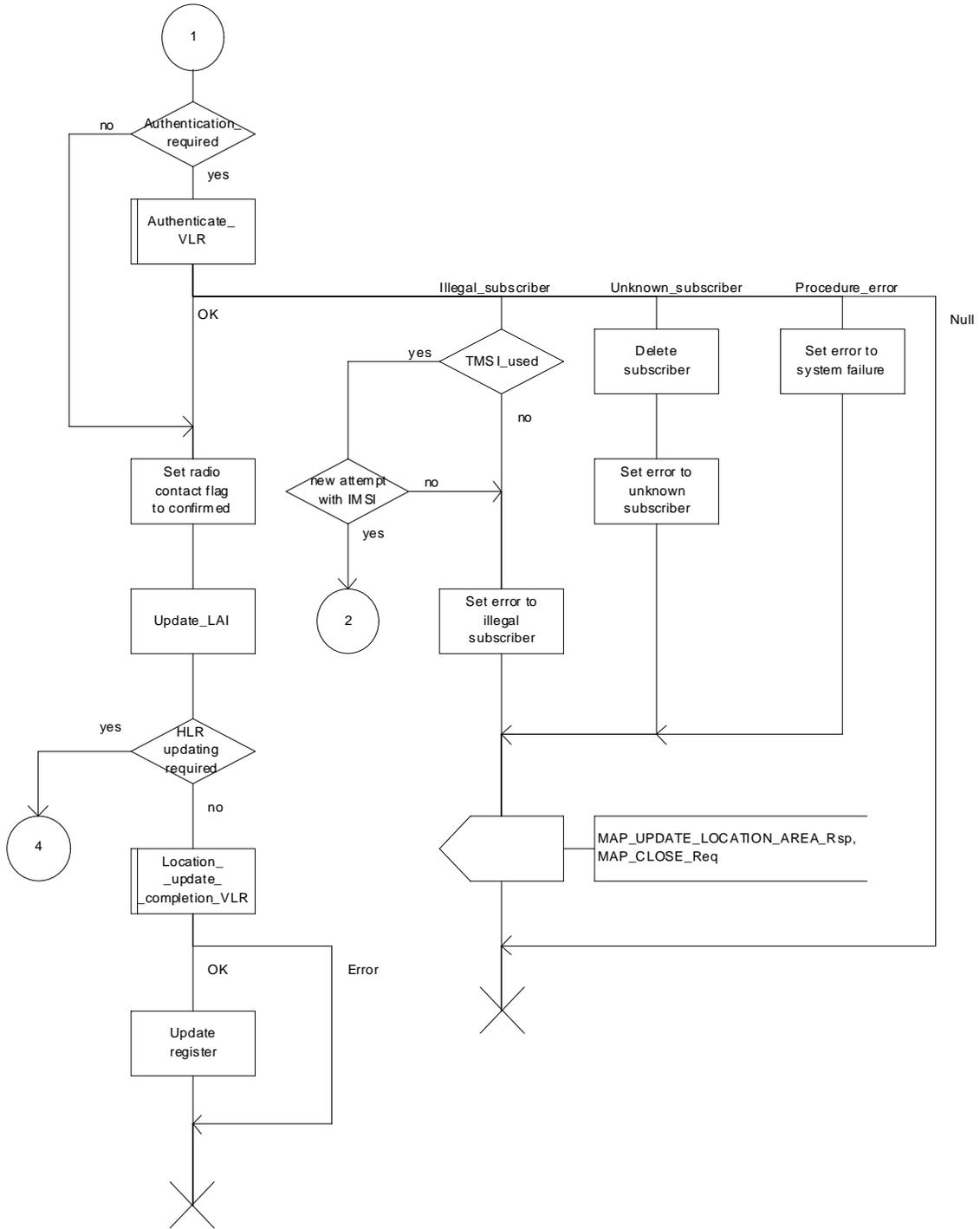


Figure 19.1.1/6 (sheet 2 of 4): Process Update_Location_Area_VLR

Process Update_Location_Area_VLR

19.1.1_6.3(4)

Figure 19.1.1/6: Location updating in VLR

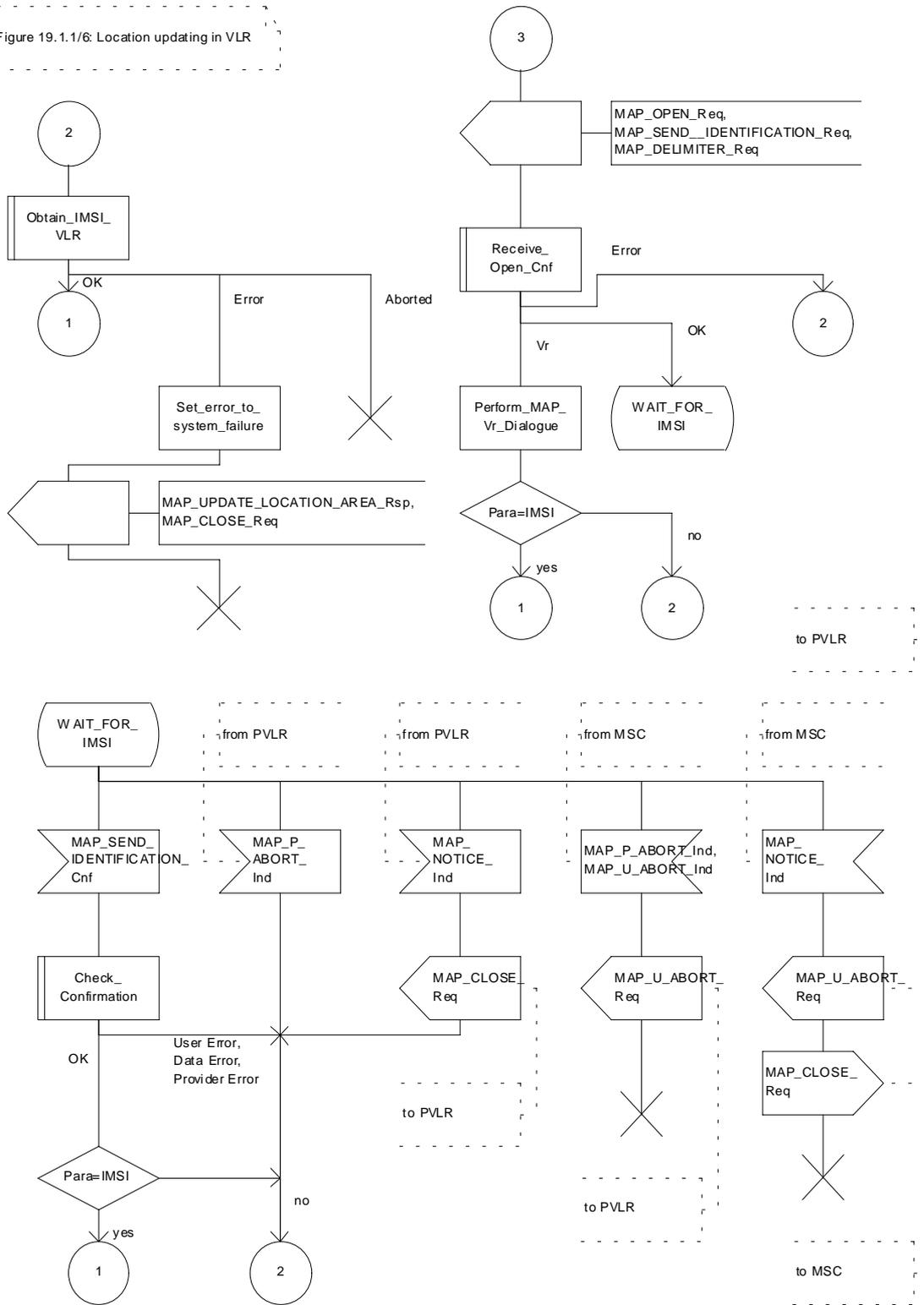


Figure 19.1.1/6 (sheet 3 of 4): Process Update_Location_Area_VLR

Process Update_Location_Area_VLR

19.1.1_6.4(4)

Figure 19.1.1/6: Location updating in VLR

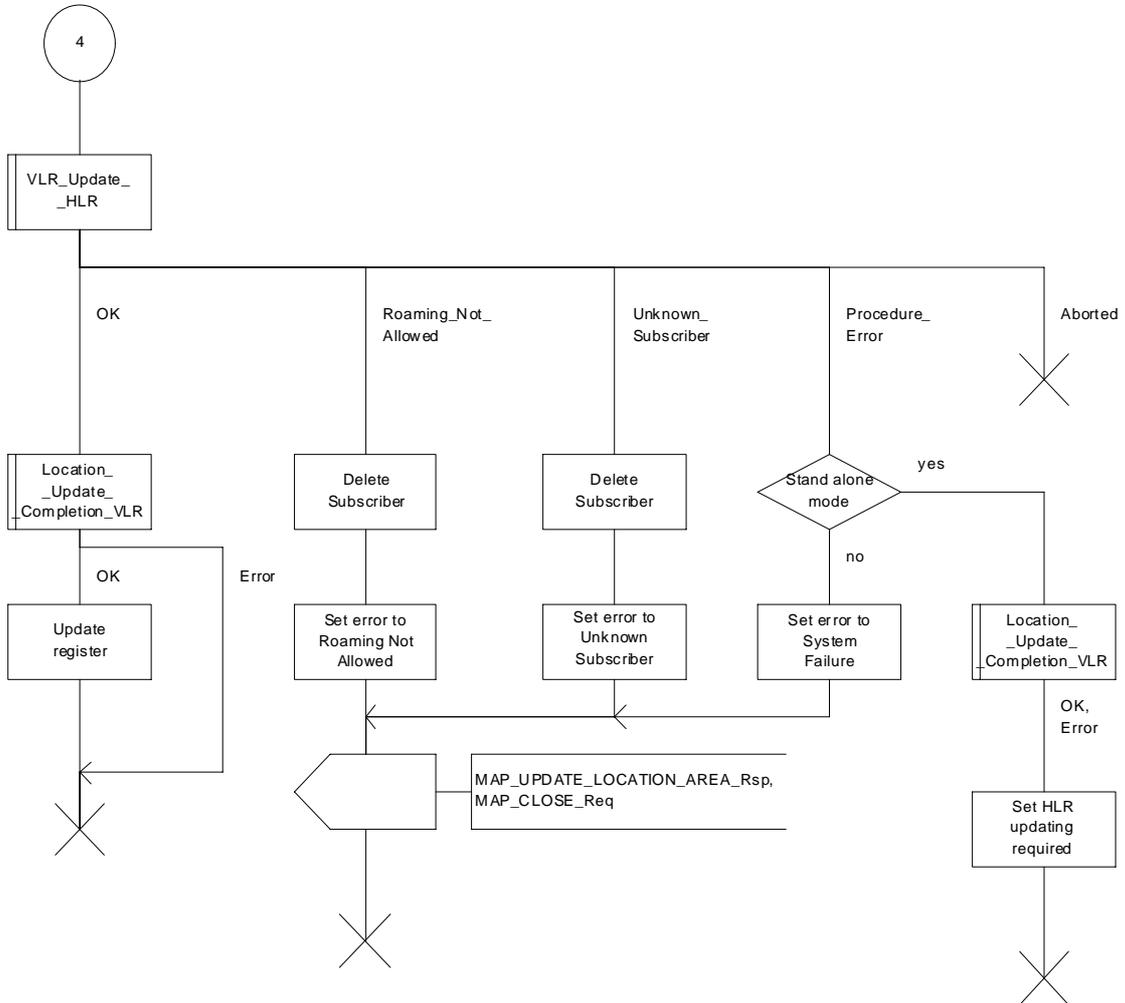


Figure 19.1.1/6 (sheet 4 of 4): Process Update_Location_Area_VLR

Macrodefinition Location_Update_Completion_VLR

19.1.1_7(1)

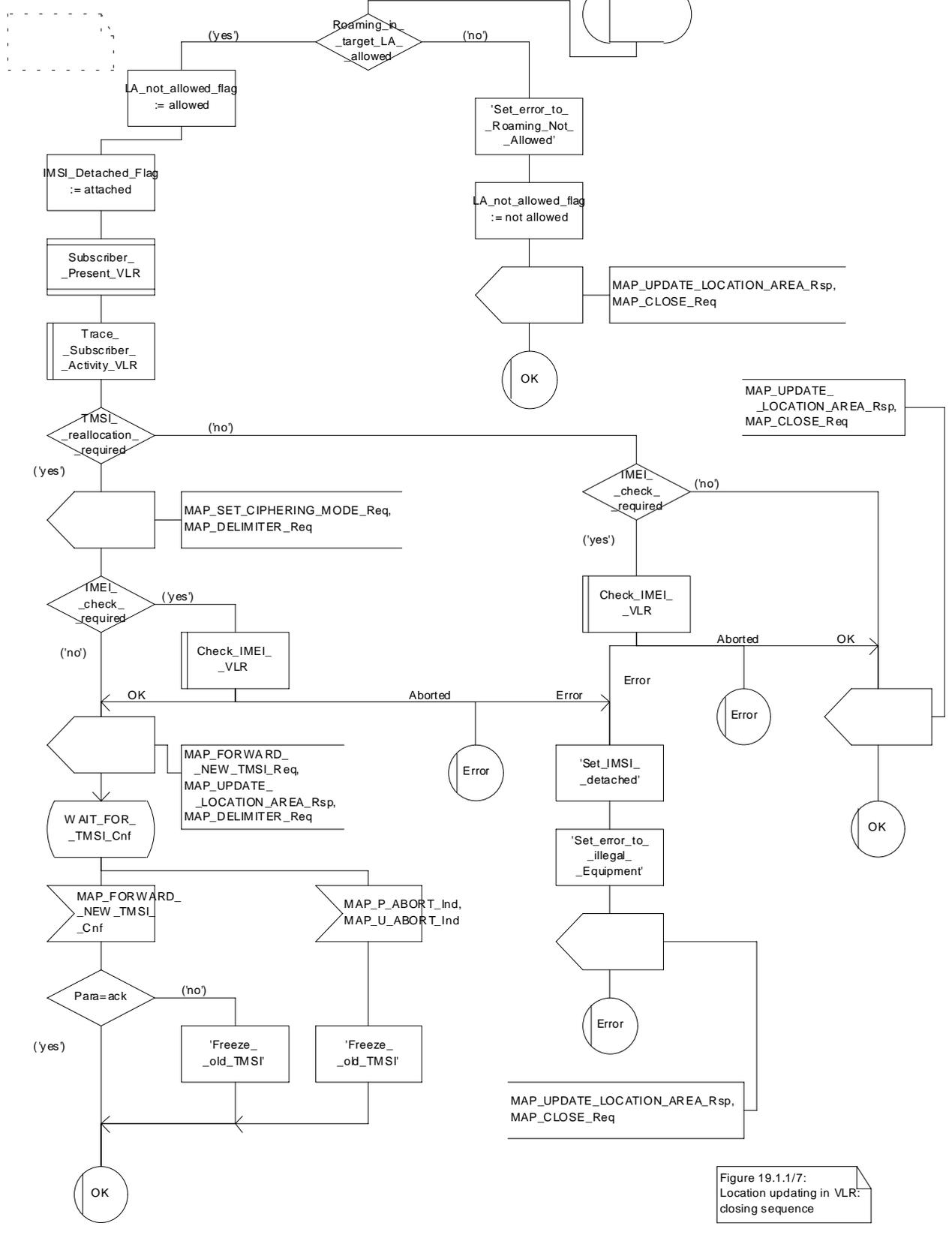


Figure 19.1.1/7: Location updating in VLR: closing sequence

Figure 19.1.1/7: Macro Location_Update_Completion_VLR

Macrodefinition VLR_Update_HLR

19.1.1_8.1(2)

Figure 19.1.1/8:
HLR updating in VLR

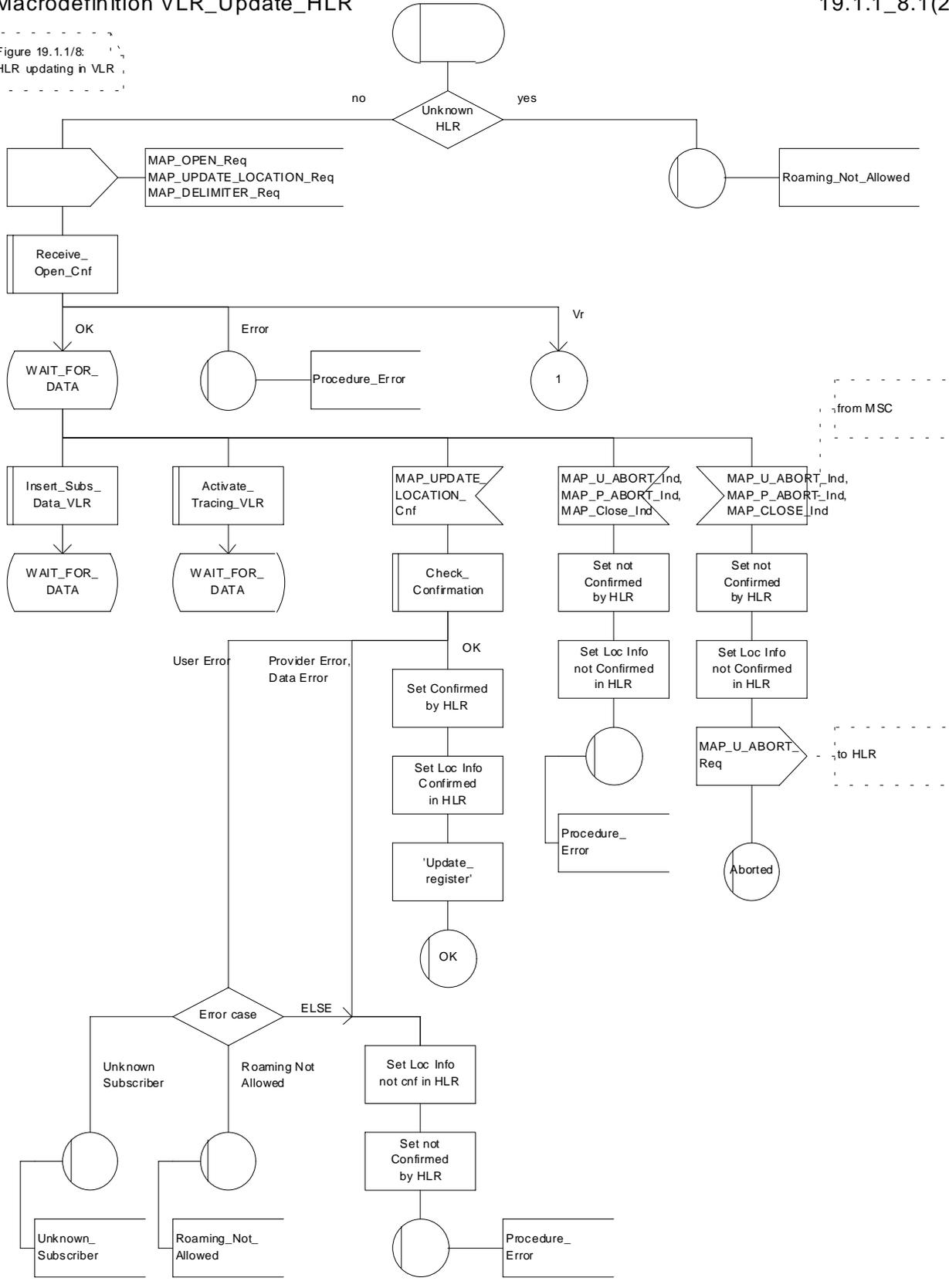


Figure 19.1.1/8 (sheet 1 of 2): Macro VLR_Update_HLR

Macrodefinition VLR_Update_HLR

19.1.1_8.2(2)

Figure 19.1.1/8:
HLR updating in VLR

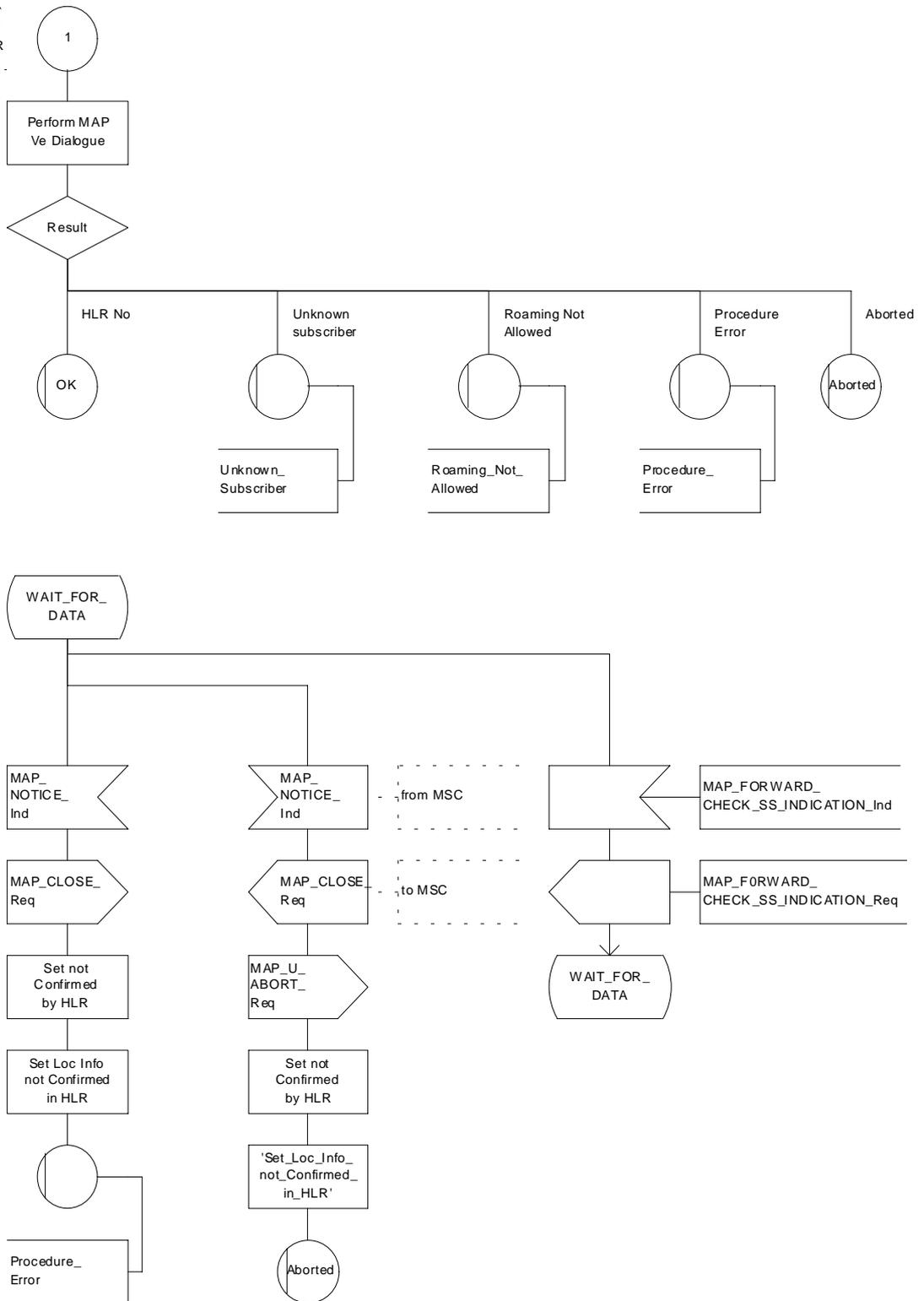


Figure 19.1.1/8 (sheet 2 of 2): Macro VLR_Update_HLR

Process GPRS_Update_Location_Area_VLR

19.1.1_16.1(2)

Figure 19.1.1/16: Location updating in VLR

signals to/from the left are to/from the SGSN

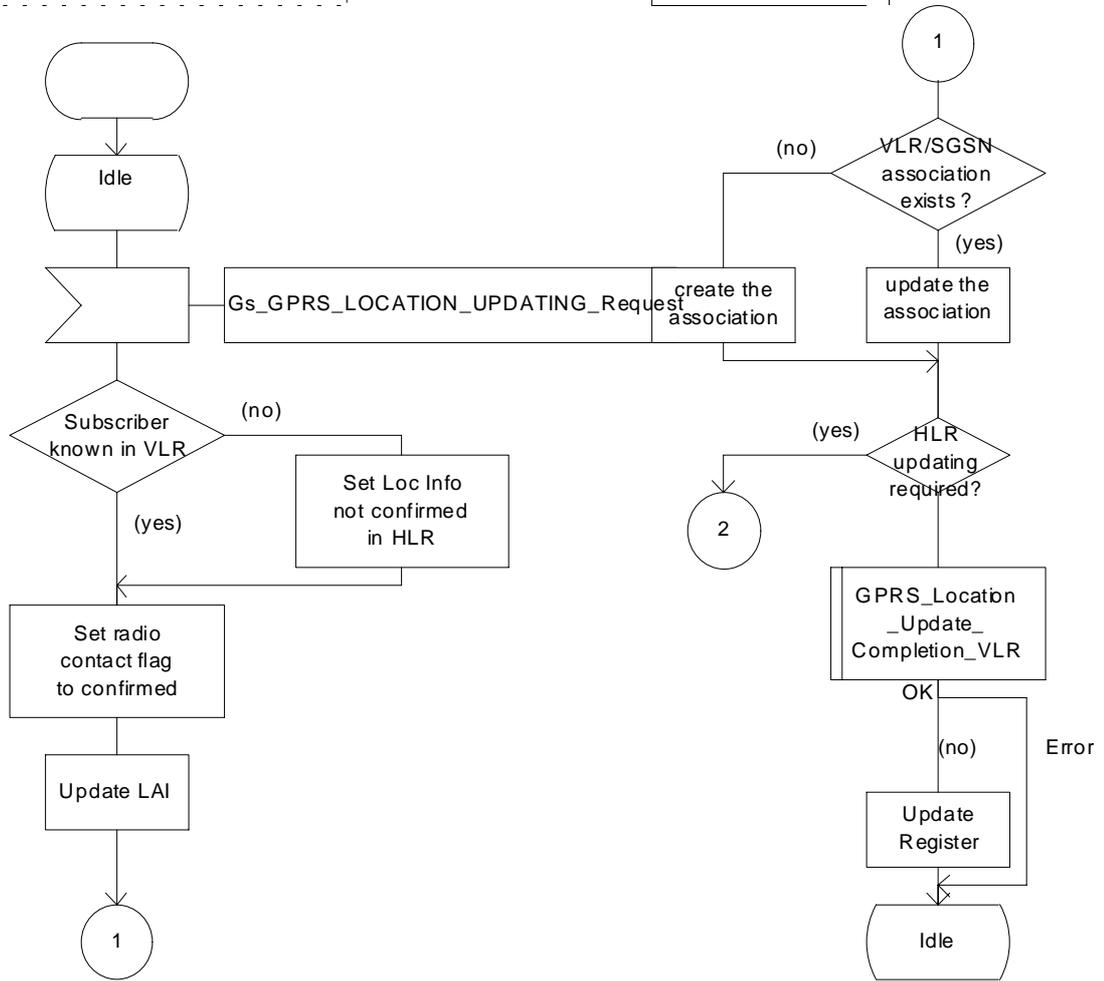


Figure 19.1.1/16 (sheet 1 of 2): Process GPRS_Update_Location_Area_VLR

Process GPRS_Update_Location_Area_VLR

19.1.1_16.2(2)

Figure 19.1.1/16: Location updating in VLR

Signals to/from the left are to/from the SGSN

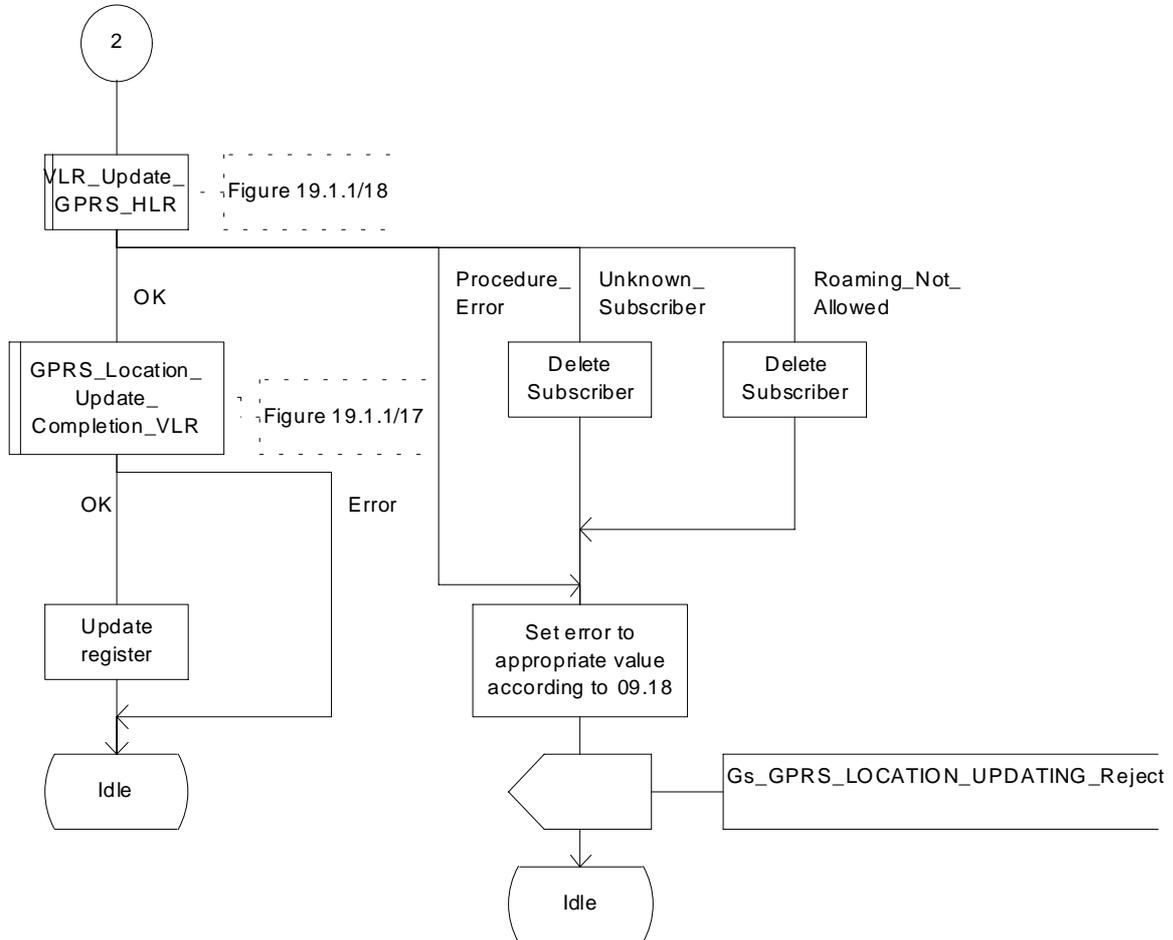


Figure 19.1.1/16 (sheet 2 of 2): Process GPRS_Update_Location_Area_VLR

Macrodefinition GPRS_Location_Update_Completion_VLR

19.1.1_17(1)

Figure 19.1.1/17:
Location updating in VLR for GPRS:
closing sequence

Signals to/from the left
are to/from the SGSN

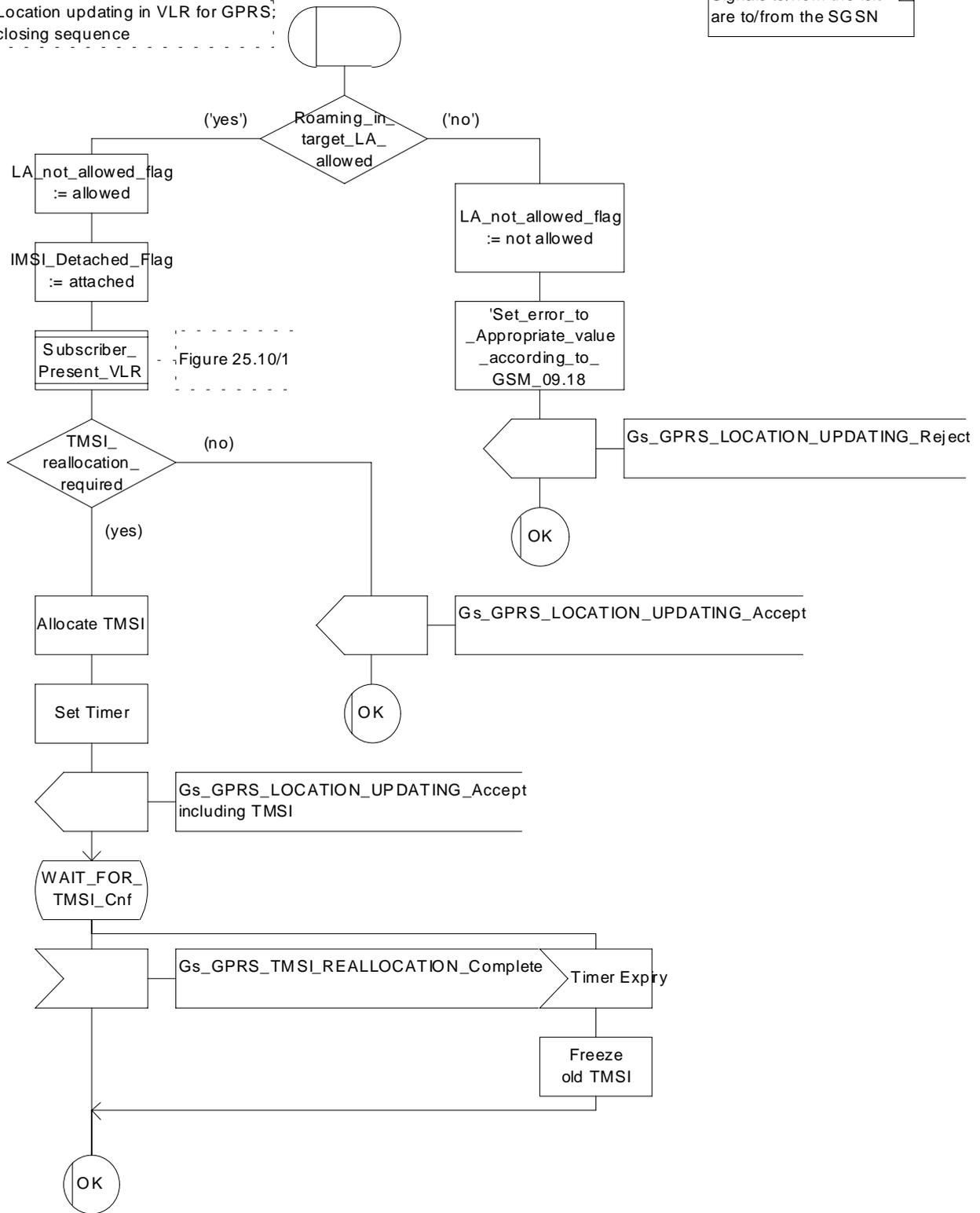


Figure 19.1.1/17: Macro GPRS_Location_Update_Completion_VLR

Macrodefinition VLR_Update_GPRS_HLR

19.1.1_18.1(2)

Figure 19.1.1/18: HLR updating in VLR

Signals to/from the right are to/from the HLR

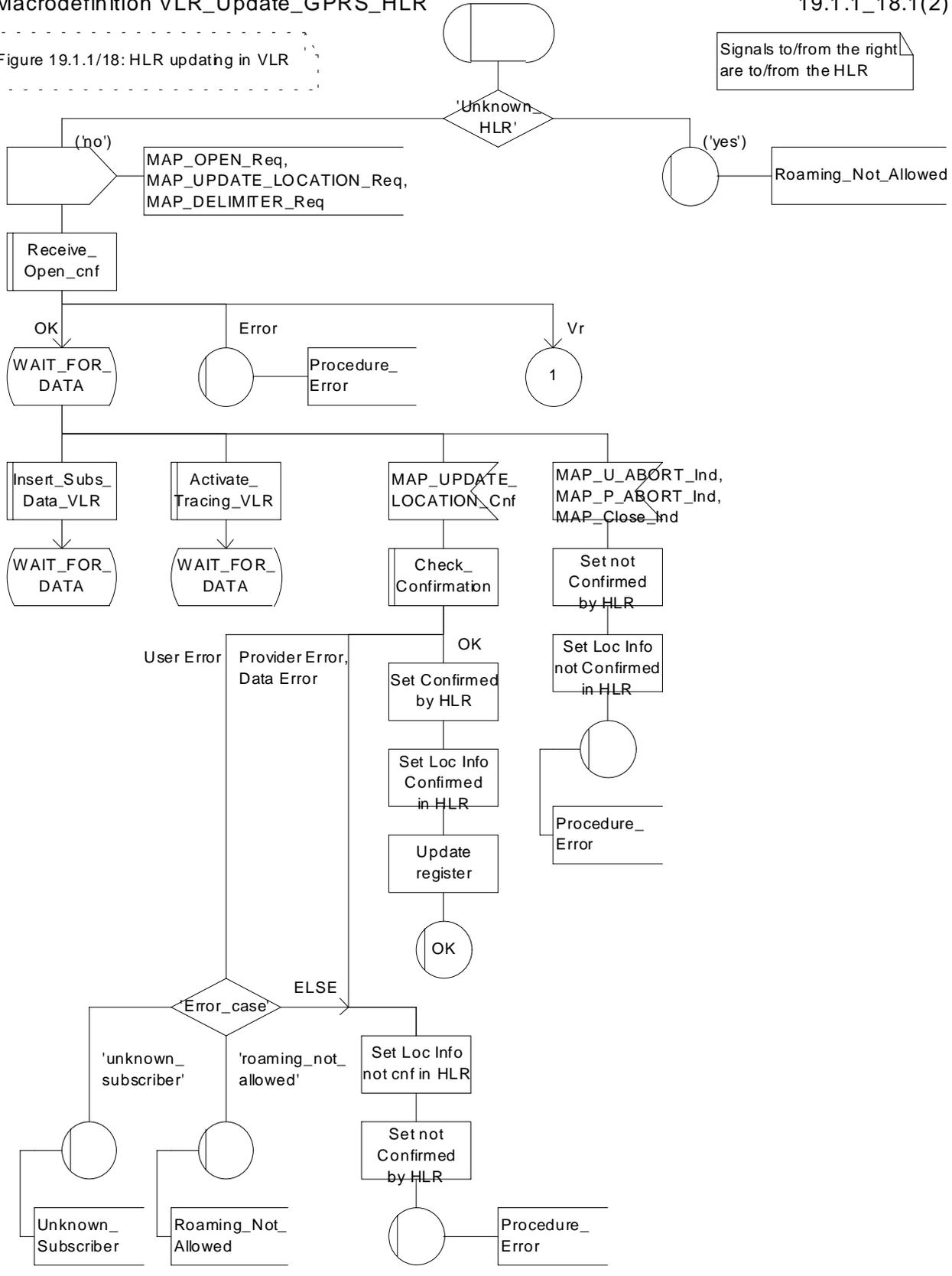


Figure 19.1.1/18 (sheet 1 of 2): Macro VLR_Update_GPRS_HLR

Figure 19.1.1/18: HLR updating in VLR

Signals to/from the right are to/from the HLR

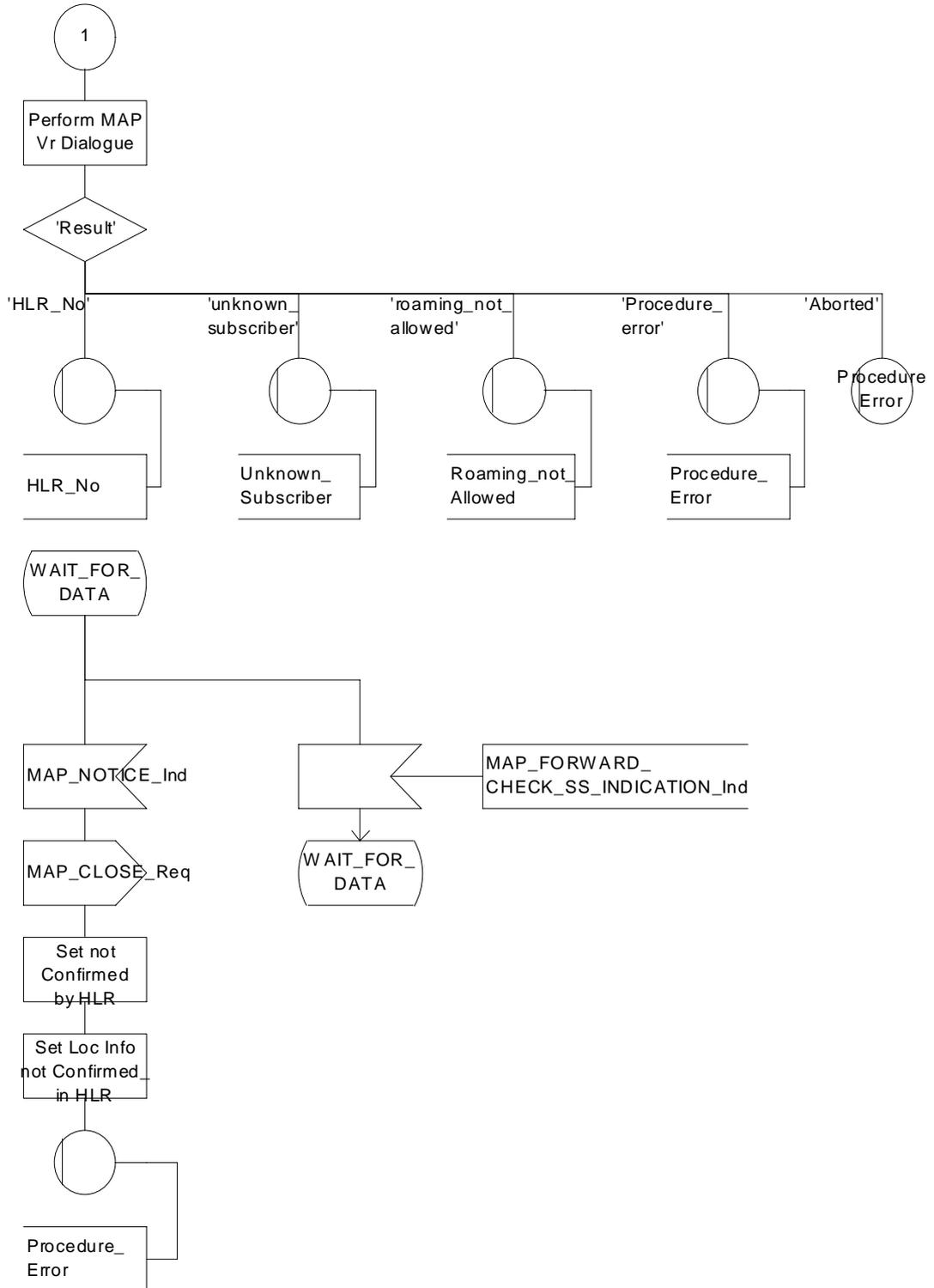


Figure 19.1.1/18 (sheet 2 of 2): Macro VLR_Update_GPRS_HLR

19.1.1.4 Detailed procedure in the HLR

When addressed by the VLR, the following macros are used by the process Update_Location_HLR:

- Receive_Open_Ind, defined in subclause 25.1;
- Check_indication, defined in subclause 25.2;
- Insert_SubData_Framed_HLR, described in subclause 19.4.1;
- Control_Tracing_HLR, described in subclause 25.9;

and the processes Cancel_Location_HLR (see subclause 19.1.2) and Subscriber_Present_HLR (see subclause 19.1.1.7) are invoked.

The location updating process in the HLR is activated by receipt of a MAP_UPDATE_LOCATION indication (see figure 19.1.1/9):

- if there is a parameter problem in the indication, the error Unexpected Data Value is returned in the MAP_UPDATE_LOCATION response (see Check_indication macro defined in subclause 25.2); if the subscriber is not known in the HLR, the error Unknown Subscriber is returned in the response. In either case the process terminates;
- if Network Access Mode is set to "GPRS only" the error Unknown Subscriber is returned in the response. The process terminates;
- tracing shall be set to deactivate in the VLR
- if the VLR address received in the MAP_UPDATE_LOCATION indication differs from the one actually stored against the subscriber, the Cancel_Location_HLR process is started to cancel the subscriber data in the stored VLR (see subclause 19.1.2).

The next action will be to check whether the subscriber is allowed to roam into the PLMN indicated by the VLR Number given in the MAP_UPDATE_LOCATION indication:

- if the subscriber is not allowed to roam into the PLMN, the error Roaming not Allowed with cause PLMN Roaming Not Allowed is returned in the MAP_UPDATE_LOCATION response, and the routing information stored (VLR number, MSC Number, LMSI) is deleted (deregistration);
- otherwise the HLR database will be updated with information received in the indication. The HLR sets the "MS purged for non-GPRS" flag to False and checks whether tracing is required for that subscriber. This is handled by the macro Control_Tracing_HLR described in subclause 25.9.

Thereafter, the macro Insert_SubData_Framed_HLR described in subclause 19.4.1 is invoked. The outcome of this macro may be:

- aborted, in which case the process terminates;
- error, in which case the error System Failure is returned in the MAP_UPDATE_LOCATION response and the process terminates;
- OK, indicating successful outcome of downloading the subscriber data to the VLR.

The SUBSCRIBER_PRESENT_HLR process is then started to alert the Short Message Service Centre, if required (see subclause 19.1.7). Additionally, the MAP_FORWARD_CHECK_SS_INDICATION request is sent to inform the subscriber about an uncertain state of his SS-Data if this is needed due to previous HLR restoration (use of this service may be omitted as an HLR operator option).

The HLR number is then returned in the MAP_UPDATE_LOCATION response.

In all cases where the HLR sends a MAP_UPDATE_LOCATION response to the VLR, the dialogue towards the VLR is terminated by a MAP_CLOSE request with parameter Release Method indicating Normal Release.

Finally the process Update_Location_HLR sends a "Location updating complete" message to the process CCBS_Coordinator_HLR (specified in GSM 03.93 [107]) and the process terminates.

When addressed by the SGSN, the following macros are used by the process Update_GPRS_Location_HLR:

- Receive_Open_indication, defined in subclause 25.1;
- Check_indication, defined in subclause 25.2;
- Insert_SubData_In_SGSN_Framed_HLR, described in subclause 19.4.x;
- Control_Tracing_HLR_with_SGSN, described in subclause 25.9;

and the processes Cancel_Location_HLR (see subclause 19.1.2) and Subscriber_Present_HLR (see subclause 19.1.1.7) are invoked.

The location updating process in the HLR is activated by receipt of a MAP_UPDATE_GPRS_LOCATION indication (see figure 19.1.1/19):

- if there is a parameter problem in the indication, the error Unexpected Data Value is returned in the MAP_UPDATE_LOCATION response (see Check_indication macro defined in subclause 25.2); if the subscriber is not known in the HLR, the error Unknown Subscriber (with diagnostic value set to "Imsi Unknown") is returned in the response. In either case the process terminates;
- if Network Access Mode is set to "non-GPRS only" the error Unknown Subscriber (with diagnostic value set to "Gprs Subscription Unknown") is returned in the response. The process terminates;
- tracing shall be set to deactivate in the SGSN.
- if the SGSN number received in the MAP_UPDATE_GPRS_LOCATION indication differs from the one actually stored against the subscriber, the Cancel_Location_HLR process is started to cancel the subscriber data in the stored SGSN (see subclause 19.1.2).

The next action will be to check whether the subscriber is allowed to roam into the PLMN indicated by the SGSN Number given in the MAP_UPDATE_GPRS_LOCATION indication:

- if the subscriber is not allowed to roam into the PLMN, the error Roaming not Allowed with cause PLMN Roaming Not Allowed or 'Operator determined Barring', depending on the case, is returned in the MAP_UPDATE_GPRS_LOCATION response, and the routing information stored (SGSN number) is deleted (deregistration);
- otherwise the HLR database will be updated with information received in the indication. The HLR sets the "MS purged for GPRS" flag to False and checks whether tracing is required for that subscriber. This is handled by the macro Control_Tracing_HLR-with_SGSN described in subclause 25.9.

Thereafter, the macro Insert_SubData_In_SGSN_Framed_HLR described in subclause 19.4.x is invoked. The outcome of this macro may be:

- aborted, in which case the process terminates;
- error, in which case the error System Failure is returned in the MAP_UPDATE_GPRS_LOCATION response and the process terminates;
- OK, indicating successful outcome of downloading the subscriber data to the SGSN.

The SUBSCRIBER_PRESENT_HLR process is then started to alert the Short Message Service Centre, if required (see subclause 19.1.7).

Finally the HLR number is returned in the MAP_UPDATE_GPRS_LOCATION response.

In all cases where the HLR sends a MAP_UPDATE_GPRS_LOCATION response to the SGSN, the dialogue towards the SGSN is terminated by a MAP_CLOSE request with parameter Release Method indicating Normal Release.

Process Update_Location_HLR

19.1.1_9.1(2)

Figure 19.1.1/9:
Location Updating in the HLR

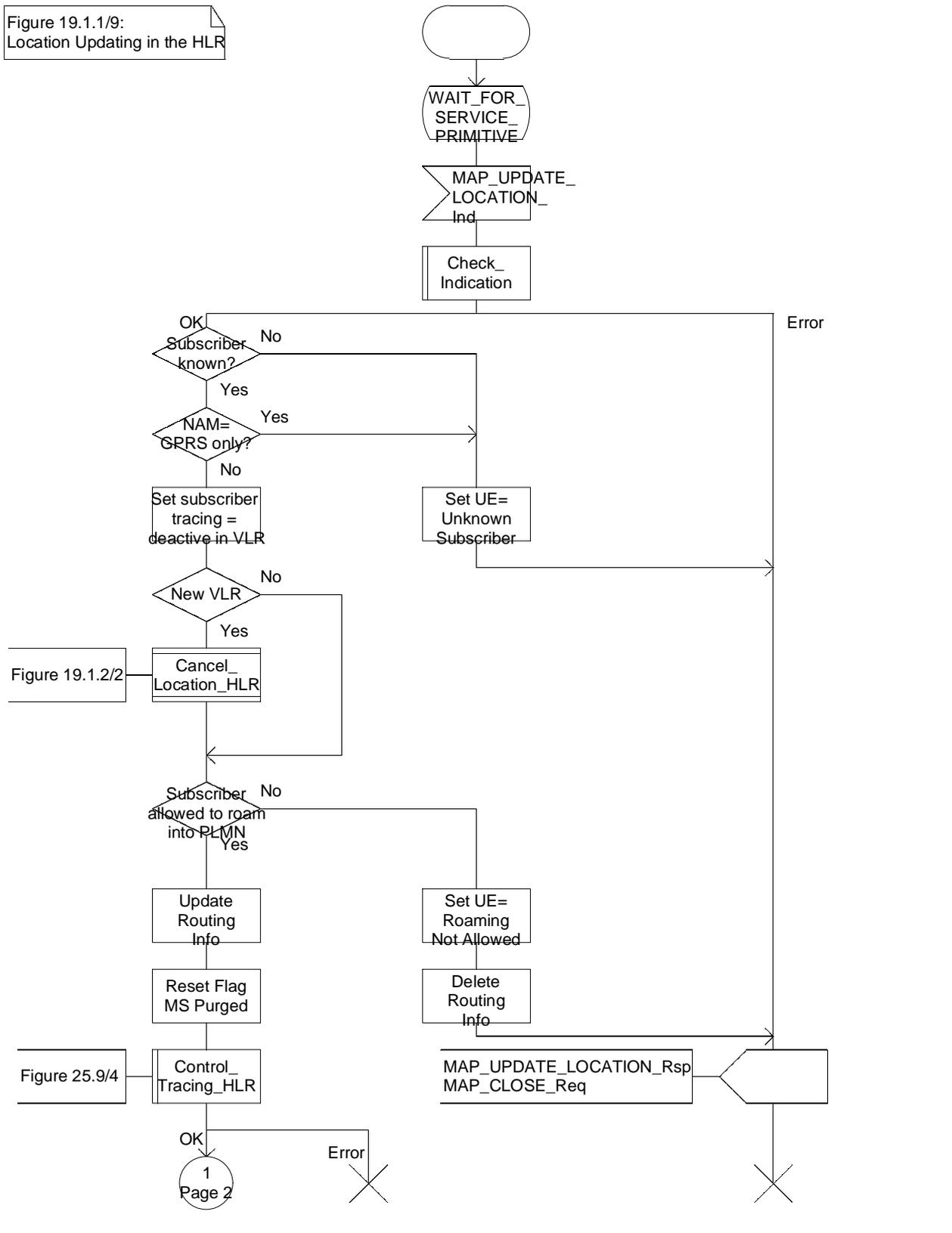


Figure 19.1.1/9 (sheet 1 of 2): Process Update_Location_HLR

Figure 19.1.1/9:
Location Updating in the HLR

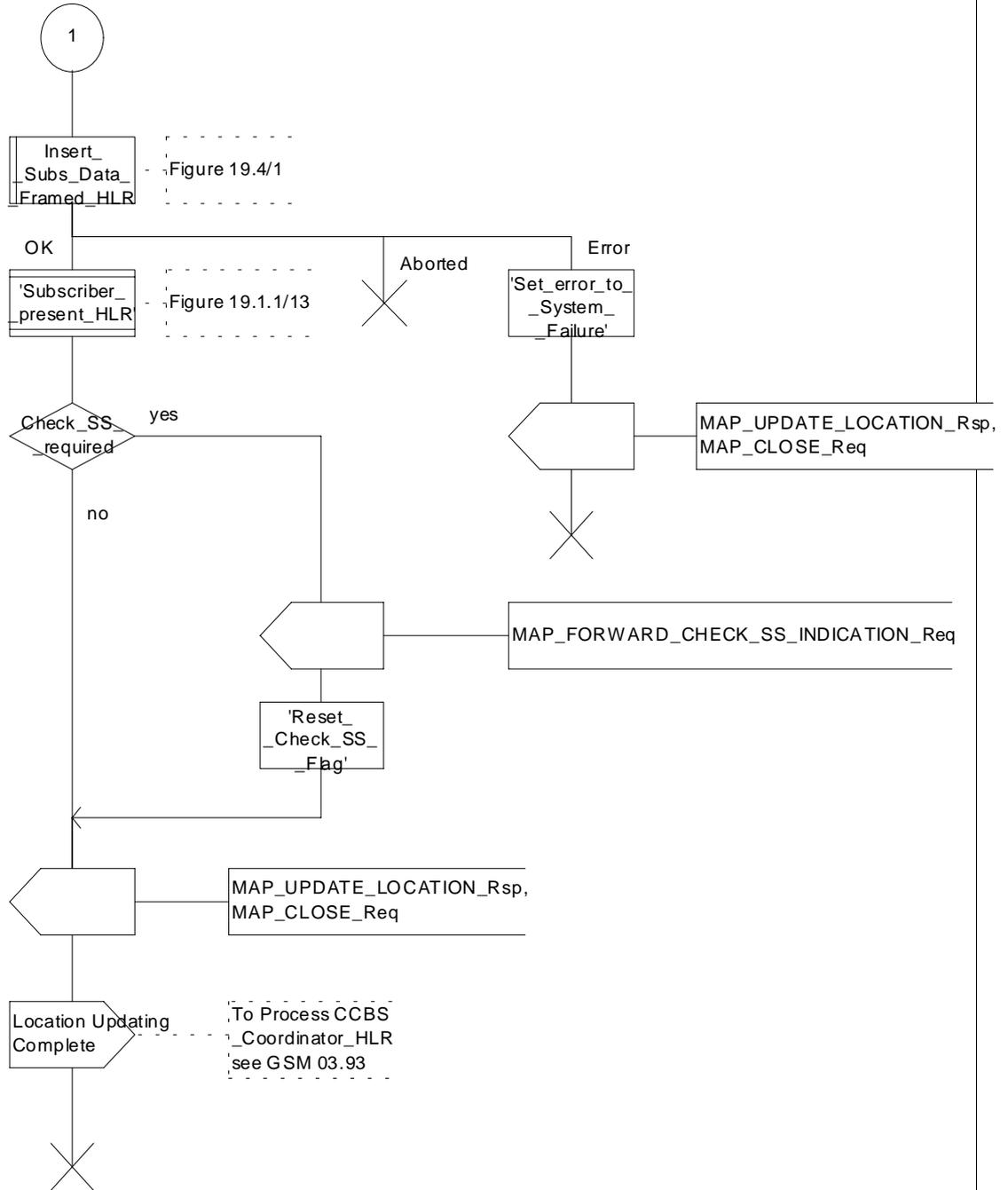


Figure 19.1.1/9 (sheet 2 of 2): Process Update_Location_HLR

Process Update_GPRS_Location_HLR

19.1.1_19.1(2)

Figure 19.1.1/19: GPRS Location Updating in the HLR

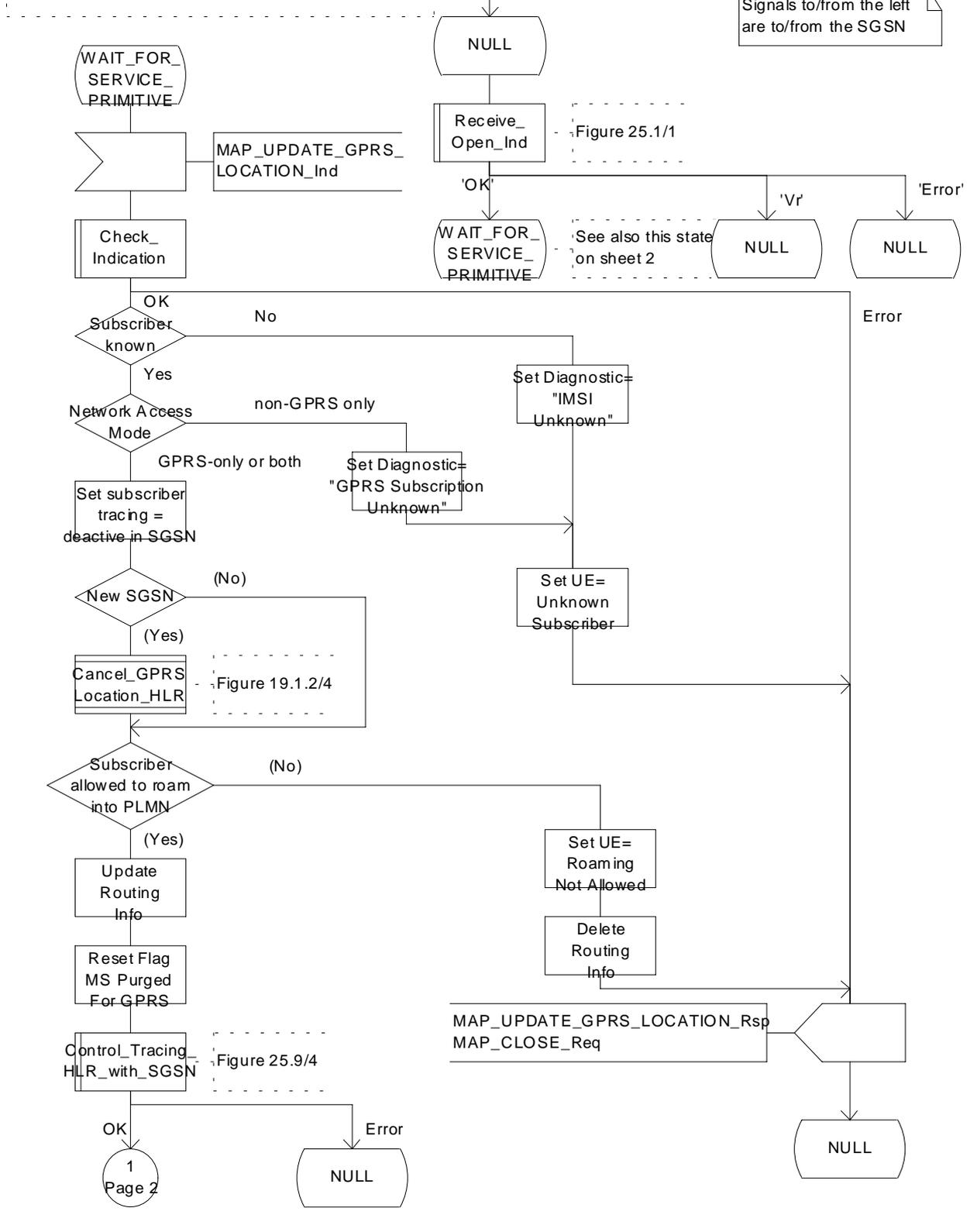


Figure 19.1.1/19 (sheet 1 of 2): Process Update_GPRS_Location_HLR

Process Update_GPRS_Location_HLR

19.1.1_19.2(2)

Figure 19.1.1/19: GPRS Location Updating in the HLR

Signals to/from the left are to/from the HLR

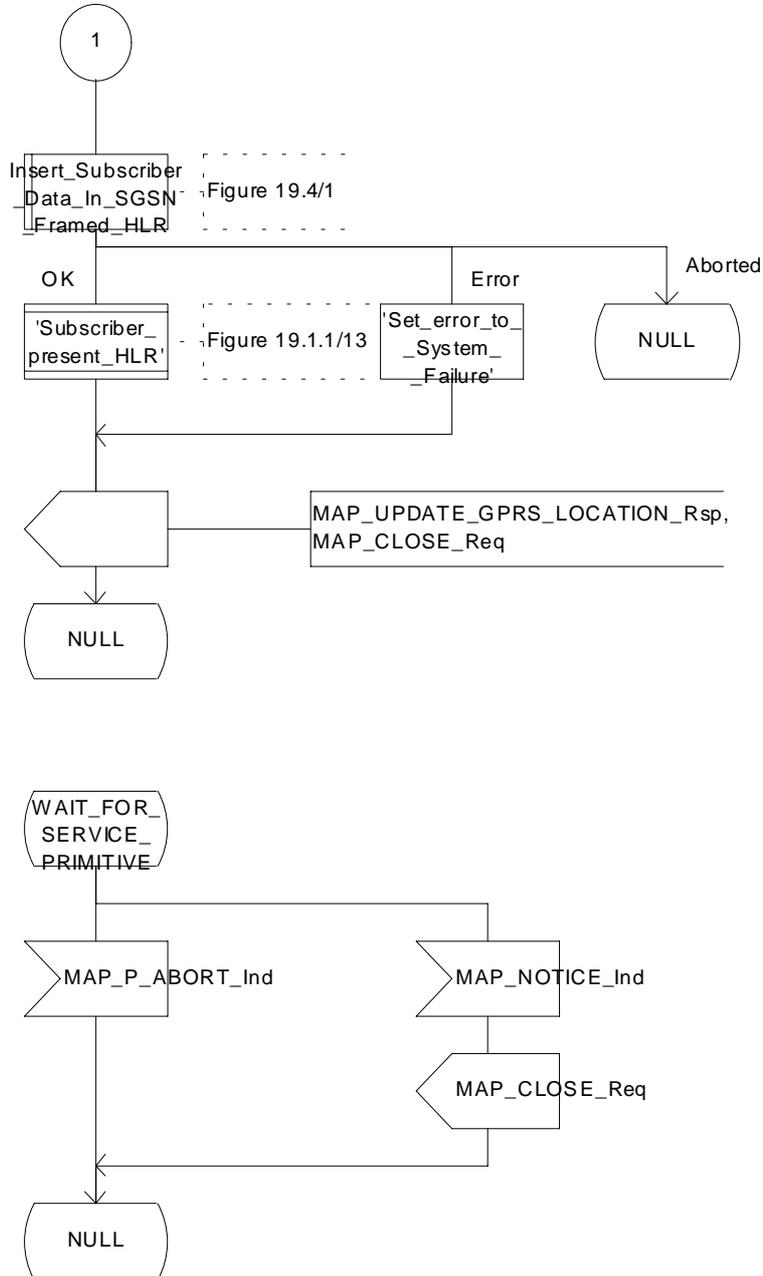
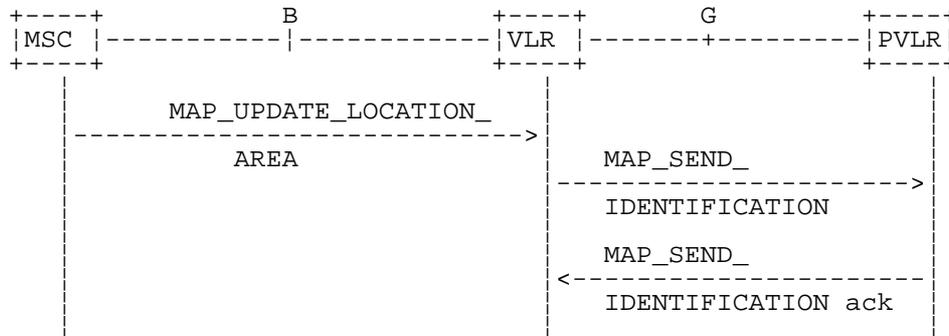


Figure 19.1.1/19 (sheet 2 of 2): Process Update_GPRS_Location_HLR

19.1.1.5 Send Identification

19.1.1.5.1 General

This service is invoked by a VLR when it receives a MAP_UPDATE_LOCATION_AREA indication containing a LAI indicating that the subscriber was registered in a different VLR (henceforth called the Previous VLR, PVLR). If the identity of the PVLR is derivable for the VLR (usually if both are within the same network), the IMSI and authentication sets are requested from the PVLR (see subclause 19.1.1.3), using the service described in subclause 8.1.4.



NOTE: The service shown in dotted lines indicates the trigger provided by other MAP signalling.

Figure 19.1.1/10: Interface and services for Send Identification

19.1.1.5.2 Detailed procedure in the VLR

The VLR procedure is part of the location area updating process described in subclause 19.1.1.3, see also figure 19.1.1/6 sheet 3.

19.1.1.5.3 Detailed procedure in the PVLR

On receipt of a dialogue request for the Send Identification procedure, (see Receive_Open_Ind macro in subclause 25.1), the PVLR will:

- terminate the procedure in case of parameter problems;
- revert to the MAP version Vr procedure in case the VLR indicated version Vr protocol; or
- continue as below, if the dialogue is accepted.

If the PVLR process receives a MAP_NOTICE indication, it terminates the dialogue by sending a MAP_CLOSE request.

If the PVLR process receives a MAP_SEND_IDENTIFICATION indication from the VLR (see figure 19.1.1/11), it checks whether the subscriber identity provided is known:

- if so, the IMSI and - if available - authentication parameters for the subscriber are returned in the MAP_SEND_IDENTIFICATION response;
- if not, the error Unidentified Subscriber is returned in the MAP_SEND_IDENTIFICATION response.

In all cases where the PVLR sends a MAP_SEND_IDENTIFICATION response to the VLR, the dialogue towards the VLR is terminated by a MAP_CLOSE request with parameter Release Method indicating Normal Release.

Process Send_Identification_PVLR

19.1.1_11(1)

Figure 19.1.1/11: Process in the Previous VLR to handle an identification request

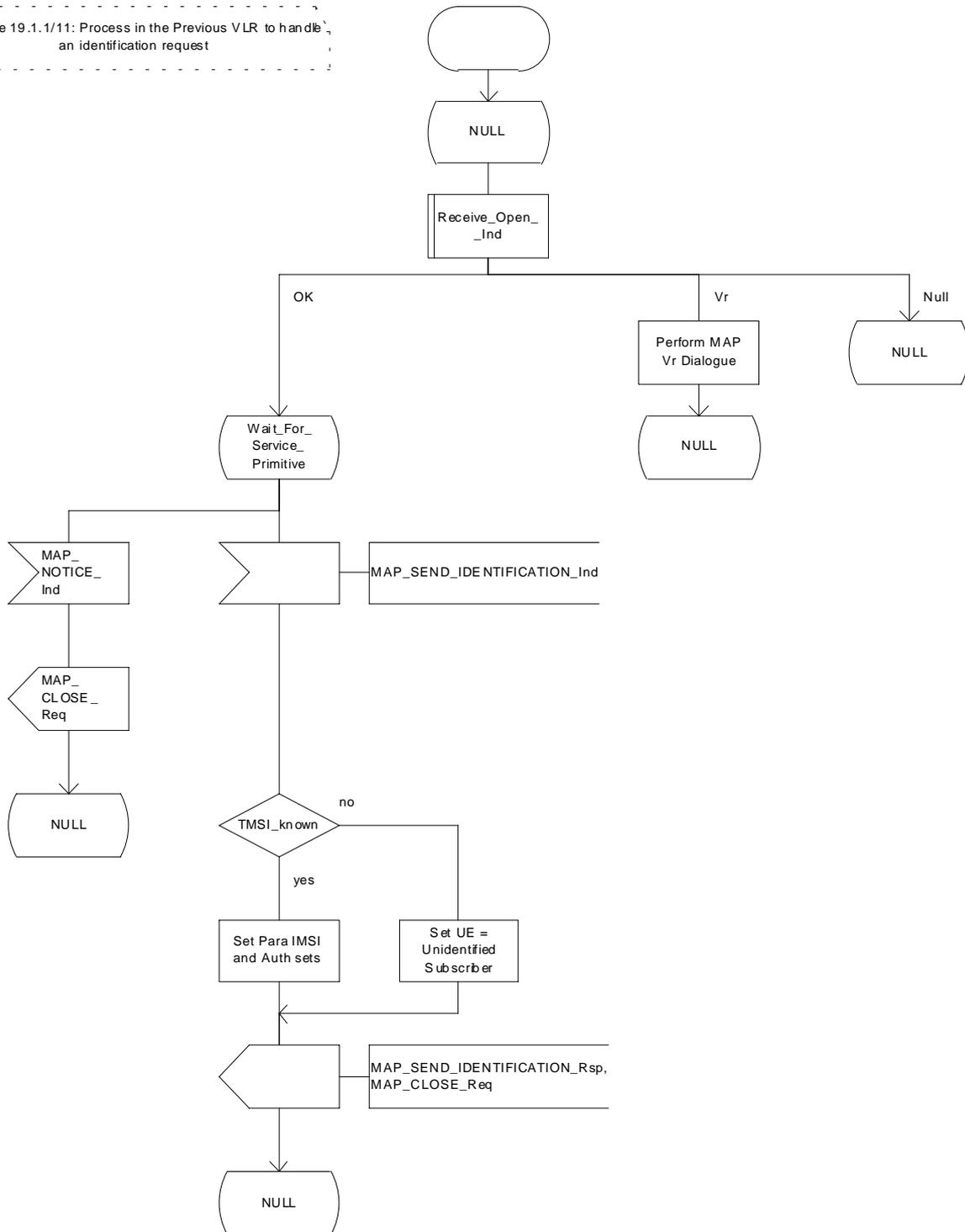


Figure 19.1.1/11: Process Send_Identification_PVLR

19.1.1.6 Process Update Location VLR

This process is started by some other MAP user process in the case the HLR need to be updated due to previous network failure. It is invoked when the subscriber accesses the network, e.g. for mobile originated call set-up, response to paging or supplementary services handling. Here, location updating consists only of invoking the macro VLR_Update_HLR described above (see subclause 19.1.1.3), which performs HLR updating and downloading of subscriber data.

If updating is successful (OK), the HLR Number is received in the MAP_UPDATE_LOCATION confirm primitive; the register will be updated and the SCP will be informed about the Mobility Management event. The process then terminates.

In the above case, the notification sent to the gsmSCF shall be '*Location Update to new VLR Service Area*'.

If one of the errors Roaming not Allowed or Unknown Subscriber is received instead, all subscriber data are deleted from the VLR before the process terminates.

In the case some other error occurs during HLR updating, the process simply terminates. Note, in all error cases the initiating restoration flags in VLR remain false, therefore a new HLR updating attempt will be started later on.

NOTE: This process will be performed independent from the calling process, no coordination is required.

NOTE: The procedure Notify_gsmSCF is specified in 3G TS 23.078.

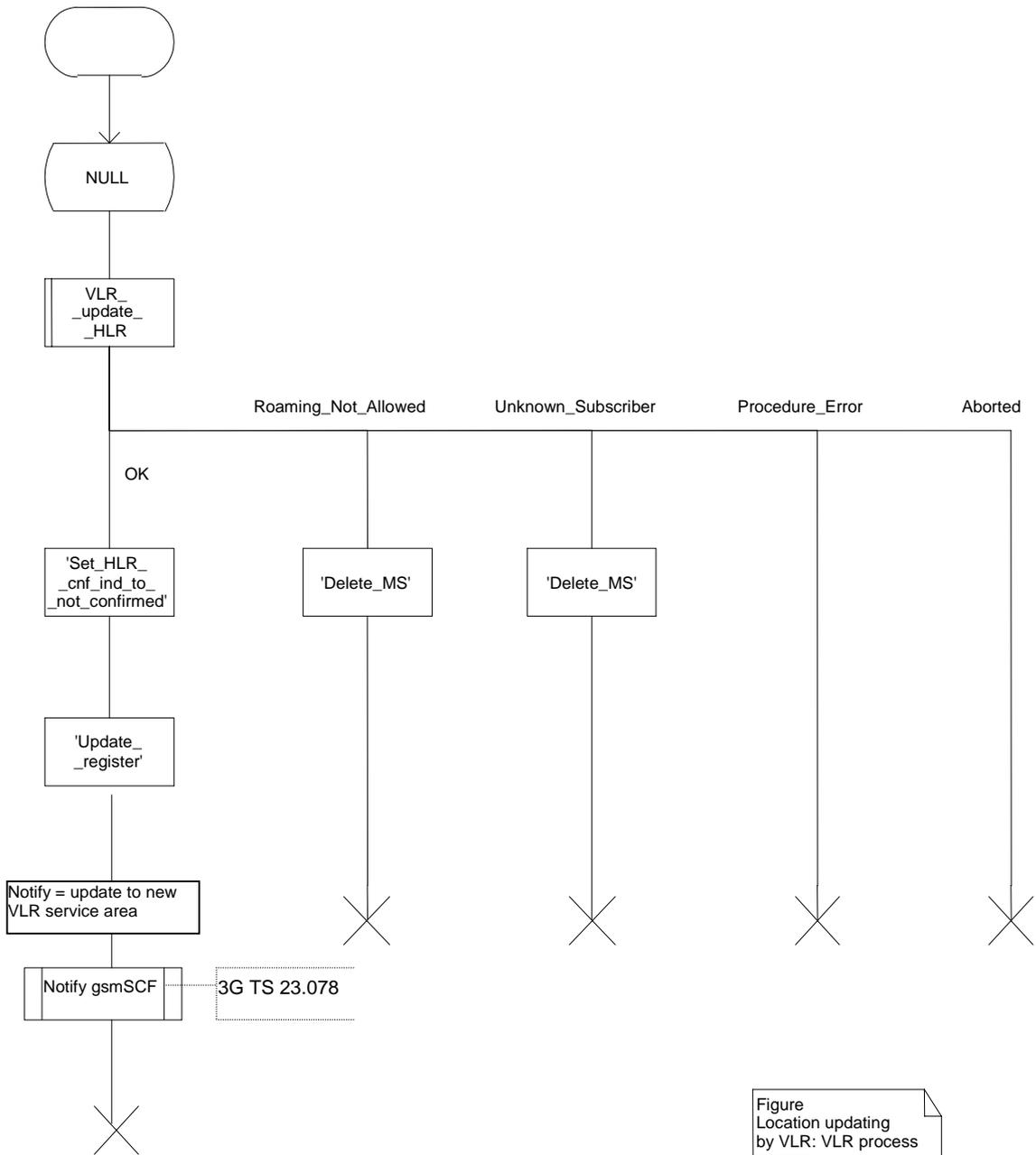


Figure Location updating by VLR: VLR process

Figure 19.1.1/12: Process UL_VLR

19.1.1.7 The Process Subscriber Present HLR

The process Subscriber Present HLR is started by the location updating process in HLR to perform actions required for short message alerting. The process checks the Message Waiting Data flag, and if this is set, the macro `Alert_Service_Centre_HLR` defined in subclause 25.10 is invoked. This macro will alert all service centres from which there are short messages waiting for this subscriber.

Figure 19.1.1/13: Process Subscriber_Present_HLR

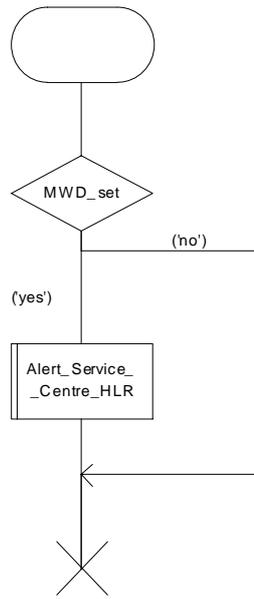


Figure 19.1.1/13: Process Subscriber_Present_HLR

19.1.1.8 Detailed procedure in the SGSN

Figure 19.1.1/20 shows the MAP process for updating of the SGSN. The following general macros are used:

Receive_Open_Cnf	subclause 25.1;
Insert_Subscriber_Data_SGSN	subclause 25.7;
Activate_Tracing_SGSN	subclause 25.9;

The location updating process

The MAP process receives an « Update HLR request » from the relevant process in the SGSN (see GSM 03.60) to perform HLR updating. If the SGSN does not know the subscribers HLR (e.g. no IMSI translation exists as there are not yet any SS7 links to the subscribers HPLMN), the « Update HLR negative response » with error Roaming Not Allowed (cause PLMN Roaming Not Allowed) is returned to the requesting process.

If the subscribers HLR can be reached, the SGSN opens a dialogue towards the HLR by sending a MAP_OPEN request without any user specific parameters, together with a MAP_UPDATE_GPRS_LOCATION request containing the parameters

- IMSI, identifying the subscriber;
- SGSN Address and SGSN number;

In case the HLR rejects dialogue opening (see subclause 25.1) or indicates version Vr protocol to be used, the SGSN will terminate the process indicating « Update HLR negative response » to the requesting process.

If the HLR accepts the dialogue, the HLR will respond with:

- a MAP_INSERT_SUBSCRIBER_DATA indication, handled by the macro Insert_Sub_Data_SGSN defined in subclause 25.7;

NOTE: The HLR may repeat this service several times depending on the amount of data to be transferred to the SGSN and to replace subscription data in case they are not supported by the SGSN.

- a MAP_ACTIVATE_TRACE_MODE indication, handled by the macro Activate_Tracing_SGSN defined in subclause 25.9;
- the MAP_UPDATE_GPRS_LOCATION confirmation:
 - if this confirmation contains the HLR Number, this indicates that the HLR has passed all information and that updating has been successfully completed. The « Update HLR response » message is returned to the requesting process for completion of the SGSN updating (see GSM 03.60).
 - if the confirmation contains an User error cause (Unknown Subscriber, Roaming Not Allowed or some other), the corresponding error is returned to the requesting process in the « Update HLR negative response ».
- a MAP_P_ABORT, MAP_U_ABORT, or MAP_CLOSE indication. In these cases, the corresponding error is returned to the requesting process in the « Update HLR negative response ».
- a MAP_NOTICE indication. Then, the dialogue towards the HLR is terminated, and the « HLR Update negative response » with the appropriate error is returned to the requesting process.

Process SGSN_Update_HLR

19.1.1_20.1(2)

Figure 19.1.1/20: HLR updating in SGSN

Signals from/to the left are from/to requesting process in SGSN
 Signals to/from the right are to/from the HLR

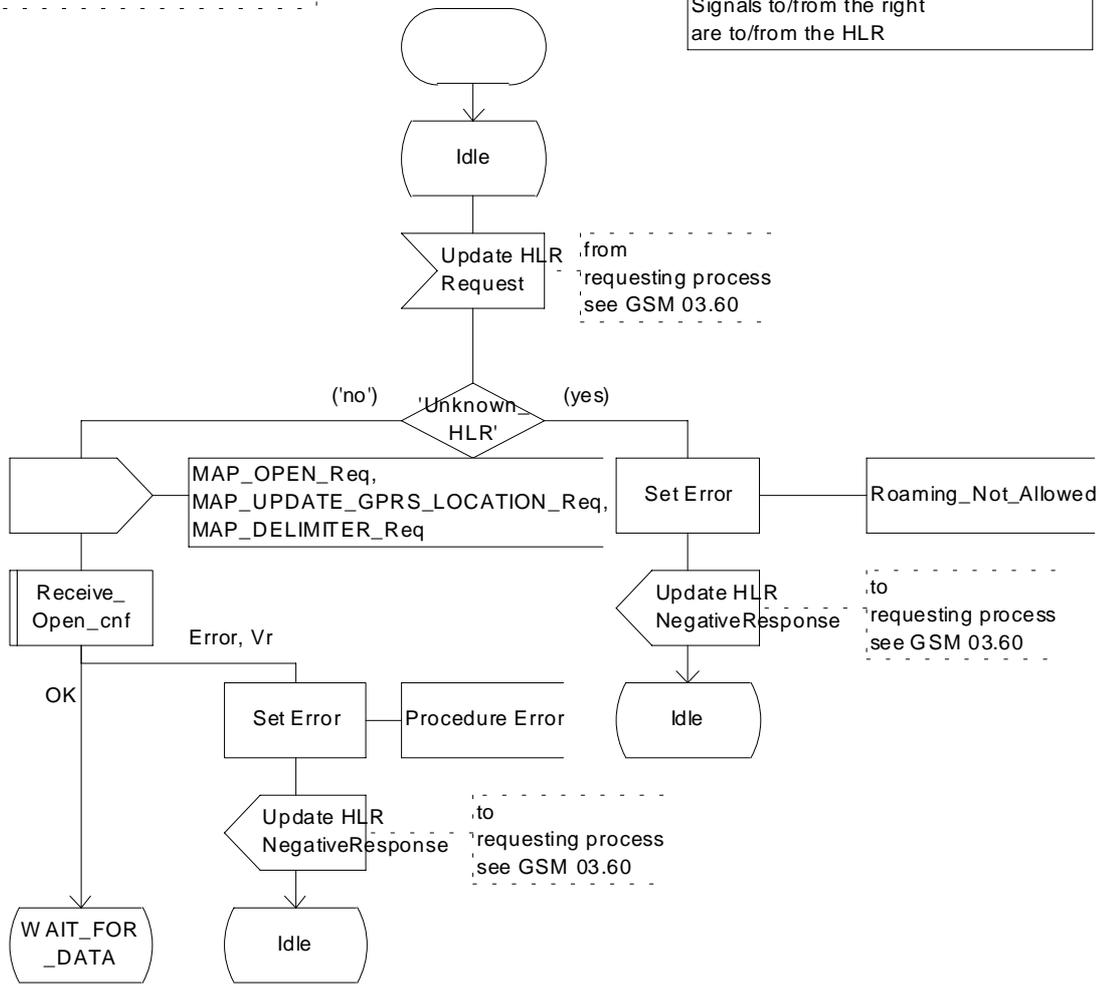


Figure 19.1.1/20 (sheet 1 of 2): Process SGSN_Update_HLR

Process SGSN_Update_HLR

19.1.1_20.2(2)

Figure 19.1.1/20: HLR updating in SGSN

Signal from/to the left are from/to requesting process in SGSN
 Signals to/from the right are to/from the HLR

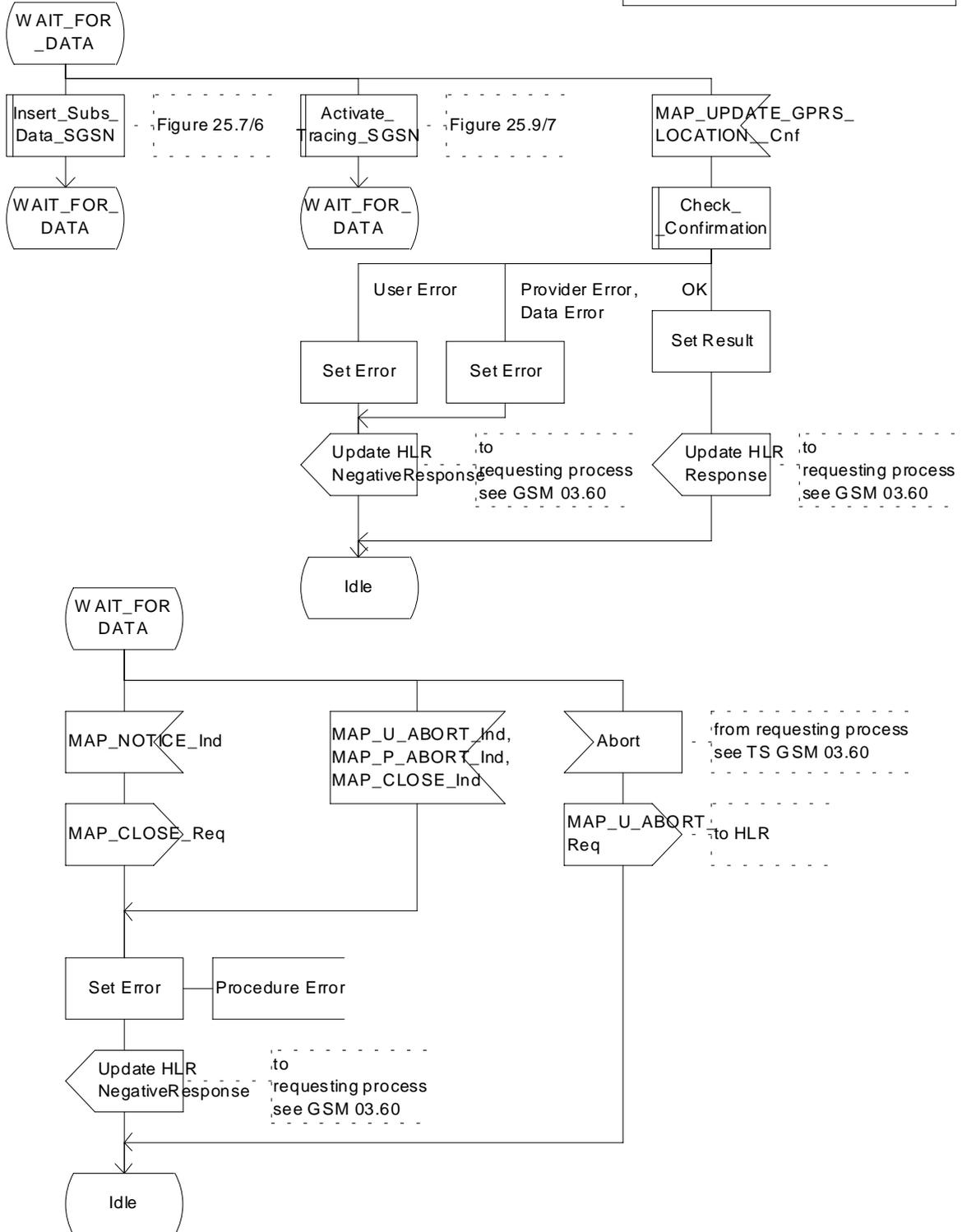


Figure 19.1.1/20 (sheet 2 of 2): Process SGSN_Update_HLR

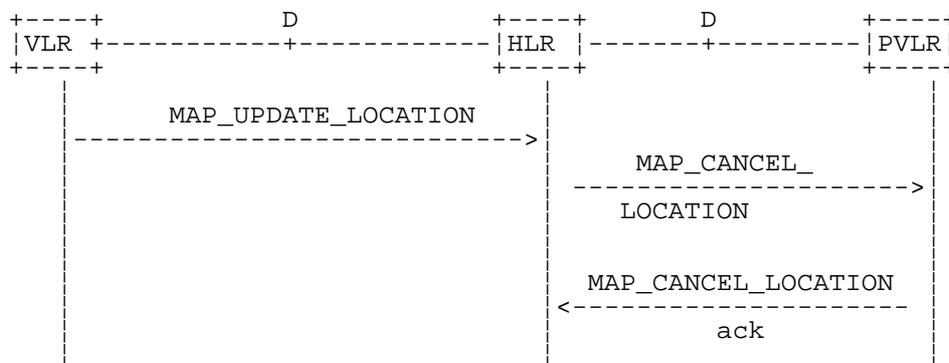
19.1.2 Location Cancellation

19.1.2.1 General

The purpose of this process is to delete a subscriber's record from a previous visitor location register after she has registered with a new visitor location register. Also this process is used to delete a subscriber's record from a old SGSN after she has registered with a SGSN. The procedure may also be used if the subscriber's record is to be deleted for other operator determined purposes, e.g. withdrawal of subscription, imposition of roaming restrictions or modifications to the subscription which result in roaming restrictions. Location cancellation can be used to enforce location updating including updating of subscriber data in the VLR or in the SGSN at the next subscriber access.

In all cases, the process is performed independently of the invoking process (e.g. Location Updating).

The service as described in subclause 8.1.3 is invoked when an HLR receives a MAP_UPDATE_LOCATION indication from a VLR other than that stored in its table for this subscriber. Also the MAP_CANCEL_LOCATION service is invoked when the HLR receives a MAP_UPDATE_GPRS_LOCATION indication from a SGSN other than stored in its table for this subscriber. Additionally the service may be invoked by operator intervention. The MAP_CANCEL_LOCATION service is in any case invoked towards the VLR or the SGSN whose identity is contained in the HLR table.



NOTE: The service shown in dotted lines indicates the trigger provided by other MAP signalling.

Figure 19.1.2/1: Interface and services for Location Cancellation

NOTE: The service shown in dotted lines indicates the trigger provided by other MAP signalling.

Figure 19.1.2/6: Interface and services for Location Cancellation in GPRS

19.1.2.2 Detailed procedure in the HLR

The location cancellation process is started by an external process as stated above. The HLR opens a dialogue with the VLR or with the SGSN whose identity is contained in the HLR table (MAP_OPEN request without any user specific parameters), sending the MAP_CANCEL_LOCATION request primitive (see figures 16.1.2/2 and 16.1.2/4), containing the parameters:

- IMSI, to identify the subscriber to be deleted from that VLR or SGSN;
- LMSI, which is included if available in the HLR. LMSI is not applicable between HLR and SGSN;
- Cancellation Type if the Cancel Location is sent to SGSN. Cancellation Type is not applicable between HLR and VLR. If the VLR receives this parameter and do not understand it this parameter shall be ignored.

The HLR then waits for the MAP_OPEN confirmation (see macro Receive_Open_Cnf, subclause 21.1), indicating either:

- reject of the dialogue (process terminates);
- reversion to version Vr when the operation is sent to SGSN (process terminates);
- reversion to version Vr when the operation is sent to VLR (process will be performed according to MAP version Vr); or
- dialogue acceptance.

When the VLR or the SGSN accepts the dialogue, it will return a MAP_CANCEL_LOCATION confirmation, containing:

- no parameter, indicating successful outcome of the procedure;
- a user error, provider error or a data error indicating unsuccessful outcome of the procedure.

In case of unsuccessful outcome or if a MAP_P_ABORT indication has been received, the HLR may repeat the MAP_CANCEL_LOCATION request later, where the number of repeat attempts and time in between are HLR operator options, depending on the error returned by the VLR or the SGSN.

19.1.2.3 Detailed procedure in the VLR

Opening of the dialogue is described in the macro Receive_Open_Ind in subclause 25.1, with outcomes:

- reversion to version Vr procedure;
- procedure termination; or
- dialogue acceptance, with processing as below.

If the VLR process receives a MAP_NOTICE indication, it terminates the dialogue by sending a MAP_CLOSE request.

If the VLR process receives a MAP_CANCEL_LOCATION indication from the HLR (see figure 19.1.2/3), the parameters are checked first (macro Check_Indication, see subclause 25.2). In case of parameter problems the appropriate error is sent in the MAP_CANCEL_LOCATION response.

If the MAP_CANCEL_LOCATION indication contains both the IMSI and the LMSI, the VLR checks whether the stored IMSI matches the received IMSI. If it does not, the VLR attempts to process the request using the IMSI received from the HLR to define the subscriber record to be deleted.

Thereafter the VLR checks whether the subscriber identity provided is known in the VLR:

- if so, the data of the subscriber are deleted from VLR table and a MAP_CANCEL_LOCATION response is returned without any parameters;
- if not, location cancellation is regarded as being successful, too, and the MAP_CANCEL_LOCATION response is returned without any parameters.

In either case, after sending the MAP_CANCEL_LOCATION response the VLR process releases any TMSI which may be associated with the IMSI of the subscriber, terminates the dialogue (MAP_CLOSE with Release Method Normal Release) and returns to the idle state.

Figure 19.1.2/2: Location Cancellation in the HLR

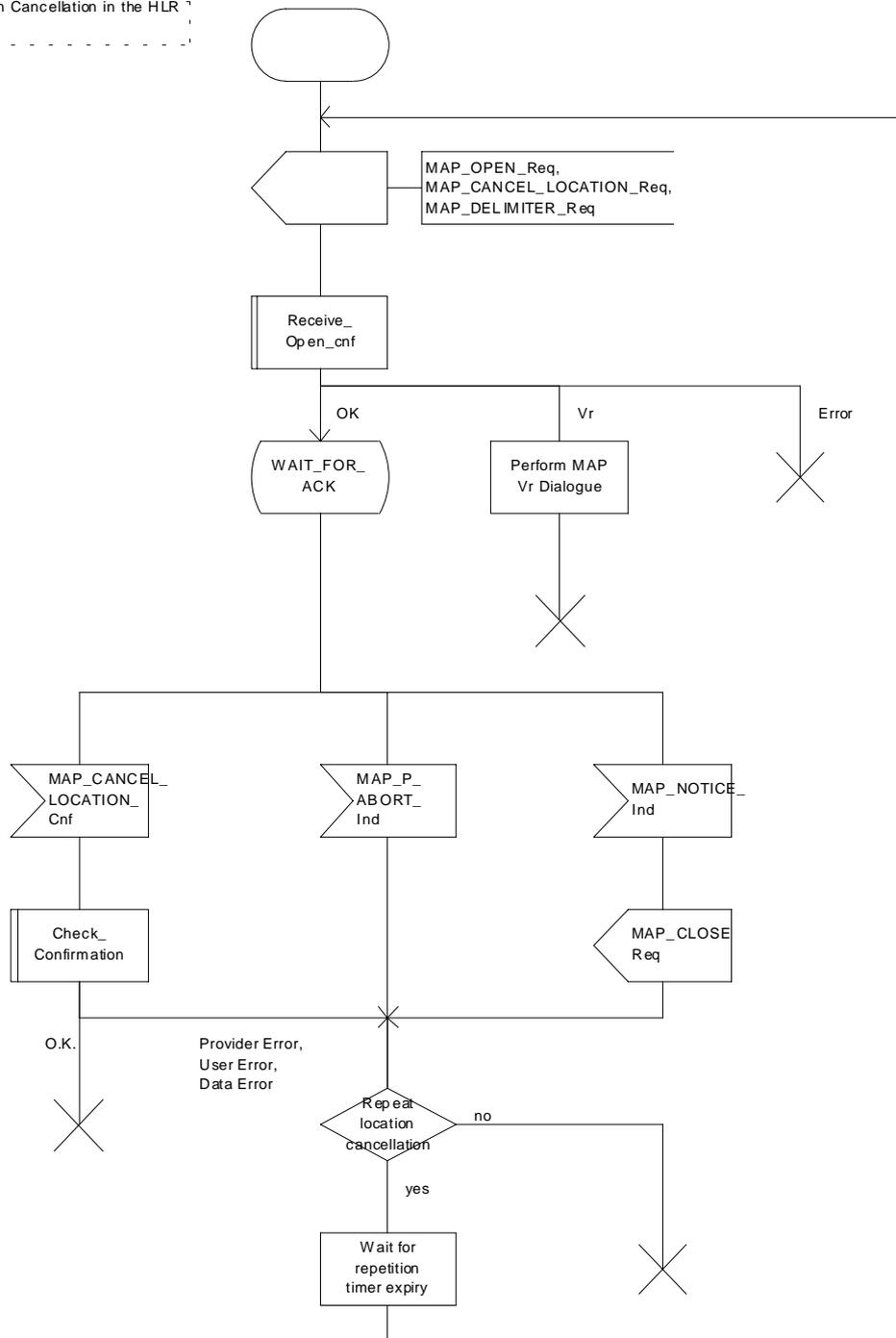


Figure 19.1.2/2: Process Cancel_Location_HLR

Process Cancel_Location_VLR

19.1.2_3(1)

Figure 19.1.2/3: Location Cancellation in the VLR

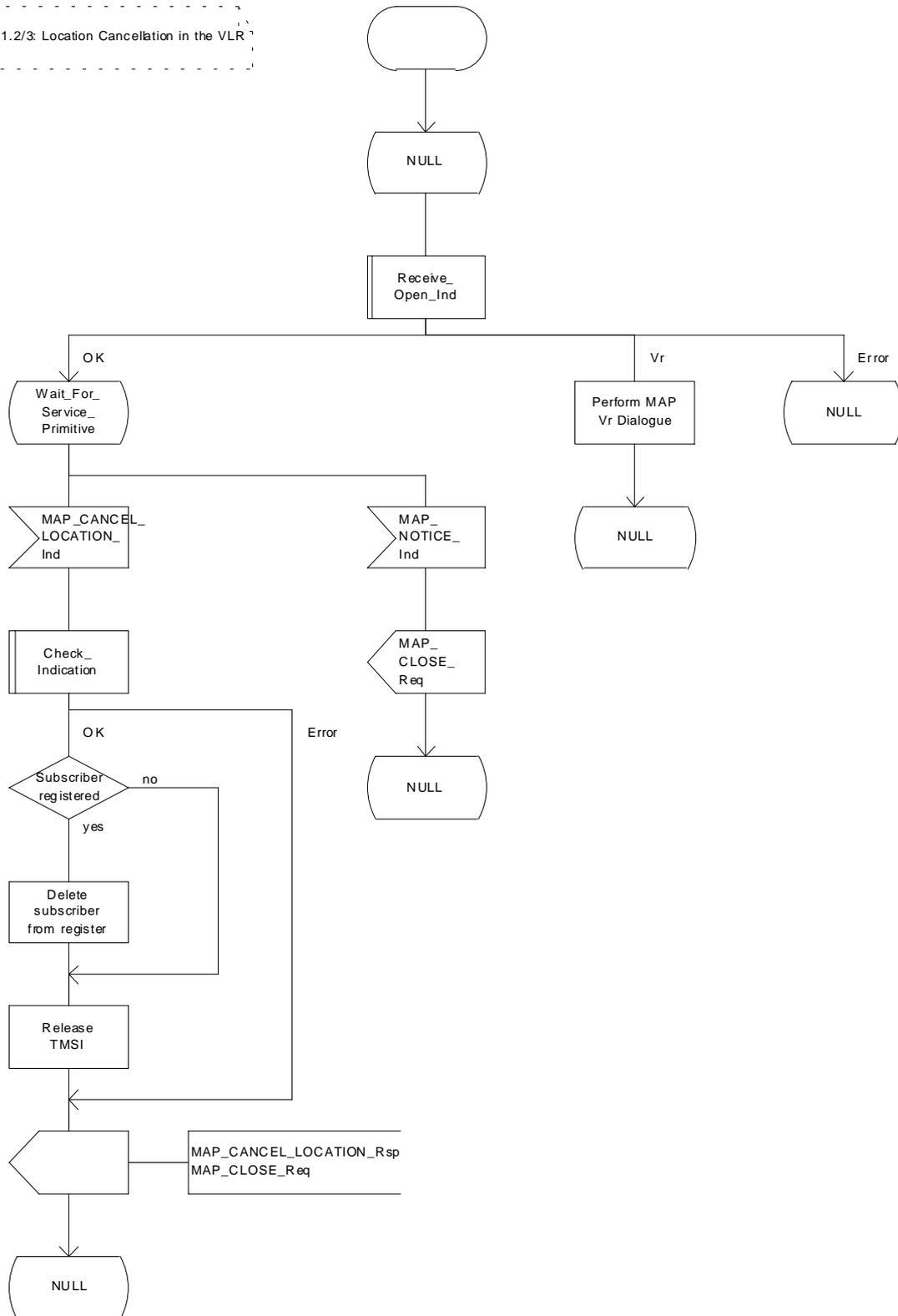


Figure 19.1.2/3: Process Cancel_Location_VLR

19.1.2.4 Detailed procedure in the SGSN

Opening of the dialogue is described in the macro `Receive_Open_Ind` in subclause 25.1, with outcomes:

- procedure termination; or
- dialogue acceptance, with processing as below.

If the SGSN process receives a `MAP_NOTICE` indication, it terminates the dialogue by sending a `MAP_CLOSE` request.

If the SGSN process receives a `MAP_CANCEL_LOCATION` indication from the HLR (see figure 19.1.2/4), the parameters are checked first (macro `Check_Indication`, see subclause 25.2). In case of parameter problems the appropriate error is sent in the `MAP_CANCEL_LOCATION` response.

Thereafter the SGSN checks whether the subscriber identity provided is known in the SGSN:

- if so, the data of the subscriber are deleted from SGSN table and a `MAP_CANCEL_LOCATION` response is returned without any parameters;
- if not, location cancellation is regarded as being successful, too, and the `MAP_CANCEL_LOCATION` response is returned without any parameters.

In either case, after sending the `MAP_CANCEL_LOCATION` response the SGSN process releases any P-TMSI which may be associated with the IMSI of the subscriber, terminates the dialogue (`MAP_CLOSE` with Release Method Normal Release) and returns to the idle state.

Figure 19.1.2/4: Location Cancellation in the HLR for GPRS

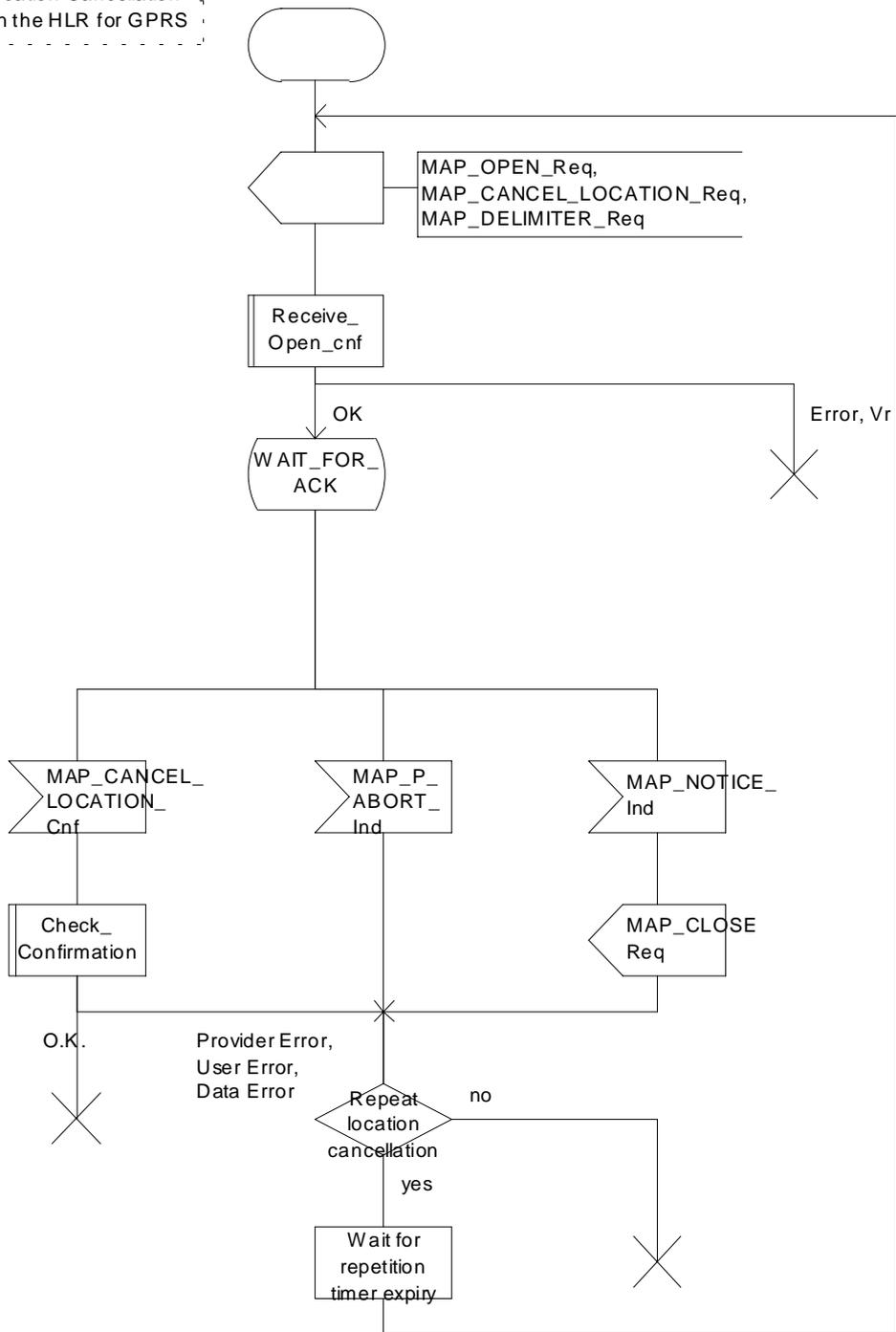


Figure 19.1.2/4: Process Cancel_GPRS_Location_HLR

Process Cancel_Location_SGSN

19.1.2_5(1)

Figure 19.1.2/5: Location Cancellation in the SGSN

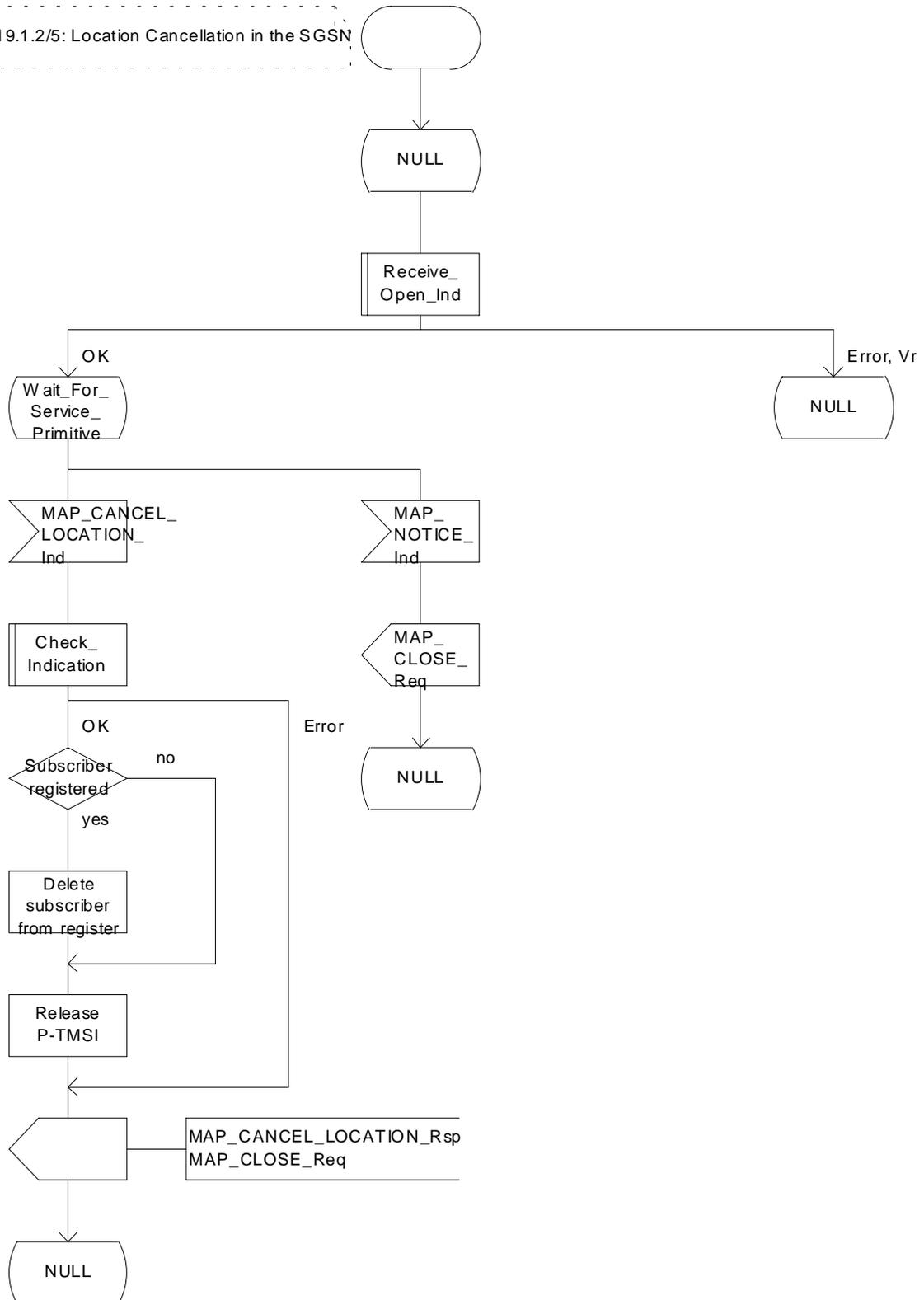


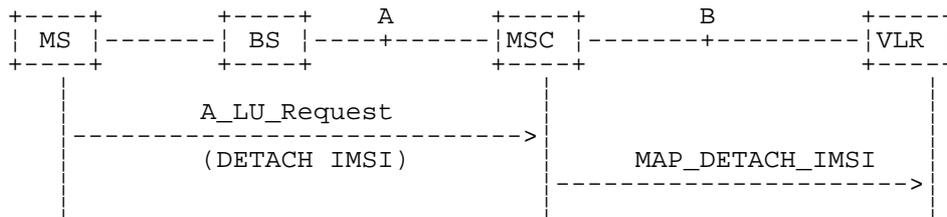
Figure 19.1.2/5: Process Cancel_Location_SGSN

19.1.3 Detach IMSI

19.1.3.1 General

On receipt of an A_LU_REQUEST (DETACH IMSI) indication from the radio interface this procedure invokes the MAP_DETACH_IMSI service described in subclause 8.1.5 in order to inform the visitor location register that a subscriber is no longer reachable (see figure 19.1.3/1), e.g. due to switched off station. This information is used by the VLR to reject mobile terminating calls or short messages without sending page messages on the radio path. The service is unconfirmed as it is likely that the MS is switched off before receiving a confirmation.

The detach IMSI feature is optional for the network operator. The MS is informed by the network whether detach IMSI is to be used or not.



NOTE: The service shown in dotted lines indicates the trigger provided by the radio interface (see GSM 09.10).

Figure 19.1.3/1: Interface and services for MAP_DETACH_IMSI

If the Gs interface is installed, the procedures to handle an IMSI Detach or a GPRS Detach request from the SGSN via the Gs interface do not require any signalling over the MAP interface. These procedures are specified in GSM 03.60 and 09.18.

19.1.3.2 Detailed procedure in the MSC

The MAP_DETACH_IMSI service is invoked by the MSC when receiving an A_LU_Request (DETACH IMSI) for a subscriber (see figure 19.1.3/2).

The MSC will open the dialogue to the VLR with a MAP_OPEN request containing no user specific parameters. The MAP_DETACH_IMSI request will contain the following parameter received from the radio side (for the mapping see GSM 09.10):

- Subscriber Id, being either a TMSI or an IMSI.

The MSC then waits for the MAP_OPEN confirmation (see macro Receive_Open_Cnf, subclause 25.1), indicating either:

- reject of dialogue (process terminates);
- reversion to version Vr(process terminates); or
- dialogue acceptance.

Thereafter, the dialogue is terminated locally by the MSC (MAP_CLOSE request with Release Method Prearranged End).

19.1.3.3 Detailed procedure in the VLR

When the VLR receives a MAP_DETACH_IMSI indication (see figure 19.1.3/3), it first checks the indication data (macro Check_Indication, see subclause 25.2). Thereafter it is checked whether the subscriber is known:

- if the subscriber is unknown the VLR ignores the indication;
- if the subscriber is known in the VLR, the IMSI detached flag is set.

The VLR process will terminate the dialogue locally (MAP_CLOSE request with Release Method Prearranged End).

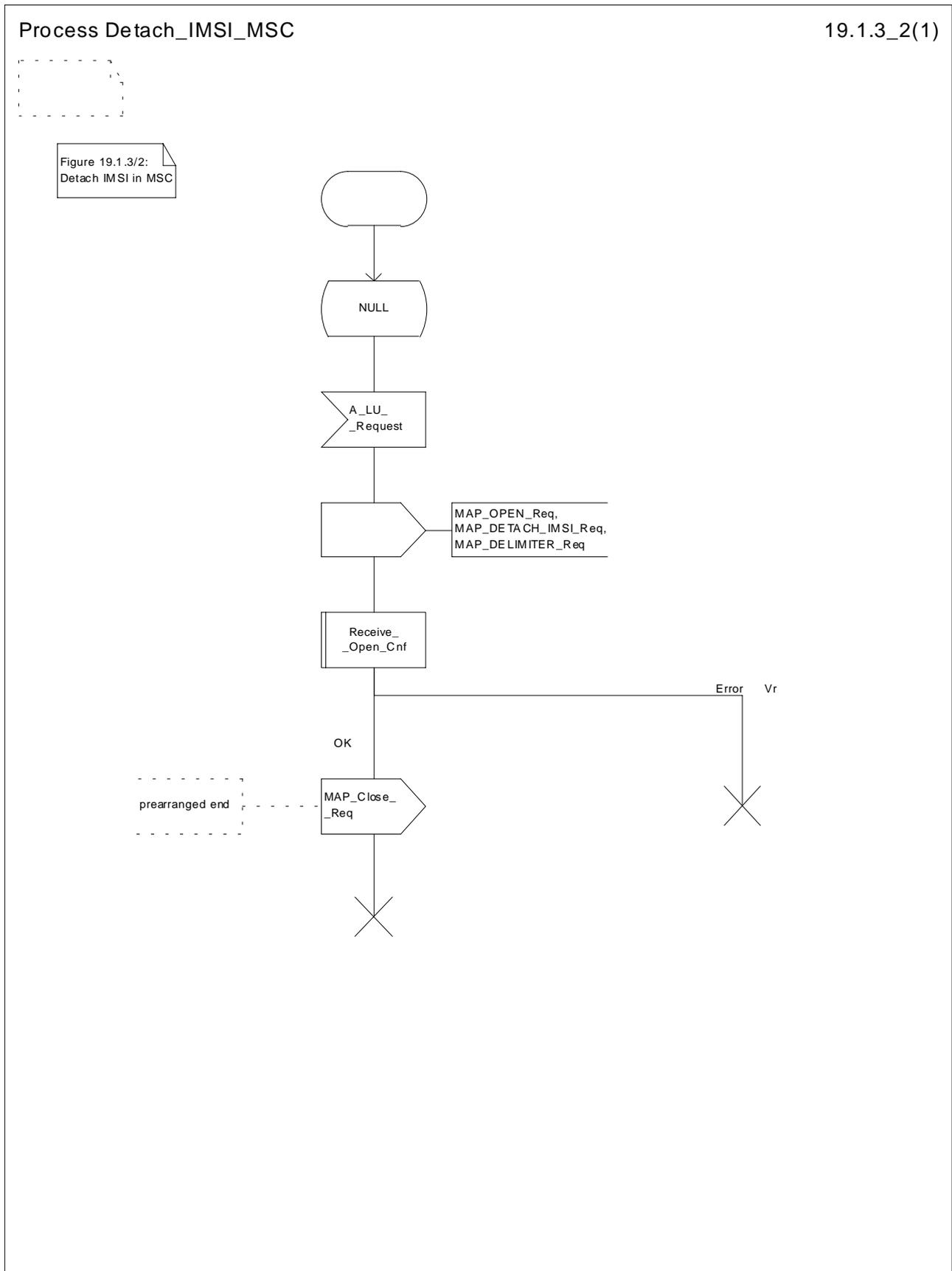


Figure 19.1.3/2: Process Detach_IMSI_MSC

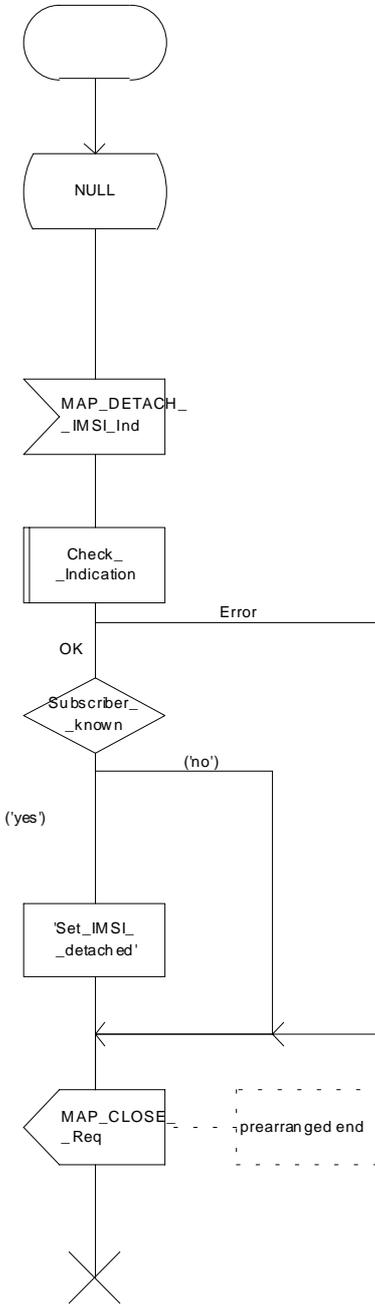


Figure 19.1.3/3: Detach IMSI in VLR

Figure 19.1.3/3: Process Detach_IMSI_VLR

19.1.4 Purge MS

19.1.4.1 General

When the VLR or the SGSN receives an indication on the O&M interface that the MS record is to be purged (either because of administrative action or because the MS has been inactive for an extended period), this procedure invokes the MAP_PURGE_MS service described in subclause 8.1.6 to request the HLR to set the "MS purged for non-GPRS" or the "MS purged for GPRS" flag for the MS so that any request for routing information for a mobile terminated call or a mobile terminated short message will be treated as if the MS is not reachable. The message flows are shown in figures 19.1.4/1 and 19.1.4/5.

It is optional for the network operator to delete MS records from the VLR or from the SGSN, but if the option is used the VLR or the SGSN shall notify the HLR when a record has been deleted.

The O&M process in the VLR or in the SGSN must ensure that during the MS purging procedure any other attempt to access the MS record is blocked, to maintain consistency of data.

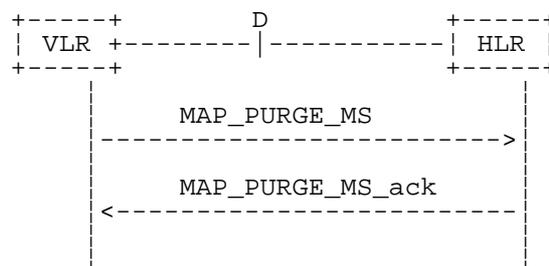


Figure 19.1.4/1: MAP-D Interface and services for MAP_PURGE_MS

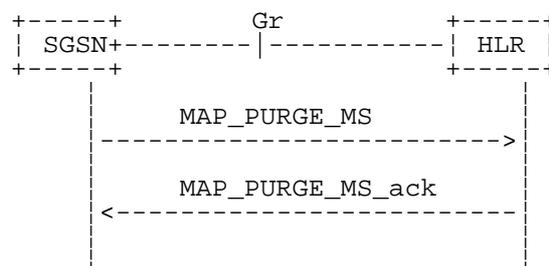


Figure 19.1.4/5: Gr Interface and services for MAP_PURGE_MS

19.1.4.2 Detailed procedure in the VLR

When the VLR receives an indication from O&M that an MS record is to be purged, it invokes the MAP_PURGE_MS service (see figure 19.1.4/2).

The VLR opens the dialogue to the HLR with a MAP_OPEN request containing no user specific parameters. The MAP_PURGE_MS request contains the IMSI of the MS which is to be purged and the VLR number.

The VLR then waits for the MAP_OPEN confirmation (see macro Receive_Open_Cnf, subclause 25.1), indicating one of:

- rejection of the dialogue (process terminates);
- reversion to version one (process terminates);
- dialogue acceptance.

If the HLR accepts the dialogue it returns a MAP_PURGE_MS confirmation, containing no parameter, indicating successful outcome of the procedure.

If a MAP_PURGE_MS confirmation containing a provider error, data error or user error, or a MAP_P_ABORT, MAP_NOTICE or premature MAP_CLOSE indication, has been received, the failure is reported to the O&M interface. Successful outcome of the procedure leads to deletion of the subscriber data and freezing of the TMSI if so requested by the HLR, and is reported to the O&M interface.

19.1.4.3 Detailed procedure in the HLR

Opening of the dialogue is described in the macro Receive_Open_Ind in subclause 25.1. The possible outcomes are:

- termination of the procedure if the AC indicates a version 1 dialogue, as this procedure is not defined for version 1;
- termination of the procedure if there is an error;
- dialogue acceptance, in which case the procedure is as described below.

If the HLR receives a MAP_NOTICE indication, it terminates the dialogue by sending a MAP_CLOSE request.

If the HLR receives a MAP_PURGE_MS indication (see figure 19.1.4/3), it first checks the indication data (macro Check_Indication, see subclause 25.2). If there is a parameter error the HLR terminates the dialogue by sending an appropriate error in the MAP_PURGE_MS response in a MAP_CLOSE request. If there is no parameter error the HLR then checks whether the subscriber is known.

- if the subscriber is unknown, the HLR reports an error to the O&M interface, the error Unknown Subscriber is returned in the MAP_PURGE_MS response and the dialogue is terminated by sending a MAP_CLOSE request ;
- if the subscriber is known, the HLR checks whether the purging notification came from the VLR or SGSN where the MS was last registered:
 - if the received VLR number and the stored VLR number match, the HLR sets the "MS purged for non-GPRS" flag for the subscriber and sends a MAP_PURGE_MS response containing a freeze TMSI indicator to indicate successful outcome;
 - if the received VLR number and the stored VLR number do not match, the HLR sends a MAP_PURGE_MS response containing an empty result to indicate successful outcome. Since the MS is known by the HLR to be in a different VLR area, it is not appropriate to block mobile terminated calls or short messages to the MS, but the VLR which initiated the purging procedure can safely purge its record for the MS without freezing the TMSI.
 - if the received SGSN number and the stored SGSN number match, the HLR sets the "MS purged for GPRS" flag for the subscriber and sends a MAP_PURGE_MS response containing a freeze P-TMSI indicator to indicate successful outcome;
 - if the received SGSN number and the stored SGSN number do not match, the HLR sends a MAP_PURGE_MS response containing an empty result to indicate successful outcome. Since the MS is known by the HLR to be in a different SGSN area, it is not appropriate to block short messages to the MS, but the SGSN which initiated the purging procedure can safely purge its record for the MS without freezing the P-TMSI.

In either cases of successful termination the HLR terminates the dialogue by sending a MAP_CLOSE request.

19.1.4.4 Detailed procedure in the SGSN

When the SGSN receives an indication from O&M that an MS record is to be purged, it invokes the MAP_PURGE_MS service (see figure 19.1.4/4).

The SGSN opens the dialogue to the HLR with a MAP_OPEN request containing no user specific parameters. The MAP_PURGE_MS request contains the IMSI of the MS which is to be purged and the SGSN number.

The SGSN then waits for the MAP_OPEN confirmation (see macro Receive_Open_Cnf, subclause 25.1), indicating one of:

- rejection of the dialogue (process terminates);
- reversion to Vr (process terminates);
- dialogue acceptance.

If the HLR accepts the dialogue it returns a MAP_PURGE_MS confirmation, containing no parameter, indicating successful outcome of the procedure.

If a MAP_PURGE_MS confirmation containing a provider error, data error or user error, or a MAP_P_ABORT, MAP_NOTICE or premature MAP_CLOSE indication, has been received, the failure is reported to the O&M interface. Successful outcome of the procedure leads to deletion of the subscriber data and freezing of the P-TMSI if so requested by the HLR, and is reported to the O&M interface.

Process Purge_MS_VLR

19.1.4_2(1)

Figure 19.1.4/2: Process in the VLR to notify the HLR that an MS record has been purged

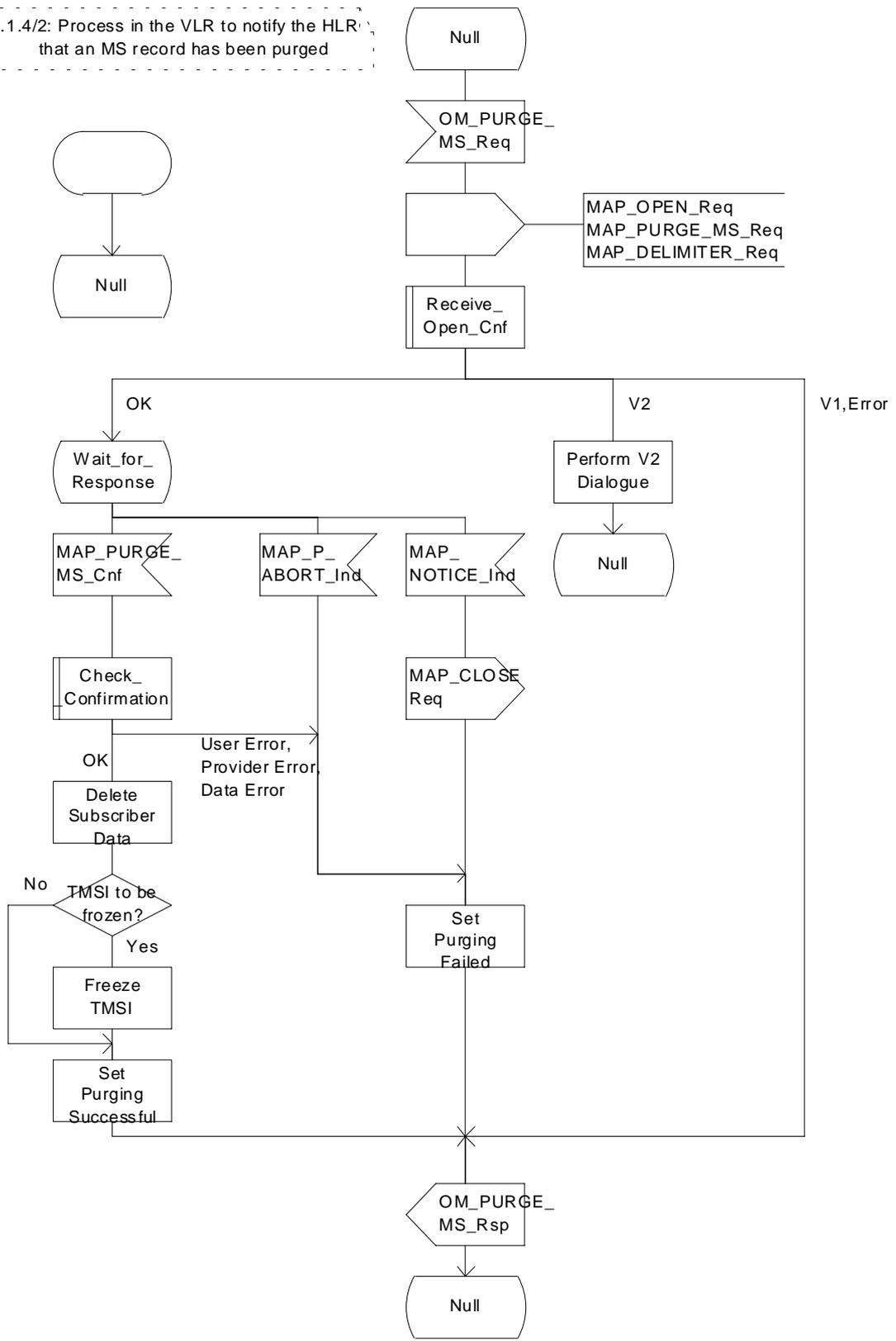


Figure 19.1.4/2: Process Purge_MS_VLR

Process Purge_MS_HLR

19.1.4_3(1)

Figure 19.1.4/3: Process in the HLR to handle a notification that an MS record has been purged

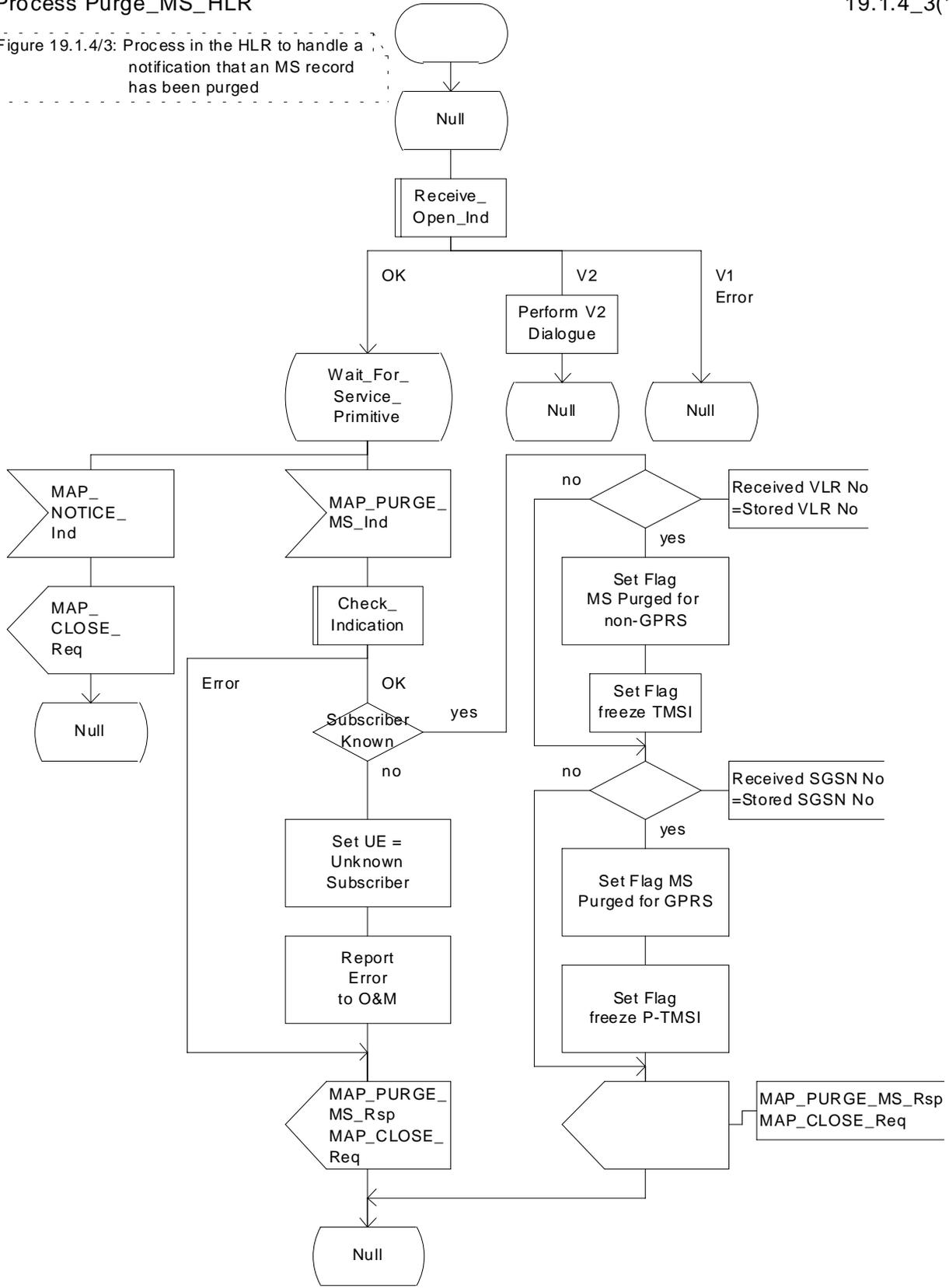


Figure 19.1.4/3: Process Purge_MS_HLR

Process Purge_MS_SGSN

19.1.4_4(1)

Figure 19.1.4/4: Process in the SGSN to notify the HLR that an MS record has been purged

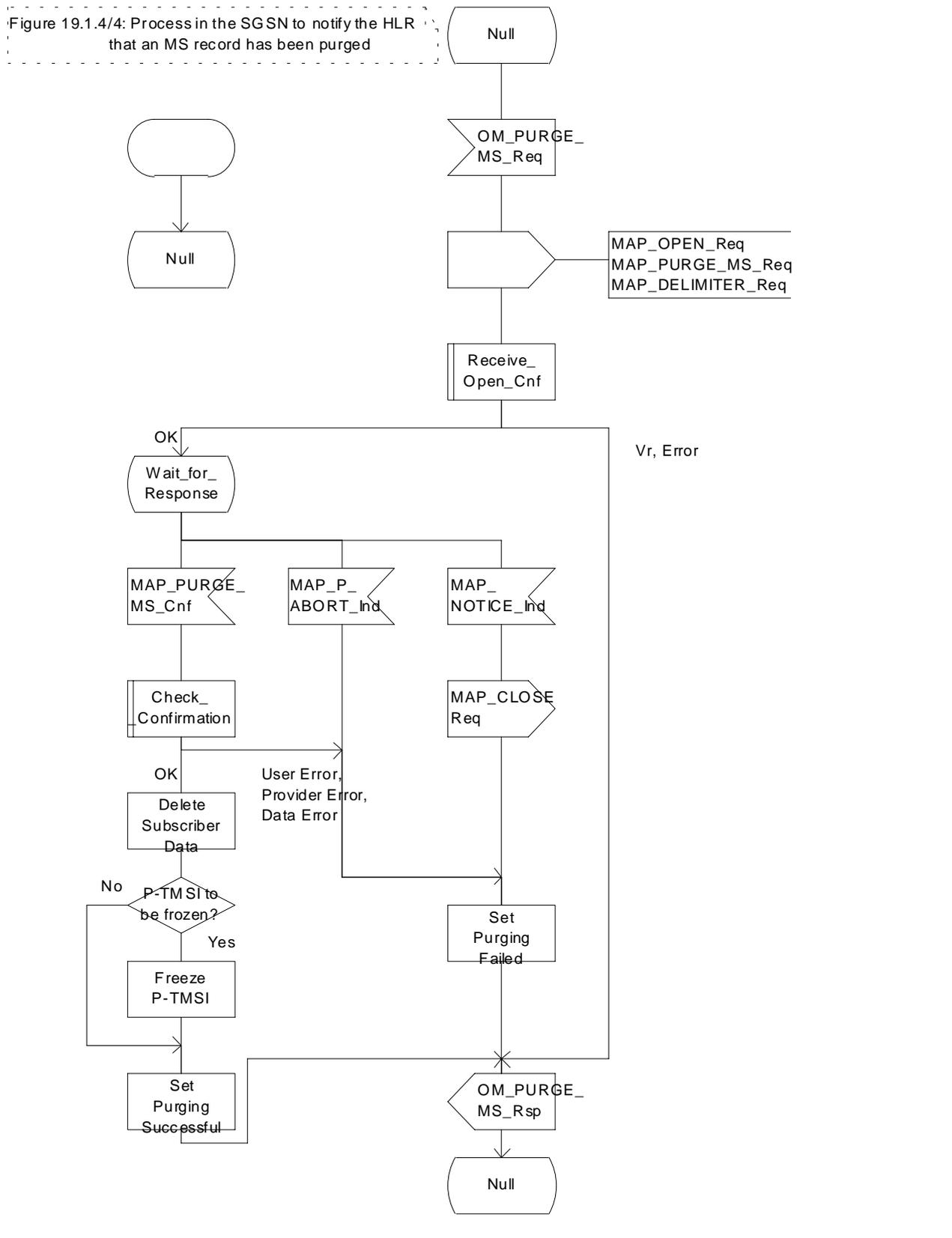


Figure 19.1.4/4: Process Purge_MS_SGSN

19.2 Handover procedure

19.2.1 General

The handover between different MSCs is called Inter-MSC handover. The interfaces involved for Inter-MSC handover are shown in figure 19.2/1. Following two Inter-MSC handover procedures apply:

1) Basic Inter-MSC handover:

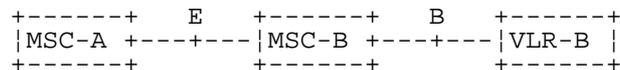
The call is handed over from the controlling MSC, called MSC-A to another MSC, called MSC-B (figure 19.2/1a).

Figure 19.2/2 shows a successful handover between MSC-A and MSC-B including a request for handover number allocation by MSC-B to VLR-B.

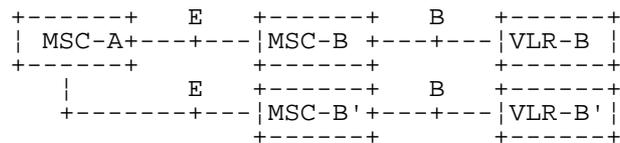
2) Subsequent Inter-MSC handover:

After the call has been handed over from MSC-A to MSC-B, a handover to either MSC-A (figure 19.2/1a) or to a third MSC (MSC-B') (figure 19.2/1b) is necessary in order to continue the connection.

Figure 19.2/3 shows a successful subsequent handover.



a) Basic handover procedure MSC-A to MSC-B and subsequent handover procedure MSC-B to MSC-A.



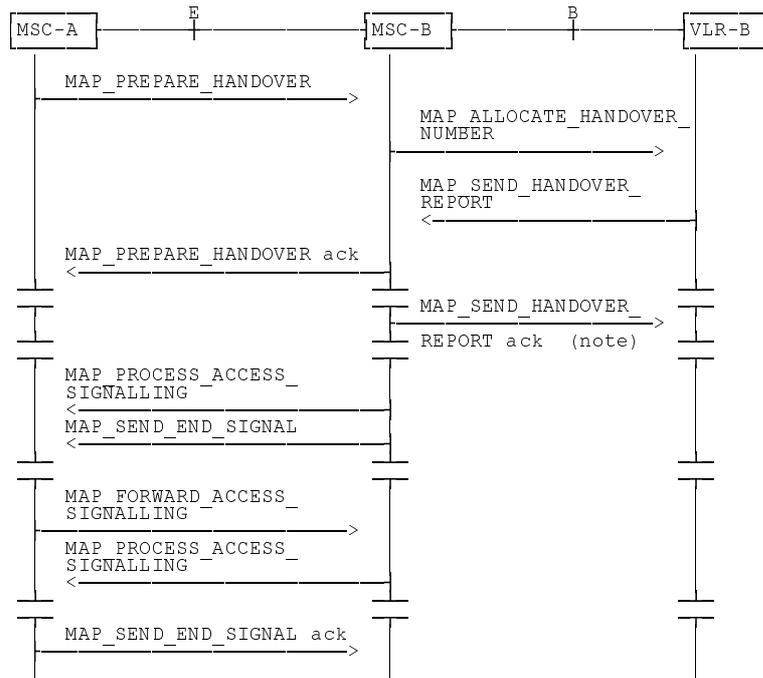
b) Subsequent handover procedure MSC-B to MSC-B'.

Figure 19.2/1: Interface structure for handover

The MAP handover procedures achieve the functionality required to set up an MSC-MSC dialogue, to optionally allocate a handover number and to transport BSSAP messages.

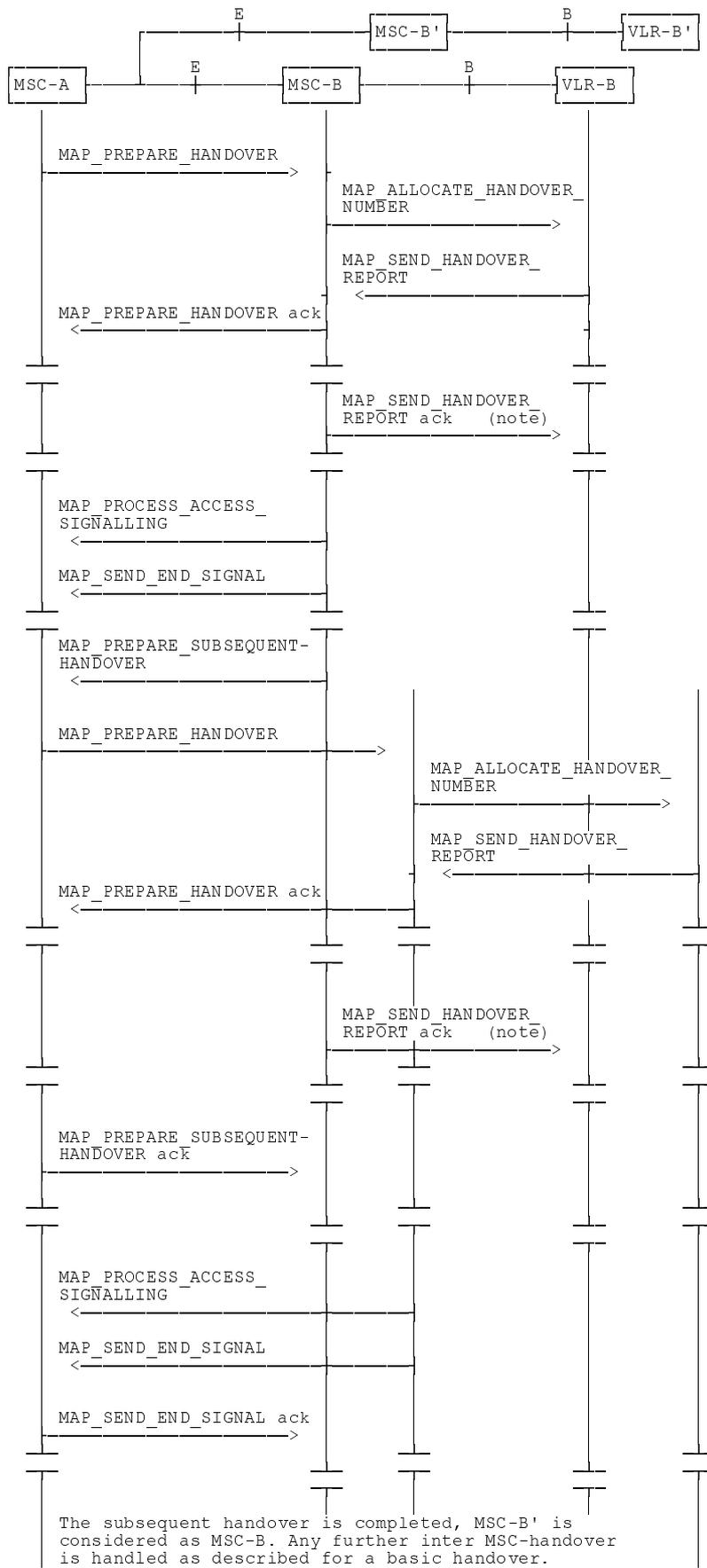
The transported BSSAP messages are controlled and handled by the Handover Control Application in the MSCs. This information will be transparent to the MAP protocol. If the MSC receives via the MAP protocol BSSAP messages, this information will be forwarded to the Handover Control Application (shown in the handover SDL diagrams with the internal HO_CA signalling, it is an internal process in the MSC) and vice versa if the Handover Control Application requires the sending of BSSAP messages via the MAP protocol.

For detailed interworking between the A-interface and MAP procedures, see GSM 03.09 and GSM 09.10.



NOTE: This can be sent at any time after the connection between MSC-A and MSC-B is established.

Figure 19.2/2: Example of a successful basic handover procedure to MSC-B



NOTE: This can be sent at any time after the connection between MSC-A and MSC-B is established.

Figure 19.2/3: Example of a handover towards a third MSC

19.2.2 Handover procedure in MSC-A

This subclause describes the handover procedure in MSC-A, including the request for a basic handover to another MSC (MSC-B), subsequent handover to a third MSC (MSC-B') or back to the controlling MSC (MSC-A).

19.2.2.1 Basic handover

When MSC-A has decided that a call has to be handed over to MSC-B, the Handover Control Application in MSC-A requests the MAP application to initiate the MAP_PREPARE_HANOVER request to MSC-B.

MSC-A opens the dialogue to MSC-B with a MAP_OPEN request containing no user specific parameters and sends a MAP_PREPARE_HANOVER request. This request may optionally contain an indication that a handover number allocation is not required, targetCellId, for compatibility reasons, and all information required by MSC-B to allocate the necessary radio resources.

If MSC-B accepts the dialogue, it returns a MAP_PREPARE_HANOVER confirmation containing a handover number, unless the request has included the HO-NumberNotRequired parameter, and BSSAP information which is forwarded to and handled by the Handover Control Application in MSC-A.

Optionally MSC-A can receive, after a MAP_PREPARE_HANOVER confirmation, a MAP_PROCESS_ACCESS_SIGNALLING indication containing BSSAP information.

When the connection has been established between the MS and MSC-B, MSC-A will be informed by a MAP_SEND_END_SIGNAL indication.

When MSC-A wants to clear the connection with BSS-B, an indication from the Handover Control Application is received in the Map Application to send the MAP_SEND_END-SIGNAL response to MSC-B to close the MAP dialogue.

MSC-A may abort the handover procedure at any time (e.g. if the call is cleared).

19.2.2.2 Handling of access signalling

If required, the Handover Control Application in MSC-A requests the MAP application to invoke the MAP_FORWARD_ACCESS_SIGNALLING request containing the information to be transferred to the A-interface of MSC-B (e.g. call control information).

MAP_FORWARD_ACCESS_SIGNALLING is a non-confirmed service.

MSC-B will then forward the required information to the Handover Control Application. The MAP_FORWARD_ACCESS_SIGNALLING is composed in such a way that the information can be passed transparently to the A-interface for call control and mobility management information. Any response received in MSC-B from the A-interface that should be brought to MSC-A will require a new independent request from the Handover Control Application in MSC-B to MSC-A by invoking a MAP_PROCESS_ACCESS_SIGNALLING request.

19.2.2.3 Other procedures in stable handover situation

During a call and after handover, a number of procedures between MSC-A and BSS-B controlled by or reported to MSC-A may be initiated in both directions by invoking a MAP_FORWARD_ACCESS_SIGNALLING request and reception of a MAP_PROCESS_ACCESS_SIGNALLING indication.

19.2.2.4 Subsequent handover

When MSC-A receives a MAP_PREPARE_SUBSEQUENT_HANOVER request, it will start the procedure of handing the call over to a third MSC (MSC-B'), or back to the controlling MSC (MSC-A). If the new handover procedure towards MSC-B' or MSC-A is successful, the handover control application in MSC-A will request the release of the dialogue towards MSC-B by sending the MAP_SEND_END_SIGNAL confirmation.

19.2.2.5 SDL Diagrams

The SDL diagrams on the following pages describe the user processes in MSC-A for the procedures described in this subclause.

The services used are defined in subclause 8.4.

NOTE: The message primitives HO_CA_MESSAGE used in the SDL-Diagrams are used to show the internal co-ordination between the MAP application and the Handover Control Application. For a detailed description of the co-ordination between the applications for the handover procedure, see GSM 03.09.

Note that in case of reception of errors from the MSCs (see the Handover error handling macro), the MAP user reports them to the Handover Control Application and does not take any action except in cases explicitly mentioned in the SDL diagrams.

Process MSC_A_HO

19.2.2_1.1(12)

Figure 19.2.2/1: HO in MSC-A

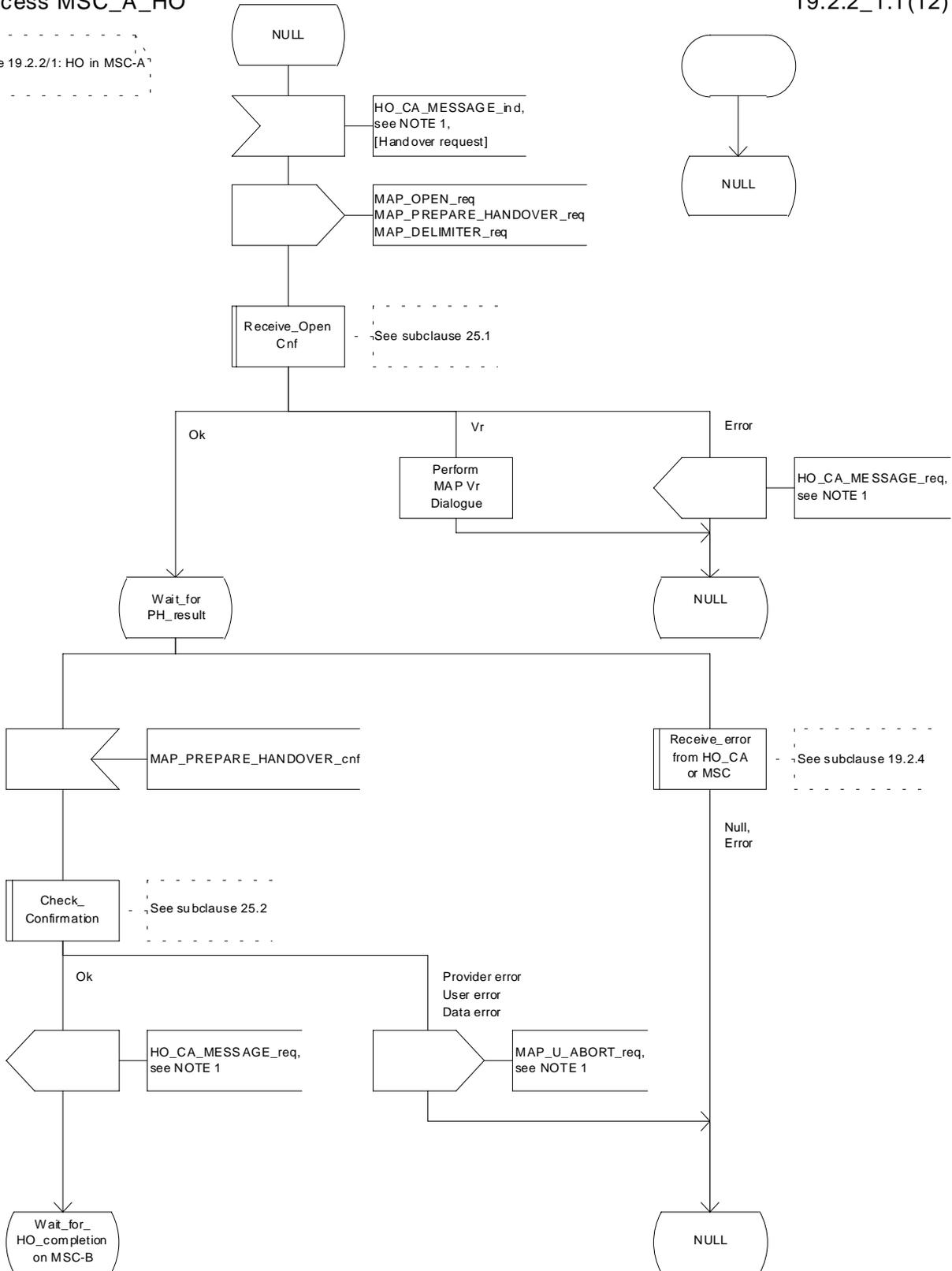


Figure 19.2.2/1 (sheet 1 of 12): Process MSC_A_HO

Figure 19.2.2/1: HO in MSC-A

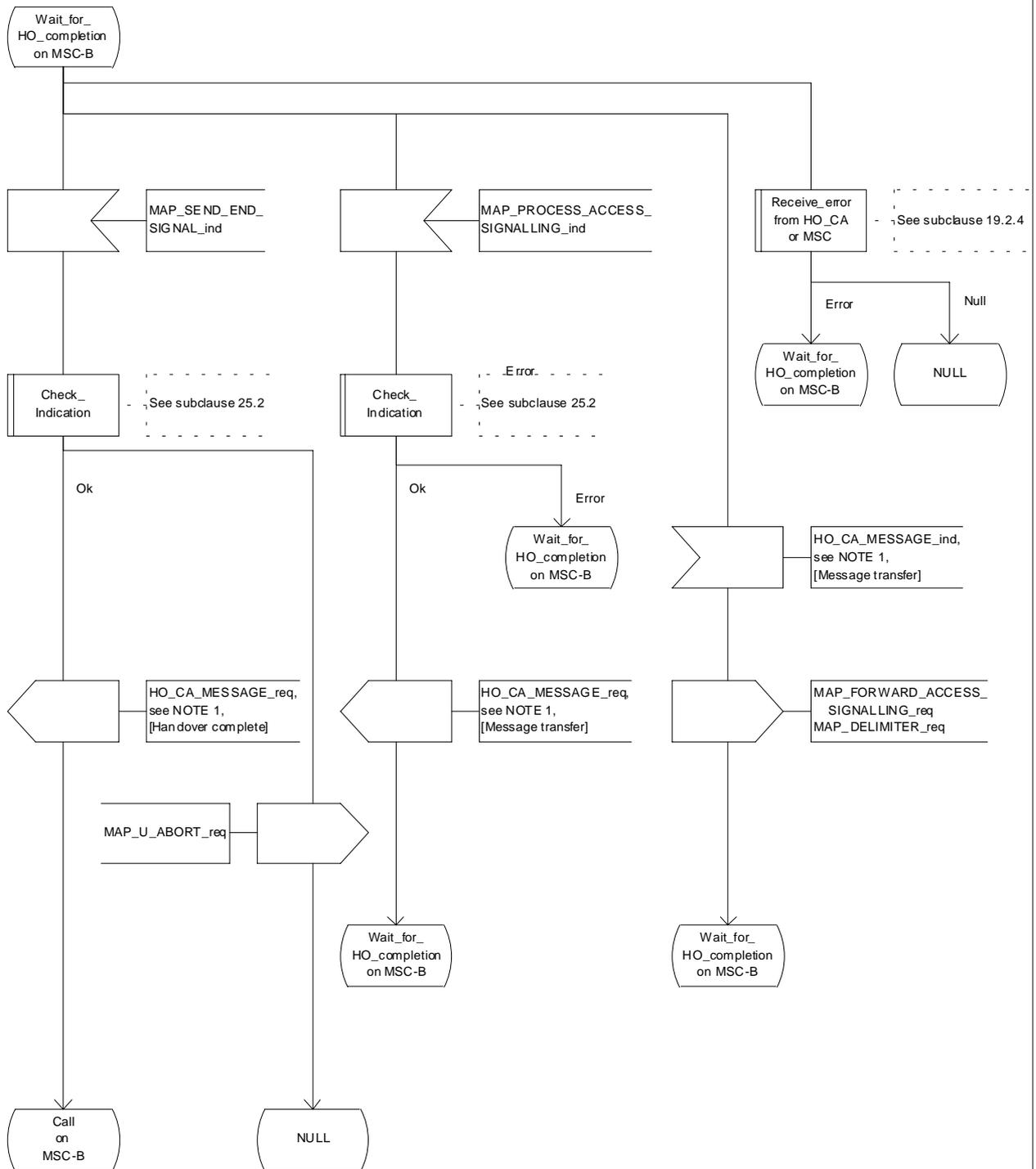


Figure 19.2.2/1 (sheet 2 of 12): Process MSC_A_HO

Figure 19.2.2/1: HO in MSC-A

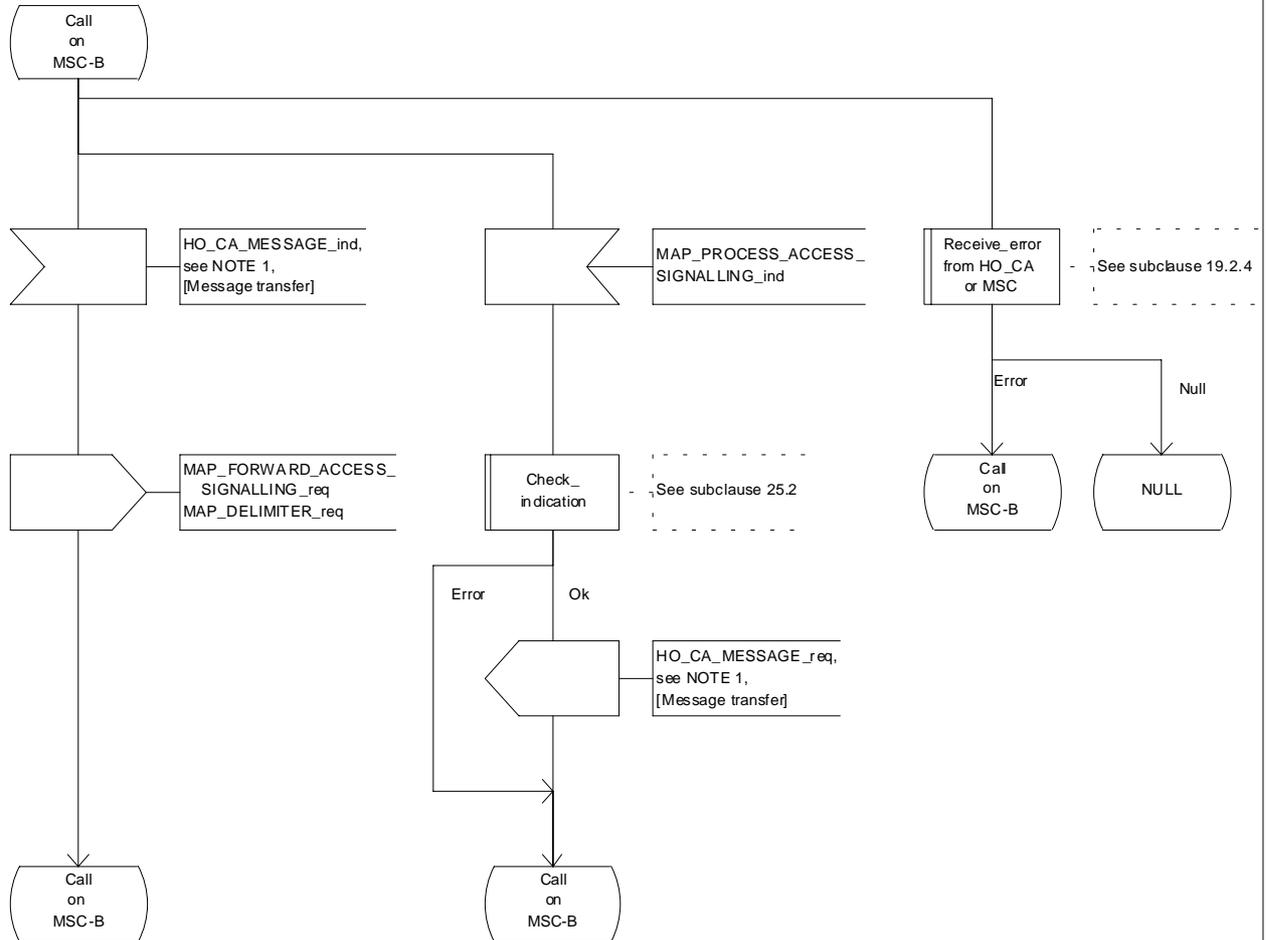


Figure 19.2.2/1 (sheet 3 of 12): Process MSC_A_HO

Figure 19.2.2/1: HO in MSC-A

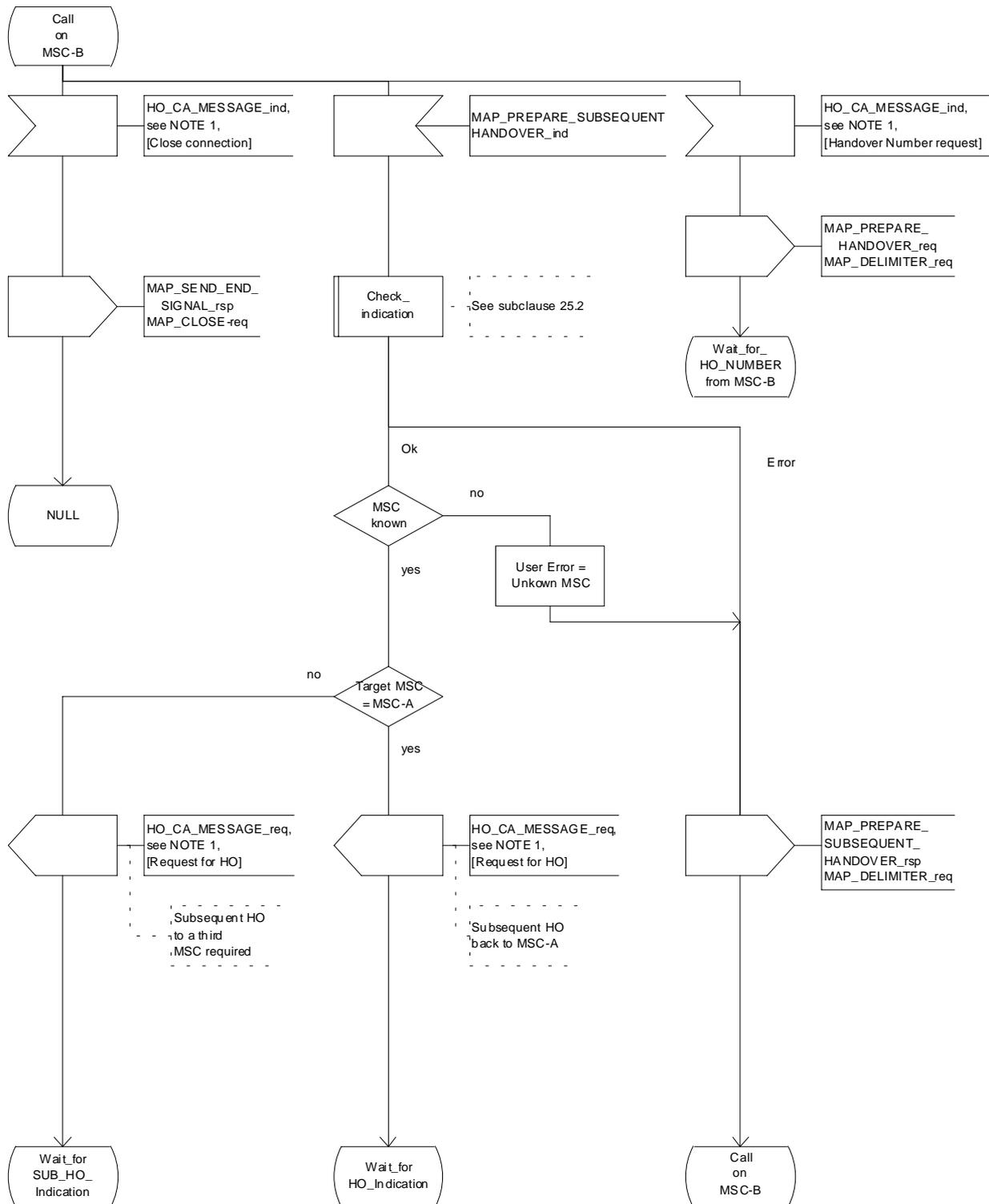


Figure 19.2.2/1 (sheet 4 of 12): Process MSC_A_HO

Figure 19.2.2/1: HO in MSC-A

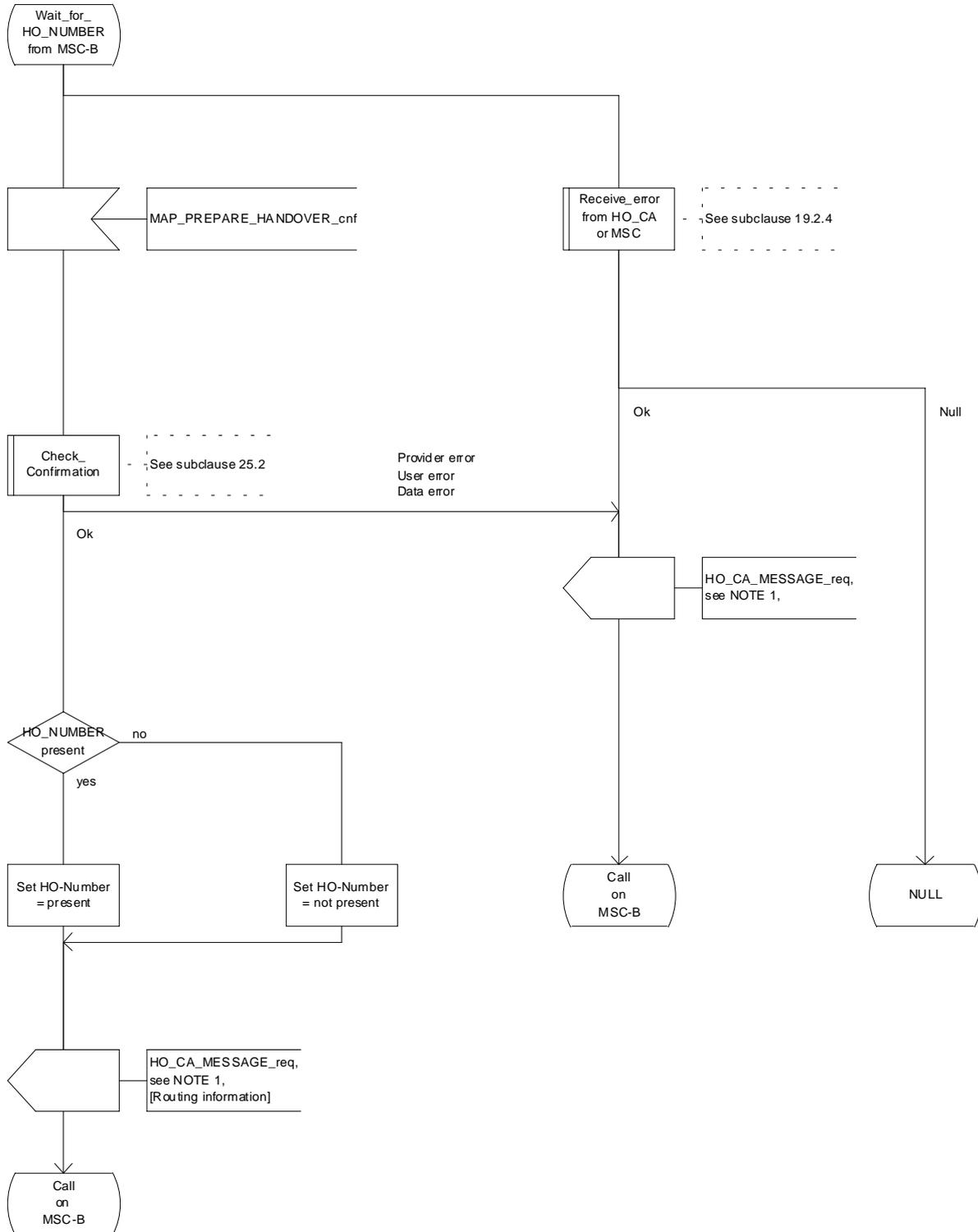


Figure 19.2.2/1 (sheet 5 of 12): Process MSC_A_HO

Figure 19.2.2/1: HO in MSC-A

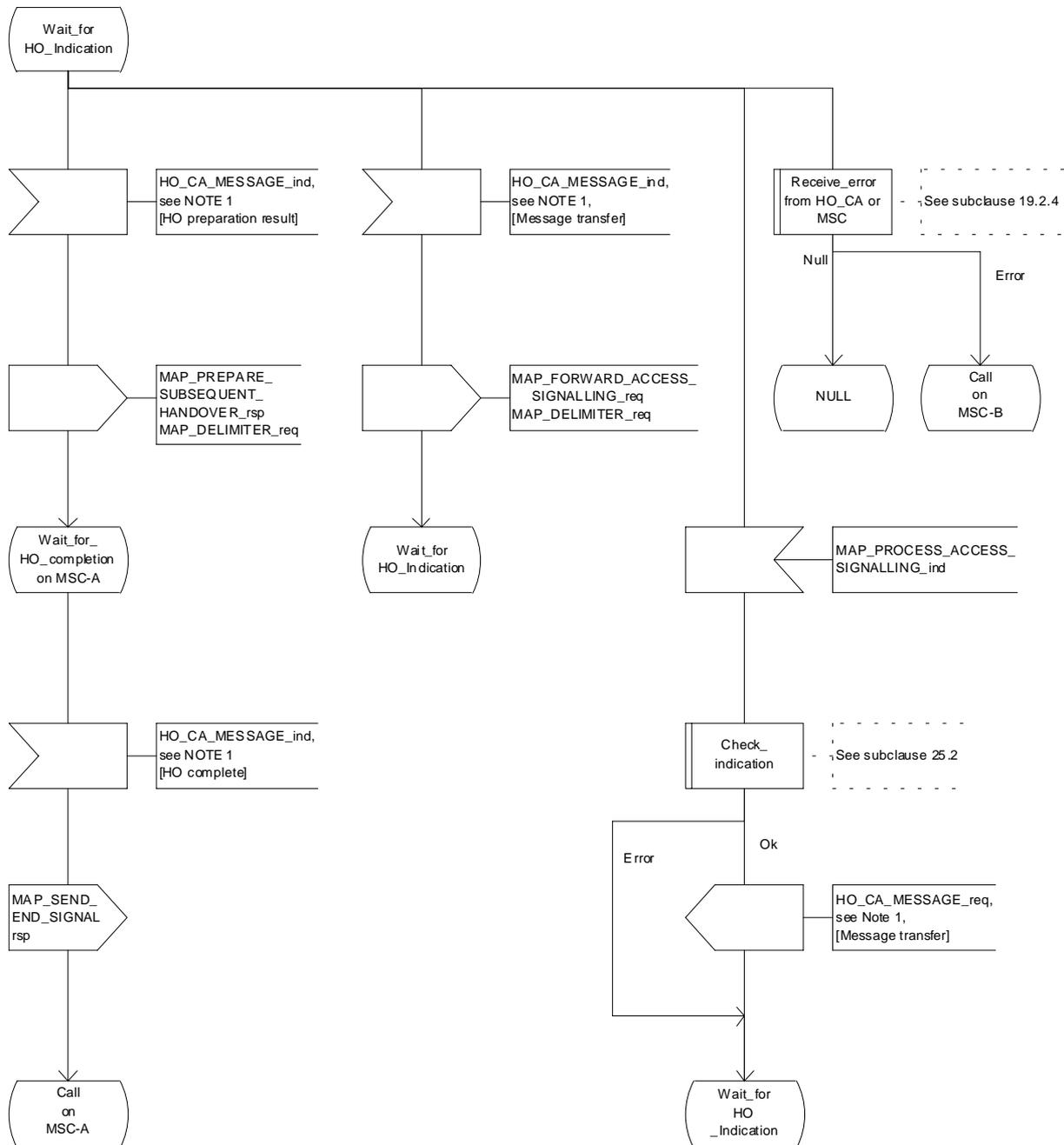


Figure 19.2.2/1 (sheet 6 of 12): Process MSC_A_HO

Figure 19.2.2/1: HO in MSC-A*

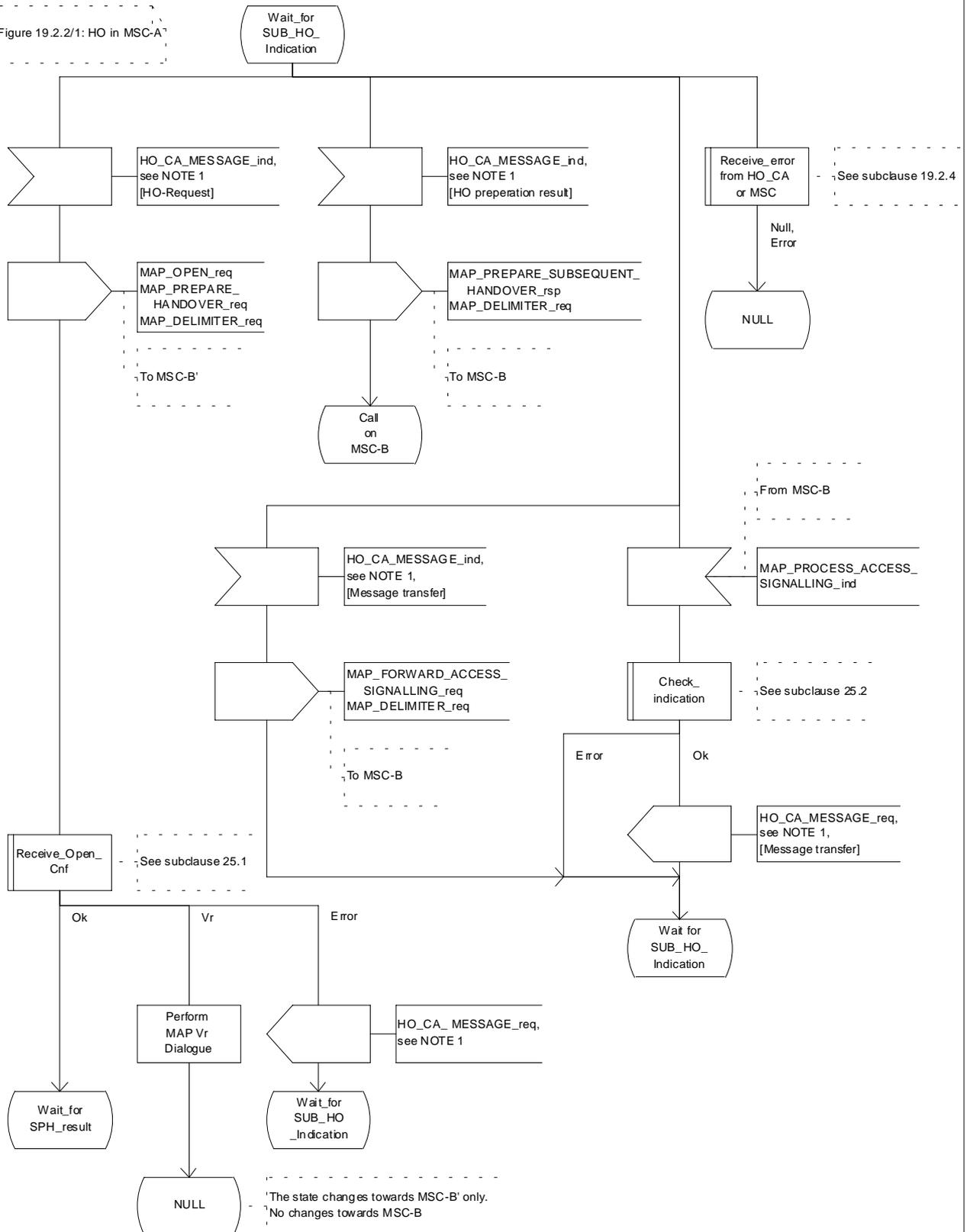


Figure 19.2.2/1 (sheet 7 of 12): Process MSC_A_HO

Figure 19.2.2/1: HO in MSC-A

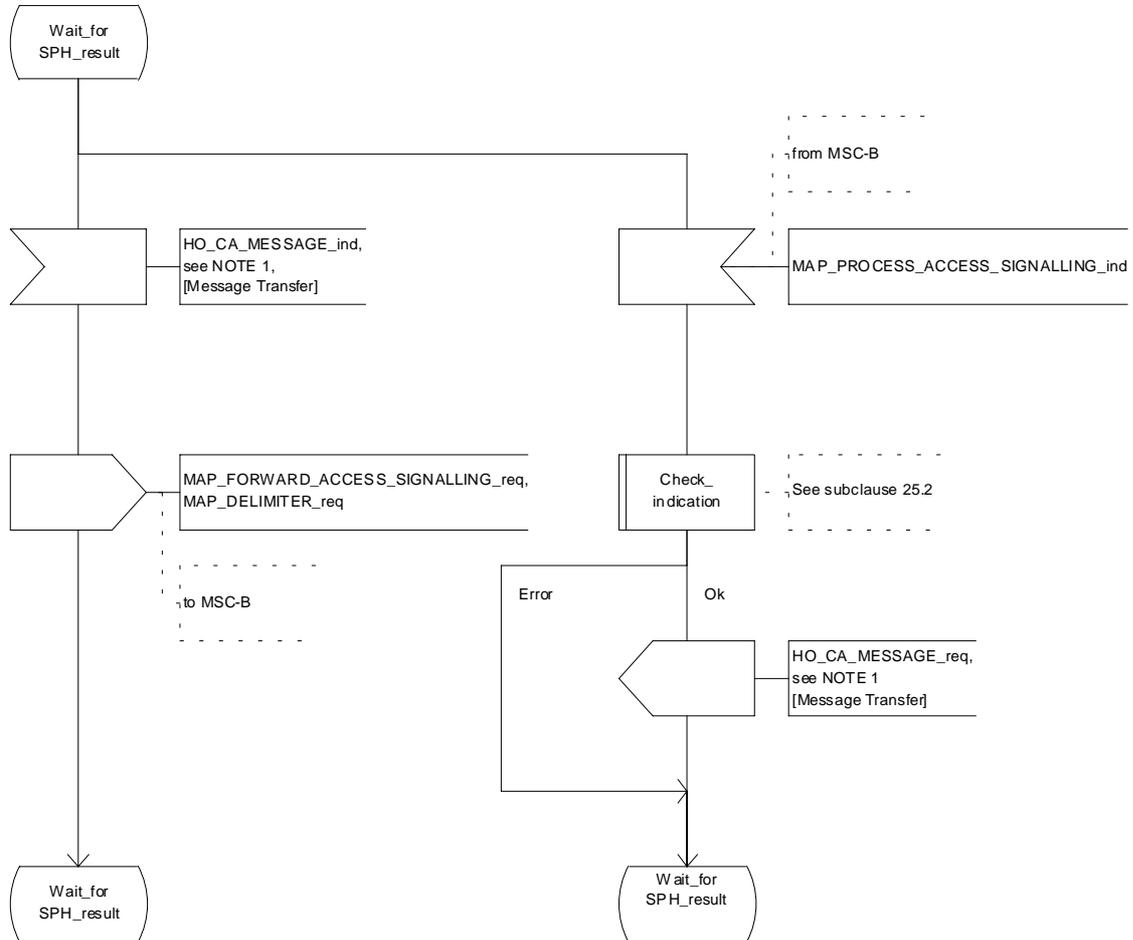


Figure 19.2.2/1 (sheet 8 of 12): Process MSC_A_HO

Figure 19.2.2/1: HO in MSC-A

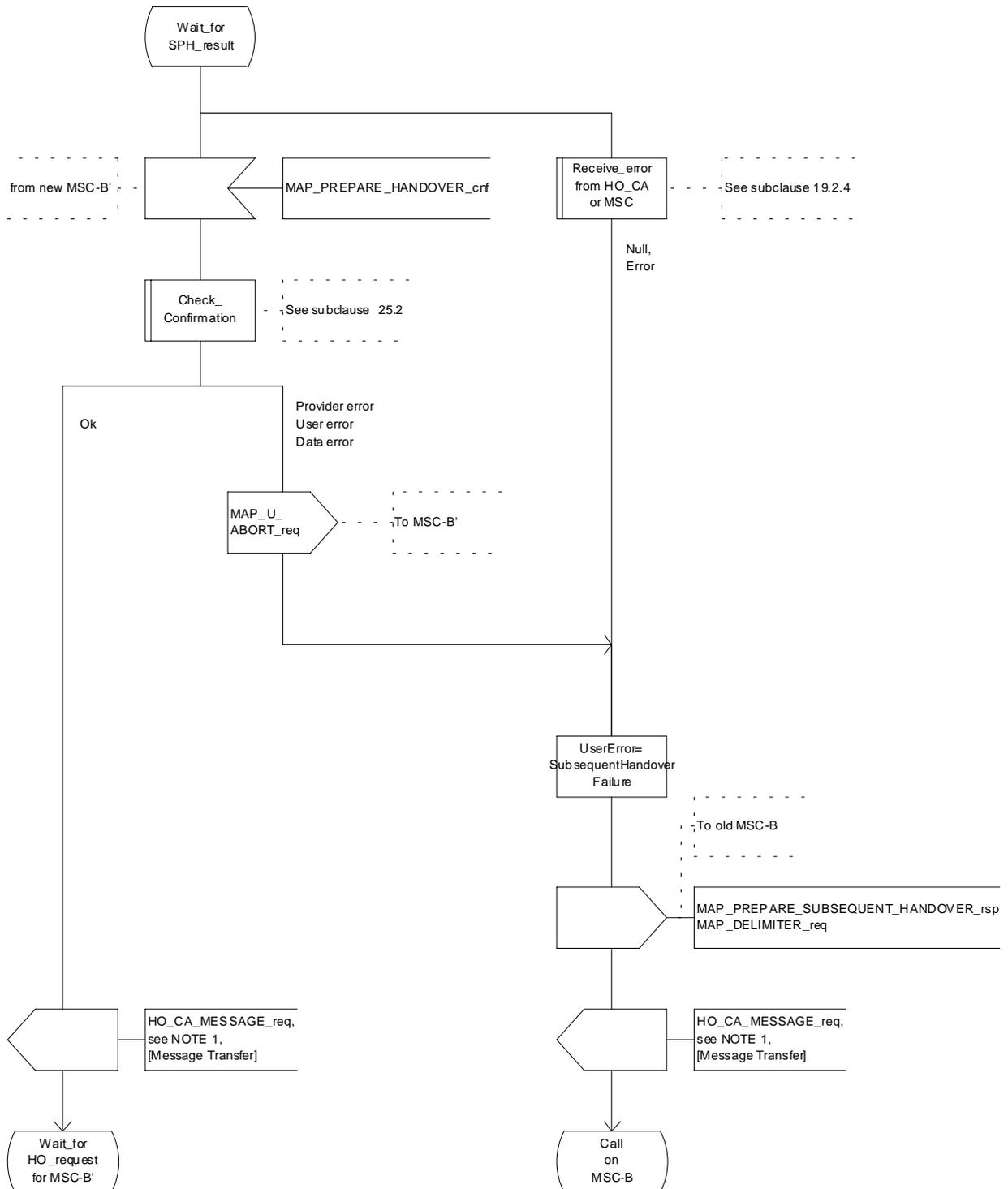


Figure 19.2.2/1 (sheet 9 of 12): Process MSC_A_HO

Figure 19.2.2/1: HO in MSC-A

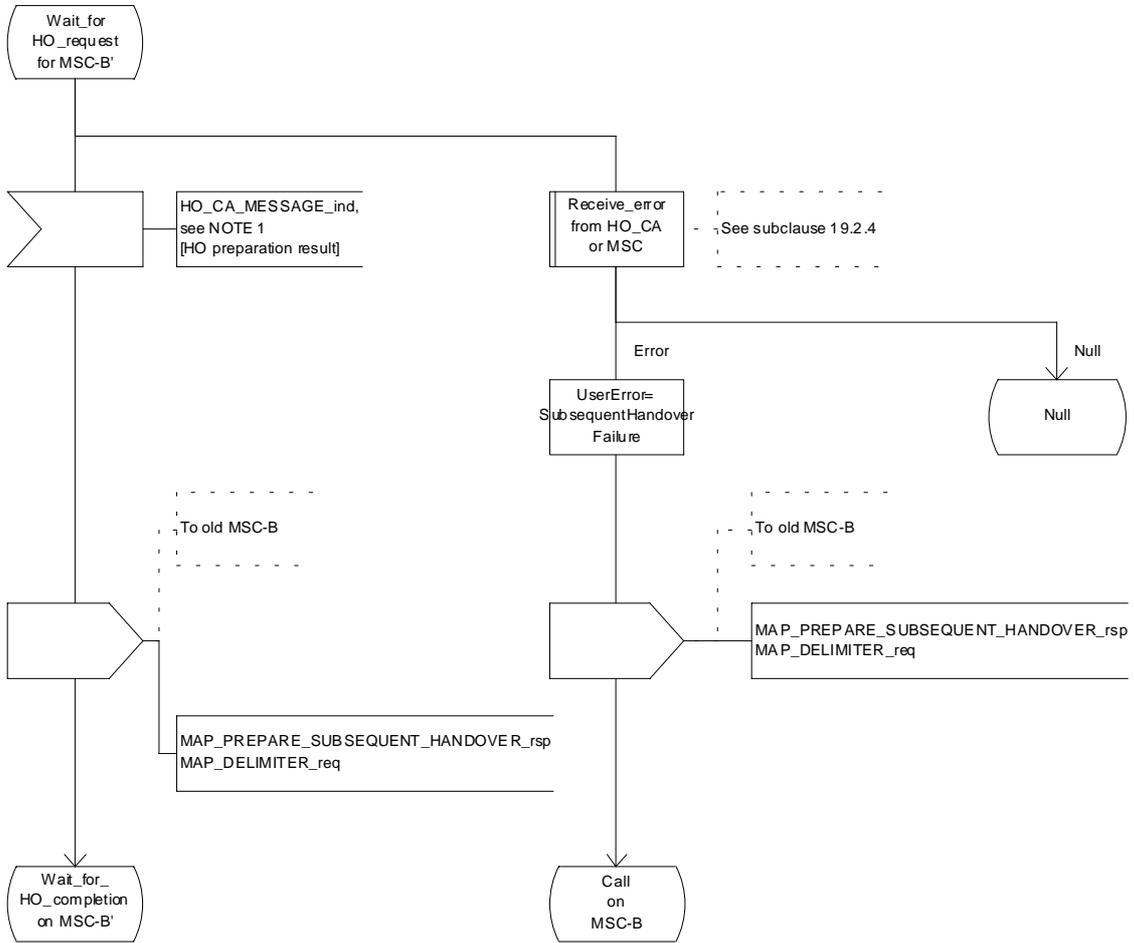


Figure 19.2.2/1 (sheet 10 of 12): Process MSC_A_HO

Figure 19.2.2/1: HO in MSC-A

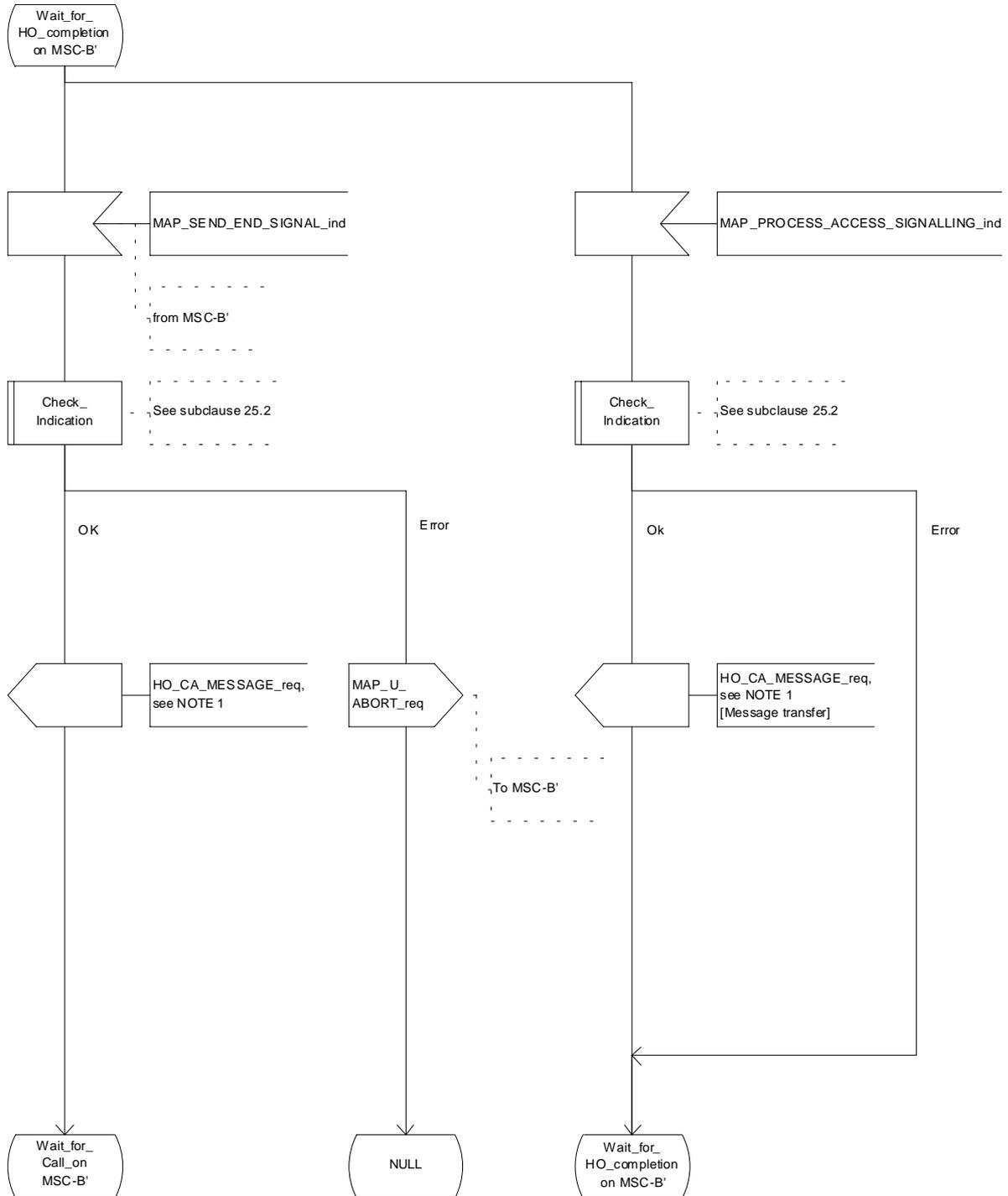


Figure 19.2.2/1 (sheet 11 of 12): Process MSC_A_HO

Figure 19.2.2/1: HO in MSC-A

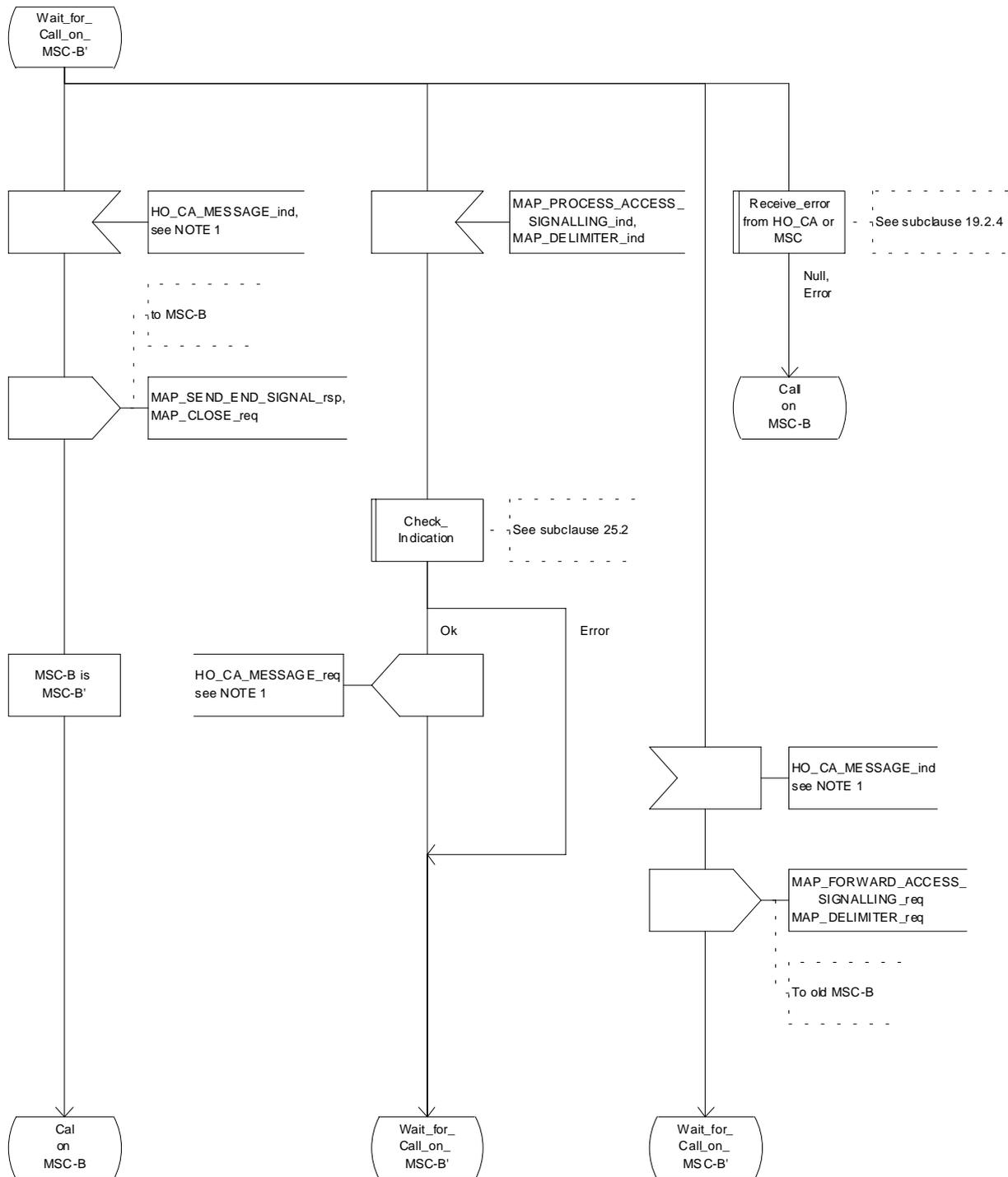


Figure 19.2.2/1 (sheet 12 of 12): Process MSC_A_HO

19.2.3 Handover procedure in MSC-B

This subclause describes the handover procedure in MSC-B, including the request for a handover from another MSC (MSC-A), subsequent handover to a third MSC (MSC-B') or back to the controlling MSC (MSC-A).

19.2.3.1 Basic handover

Opening of the dialogue is described in the macro `Receive_Open_Ind` in subclause 25.1.

When MSC-B process receives a `MAP_PREPARE_HANOVER` indication from MSC-A, MSC-B requests its associated VLR to provide a handover number, unless the parameter `HO-NumberNotRequired` is received in the indication.

When the connection between the MS and MSC-B is established on MSC-B, the Handover Control Application will request the MAP application to indicate this event to MSC-A by invoking the `MAP_SEND_END_SIGNAL` request. When a call is released, MSC-A will inform MSC-B by `MAP_SEND_END_SIGNAL` response and the MAP dialogue between MSC-A and MSC-B is closed.

19.2.3.2 Allocation of handover number

When a handover number is required, a `MAP_ALLOCATE_HANOVER_NUMBER` request will be sent to the VLR. The handover number is received in the `MAP_SEND_HANOVER_REPORT` request, and will be included in the `MAP_PREPARE_HANOVER` response to MSC-A.

As soon as the call from MSC-A using the handover number arrives in MSC-B, MSC-B shall release the handover number in the VLR using the `MAP_SEND_HANOVER_REPORT` response.

19.2.3.3 Handling of access signalling

If required by the Handover Control Application, MSC-B invokes the `MAP_PROCESS_ACCESS_SIGNALLING` request containing the information received on the A-interface that should be transferred to MSC-A (e.g. call control information).

`MAP_PROCESS_ACCESS_SIGNALLING` is a non-confirmed service and any response from MSC-A will require a `MAP_FORWARD_ACCESS_SIGNALLING` request.

19.2.3.4 Other procedures in stable handover situation

During a call and after handover, a number of procedures between MSC-A and BSS-B controlled by or reported to MSC-A may be initiated by involving access signalling transfer in both directions.

19.2.3.5 Subsequent handover

The procedure is used when the Handover Control Application in MSC-B has decided that a call is to be handed over to another MSC (either back to the controlling MSC (MSC-A) or to a third MSC (MSC-B')).

After the `MAP_PREPARE_SUBSEQUENT_HANOVER` response is received from MSC-A, MSC-B will await the disconnection of the call. Once the disconnect is complete, MSC-B will inform its VLR by invoking the `MAP_SEND_HANOVER_REPORT` confirmation. VLR-B will then release the allocated handover number.

The subsequent handover procedure is shown in figure 19.2/3.

19.2.3.6 SDL Diagrams

The SDL diagrams on the following pages describe the user process in MSC-B for the procedures described in this subclause.

The services used are defined in subclause 8.4.

NOTE 1: The message primitives HO_CA_MESSAGE in the SDL-diagrams are used to show the internal co-ordination between the MAP application and the Handover Control Application. For a detailed description of the co-ordination between the applications for the handover procedure, see GSM 03.09.

NOTE 2: The order in the SDL diagrams to allocate first the handover number and then the radio resources is not binding.

Figure 19.2.3/1: HO in MSC-B

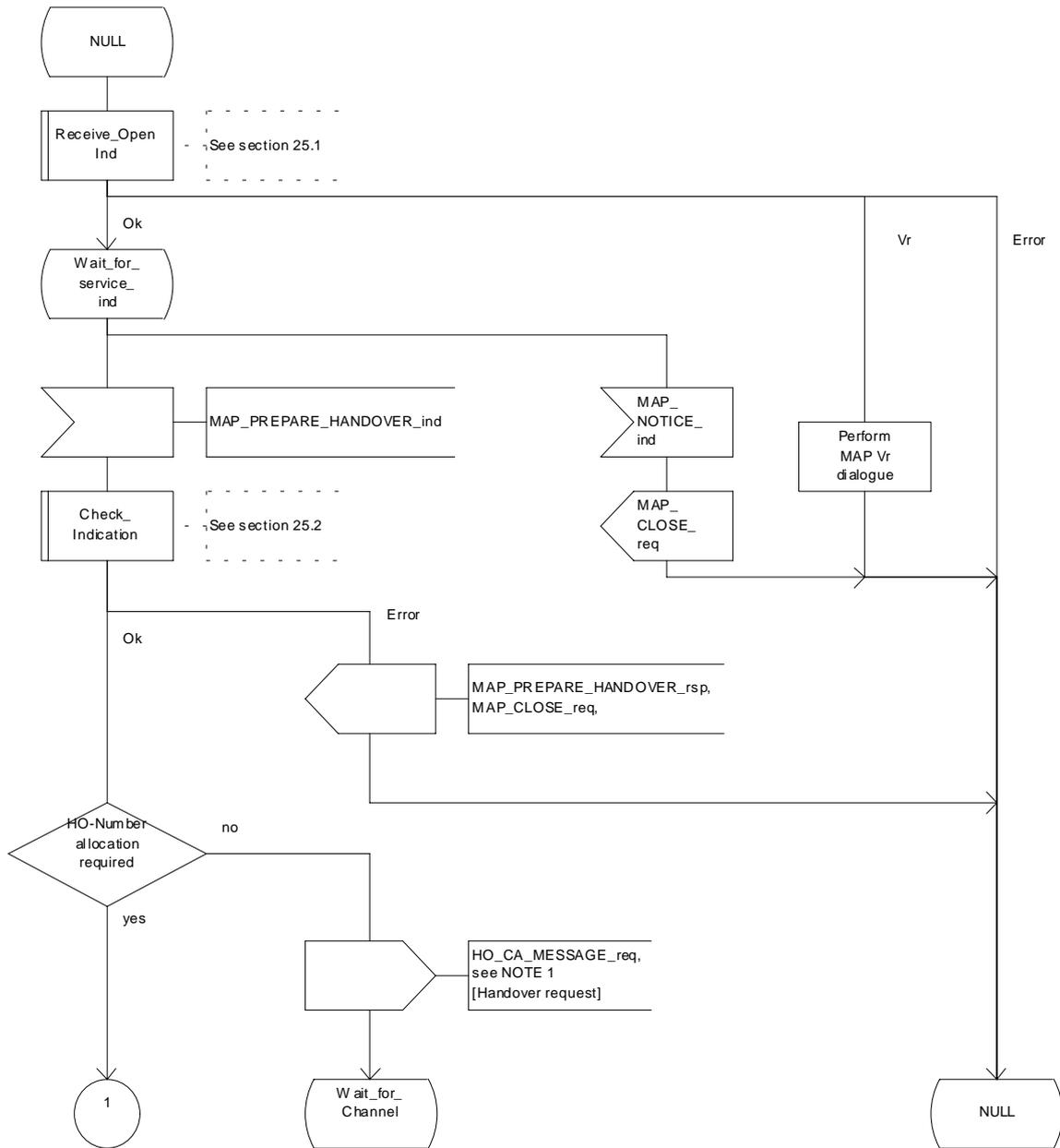


Figure 19.2.3/1 (sheet 1 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

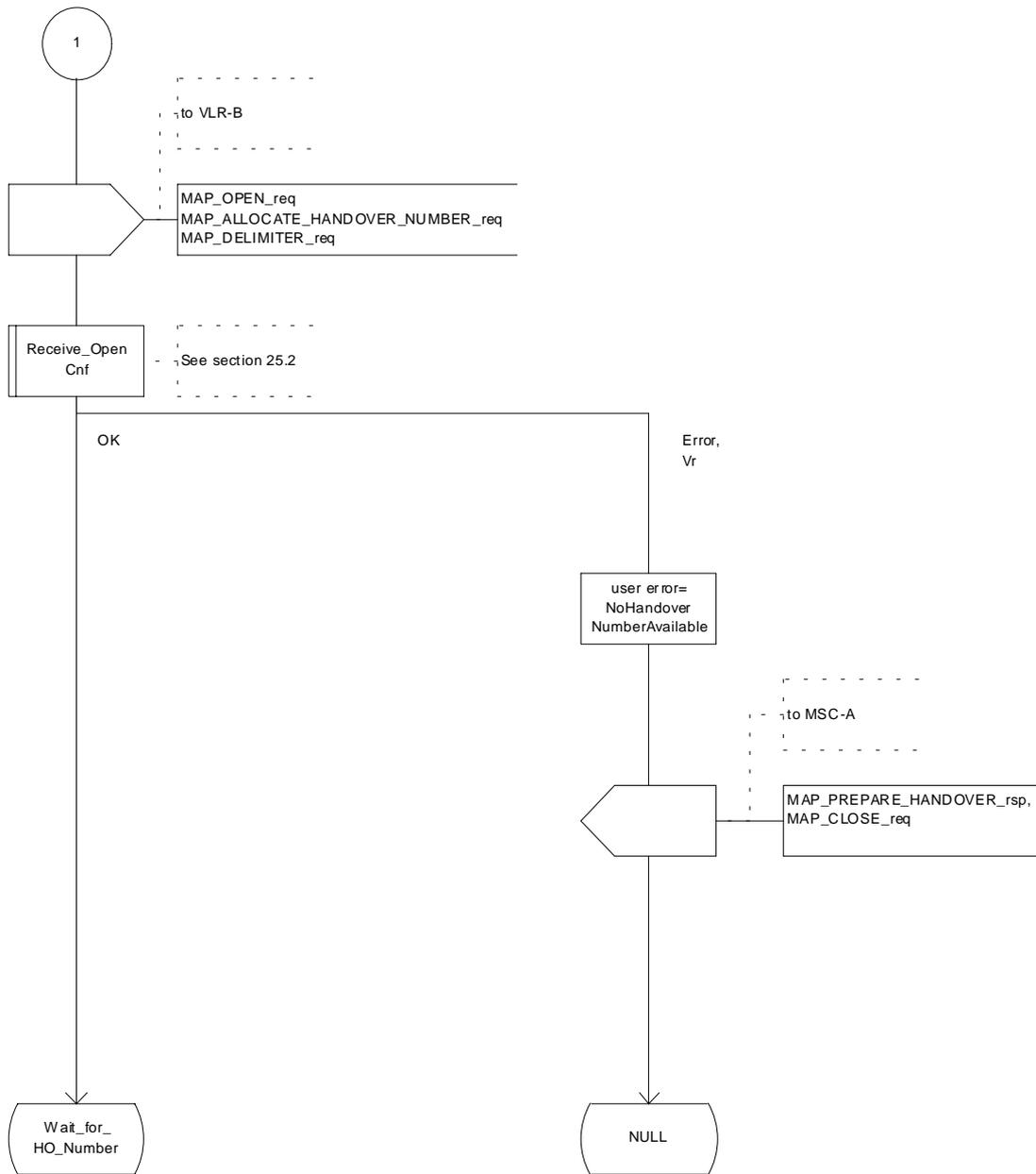


Figure 19.2.3/1 (sheet 2 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

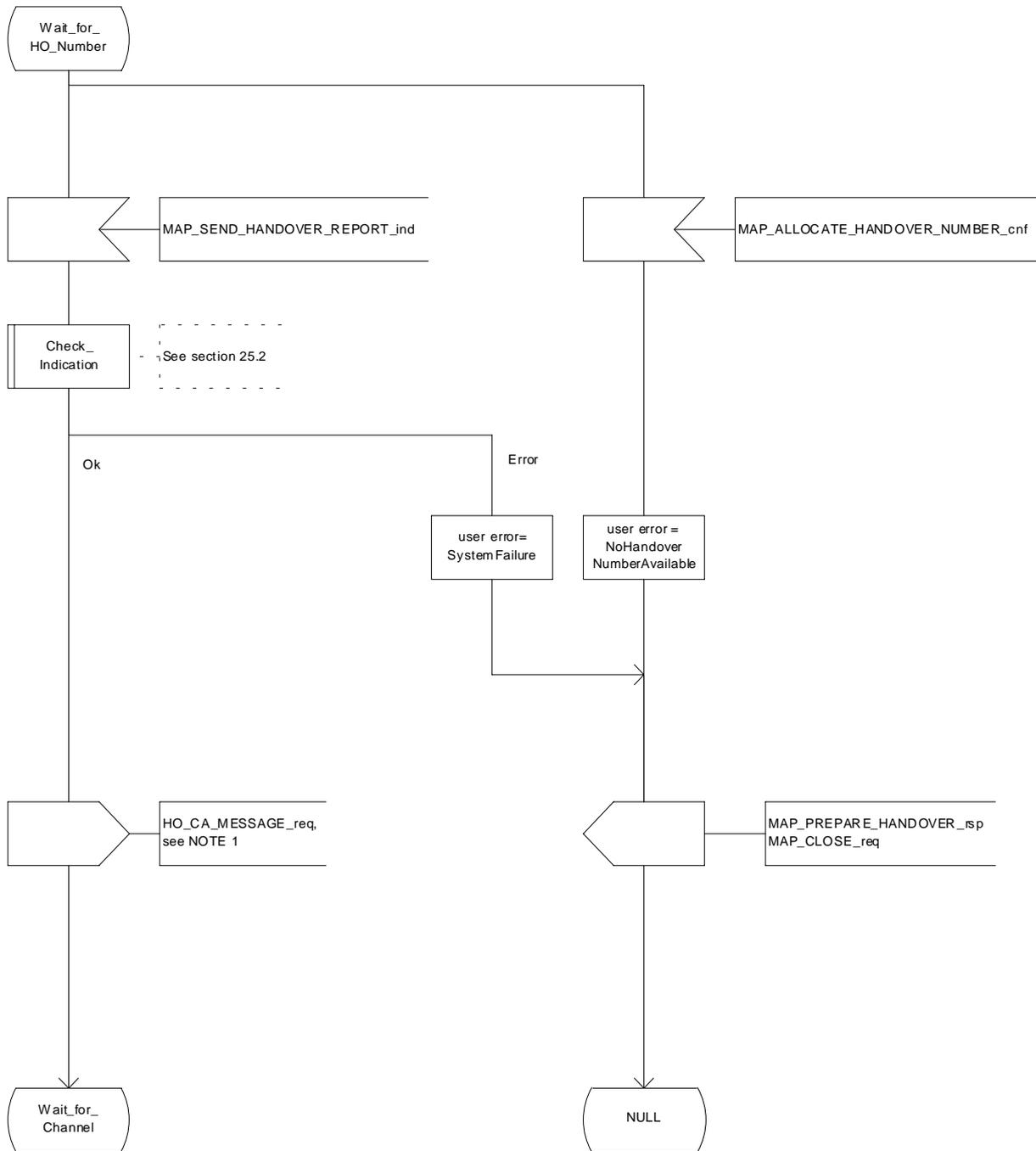


Figure 19.2.3/1 (sheet 3 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

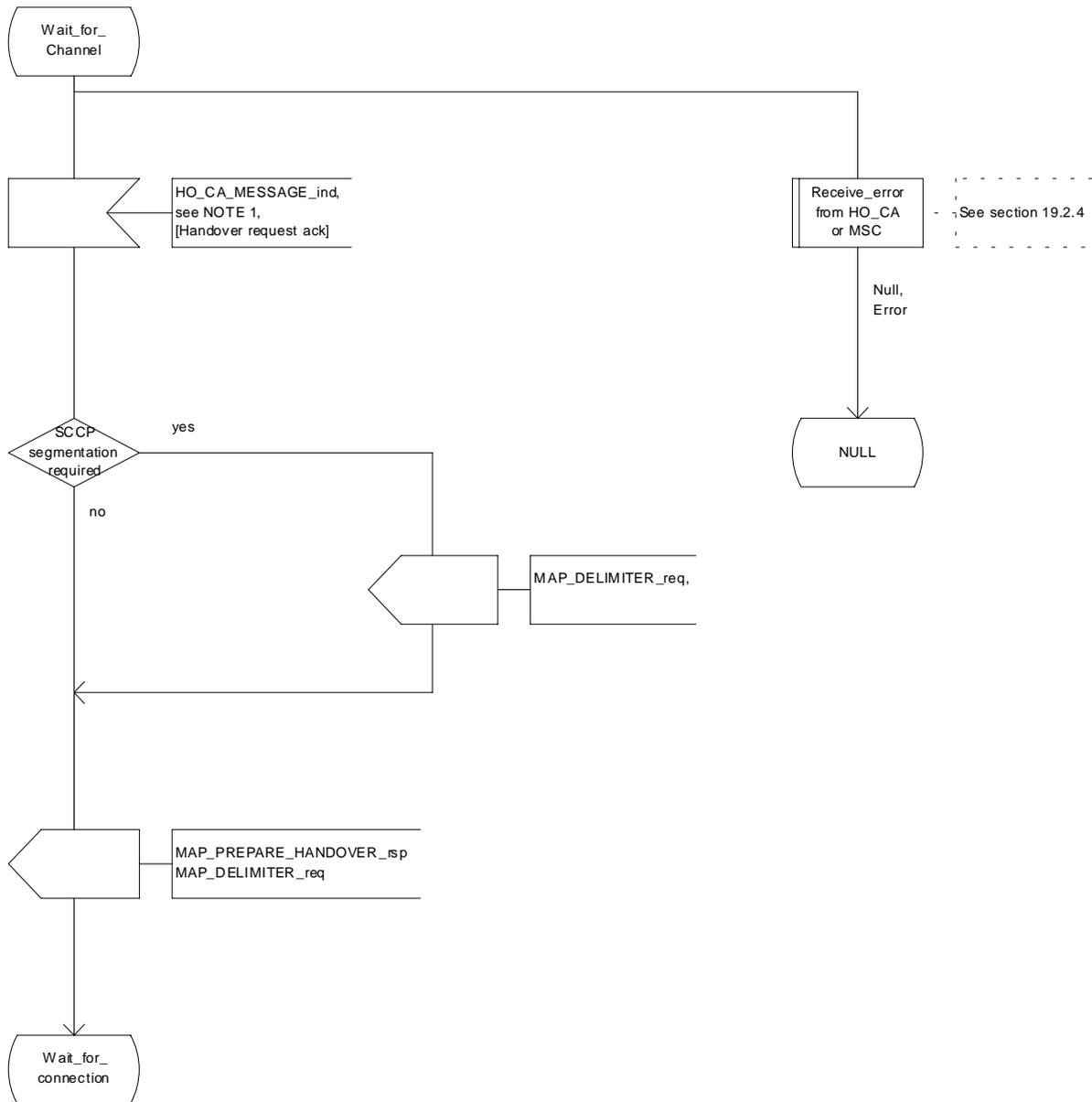


Figure 19.2.3/1 (sheet 4 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

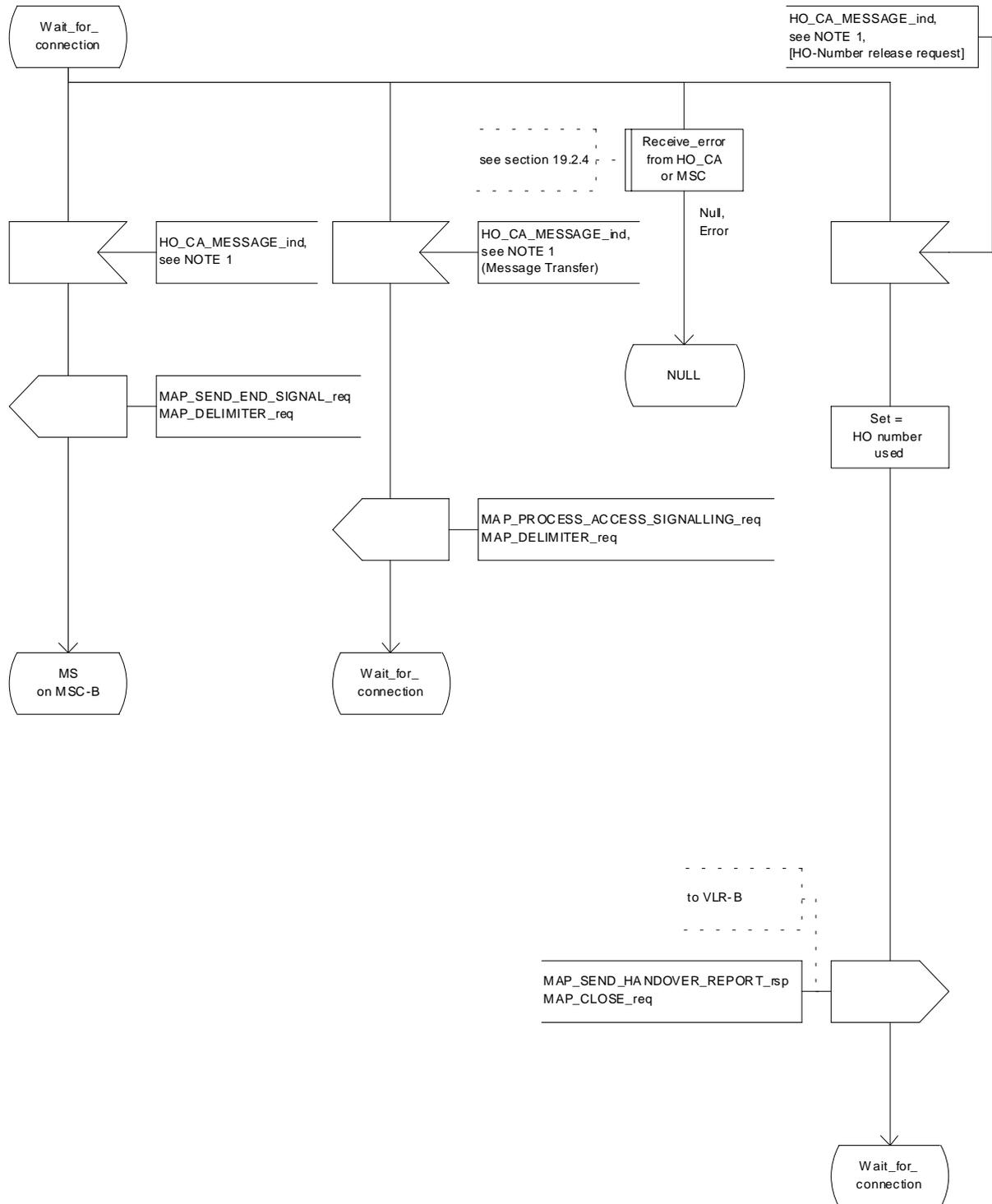


Figure 19.2.3/1 (sheet 5 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

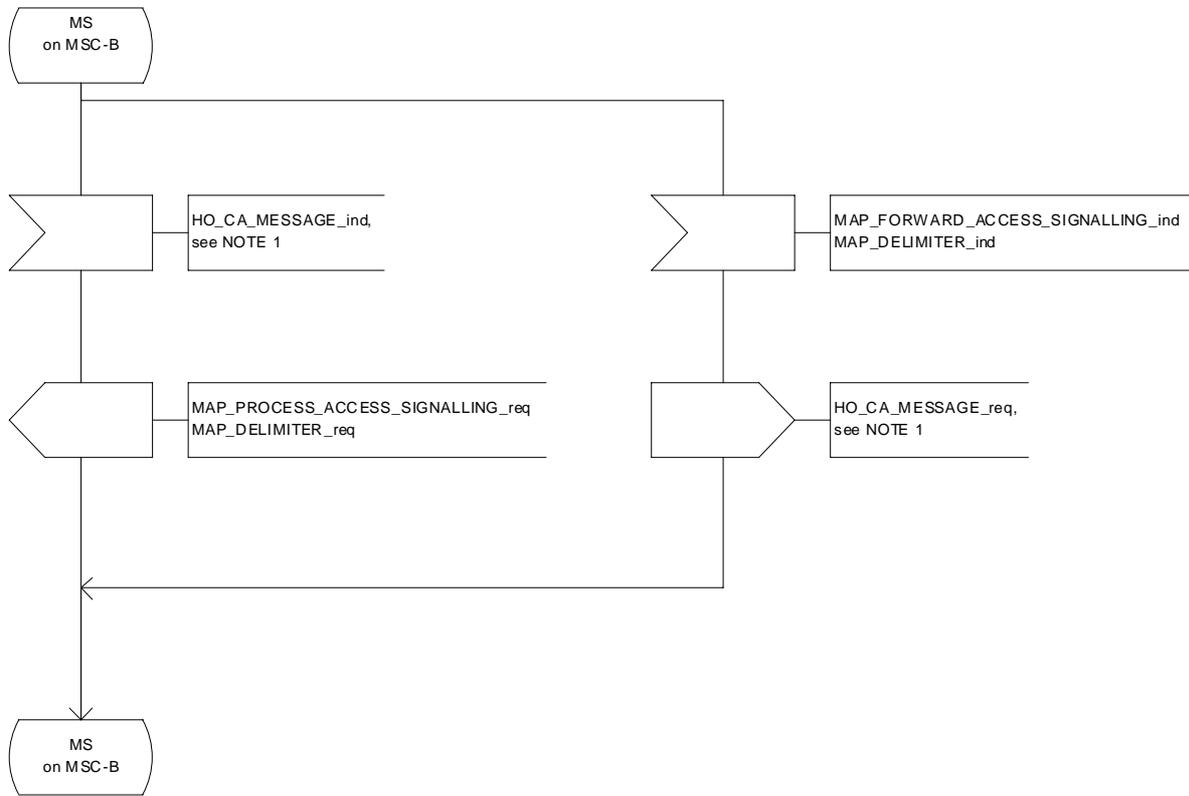


Figure 19.2.3/1 (sheet 6 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

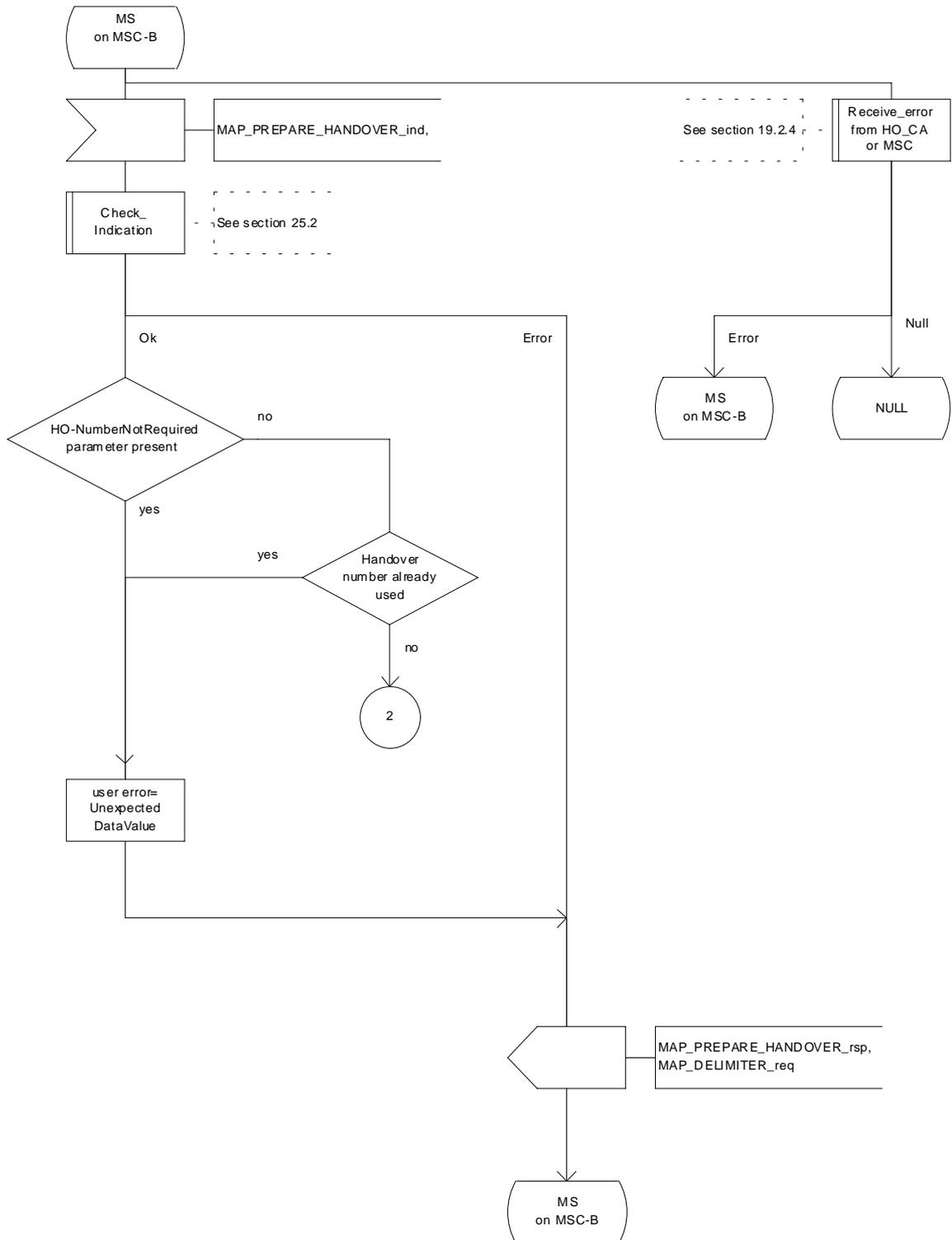


Figure 19.2.3/1 (sheet 7 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

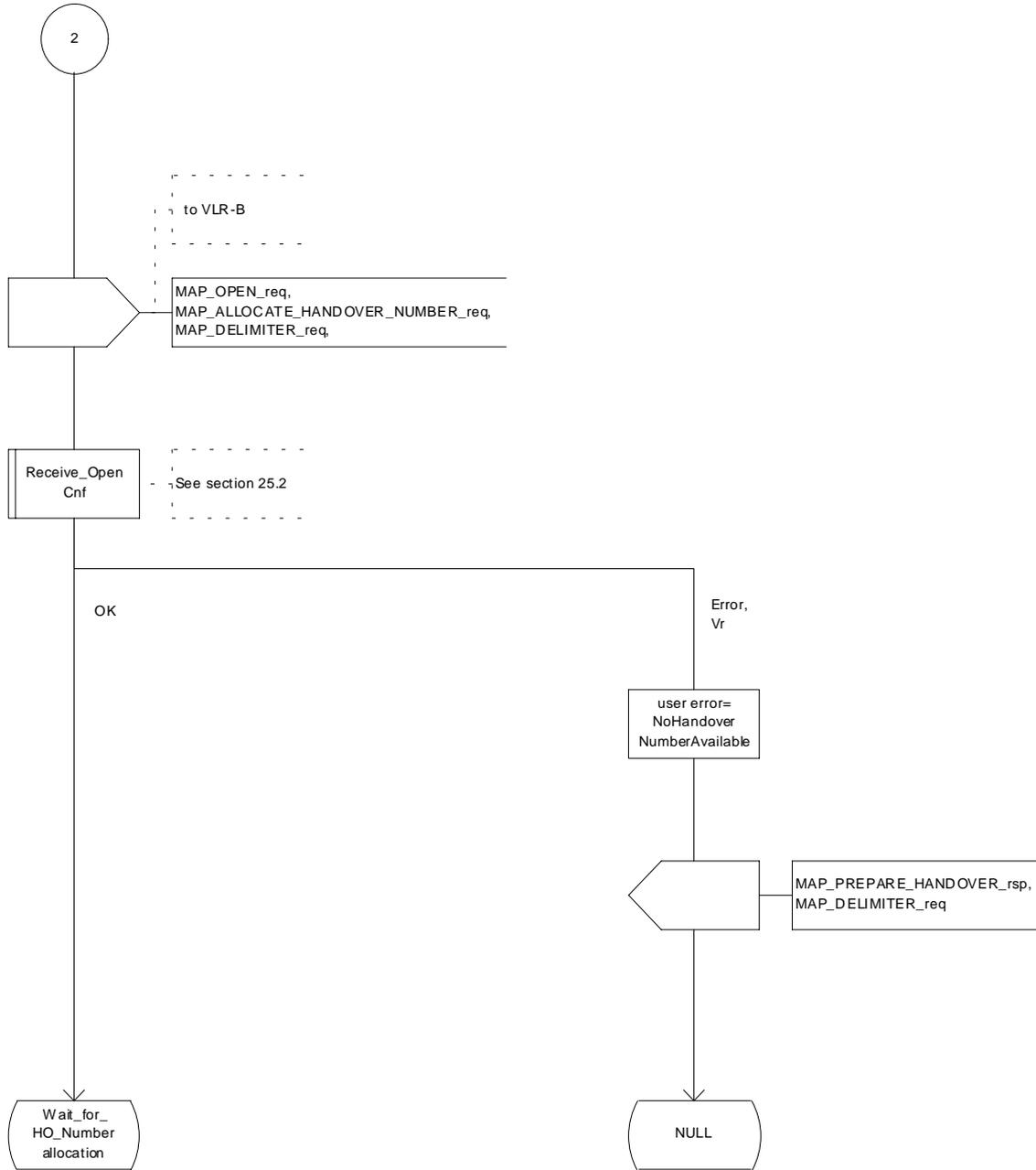


Figure 19.2.3/1 (sheet 8 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

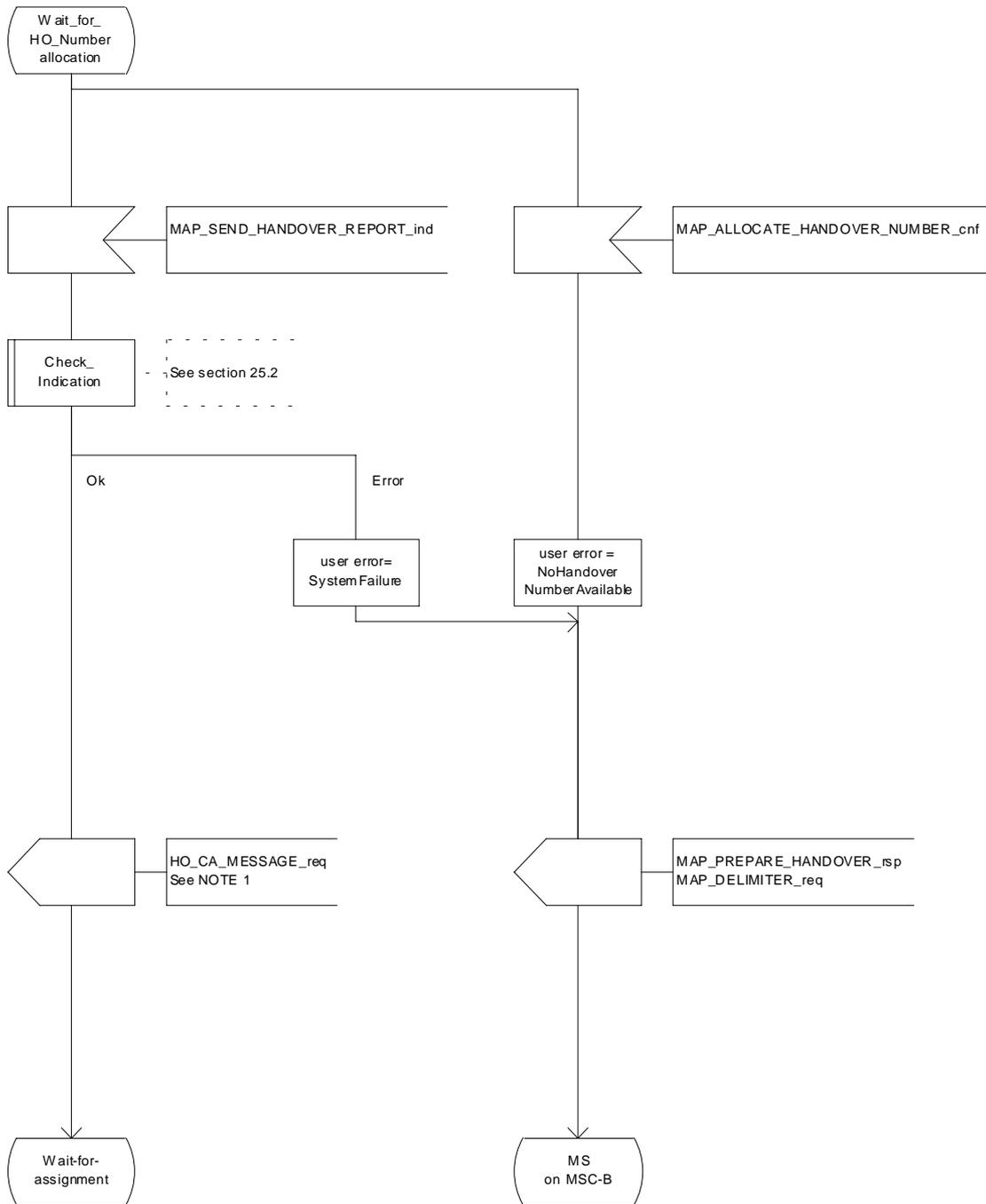


Figure 19.2.3/1 (sheet 9 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

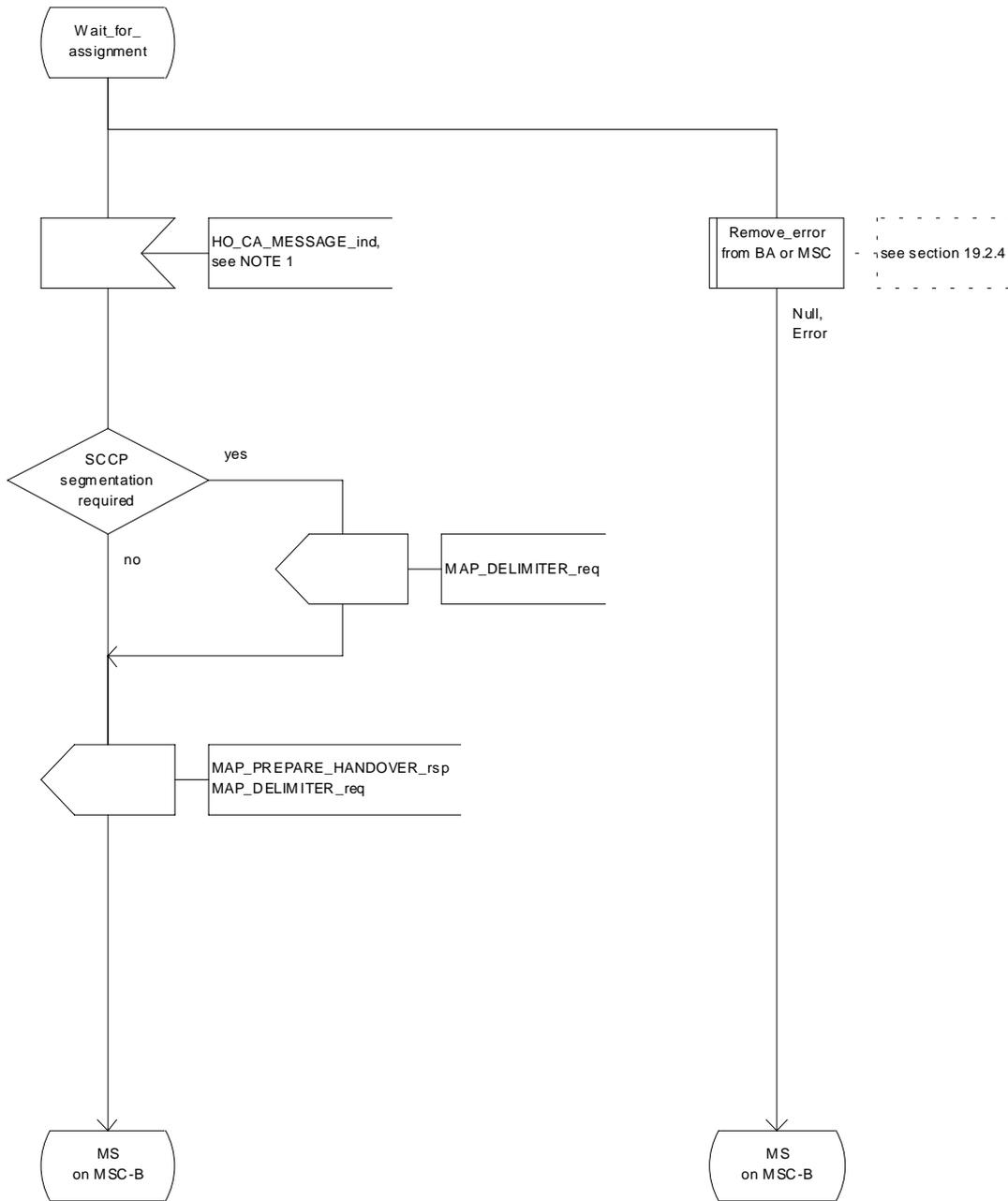


Figure 19.2.3/1 (sheet 10 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

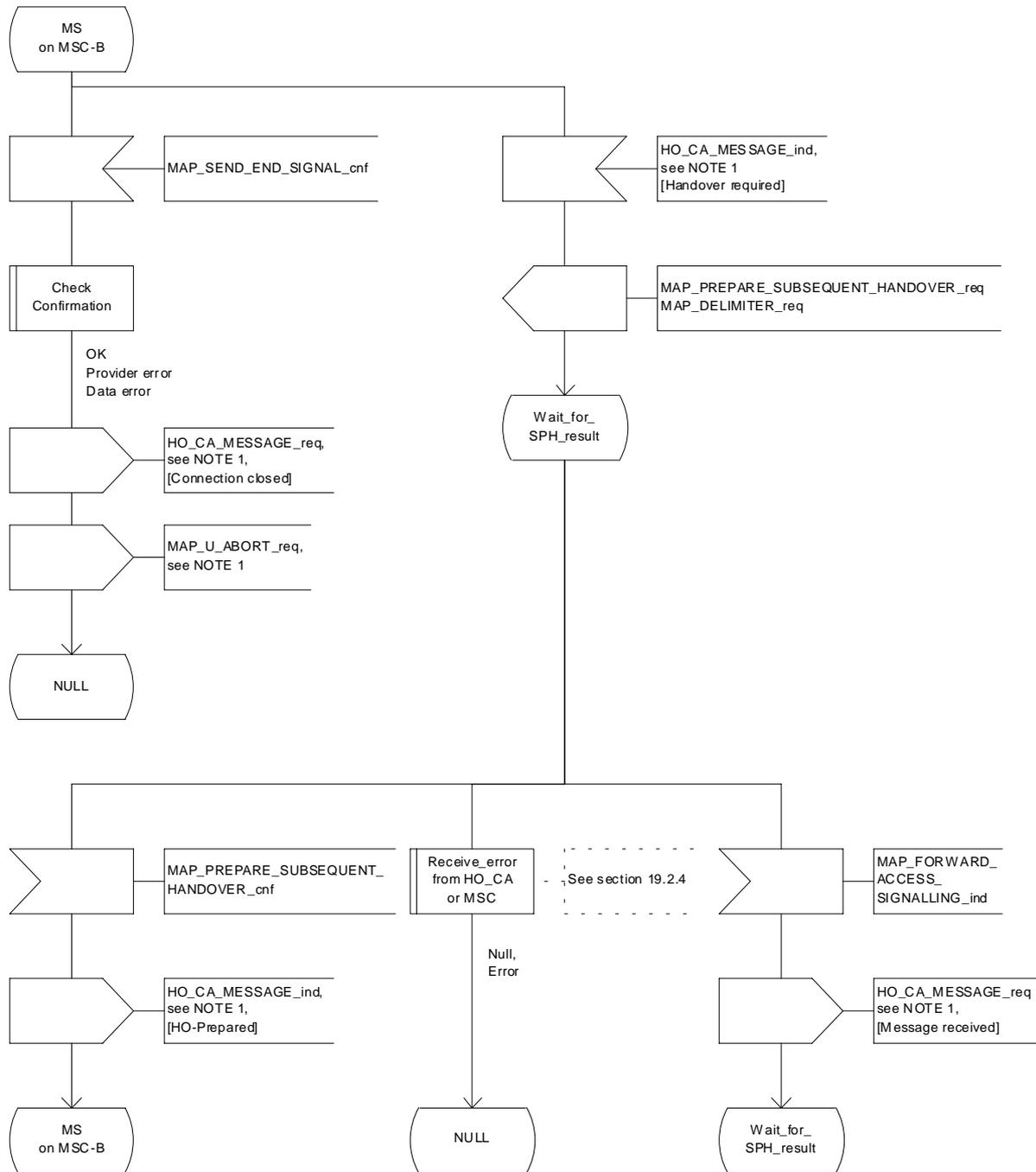


Figure 19.2.3/1 (sheet 11 of 11): Process MSC_B_HO

19.2.4 Handover error handling macro

This macro is used for the handover procedures to receive errors from the MSCs and from the Handover Control Application at any state of a handover process.

If a MAP_NOTICE indication is received, the Handover Control Application is informed and the actual situation is kept and the Handover Control Application decides how the handover process should continue. In all other cases the MSC is returned to a "NULL" state.

Figure 19.2.4/1: Macro Receive_error_from_HO_CA_or_MSC

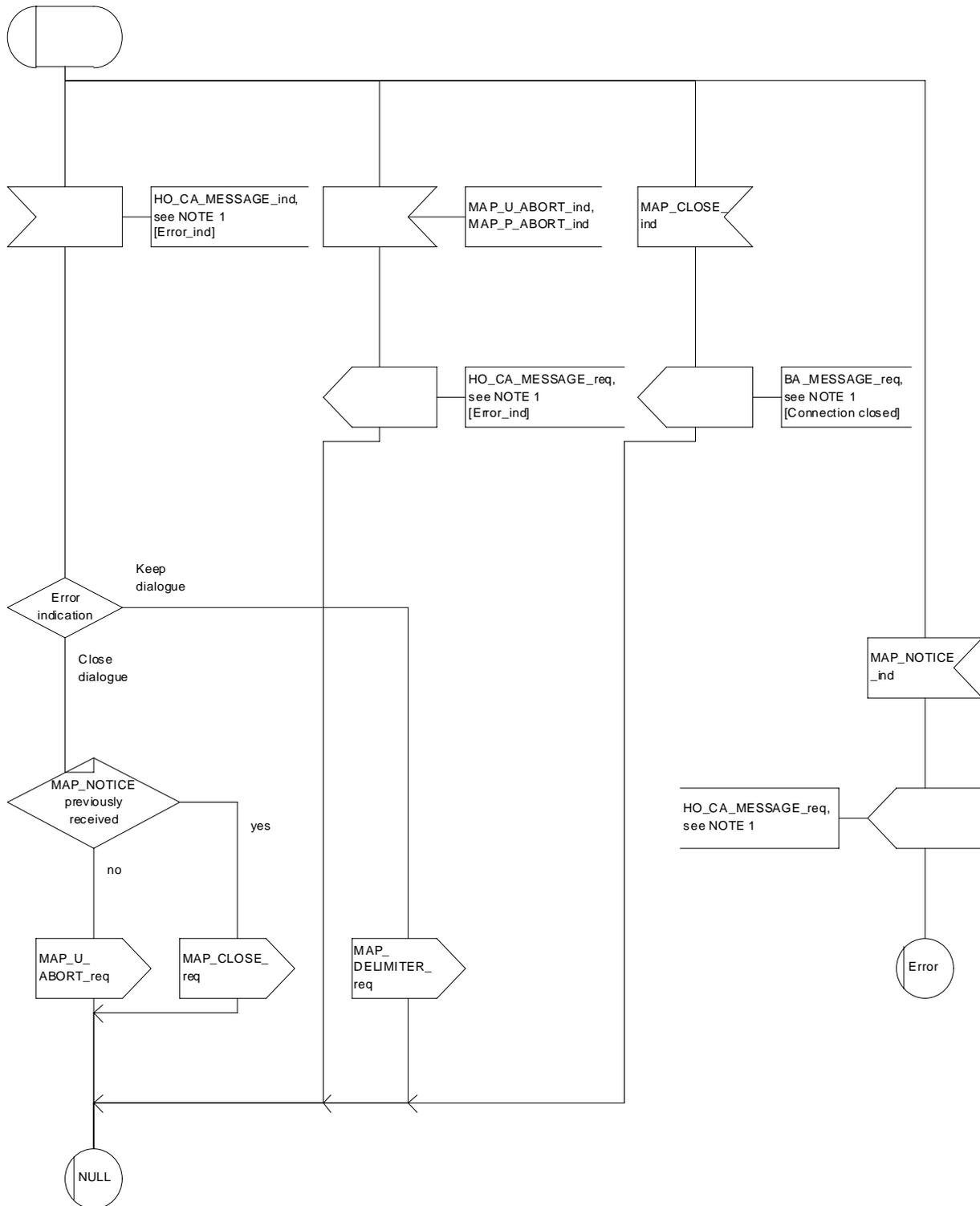


Figure 19.2.4/1: Macro Receive_error_from_HO_CA_or_MSC

19.2.5 Handover procedure in VLR

19.2.5.1 Allocation of handover number

When receiving the MAP_ALLOCATE_HANDBER_NUMBER indication, the VLR will determine whether a handover number is available. If no handover number is available, this will be indicated by a MAP_ALLOCATE_HANDBER_NUMBER response with the appropriate error.

The handover number allocated will otherwise be returned to MSC-B in the MAP_SEND_HANDBER_REPORT request.

The handover number will be reserved until a MAP_SEND_HANDBER_REPORT confirmation is received from MSC-B.

19.2.5.2 SDL Diagrams

The SDL diagrams on the following pages describe the user processes in VLR for the procedures described in this subclause.

The services used are defined in subclause 8.4.

Process VLR_B_HO

19.2.5_1.1(2)

Figure 19.2.5/1

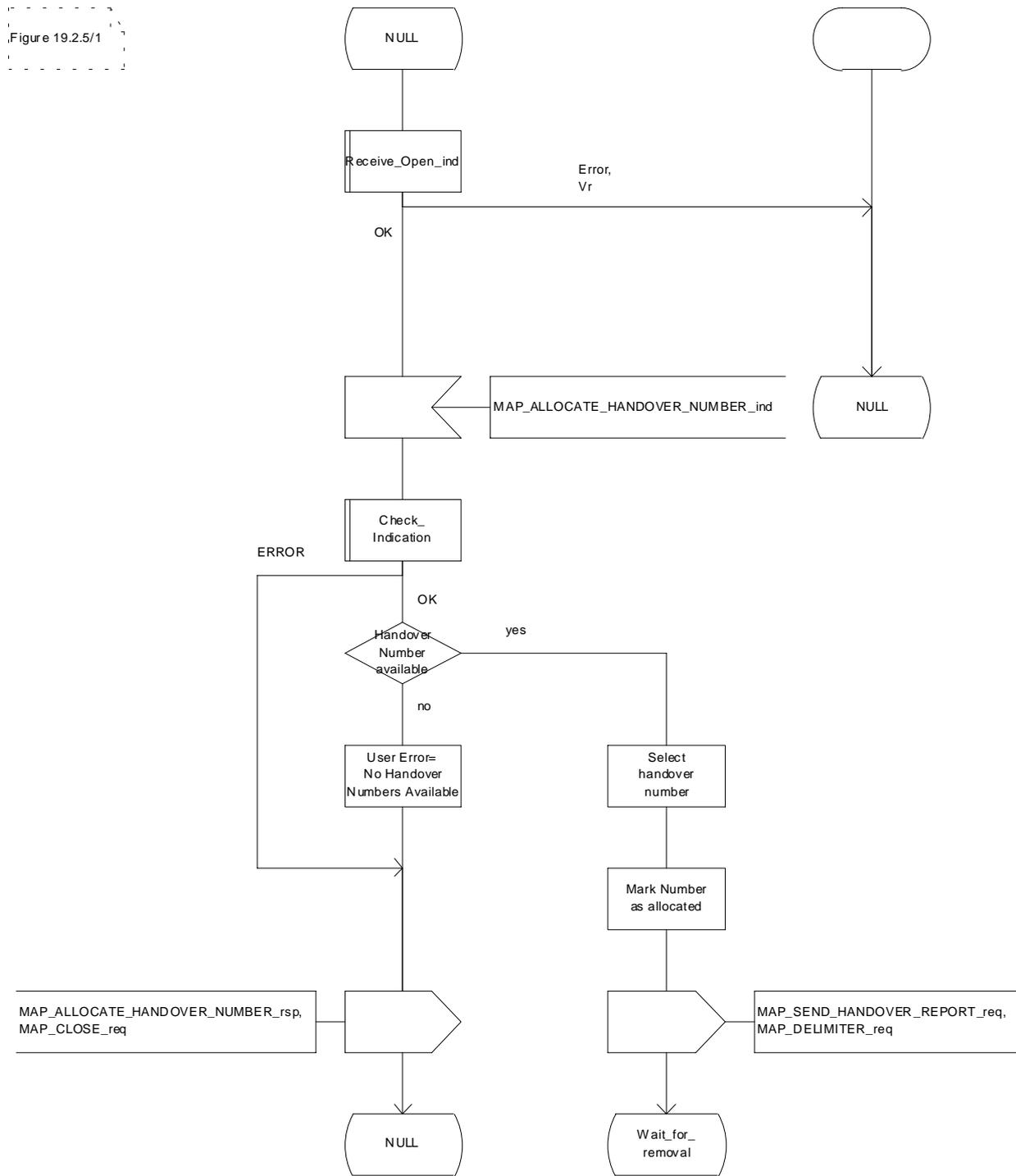


Figure 19.2.5/1 (sheet 1 of 2): Process VLR_B_HO

Figure 19.2.5/1

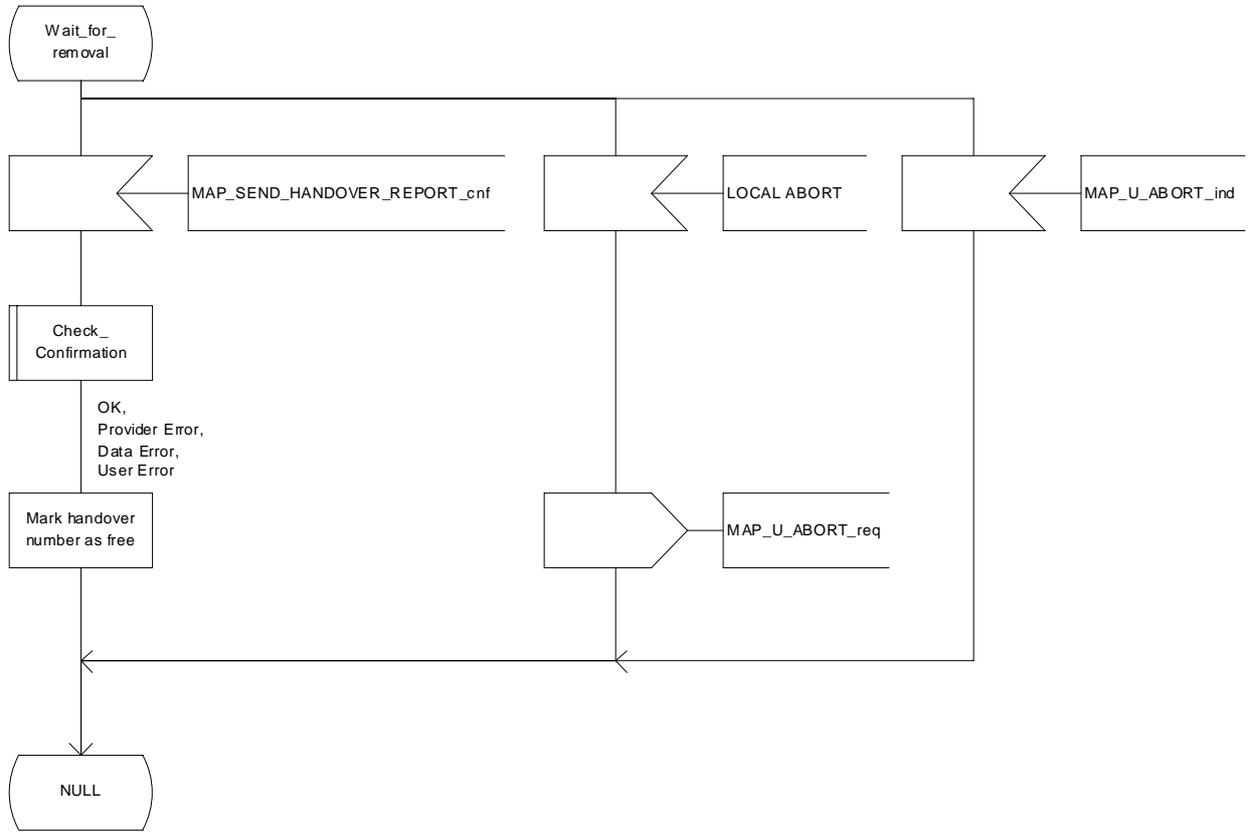


Figure 19.2.5/1 (sheet 2 of 2): Process VLR_B_HO

19.3 Fault recovery procedures

After a fault of a location register, the fault recovery procedures ensure that the subscriber data in the VLR or in the SGSN become consistent with the subscriber data that are stored in the HLR for the MS concerned and that the location information in HLR, VLR and SGSN reflect accurately the current location of the MS.

The detailed specification of fault recovery procedures of location registers is given in GSM 03.07.

19.3.1 VLR fault recovery procedures

The following processes are involved with the restoration of one IMSI record in the VLR:

- In case of a location registration request from the MS:
 - Update_Location_Area_VLR subclause 19.1.1.3;
 - Update_Location_HLR subclause 19.1.1.4.
- In case of a mobile terminated call:
 - PRN_VLR subclause 21.2.4;
 - RESTORE_DATA_VLR subclause 21.2.4;
 - RESTORE_DATA_HLR subclause 19.3.3;
 - ICS_VLR subclause 21.3.3.

After a restart, the VLR shall erase all IMSI records affected by the failure and shall cause all affected TMSIs and all affected LMSIs to become invalid. There will be no subscriber data or location information stored for an affected MS until after the VLR has received either a MAP_PROVIDE_ROAMING_NUMBER indication or a MAP_UPDATE_LOCATION_AREA indication for that MS. Restoration of subscriber data in the VLR is triggered individually for each IMSI record by receipt of either of these indications.

Reception of either a MAP_UPDATE_LOCATION_AREA indication or a MAP_PROVIDE_ROAMING_NUMBER indication with an IMSI that is unknown in the VLR causes creation of a skeleton IMSI record that is marked as:

- not confirmed by radio contact by the indicator "Confirmed by Radio Contact" (The function of this indicator is described in GSM 03.07), and
- not confirmed by HLR by the indicator "Confirmed by HLR" (The function of this indicator is described in GSM 03.07).

A third indicator "Location Information Confirmed in HLR" is allocated to each IMSI record in the VLR (The function of this indicator is described in GSM 03.07).

The indicator "Location Information Confirmed in HLR" shall be checked whenever authenticated radio contact with an MS has been established. The status "Not Confirmed" of this indicator shall force the VLR to invoke the MAP_UPDATE_LOCATION service but it shall never cause rejection of a mobile originated request. The status is changed from "Not Confirmed" to "Confirmed" only after successful completion of a MAP_UPDATE_LOCATION procedure for the MS concerned.

If the VLR serves only one MSC, the indicator "Location Information Confirmed in HLR" is only relevant to the HLR restoration procedure and an initial value must be assigned when an IMSI record is created in the VLR:

- if the IMSI record was created due to a roaming number request, the initial value must be set to "Confirmed";
- if reception of a MAP_UPDATE_LOCATION_AREA indication causes creation of the IMSI record, the initial value must be "Not Confirmed".

If the VLR serves more than one MSC, the indicator "Location Information Confirmed in HLR" is used in the VLR restoration procedure as well as in the HLR restoration procedure. When an IMSI record is created in the VLR, the indicator must be set to "Not Confirmed".

VLR restoration triggered by a location registration request

Upon receipt of a MAP_UPDATE_LOCATION_AREA indication, the VLR retrieves authentication data from the HLR by using the MAP_SEND_AUTHENTICATION_INFO service if authentication is required and if no authentication data are available in the VLR for the IMSI concerned (see figure 19.1.1/6).

Receipt of a MAP_UPDATE_LOCATION_AREA indication for an MS whose IMSI is unknown in the VLR or whose data stored in the VLR are marked as "Not Confirmed" by the indicator "Confirmed by HLR" and/or by the indicator "Location Information Confirmed in HLR" forces the VLR to invoke the MAP_UPDATE_LOCATION service after successful authentication, if required. The location updating procedure is performed as described in subclause 19.1.

Any other mobile originated request from an MS whose IMSI is unknown in the VLR or whose subscriber data stored in the VLR are marked as "Not Confirmed" by the indicator "Confirmed by HLR" shall be rejected with error cause "Unidentified Subscriber". This causes the MS to trigger the location registration procedure.

After successful completion of the MAP_UPDATE_LOCATION procedure, the indicators "Confirmed by HLR" and "Location Information Confirmed in HLR" are set to "Confirmed".

The indicator "Confirmed by Radio Contact" is set to "Confirmed" when the radio contact with the MS is authenticated.

VLR restoration triggered by a roaming number request

Figure 19.3/1 illustrates the signalling sequence for restoration of an IMSI record in the VLR triggered by a mobile terminating call set-up.

Upon receipt of a MAP_PROVIDE_ROAMING_NUMBER indication for an IMSI that is unknown in the VLR and for which authentication is required, the VLR retrieves authentication data from the HLR by using the MAP_SEND_AUTHENTICATION_INFO service after an MSRN has been sent to the HLR in the MAP_PROVIDE_ROAMING_NUMBER response.

Receipt of a MAP_PROVIDE_ROAMING_NUMBER indication for an MS whose IMSI is unknown in the VLR or whose data record in the VLR is marked as "Not Confirmed" by the indicator "Confirmed by HLR" forces the VLR to request subscriber data from the HLR by sending a MAP_RESTORE_DATA request which triggers one or more INSERT_SUBSCRIBER_DATA operations from the HLR. The MAP_RESTORE_DATA request may also be used to send the LMSI to the HLR.

The MAP_RESTORE_DATA process in the VLR is described in subclause 21.2.4.

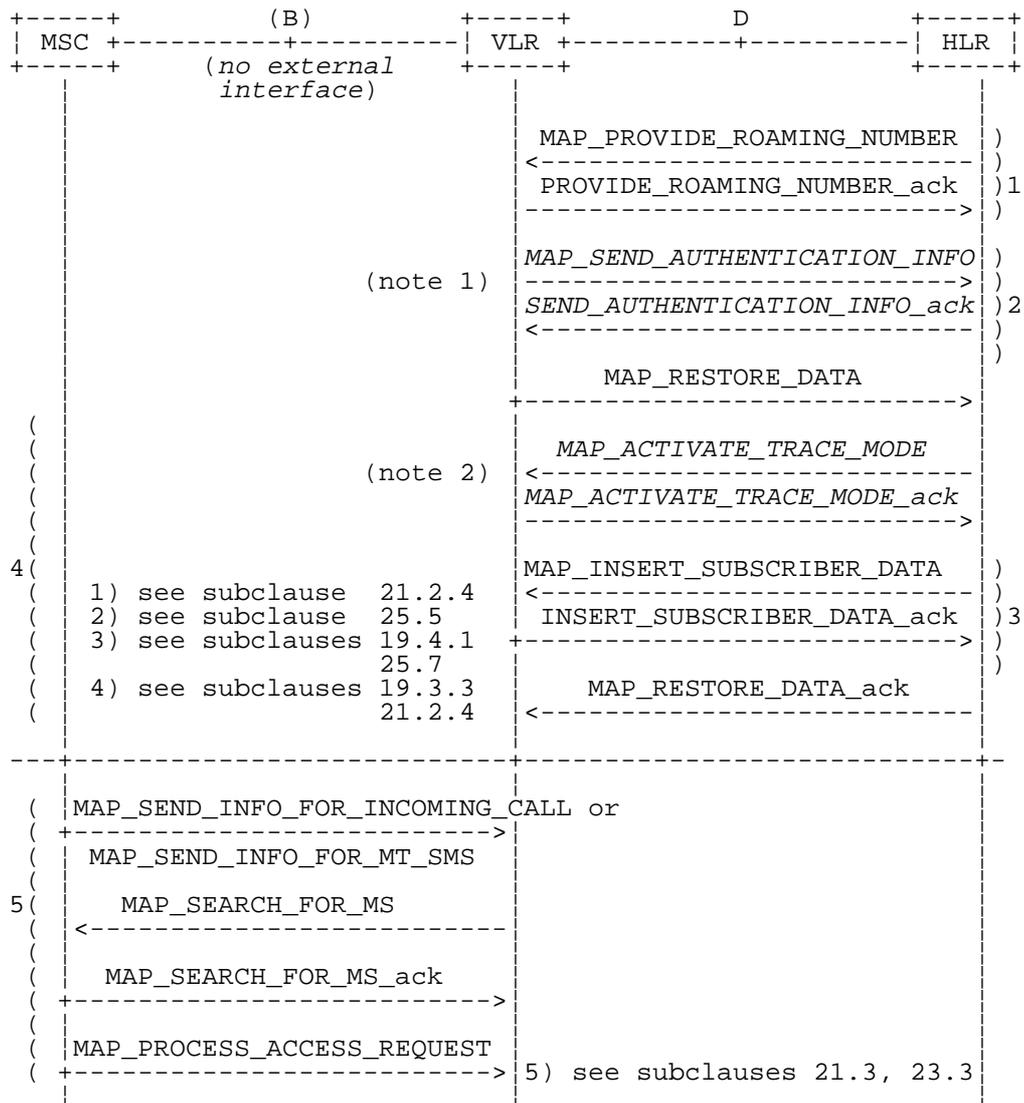
The MAP_RESTORE_DATA process in the HLR is described in subclause 19.3.3.

After successful completion of the MAP_RESTORE_DATA procedure, the indicator "Confirmed by HLR" is set to "Confirmed".

If restoration of an IMSI record was triggered by a MAP_PROVIDE_ROAMING_NUMBER indication (i.e. by a mobile terminating call), the VLR has no valid Location Area Identity information for the MS concerned before successful establishment of the first authenticated radio contact. Upon receipt of a MAP_SEND_INFO_FOR_INCOMING_CALL indication from the MSC (see 5 in figure 19.3/1) for an MS whose subscriber data are marked as "Confirmed" by the indicator "Confirmed by HLR" but not confirmed by radio contact, the VLR shall invoke a "MAP_SEARCH_FOR_MS" instead of a "MAP_PAGE".

A MAP_SEARCH_FOR_MS shall also be performed if the VLR receives a MAP_SEND_INFO_FOR_MT_SMS indication from the MSC for an MS whose IMSI record is marked as "Confirmed" by the indicator "Confirmed by HLR" but not confirmed by radio contact.

The indicator "Confirmed by Radio Contact" is set to "Confirmed" when authenticated radio contact caused by a mobile originated or a mobile terminated activity is established.



NOTE 1: If authentication required.

NOTE 2: If subscriber tracing active in HLR.

Figure 19.3/1: Procedures related to restoration of VLR in case of mobile terminated call set-up

19.3.2 HLR fault recovery procedures

The following processes are involved with the restart of the HLR:

- HLR_RESTART subclause 19.3.2;
- REC_RESET_IN_VLR subclause 19.3.2;
- REC_RESET_IN_SGSN subclause 19.3.2.

In the case of a location registration request from the MS, the following processes are involved with the HLR restoration procedure:

- Update_Location_Area_VLR subclause 19.1.1.3;
- Update_Location_HLR subclause 19.1.1.4;
- Update_GPRS_Location_HLR subclause 19.1.1.4;
- GPRS_Update_Location_Area_VLR subclause 19.1.1.3;
- SGSN_Update_HLR subclause 19.1.1.8.

In the case of a mobile originated service request, the

- Macro_Process_Access_Request_VLR subclause 25.4.2; and the
- Process_Update_Location_HLR subclause 19.1.1.4,

are involved with the HLR restoration procedure.

For the HLR, periodic back-up of data to non-volatile memory is mandatory.

Data that have been changed in the period of time after the last back-up storage and before the restart of the HLR cannot be recovered by reload from the non-volatile memory. Therefore, a restoration procedure is triggered individually for each IMSI record that has been affected by the HLR fault at the first authenticated radio contact that is established with the MS concerned.

The HLR restoration procedure forces updating of MSC number, VLR number, SGSN number and, if provided by the VLR, LMSI in the HLR. Consistency of subscriber data that are stored in the VLR or in the SGSN for an MS that has been affected by a HLR fault with the subscriber data stored in the HLR for this MS will be achieved.

As an implementation option, a notification can be forwarded to the MS to alert the subscriber to check the parameters for supplementary services that allow subscriber controlled input (MAP_FORWARD_CHECK_SS_INDICATION service). If the VLR receives this notification from the HLR it shall forward the notification to the MS. If the Gs-interface is present the VLR shall not forward this notification.

Figures 19.3/2 and 19.3/9 illustrates the signalling sequence for HLR restoration.

After a restart, the home location register performs the following actions for the subscriber data records that have been affected by the HLR fault (see figure 19.3/3):

- reload all data from the non-volatile back-up;
- if the MAP_FORWARD_CHECK_SS_INDICATION service is implemented, mark each subscriber record "SS Check Required" by setting the "Check SS" indicator;
- set subscriber tracing deactive in the VLR for each of its Mss;
- reset the "MS Purged" flag for each of its MSs;
- send a MAP_RESET request to the VLRs where its MSs are located (see figure 19.3/4).
- send a MAP_RESET request to the SGSNs where its MSs are located (see figure 19.3/7).

The MAP_RESET request contains the HLR number and optionally the HLR Identity List.

When receiving a MAP_RESET indication, the VLR or the SGSN will derive all involved MSs of that HLR either from the HLR Identity List (if present), or from the HLR number. The VLR or the SGSN will then mark these MSs with the indicator "Location Information Confirmed in HLR" set to "Not Confirmed" and will deactivate all subscriber tracings for these Mss (see figures 19.3/5 and 19.3/8).

The status "Not Confirmed" of the indicator "Location Information Confirmed in HLR" forces the VLR to invoke the MAP_UPDATE_LOCATION service after establishment of authenticated radio contact with the MS concerned.

Also the status "Not Confirmed" of the indicator "Location Information Confirmed in HLR" forces the SGSN to invoke the MAP_UPDATE_GPRS_LOCATION service after establishment of authenticated radio contact with the MS concerned.

The MAP_UPDATE_LOCATION procedure is performed as described in subclause 19.1.

After receipt of the MAP_UPDATE_LOCATION or the MAP_UPDATE_GPRS_LOCATION acknowledge containing the HLR number, the status of the indicator "Location Information Confirmed in HLR" is changed to "Confirmed".

If the MAP_UPDATE_LOCATION procedure is unsuccessful for any reason, the status of the indicator "Location Information Confirmed in HLR" remains unchanged except for the case that the IMSI record in the VLR is deleted because either of the errors "Unknown Subscriber" or "Roaming Not Allowed" has been received from the HLR in response to a MAP_UPDATE_LOCATION request.

If the MAP_UPDATE_GPRS_LOCATION procedure is unsuccessful for any reason, the status of the indicator "Location Information Confirmed in HLR" remains unchanged except for the case that the IMSI record in the SGSN is deleted because either of the errors "Unknown Subscriber" or "Roaming Not Allowed" has been received from the HLR in response to a MAP_UPDATE_GPRS_LOCATION request.

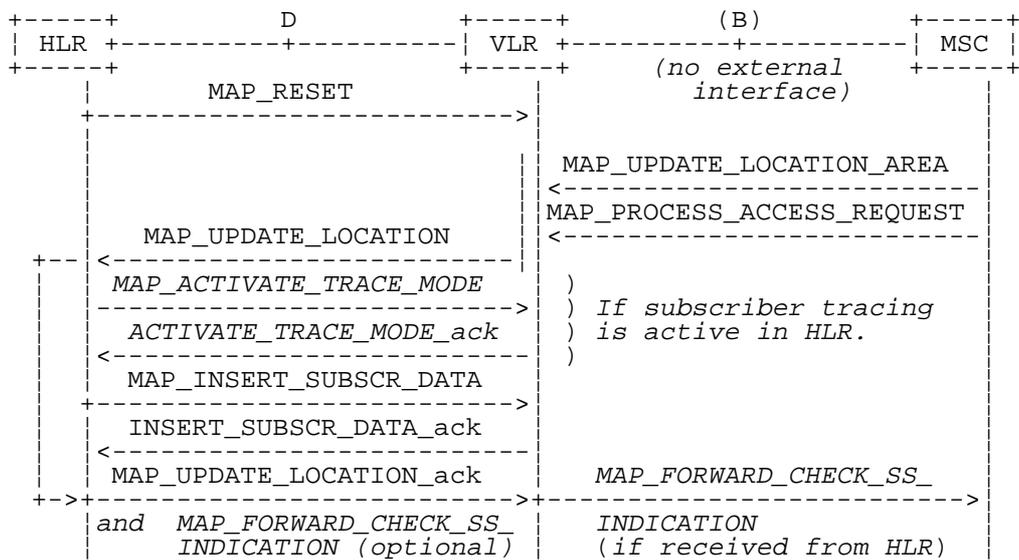


Figure 19.3/2: Procedures related to restoration of HLR

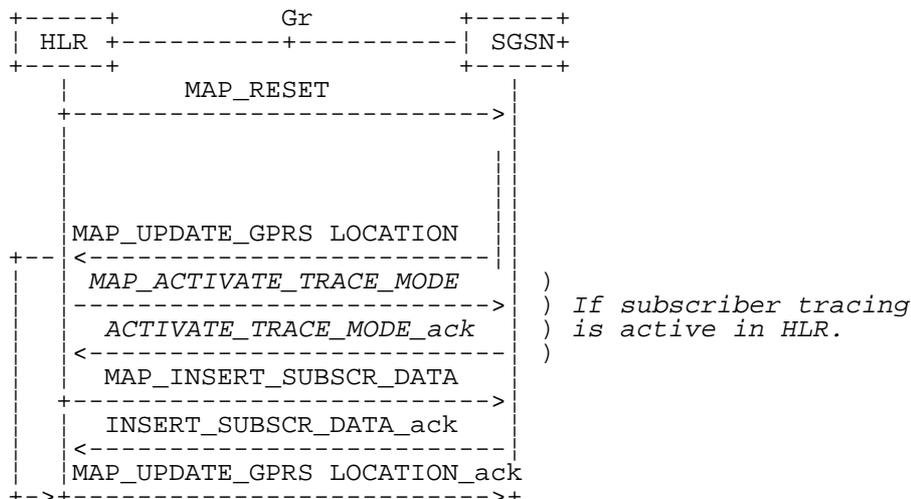


Figure 19.3/9: Procedures related to restoration of HLR for GPRS

Process HLR_RESTART

19.3_3(1)

Figure 19.3/3 Restoration of the HLR
Application process in the HLR for HLR Restart

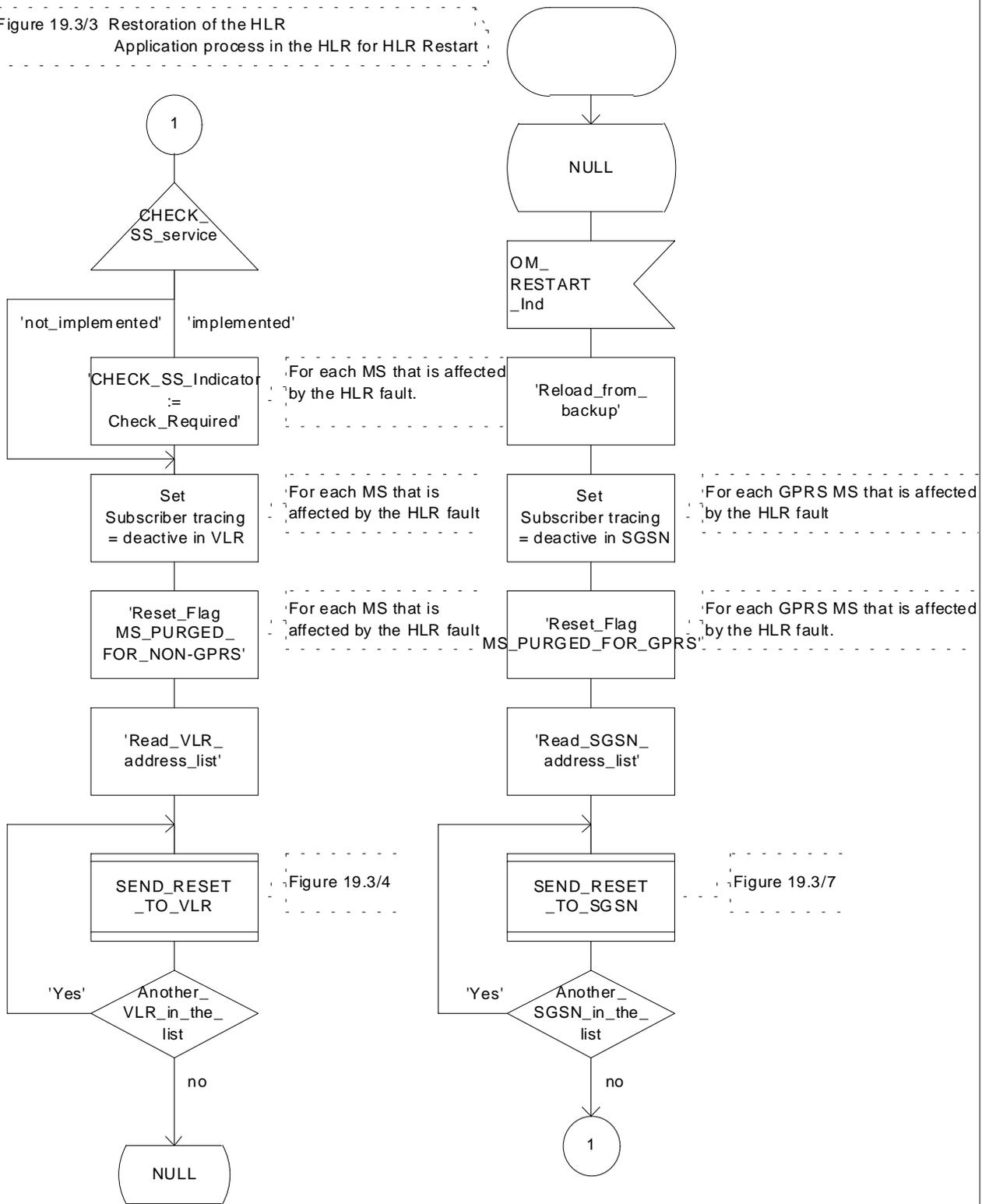


Figure 19.3/3: Process HLR_RESTART

Process SEND_RESET_TO_VLR

19.3_4(1)

Figure 19.3/4 Restoration of the HLR
Process for sending the RESET message
from HLR to VLR

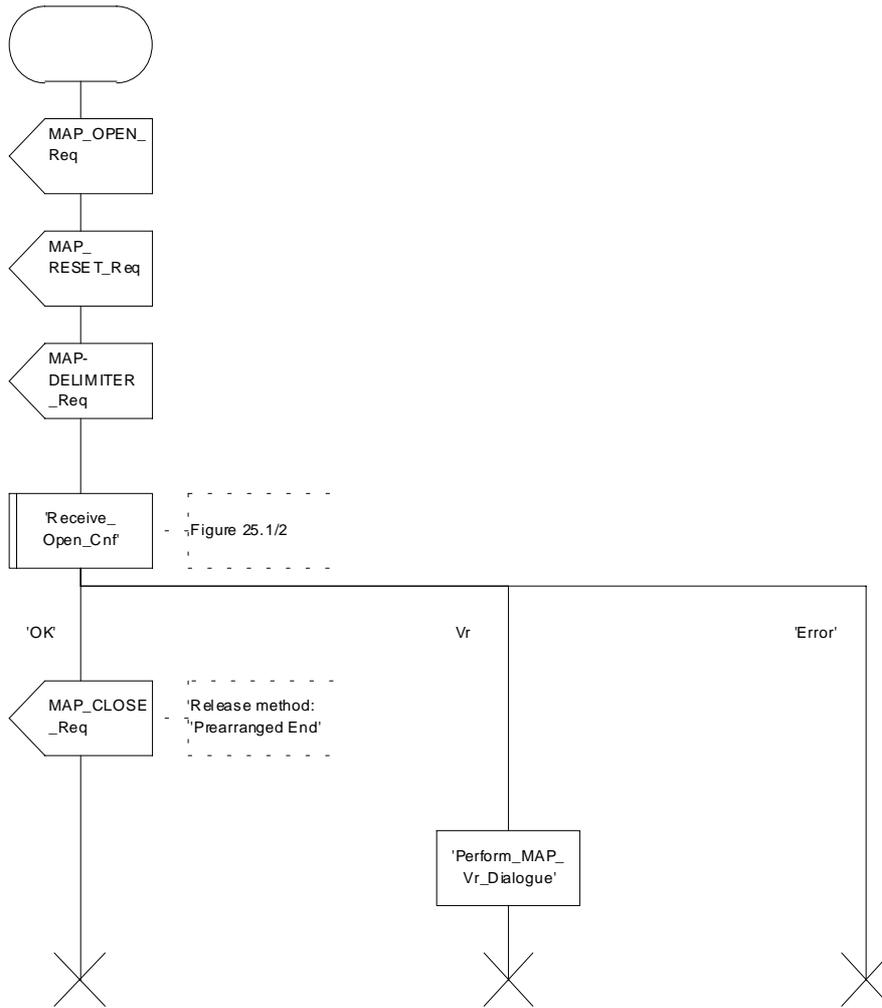


Figure 19.3/4: Process SEND_RESET_TO_VLR

Figure 19.3/5 Restoration of the HLR - Application process in the VLR for reception of the RESET message from HLR

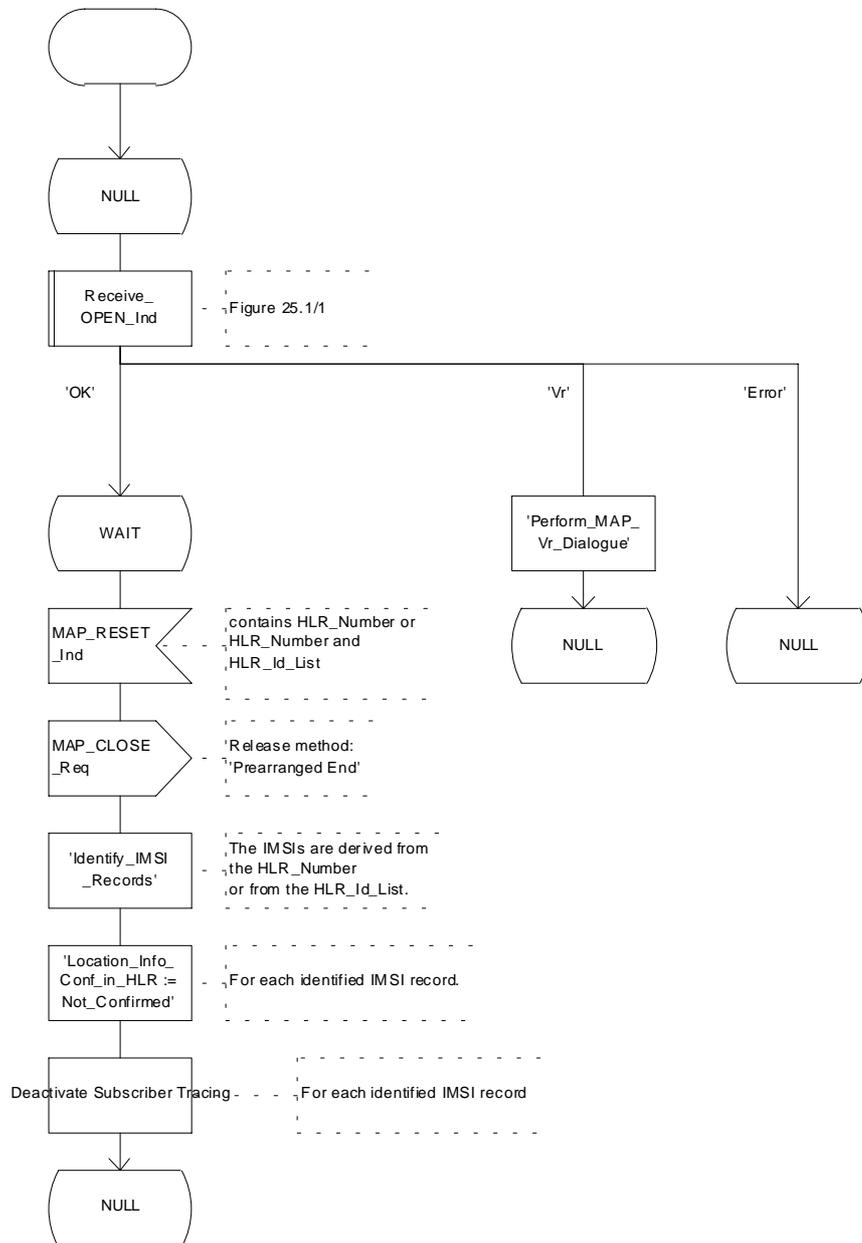


Figure 19.3/5: Process REC_RESET_IN_VLR

Process SEND_RESET_TO_SGSN

19.3_7(1)

Figure 19.3/7: Restoration of the HLR
Process for sending the RESET message
from HLR to SGSN

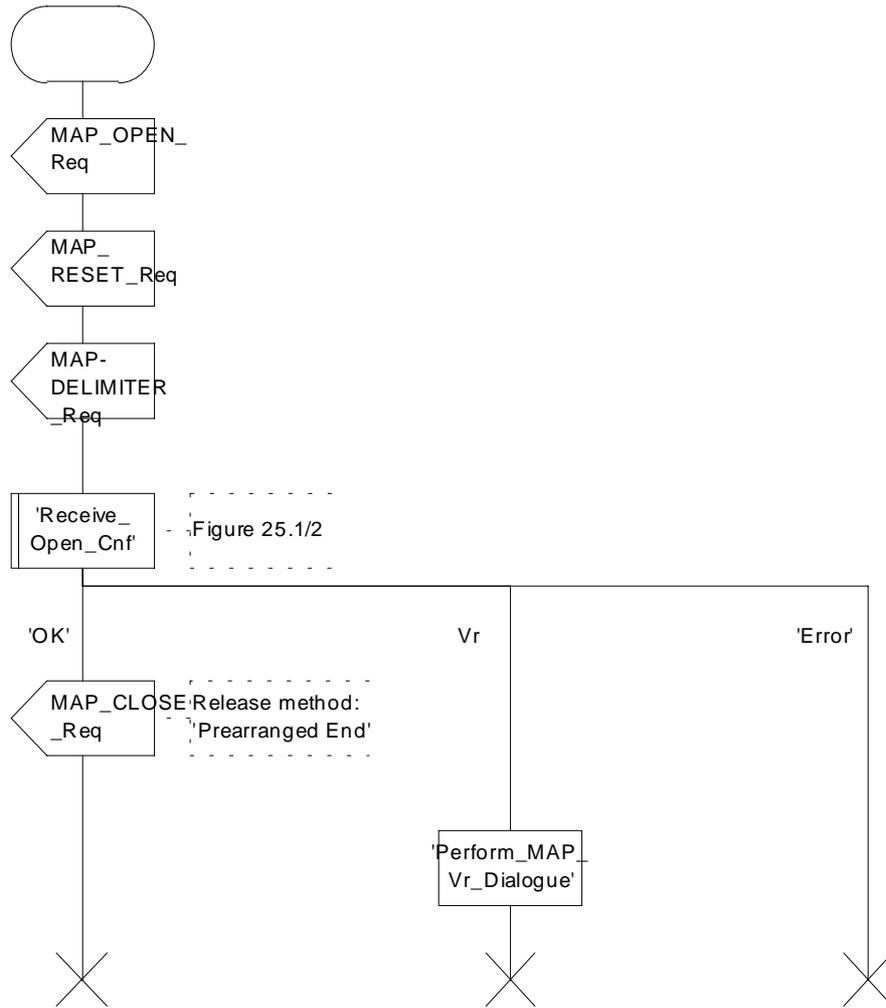


Figure 19.3/7: Process SEND_RESET_TO_SGSN

Figure 19.3/8: Restoration of the HLR - Application process in the SGSN for reception of the RESET message from HLR

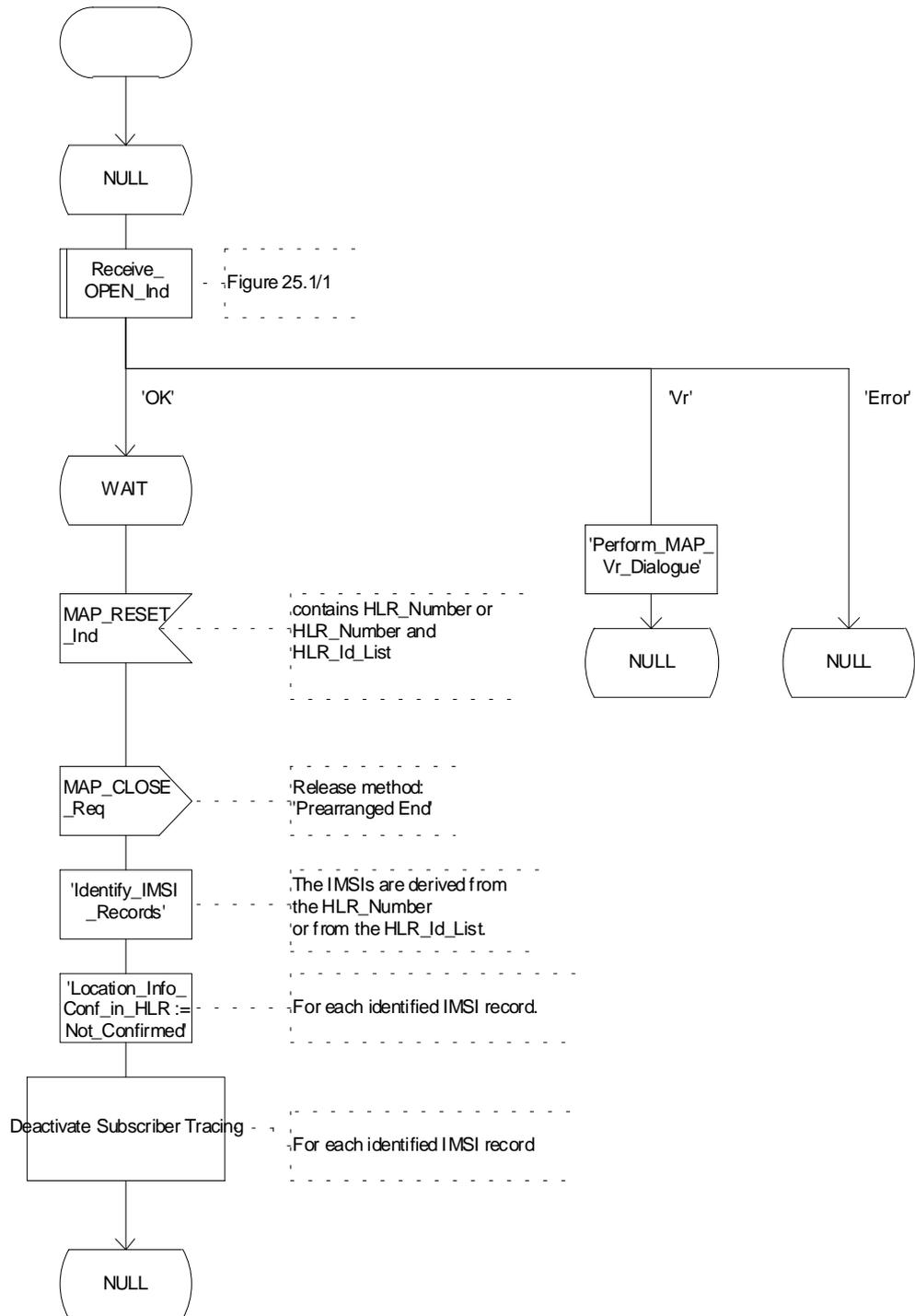


Figure 19.3/8: Process REC_RESET_IN_SGSN

Process RESTORE_DATA_HLR

19.3_6(1)

Figure 19.3/6 VLR Restoration - Application Process in the HLR

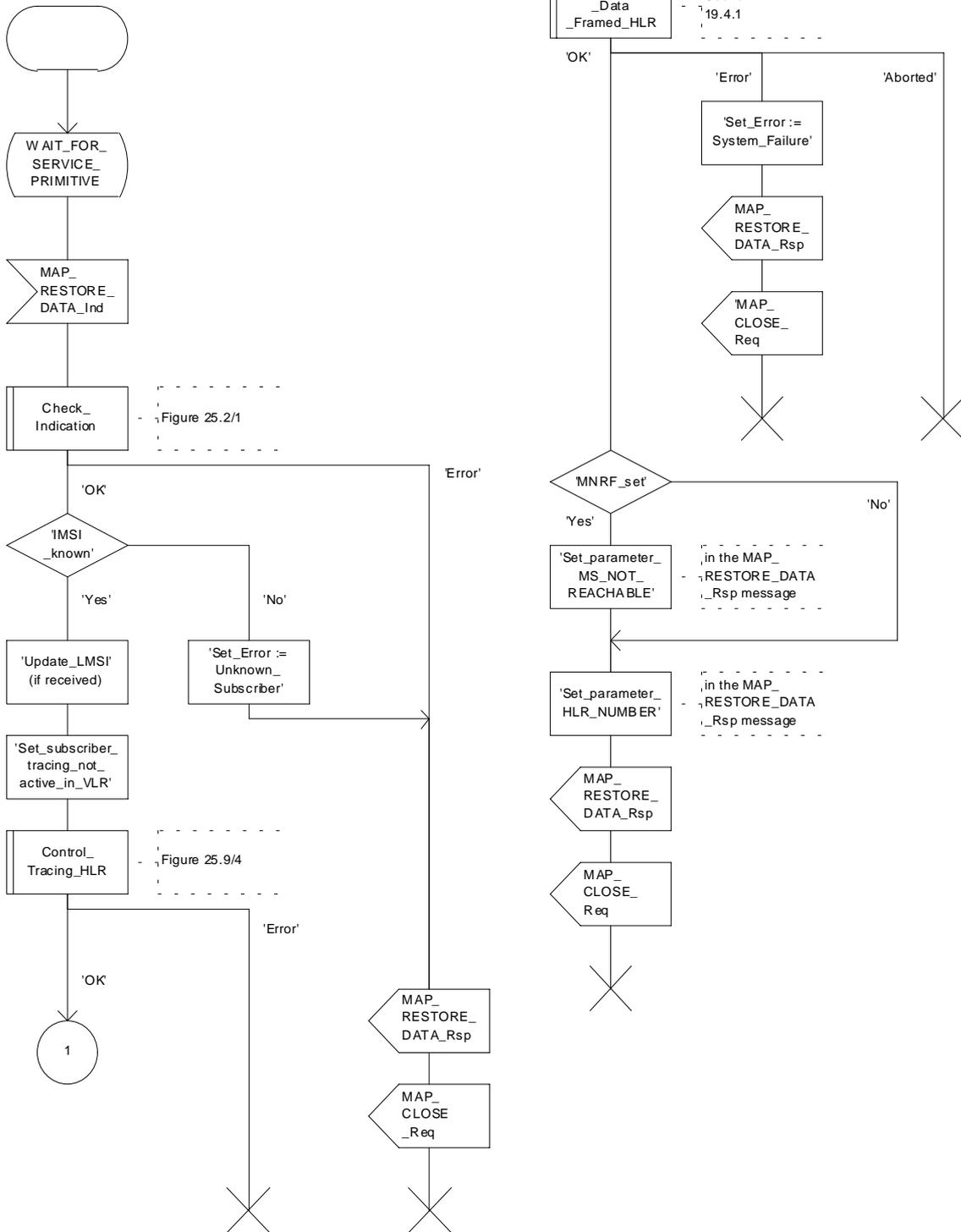


Figure 19.3/6: Process RESTORE_DATA_HLR

19.4 Macro Insert_Subscriber_Data_Framed_HLR

This macro is used by any procedure invoked in HLR which requires the transfer of subscriber data by means of the InsertSubscriberData operation (e.g. Update Location or Restore Data).

The invocation of the operation is done in a dialogue already opened by the framing procedure. Therefore the latter is the one that handles the reception of the open indication and sends the dialogue close request.

The macro calls the process "Send_Insert_Subscriber_Data" (see subclause 25.7.4) as many times as it is needed for transferring all subscriber data. This process call is meant to describe two possible behaviours of HLR to handle service requests and confirmations:

- either the HLR handles requests and confirmations in parallel; or
- the HLR sends the next request only after receiving the confirmation to the previous one.

Another call is done to the macro "Wait_for_Insert_Subscriber_Data" (see subclause 25.7.3). There the reception and handling of the service confirmations is described.

If certain services required for a subscriber are not supported by the VLR or by the SGSN (e.g. Advice of Charge Charging Level), this may result in one of the following outcomes:

- The HLR stores and sends "Roaming Restriction Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restriction Due To Unsupported Feature" is stored in the HLR, the "MSC Area Restricted Flag" shall be set to "restricted". This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR;
- The HLR stores and sends other induced subscriber data (e.g. a specific barring program) in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. This will cause rejection of mobile originated service requests, except emergency calls.
- The HLR stores and sends "Roaming Restricted in the SGSN Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restricted In SGSN Due To Unsupported Feature" is stored in the HLR, the "SGSN Area Restricted Flag" shall be set to "restricted". This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP-Context Activation;

When the VLR receives regional subscription data (Zone Code List) it may respond with "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "MSC Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR.

If the HLR neither stores "Roaming Restriction Due To Unsupported Feature" nor receives "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response, the "MSC Area Restricted Flag" in the HLR shall be set to "not restricted".

If subscriber data for CAMEL Phase 2 or 3 services are sent to a VLR which does not support CAMEL Phase 2 or 3, the service behaviour may be unpredictable or incorrect. The HLR therefore needs to ensure that at the conclusion of a location updating dialogue the data in the VLR do not require a capability that the VLR does not have. Possible mechanisms to ensure this are described in 3G TS 23.078.

The HLR should send a Forwarded-to number which is not in E.164 international format to the VLR only when the HLR has ascertained that the VLR supports CAMEL Phase 2 or higher. Thus, the ISD message containing the Forwarded-to number which is not in E.164 international format shall be sent to the VLR only after the HLR receives confirmation in the first ISD message result that CAMEL Phase 2 or higher is supported.

A Forwarded-to number non-international E.164 format shall only be sent from an HLR to a VLR if the VLR supports CAMEL Phase 2, or a subsequent phase of CAMEL.

When the SGSN receives regional subscription data (Zone Code List) it may respond with "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "SGSN Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP-Context Activation.

If the HLR neither stores "Roaming Restricted In SGSN Due To Unsupported Feature" nor receives "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response, the "SGSN Area Restricted Flag" in the HLR shall be set to "not restricted".

The SDL diagrams are shown in figures 19.4/1 and 19.4/2.

Macrodefinition Insert_SubData_Framed_HLR

19.4_1(1)

Figure 19.4/1: Macro to transfer subscriber data from HLR to VLR during an existing dialogue

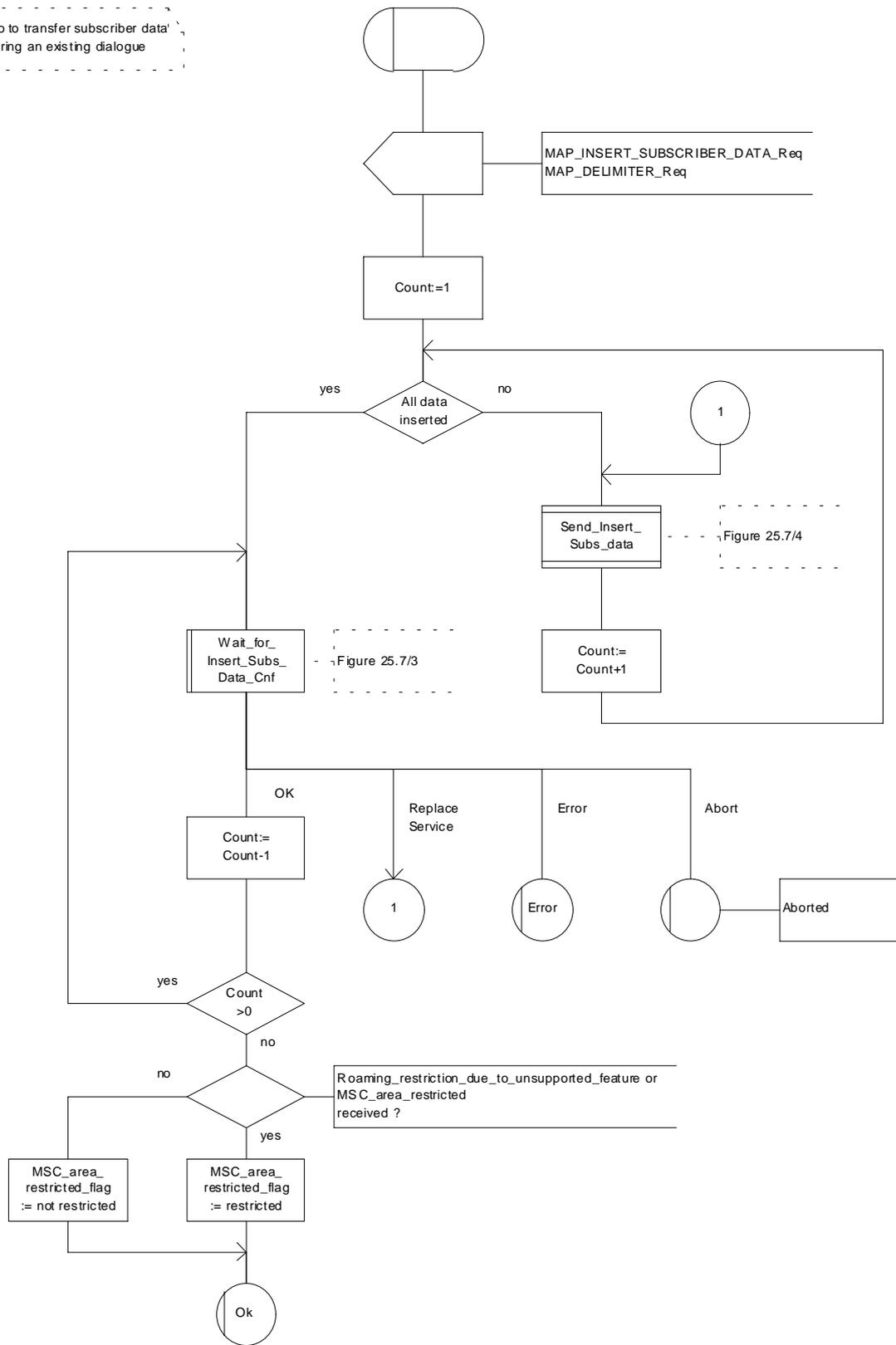


Figure 19.4/1: Macro Insert_SubData_Framed_HLR

Figure 19.4/2: Macro to transfer subscriber data from HLR to SGSN during an existing dialogue

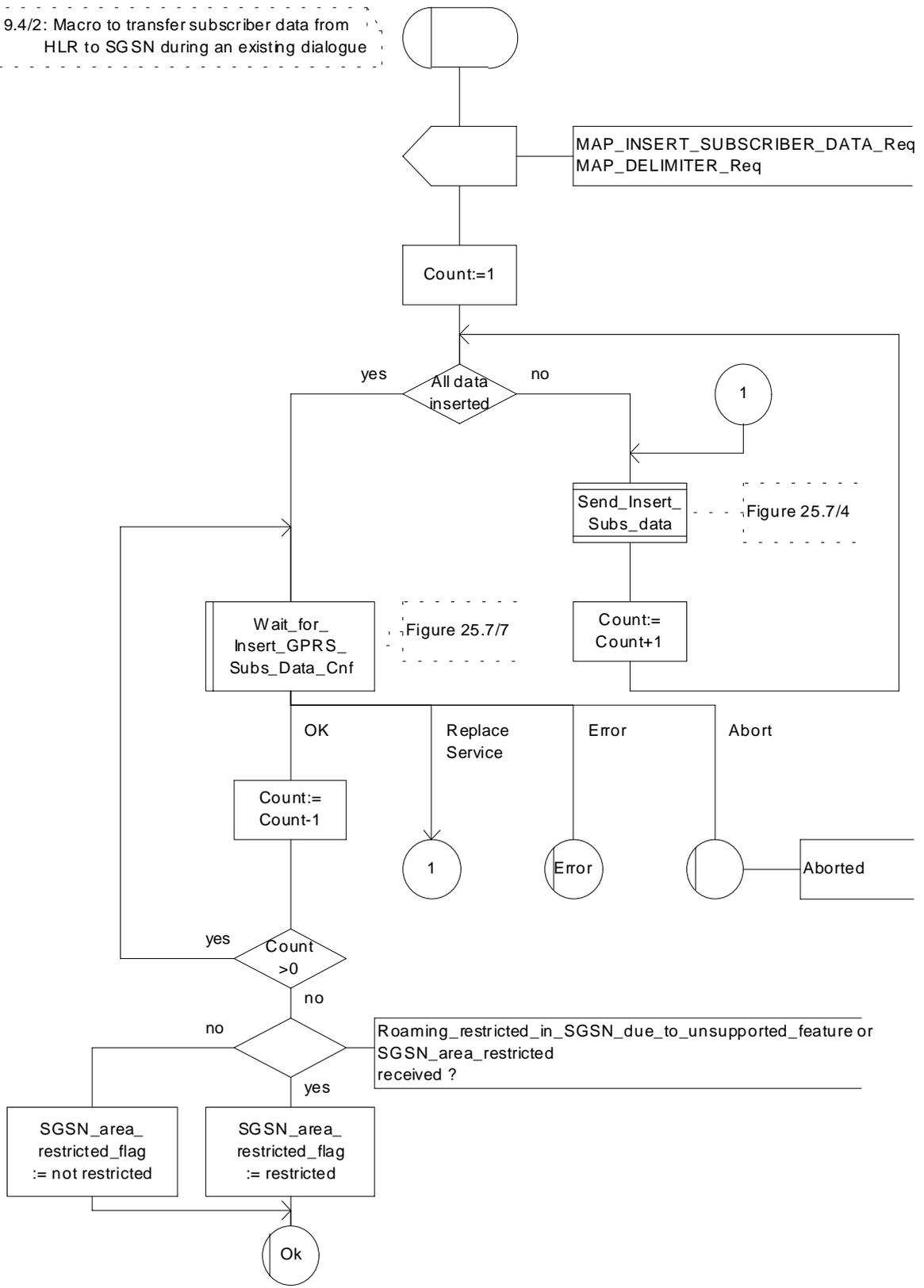


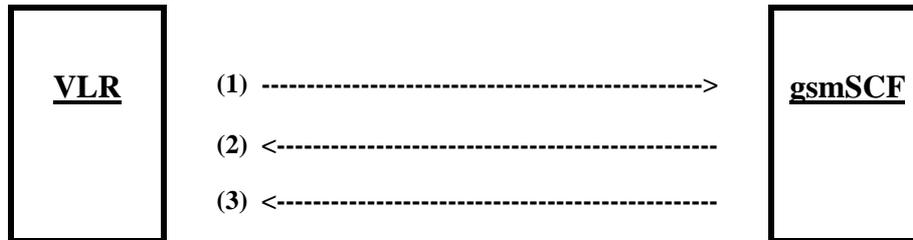
Figure 19.4/2: Macro Insert_Subs_Data_In_SGSN_Framed_HLR

19.5 Mobility Management Event notification procedure

19.5.1 General

The Mobility Management Event Notification VLR process (MMEN_VLR) is used to notify a gsmSCF about the successful completion of a Mobility Management event.

Figure 19.5/1. depicts the MAP signalling used for the event notification.



- (1) Report Mobility Management Event (VLR to gsmSCF)
- (2) Report Mobility Management Event Result (gsmSCF to VLR)
- (3) Report Mobility Management Event Error (gsmSCF to VLR)

Figure 19.5/1: Interfaces and MAP Messages for Mobility Management Event notifications

19.5.2 Process in the VLR

The Mobility Management event notification procedure in the VLR is triggered when the following conditions are fulfilled:

1. The VLR has successfully completed a Mobility Management event
2. The subscriber has a subscription to Mobility Management event notifications
3. The Mobility Management event is marked for reporting

The VLR notifies the gsmSCF of a mobility management event with the ReportMMEvent MAP message. This message is sent in a TCAP TC-BEGIN primitive. The VLR then awaits a positive result (RESULT) or a negative result (ERROR). This is received in a TCAP TC-END primitive. The Basic End procedure is used.

When the VLR has received the RESULT or ERROR, the relationship between the VLR and the gsmSCF is terminated. The relationship, if existing, is also terminated when the VLR sends a TCAP P-ABORT primitive to the calling procedure or when the VLR receives a TCAP P-ABORT or a TCAP-U-ABORT primitive from the gsmSCF.

The sending process shall indicate to the MMEN_VLR process, which Mobility Management event shall be reported to the gsmSCF.

The MMEN_VLR process is illustrated in Figure 19.5/2.

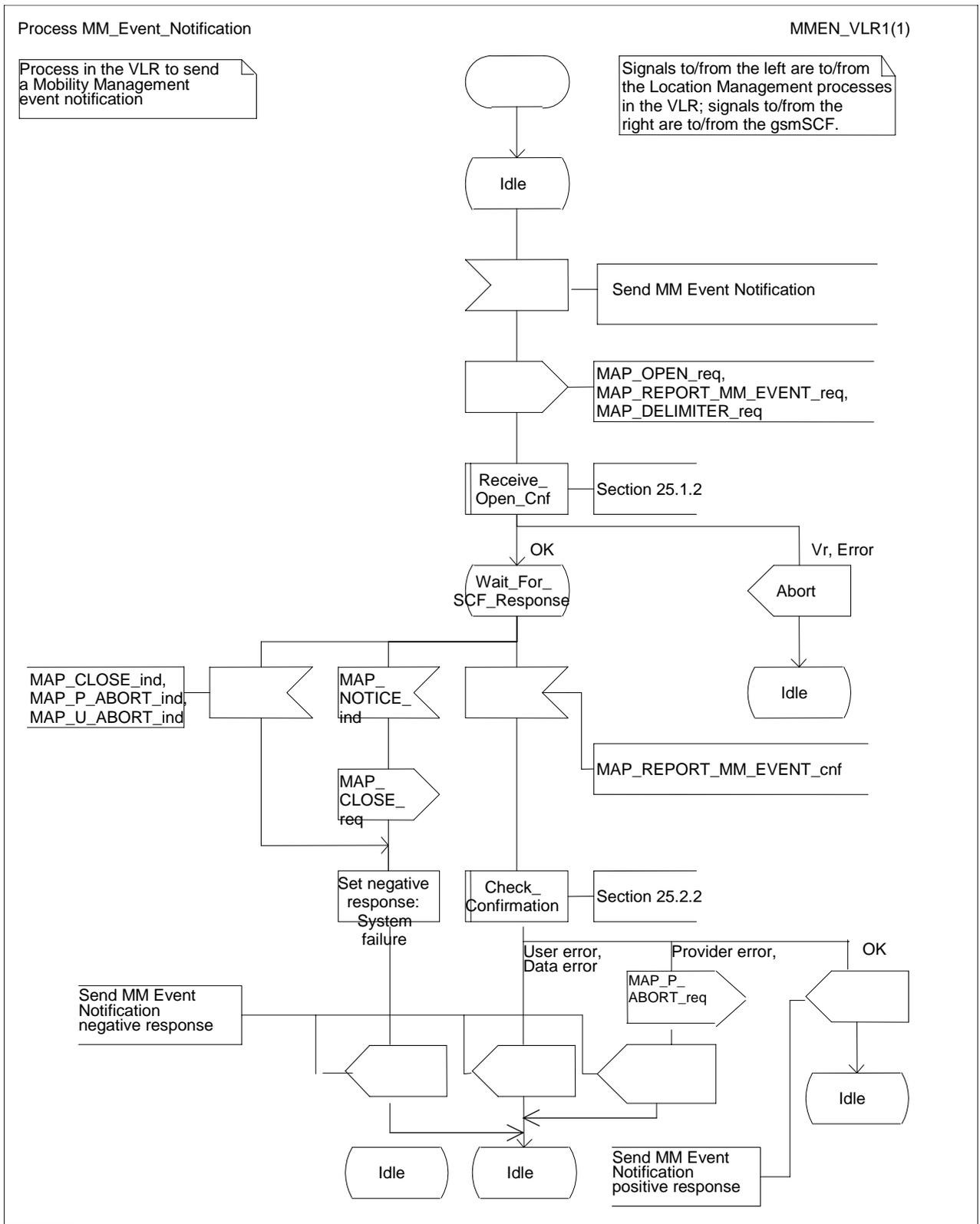


Figure 19.5/2: Process MM_Event_Notification_VLR (sheet 1 of 1)

19.5.3 Process in the gsmSCF

When the gsmSCF receives the ReportMMEvent MAP Message (in a TCAP TC-BEGIN primitive), the MM_Event_Notification_gsmSCF' (MMEN_SCF) process is started.

If the gsmSCF has validated the information it has received in the ReportMMEvent MAP Message, then it informs the Service Logic in the SCP and awaits a response.

If a positive response is received from the Service Logic, then a REPORT_MM_EVENT_RESULT is sent to the VLR.

If a negative response is received from the Service Logic, then a REPORT_MM_EVENT_ERROR is sent to the VLR.

Both RESULT and ERROR are sent in a TCAP TC-END primitive. The Basic End procedure is used.

If the Service Logic returns a User Error, then a MAP U-ABORT primitive is sent to the VLR.

The gsmSCF TCAP service may choose to abort the relationship with the VLR by sending a TCAP P-ABORT primitive to the VLR.

When the gsmSCF receives a TCAP P-ABORT primitive from the VLR, it shall immediately terminate the mobility management process.

This is illustrated in figure 19.5/3.

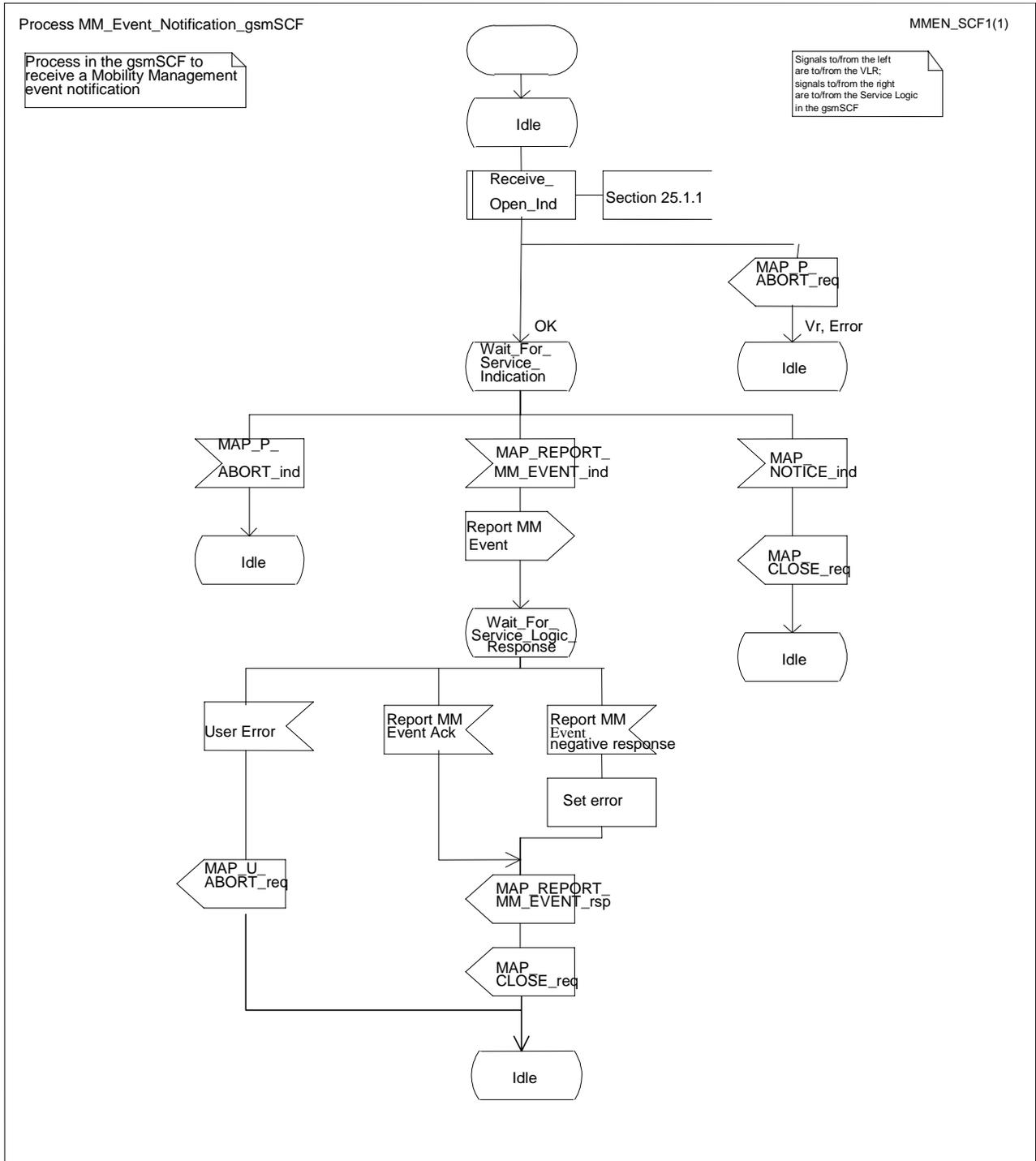


Figure 19.5/3 Process MM_Event_Notification_gsmSCF (sheet 1 of 1)

20 Operation and maintenance procedures

20.1 General

The Operation and Maintenance procedures are needed for operating and maintaining the GSM PLMN network.

The following procedures exist for operation and maintenance purposes:

- i) Tracing procedures;
- ii) Subscriber Data Management procedures;
- iii) Subscriber Identity procedures.

The following application contexts refer to complex MAP Users consisting of several processes:

- subscriberDataManagementContext;
- tracingContext.

These two application contexts need a co-ordinating process in the VLR or in the SGSN as described in the following subclauses.

20.1.1 Tracing Co-ordinator for the VLR

The MAP_OPEN indication opens the dialogue for the stand-alone tracing procedure when the application context tracingContext is received. If that service is successful, the Co-ordinator can receive the first service primitive from the MAP_PM. Depending on the received primitive, the user process is created as follows:

- if the MAP_ACTIVATE_TRACE_MODE indication is received, the process ATM_VLR_Standalone is created;
- if the MAP_DEACTIVATE_TRACE_MODE indication is received, the process DTM_VLR_Standalone is created.

After creation of the user process the Co-ordinator relays the messages between the MAP_PM and the invoked process until a request or an indication for dialogue termination is received.

The Tracing Co-ordinator is shown in the figure 20.1/1.

Process Co_Tracing_VLR

20.1_1(1)

Figure 20.1/1: Co-ordinating process for the tracing procedures in the VLR

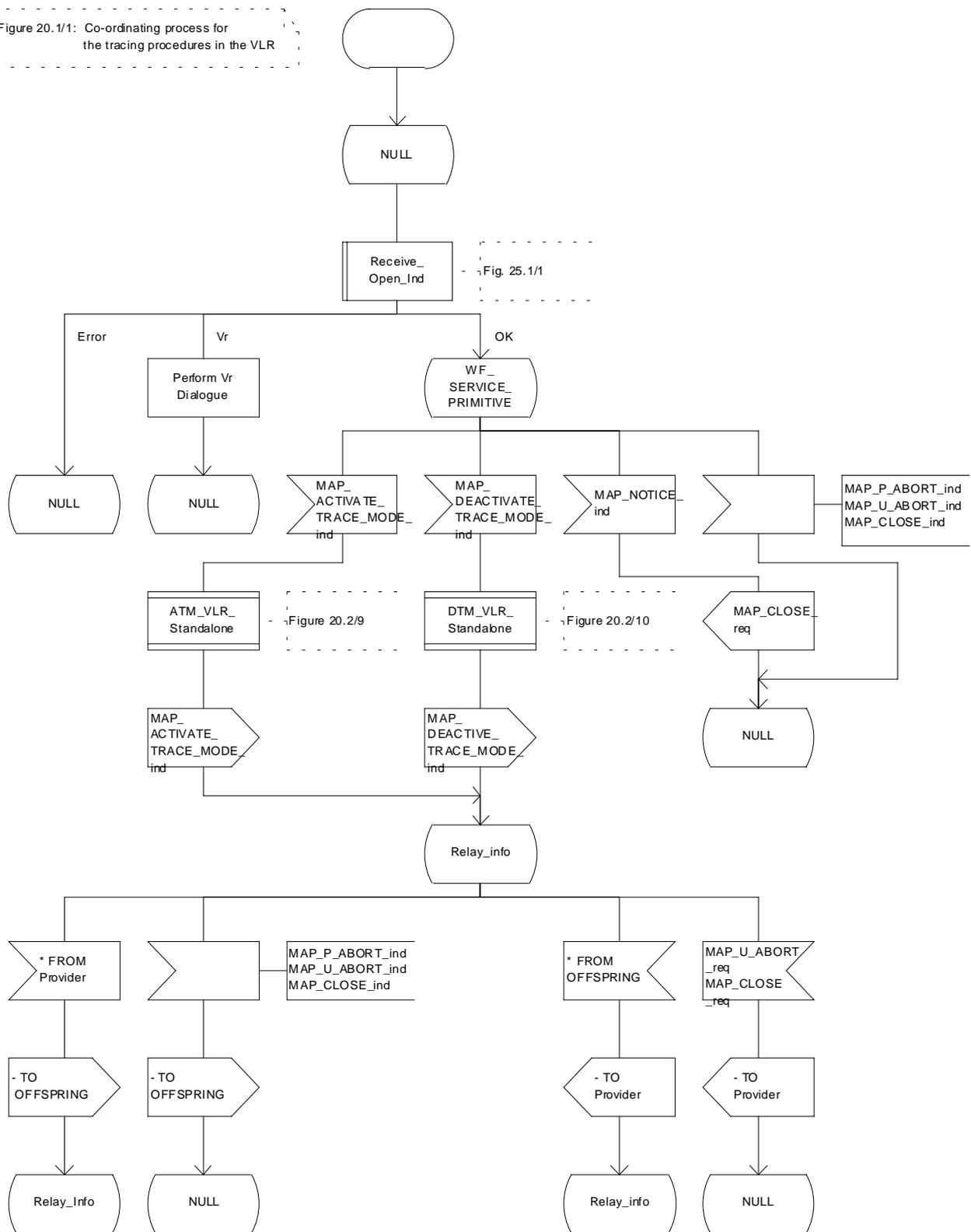


Figure 20.1/1: Process Co_Tracing_VLR

20.1.2 Subscriber Data Management Co-ordinator for the VLR

The MAP_OPEN indication opens the dialogue for the stand-alone subscriber data management procedure when the application context subscriberDataManagementContex is received. If that service is successful, the Co-ordinator can receive the firs service primitive from the MAP_PM. Depending on the received primitive, the user process is created as follows:

- if the MAP_INSERT_SUBSCRIBER_DATA indication is received, the process INS_SUBS_DATA_VLR is created;
- if the MAP_DELETE_SUBSCRIBER_DATA indication is received, the process Delete_Subscriber_Data_VLR is created.

After creation of the user process the Co-ordinator relays the messages between the MAP_PM and the invoked process until a request or an indication for dialogue termination is received.

The Subscriber_Data_Management Co-ordinator is shown in the figure 20.1/2.

Figure 20.1/2: Co data management

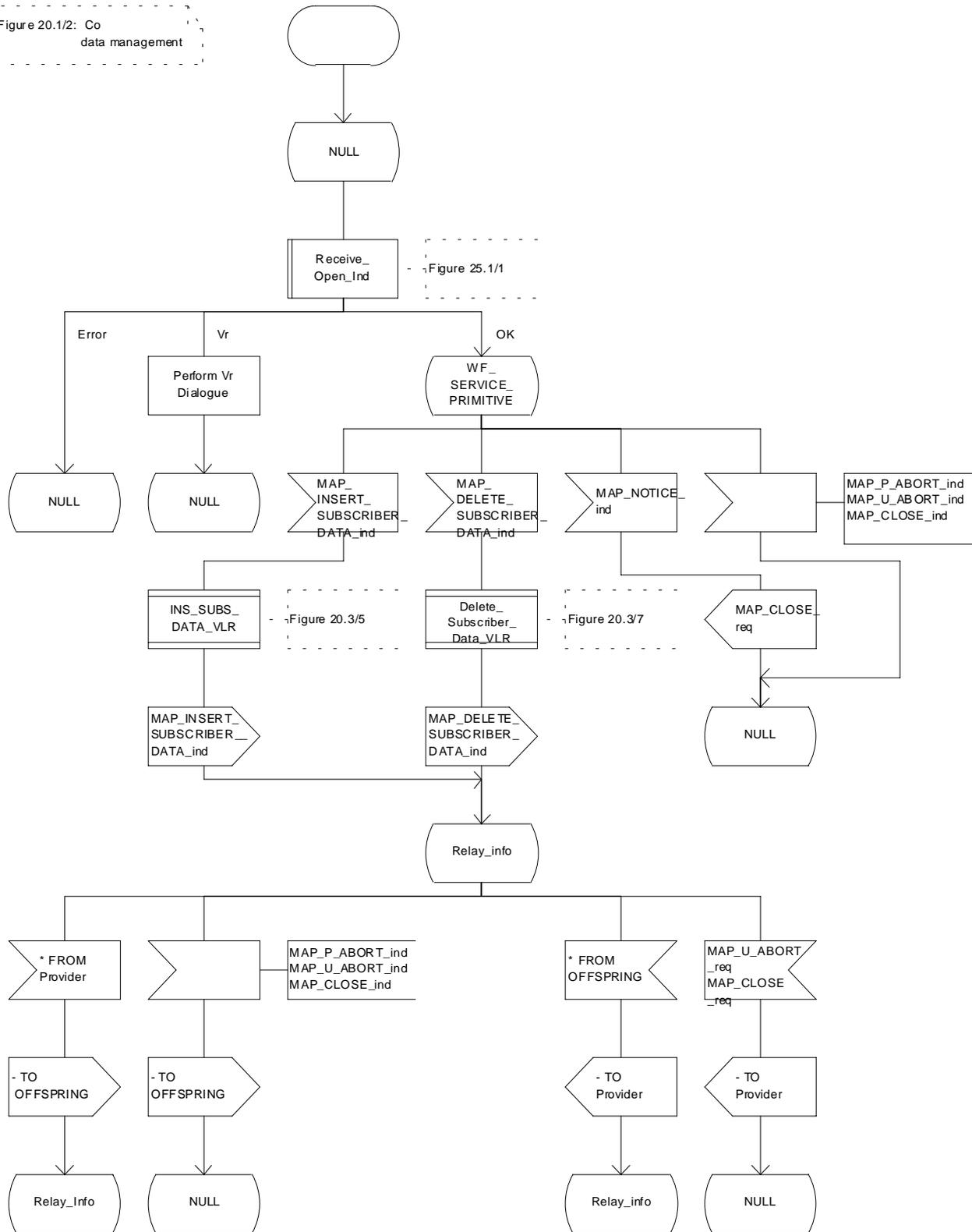


Figure 20.1/2: Process Co_Data_Management_VLR

20.1.3 Tracing Co-ordinator for the SGSN

The MAP_OPEN indication opens the dialogue for the stand-alone tracing procedure when the application context tracingContext is received. If that service is successful, the Co-ordinator can receive the first service primitive from the MAP_PM. Depending on the received primitive, the user process is created as follows:

- if the MAP_ACTIVATE_TRACE_MODE indication is received, the process ATM_SGSN_Standalone is created;
- if the MAP_DEACTIVATE_TRACE_MODE indication is received, the process DTM_SGSN_Standalone is created.

After creation of the user process the Co-ordinator relays the messages between the MAP_PM and the invoked process until a request or an indication for dialogue termination is received.

The Tracing Co-ordinator for the SGSN is shown in the figure 20.1/3.

Figure 20.1/3: Co-ordinating process for the tracing procedures in the SGSN

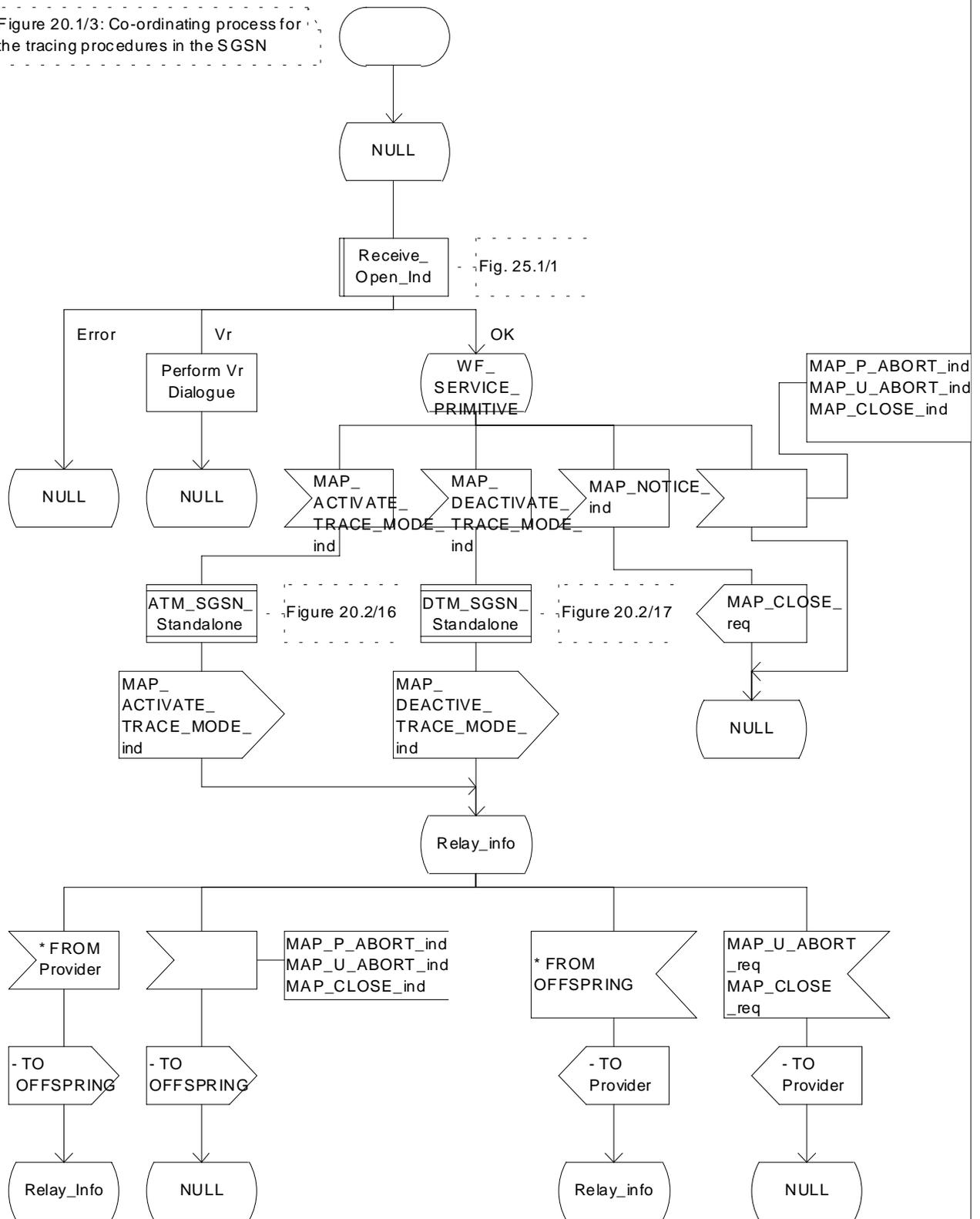


Figure 20.1/3: Process Co_Tracing_SGSN

20.1.4 Subscriber Data Management Co-ordinator for the SGSN

The MAP_OPEN indication opens the dialogue for the stand-alone subscriber data management procedure when the application context subscriberDataManagementContext is received. If that service is successful, the Co-ordinator can receive the first service primitive from the MAP_PM. Depending on the received primitive, the user process is created as follows:

- if the MAP_INSERT_SUBSCRIBER_DATA indication is received, the process INS_SUBS_DATA_SGSN is created;
- if the MAP_DELETE_SUBSCRIBER_DATA indication is received, the process Delete_Subscriber_Data_SGSN is created.

After creation of the user process the Co-ordinator relays the messages between the MAP_PM and the invoked process until a request or an indication for dialogue termination is received.

The Subscriber_Data_Management Co-ordinator is shown in the figure 20.1/4.

Figure 20.1/4: Co-ordinating process for the subscriber data management procedures in the SGSN

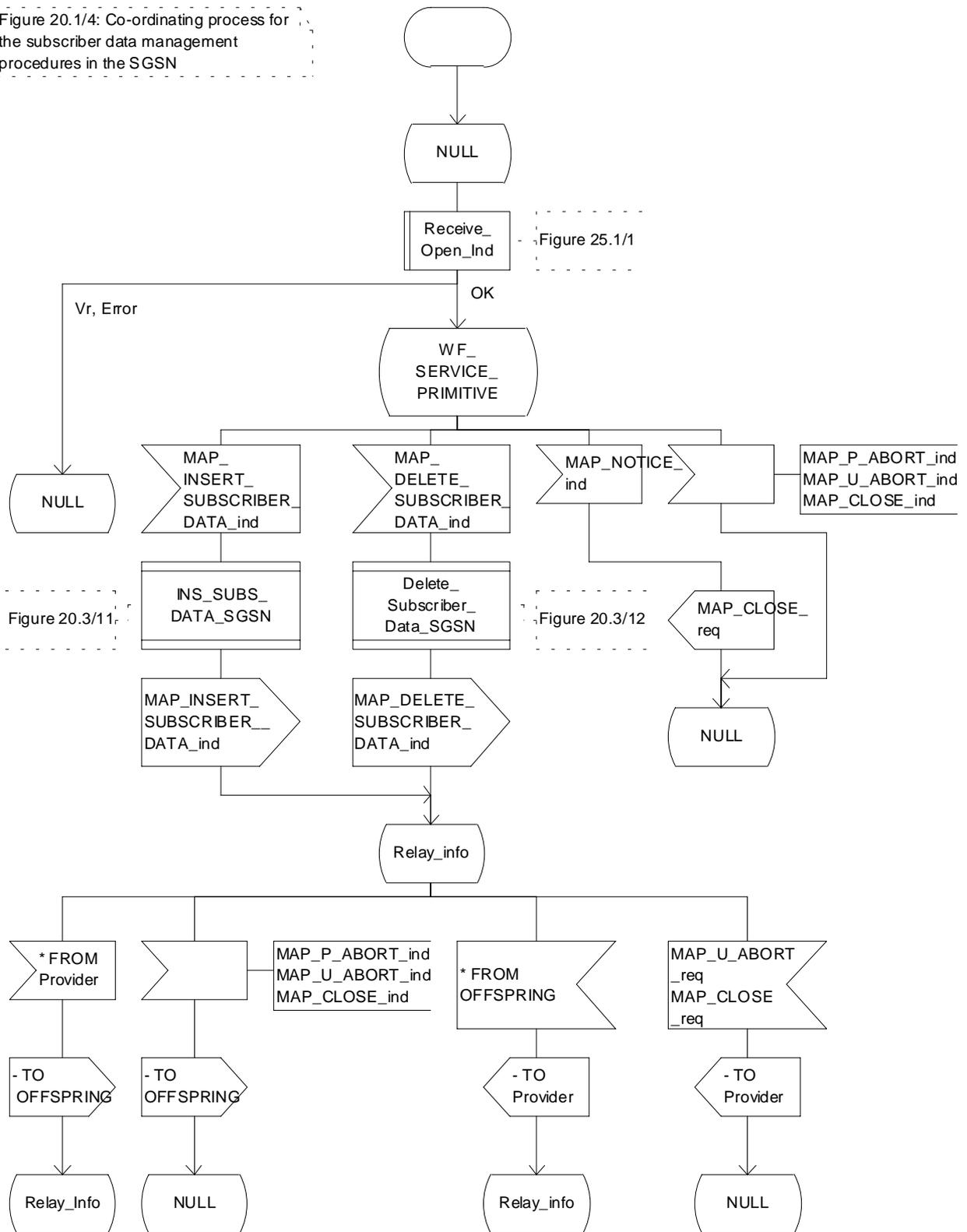


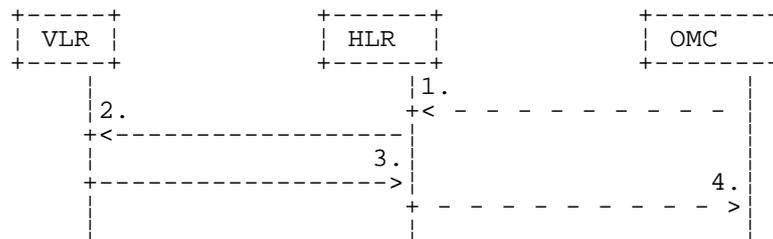
Figure 20.1/4: Process Co_Data_Management_SGSN

20.2 Tracing procedures

Three type of tracing procedures exist:

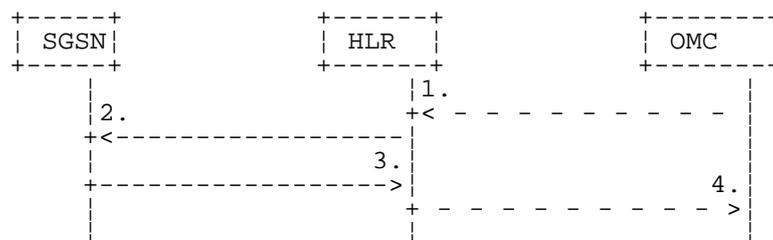
- i) Subscriber tracing management procedures;
- ii) Subscriber tracing procedures;
- iii) Event tracing procedures.

The subscriber tracing management procedures are used for management of the status and the type of the tracing. The subscriber tracing activation procedure is used at location updating or data restoration when the trace mode of a subscriber is set active in the HLR or, as a stand alone procedure, when the subscriber is already registered and the trace mode becomes active in the HLR. The procedures for providing a trace request to the VLR are shown in figures 20.2/1 and 20.2/2. The procedures for providing a trace request to the SGSN are shown in figures 20.2/11 and 20.2/12.



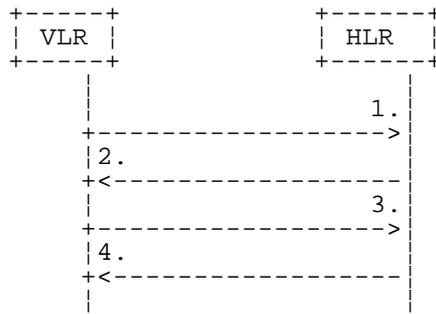
- 1) Subscriber Tracing Activation
- 2) MAP_ACTIVATE_TRACE_MODE
- 3) MAP_ACTIVATE_TRACE_MODE_ACK
- 4) Subscriber Tracing Activation Accepted

Figure 20.2/1: Stand alone subscriber tracing activation procedure



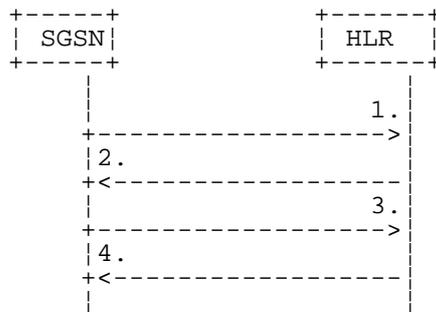
- 1) Subscriber Tracing Activation
- 2) MAP_ACTIVATE_TRACE_MODE
- 3) MAP_ACTIVATE_TRACE_MODE_ACK
- 4) Subscriber Tracing Activation Accepted

Figure 20.2/11: Stand alone subscriber tracing activation procedure for GPRS



- 1) MAP_UPDATE_LOCATION or MAP_RESTORE_DATA
- 2) MAP_ACTIVATE_TRACE_MODE
- 3) MAP_ACTIVATE_TRACE_MODE_ACK
- 4) MAP_UPDATE_LOCATION_ACK or MAP_RESTORE_DATA_ACK

Figure 20.2/2: Subscriber tracing activation procedure at location updating or data restoration

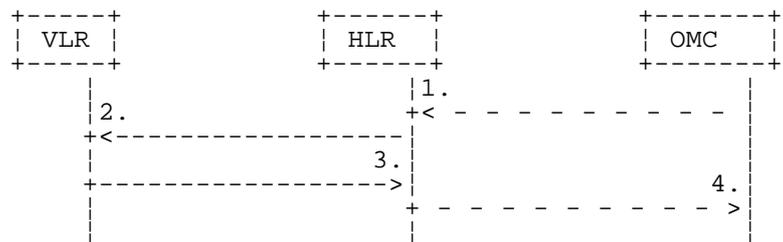


- 1) MAP_UPDATE_GPRS_LOCATION
- 2) MAP_ACTIVATE_TRACE_MODE
- 3) MAP_ACTIVATE_TRACE_MODE_ACK
- 4) MAP_UPDATE_GPRS_LOCATION_ACK

Figure 20.2/12: Subscriber tracing activation procedure at GPRS location updating

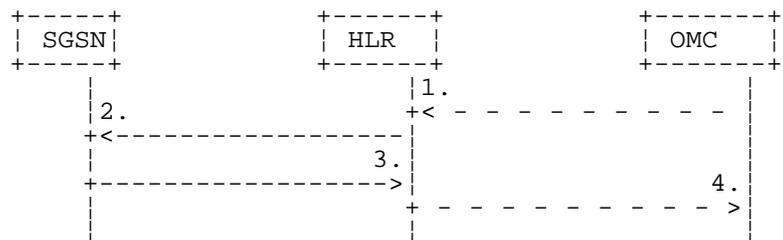
The HLR sends the trace request (IMSI, trace reference, trace type and identity of the OMC) to the VLR or to the SGSN in a MAP_ACTIVATE_TRACE_MODE request. The receipt of this primitive is acknowledged. The acknowledge primitive will indicate that the trace request is accepted by the VLR or by the SGSN. If the request is not accepted, the reason will be reported to the HLR.

The subscriber tracing deactivation procedure is used when the trace request of a subscriber is to be cancelled in the VLR or in the SGSN. The procedures is shown in figures 20.2/3 and 20.2/13.



- 1) Subscriber Tracing Deactivation
- 2) MAP_DEACTIVATE_TRACE_MODE
- 3) MAP_DEACTIVATE_TRACE_MODE_ACK
- 4) Subscriber Tracing Deactivation Accepted

Figure 20.2/3: Subscriber tracing deactivation procedure

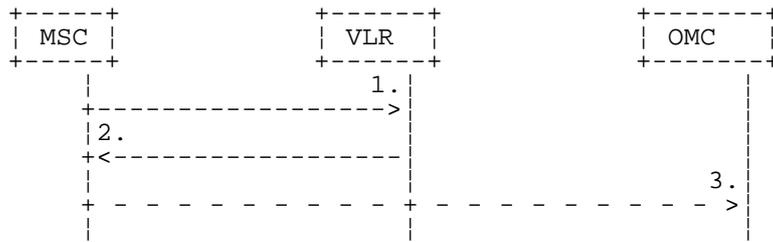


- 1) Subscriber Tracing Deactivation
- 2) MAP_DEACTIVATE_TRACE_MODE
- 3) MAP_DEACTIVATE_TRACE_MODE_ACK
- 4) Subscriber Tracing Deactivation Accepted

Figure 20.2/13: Subscriber tracing deactivation procedure for GPRS

The HLR sends a MAP_DEACTIVATE_TRACE_MODE request to the VLR or to the SGSN. The VLR or the SGSN will acknowledge the deactivation. The acknowledge primitive will indicate that the trace request has been deleted by the VLR or by the SGSN. If the deactivation is not accepted, the reason will be reported to the HLR.

The subscriber tracing procedures are used when the VLR detects any subscriber related activity for which the trace mode is activated, e.g. receives the MAP_PROCESS_ACCESS_REQUEST indication. The procedure is shown in figure 20.2/4.



- 1) MAP_PROCESS_ACCESS_REQUEST, MAP_UPDATE_LOCATION_AREA,
- 2) MAP_TRACE_SUBSCRIBER_ACTIVITY
- 3) Subscriber tracing information

Figure 20.2/4: Subscriber tracing procedure in the servicing MSC

The VLR will generate the MAP_TRACE_SUBSCRIBER_ACTIVITY indication. The receiving MSC will send the trace record to the OMC.

[Figure numbers 20.2/5 and 20.2/6 are spare.]

20.2.1 Procedures in the HLR

20.2.1.1 Subscriber tracing activation procedure

When receiving the subscriber tracing mode activation command for a subscriber from the OMC, the HLR will activate tracing, if the subscriber is known and registered in the HLR and the subscriber is roaming in the home PLMN area. The MAP_ACTIVATE_TRACE_MODE request is sent to the VLR or to the SGSN where the subscriber is registered.

If the MAP_ACTIVATE_TRACE_MODE confirmation is received indicating an error situation, the errors are mapped to the OMC interface. The activation request may also be repeated; the number of repeat attempts and the time in between are HLR operator options, depending on the error returned by the VLR or the SGSN.

If the subscriber is known in the HLR, but is deregistered or roaming outside the home PLMN area, the subscriber tracing status is activated in the HLR, but the VLR or the SGSN is not updated.

When receiving a request for location updating or data restoration while the subscriber trace mode is active, the macro Control_Tracing_HLR (see figure 25.9/4) shall be initiated by the location updating process in the HLR.

The subscriber tracing activation process in the HLR with VLR is shown in figure 20.2/7.

The subscriber tracing activation process in the HLR with SGSN is shown in figure 20.2/14.

Figure 20.2/7: The subscriber tracing activation process in the HLR

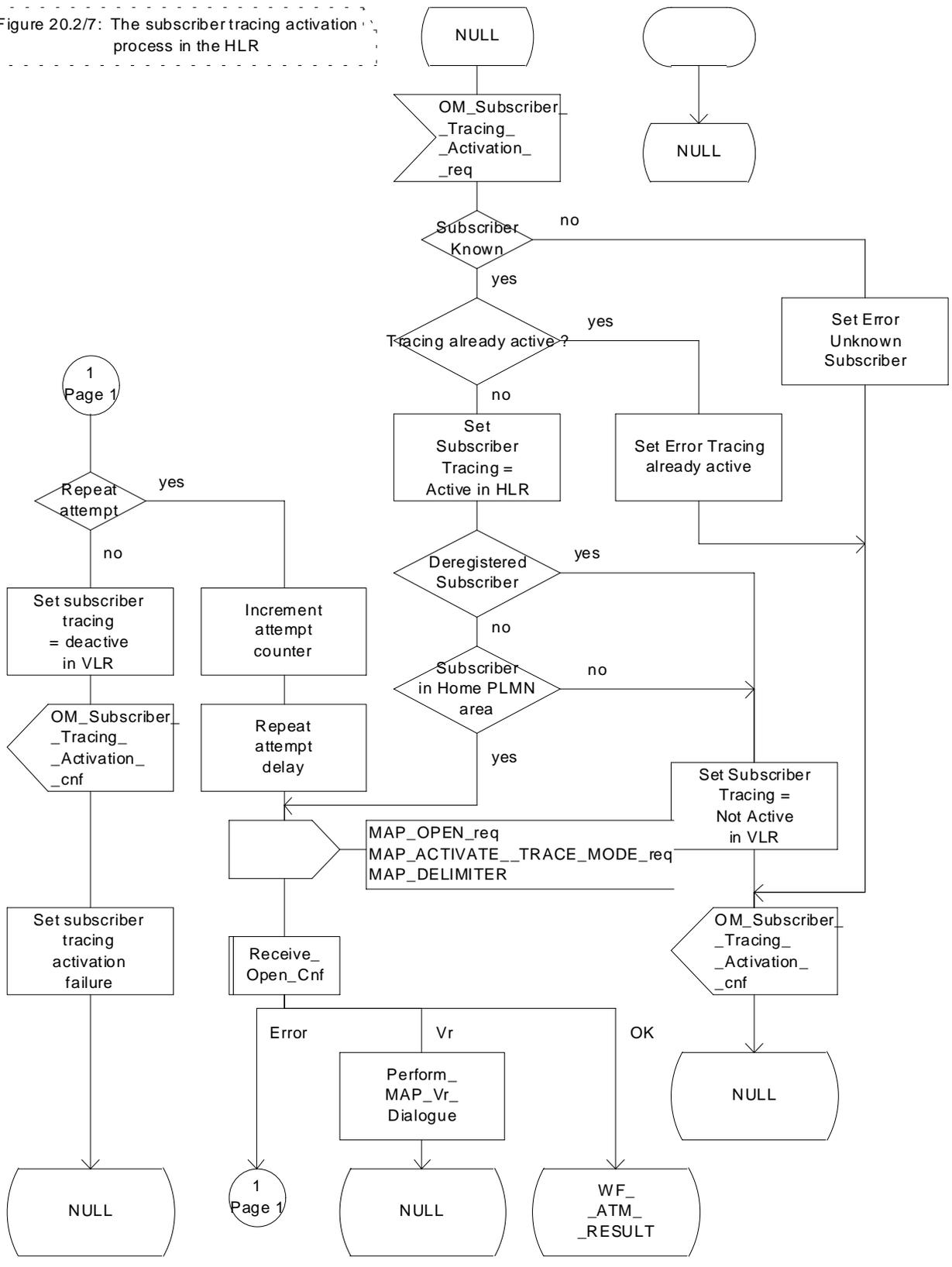


Figure 20.2/7 (sheet 1 of 2): Process ATM_HLR_with_VLR

Figure 20.2/7: The subscriber tracing activation process in the HLR

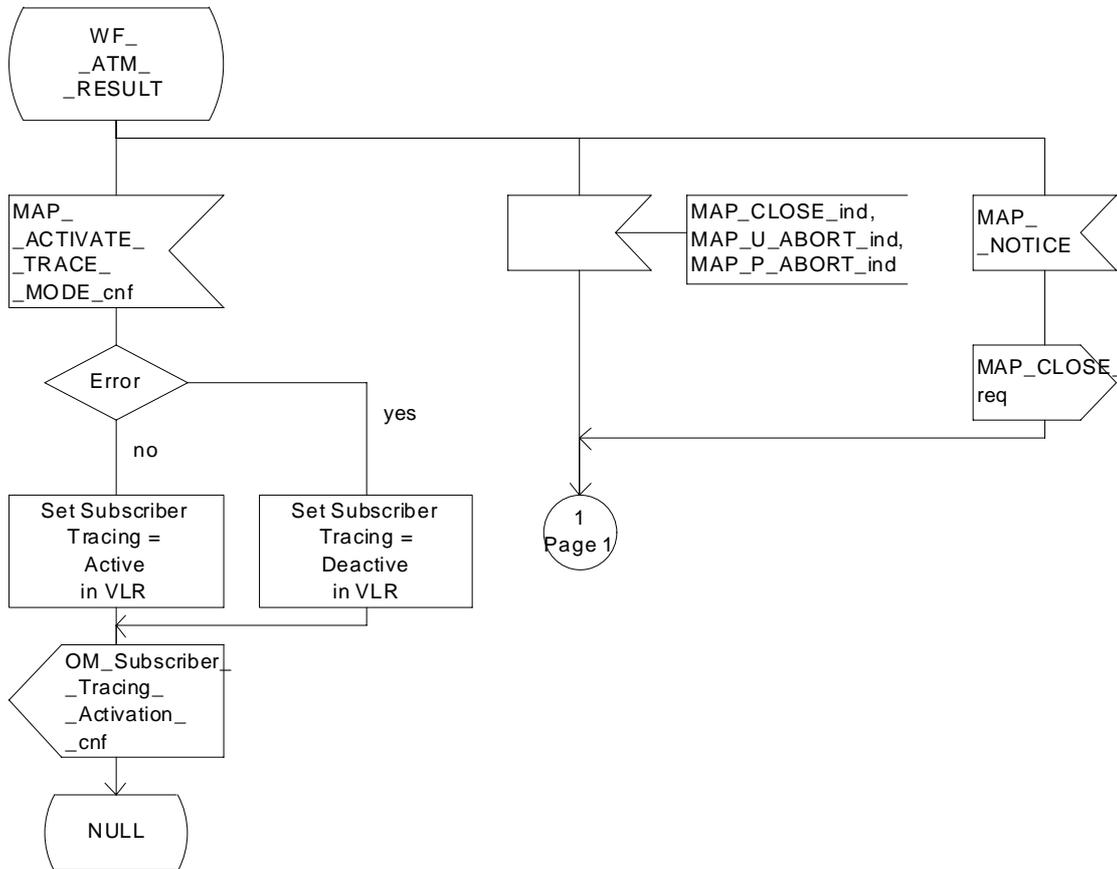


Figure 20.2/7 (sheet 2 of 2): Process ATM_HLR_with_VLR

Process ATM_HLR_with_SGSN

20.2_14.1(2)

Figure 20.2/14: The subscriber tracing activation process in the HLR with SGSN

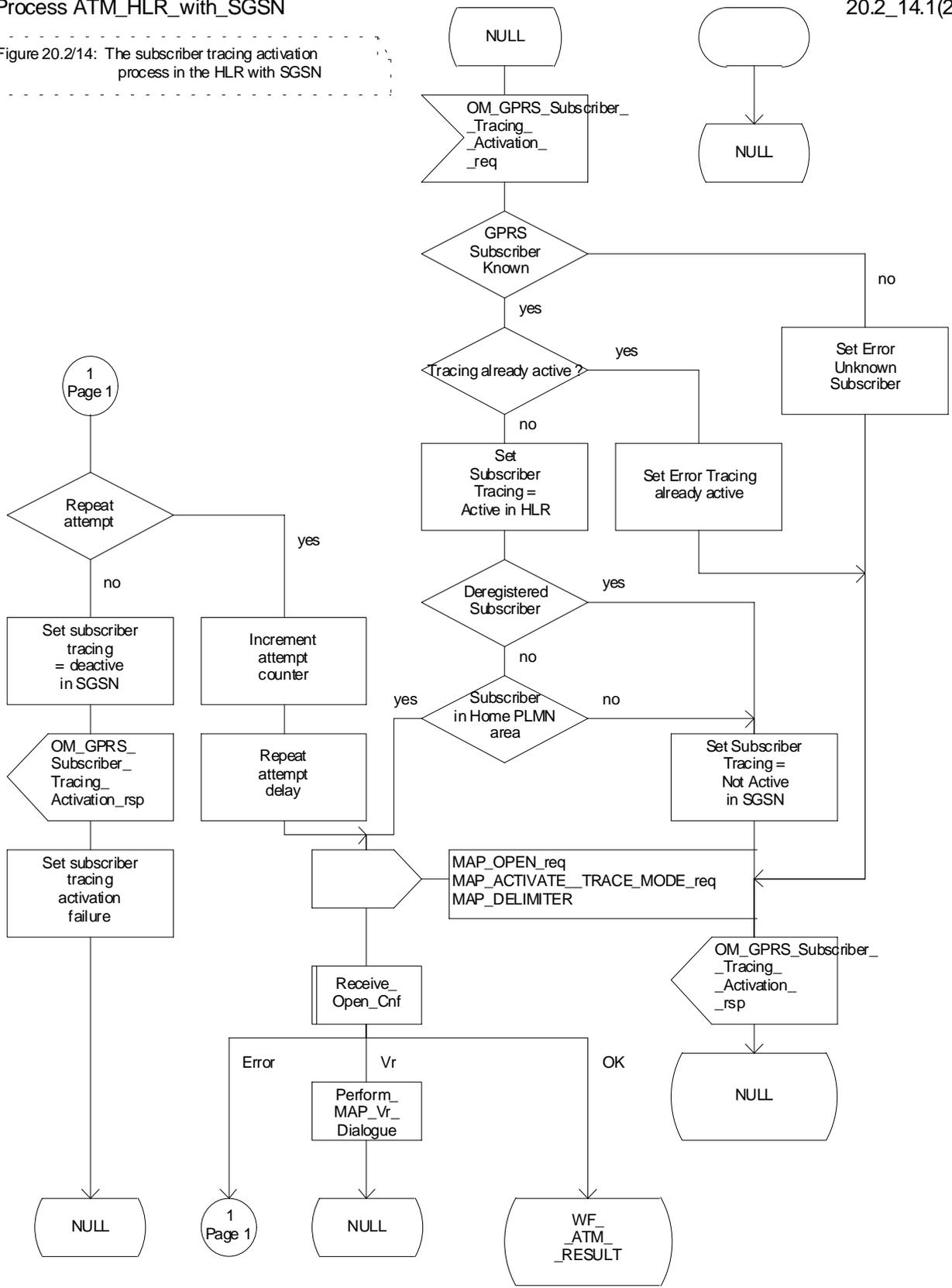


Figure 20.2/14 (sheet 1 of 2): Process ATM_HLR_with_SGSN

Figure 20.2/14: The subscriber tracing activation process in the HLR with SGSN

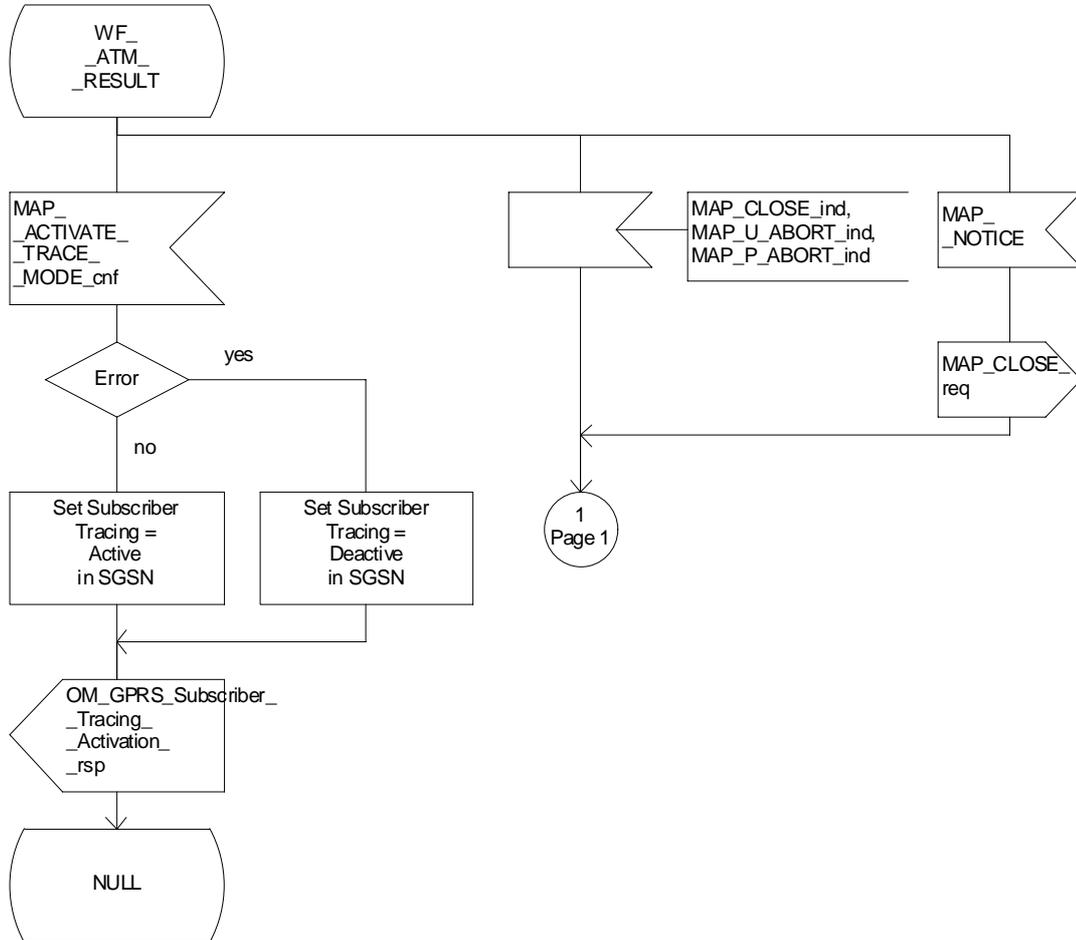


Figure 20.2/14 (sheet 2 of 2): Process ATM_HLR_with_SGSN

20.2.1.2 Subscriber tracing deactivation procedure

When receiving the subscriber trace mode deactivation command for a subscriber from the OMC, the HLR will send the MAP_DEACTIVATE_TRACE_MODE request to the VLR or to the SGSN where the subscriber is registered, if the trace mode activation has been carried out. The subscriber tracing in HLR is set to a deactive state.

If the operation is successful, the HLR will set the subscriber tracing in VLR or in SGSN to a deactive state.

If the MAP_DEACTIVATE_TRACE_MODE confirmation is received indicating an error situation, the errors are mapped to the OMC interface. The deactivation request may be also repeated; the number of repeat attempts and the time in between are HLR operator options, depending on the error returned by the VLR or by the SGSN.

The subscriber tracing deactivation procedure with VLR is shown in figure 20.2/8.

The subscriber tracing deactivation procedure with SGSN is shown in figure 20.2/15.

Figure 20.2/8: The subscriber tracing deactivation process in the HLR

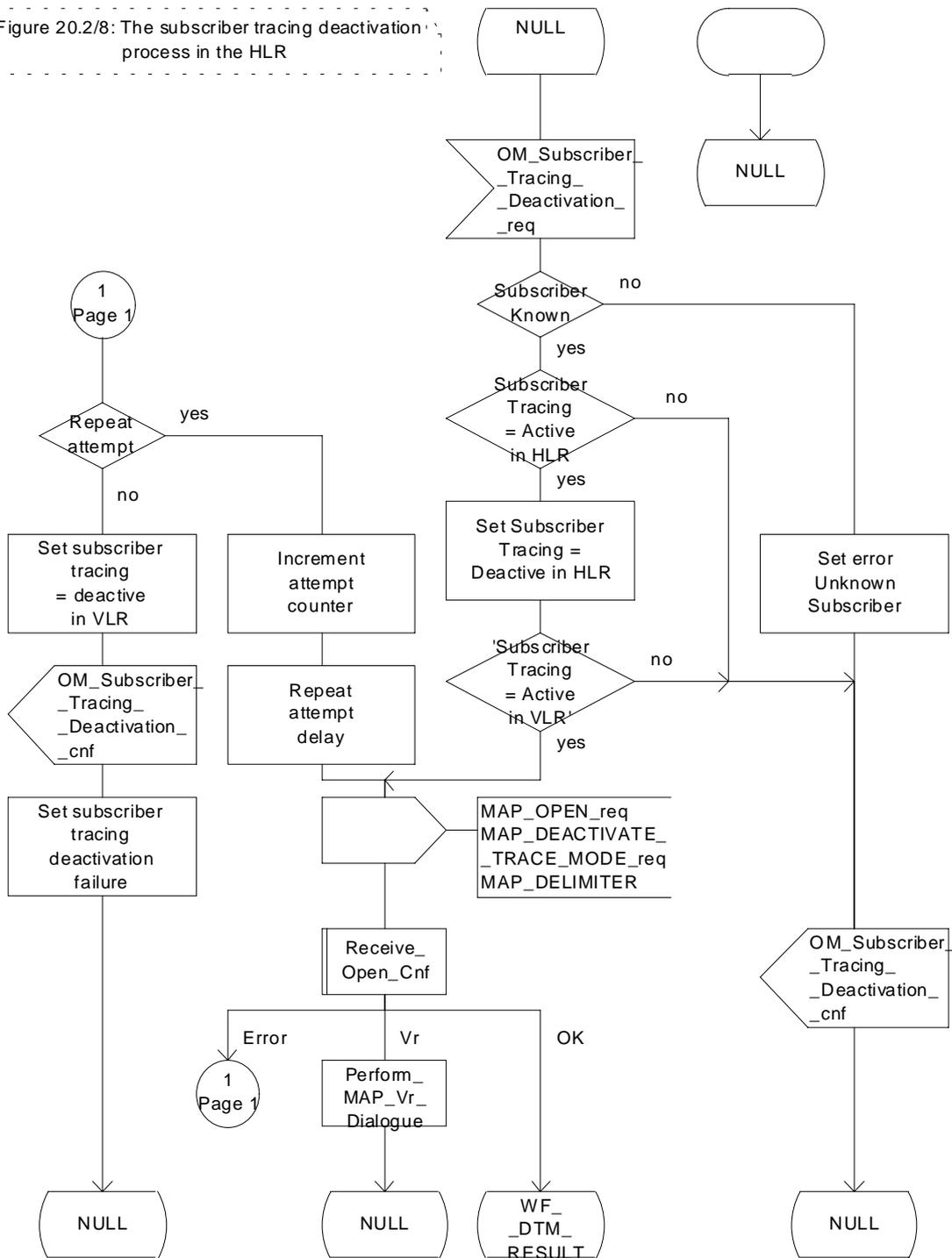


Figure 20.2/8 (sheet 1 of 2): Process DTM_HLR_with_VLR

Figure 20.2/8: The subscriber tracing deactivation process in the HLR

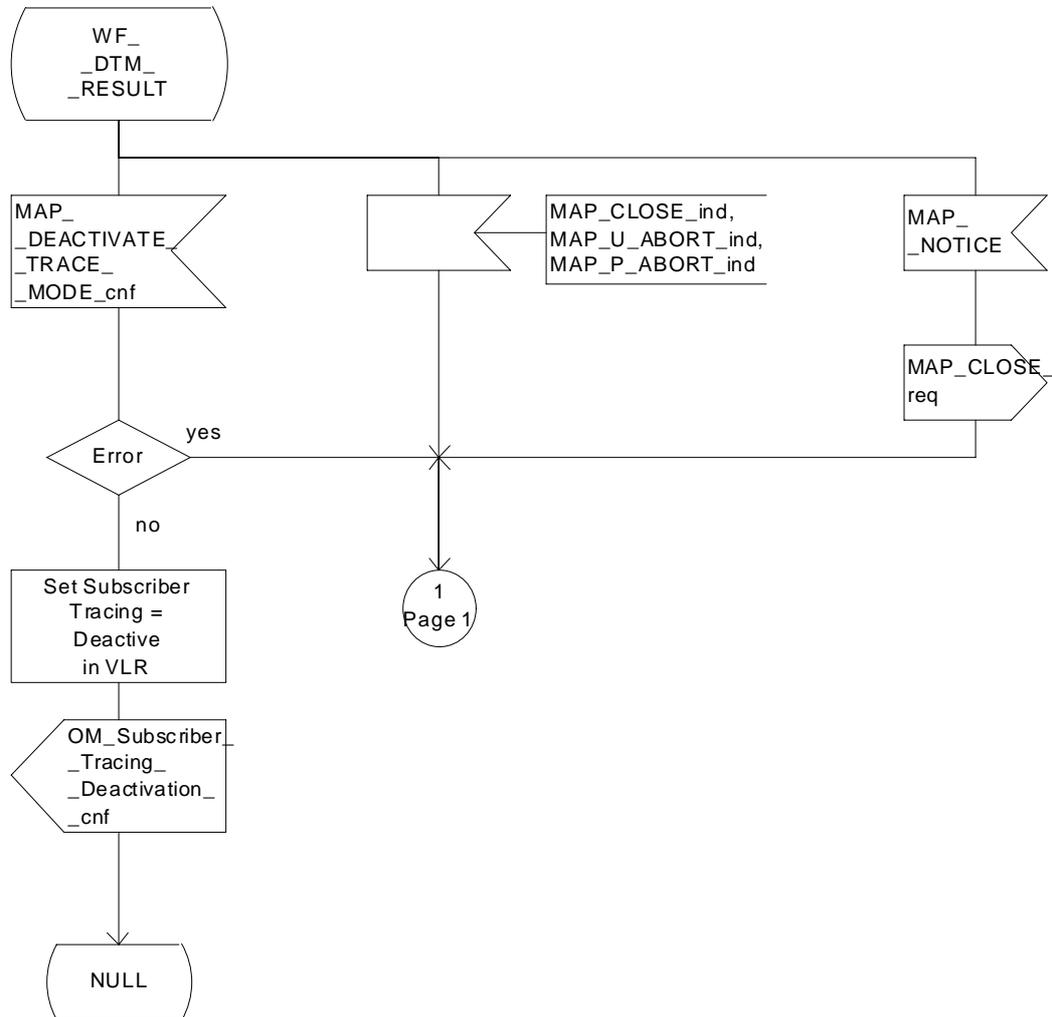


Figure 20.2/8 (sheet 2 of 2): Process DTM_HLR_with_VLR

Figure 20.2/15: The subscriber tracing deactivation process in the HLR with SGSN

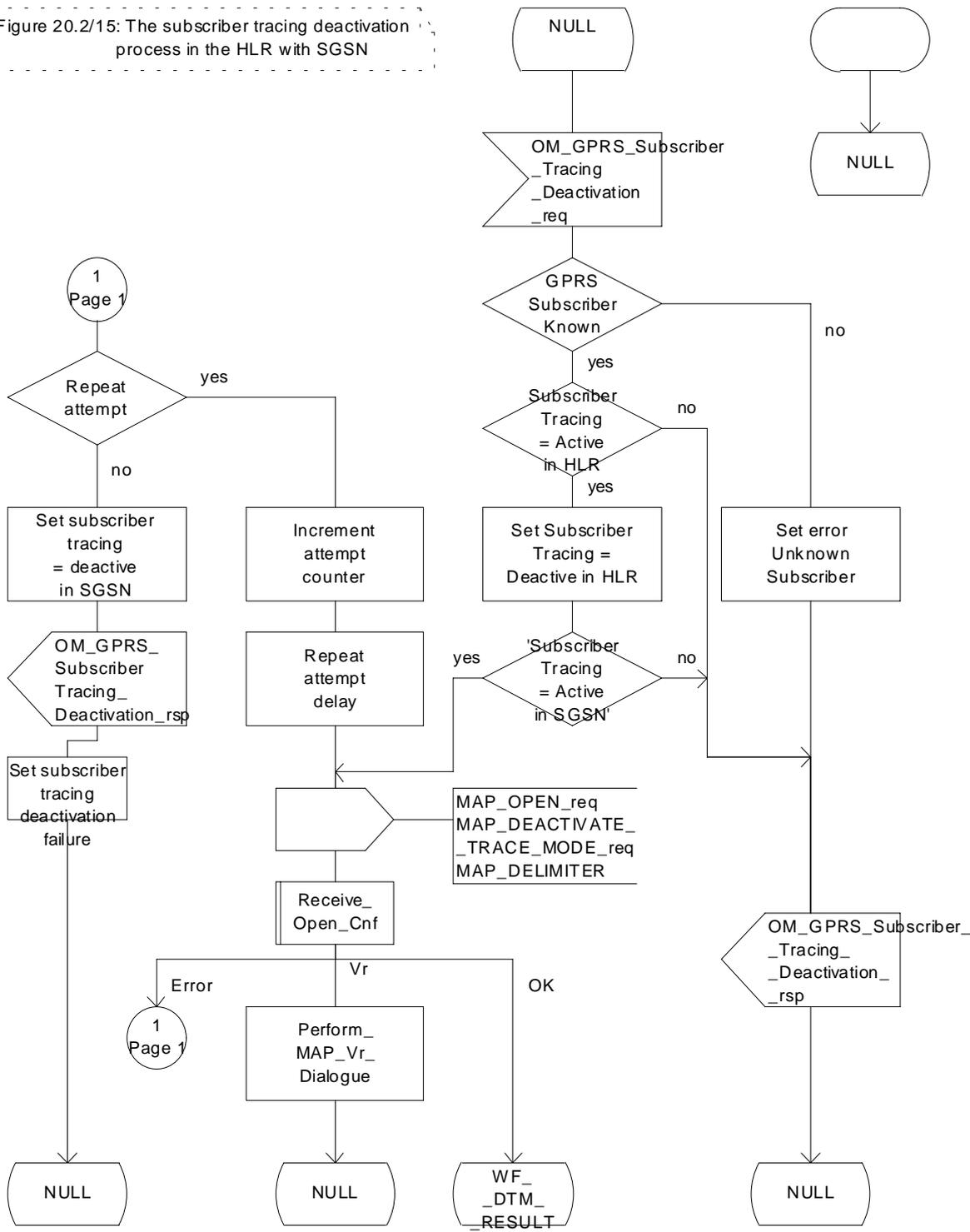


Figure 20.2/15 (sheet 1 of 2): Process DTM_HLR_with_SGSN

Figure 20.2/15: The subscriber tracing deactivation process in the HLR with SGSN

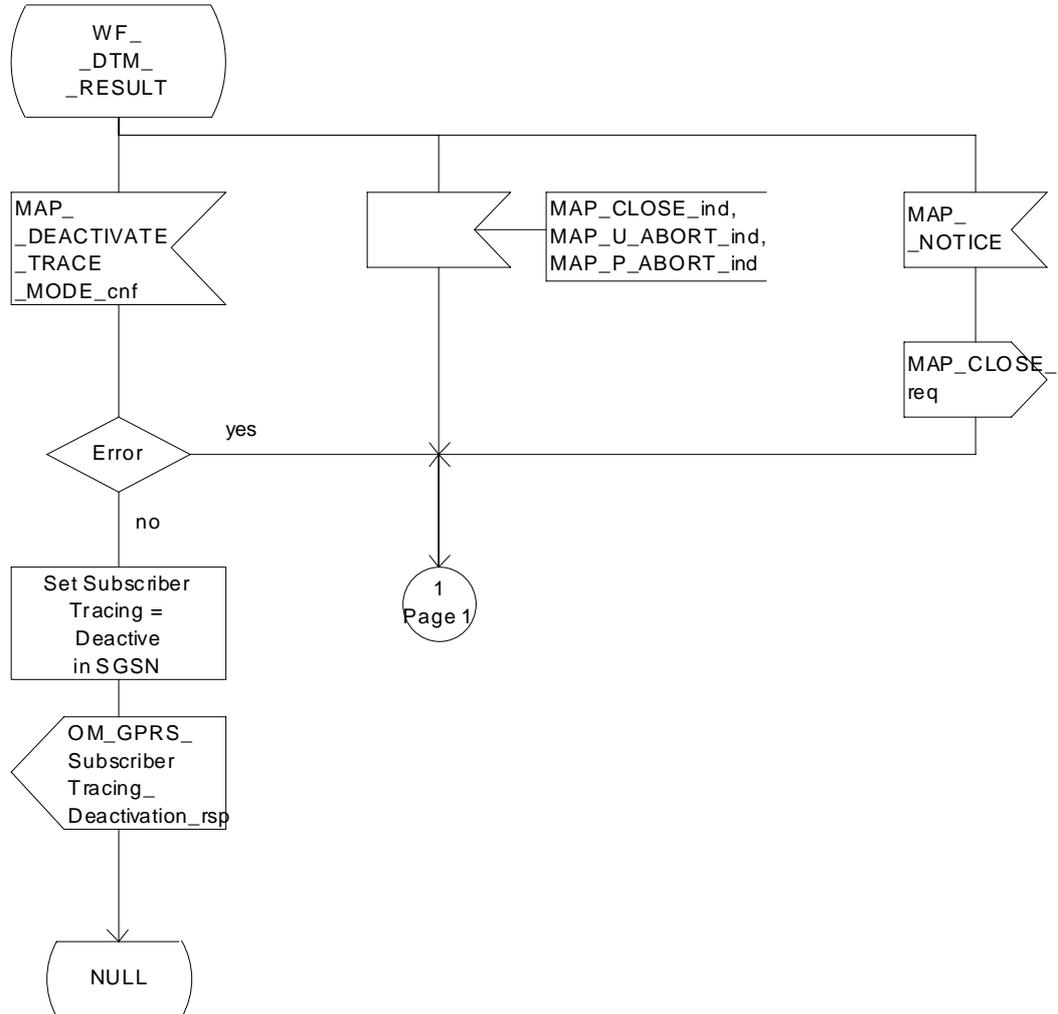


Figure 20.2/15 (sheet 2 of 2): Process DTM_HLR_with_SGSN

20.2.2 Procedures in the VLR

The VLR is involved in the following tracing procedures:

- i) Subscriber tracing activation procedure;
- ii) Subscriber tracing deactivation procedure;
- iii) Subscriber tracing procedure.

20.2.2.1 Subscriber tracing activation procedure

When receiving a MAP_ACTIVATE_TRACE_MODE indication, the VLR will check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or as a data missing error depending on the nature of the error.

If the subscriber is known, the tracing facility is supported and the tracing capacity is not exceeded, the successful report is sent in the MAP_ACTIVATE_TRACE_MODE response primitive.

The MAP_ACTIVATE_TRACE_MODE indication primitive may be received during a location updating or data restoration procedure, so the location updating or restore data process shall use the macro Activate_Tracing_VLR (see figure 25.9/3).

The subscriber tracing activation process in the VLR is shown in figure 20.2/9.

Process ATM_VLR_Standalone

20.2_9(1)

FIGURE 20.2/9 The subscriber tracing activation process for standalone operation in the VLR

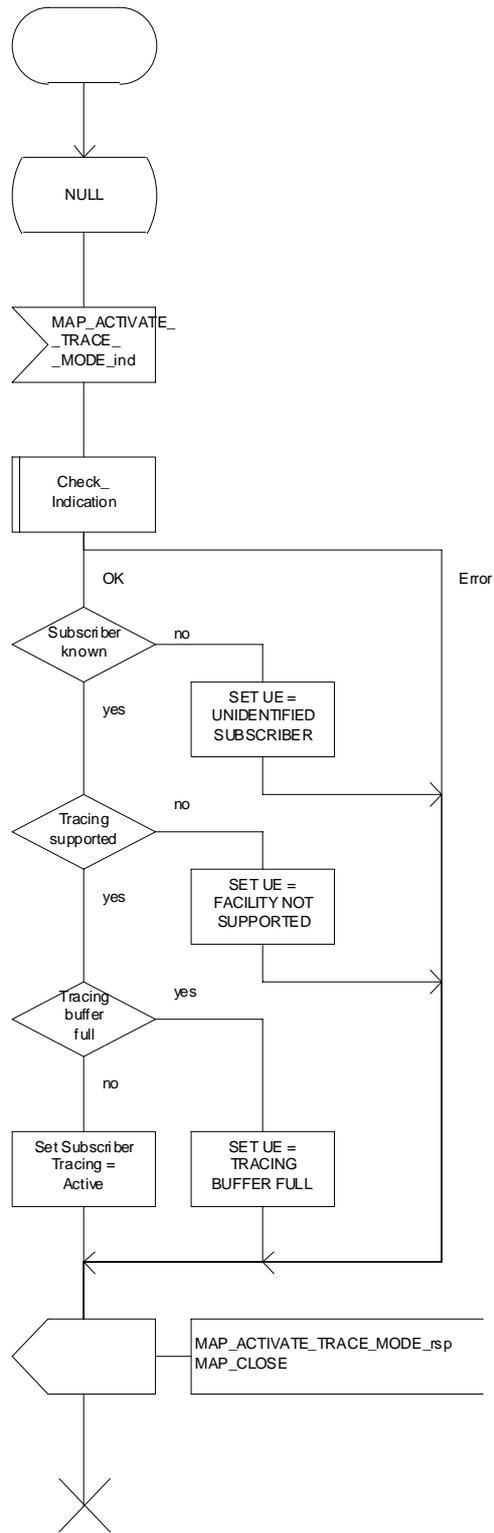


Figure 20.2/9: Process ATM_VLR_Standalone

20.2.2.2 Subscriber tracing deactivation procedure

When receiving a MAP_DEACTIVATE_TRACE_MODE indication, the VLR will check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or as a data missing error depending on the nature of the error.

If the subscriber is known and the tracing facility is supported, the successful report is sent in the MAP_DEACTIVATE_TRACE_MODE response primitive.

The subscriber tracing deactivation procedure in the VLR is shown in figure 20.2/10.

Figure 20.2/10: The subscriber tracing deactivation process in the VLR

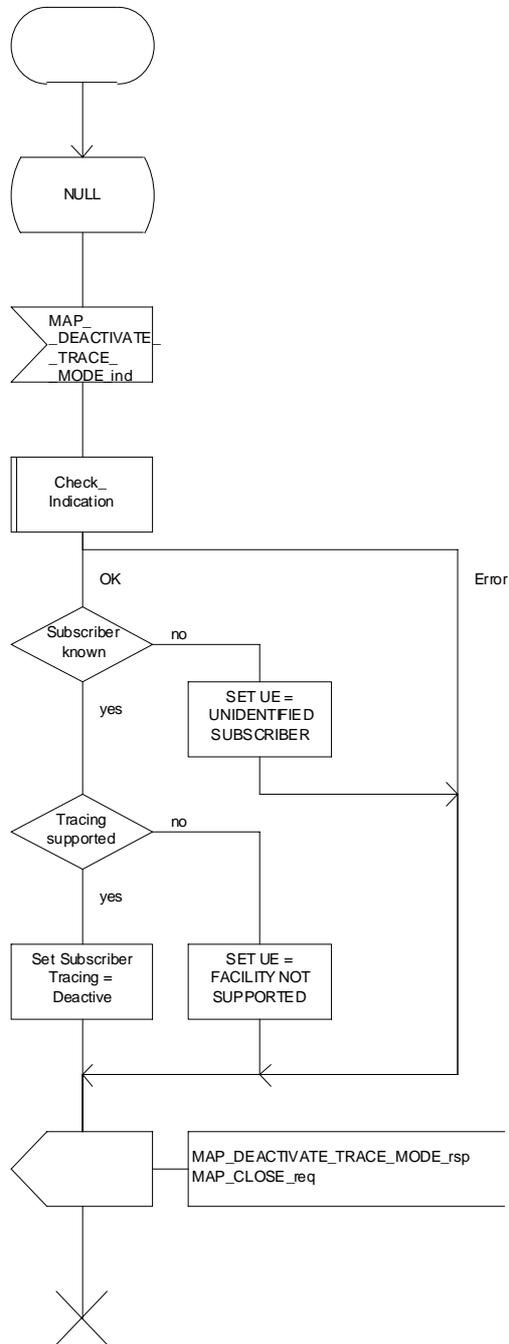


Figure 20.2/10: Process DTM_VLR_Standalone

20.2.2.3 Subscriber tracing procedure

When the VLR receives a MAP_PROCESS_ACCESS_REQUEST or MAP_UPDATE_LOCATION_AREA indication related to any subscriber activity from the MSC, the subscriber tracing procedure may be carried out. The macro Trace_Subscriber_Activity_VLR is shown in figure 25.9/2.

20.2.3 Procedures in the MSC

The MSC is involved in the following tracing procedure:

- i) Subscriber tracing procedure.

20.2.3.1 Subscriber tracing procedure

When receiving the MAP_TRACE_SUBSCRIBER_ACTIVITY indication from the VLR, the MSC stores trace reference, trace type and the identity of the OMC in charge of the trace, and the MSC starts to collect the trace information. The MSC will send the trace record to the OMC.

The macro Trace_Subscriber_Activity_MSC is shown in figure 25.9/1.

20.2.4 Procedures in the SGSN

The SGSN is involved in the following tracing procedures:

- i) Subscriber tracing activation procedure;
- ii) Subscriber tracing deactivation procedure;

20.2.4.1 Subscriber tracing activation procedure

When receiving a MAP_ACTIVATE_TRACE_MODE indication, the SGSN will check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or as a data missing error depending on the nature of the error.

If the subscriber is known, the tracing facility is supported and the tracing capacity is not exceeded, the successful report is sent in the MAP_ACTIVATE_TRACE_MODE response primitive.

The MAP_ACTIVATE_TRACE_MODE indication primitive may be received during a location updating or data restoration procedure, so the location updating or restore data process shall use the macro Activate_Tracing_SGSN (see figure 25.9/7).

The subscriber tracing activation process in the SGSN is shown in figure 20.2/16.

20.2.4.2 Subscriber tracing deactivation procedure in SGSN

When receiving a MAP_DEACTIVATE_TRACE_MODE indication, the SGSN will check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or as a data missing error depending on the nature of the error.

If the subscriber is known and the tracing facility is supported, the successful report is sent in the MAP_DEACTIVATE_TRACE_MODE response primitive.

The subscriber tracing deactivation procedure in the SGSN is shown in figure 20.2/17.

FIGURE 20.2/16: The subscriber tracing activation process for standalone operation in the SGSN

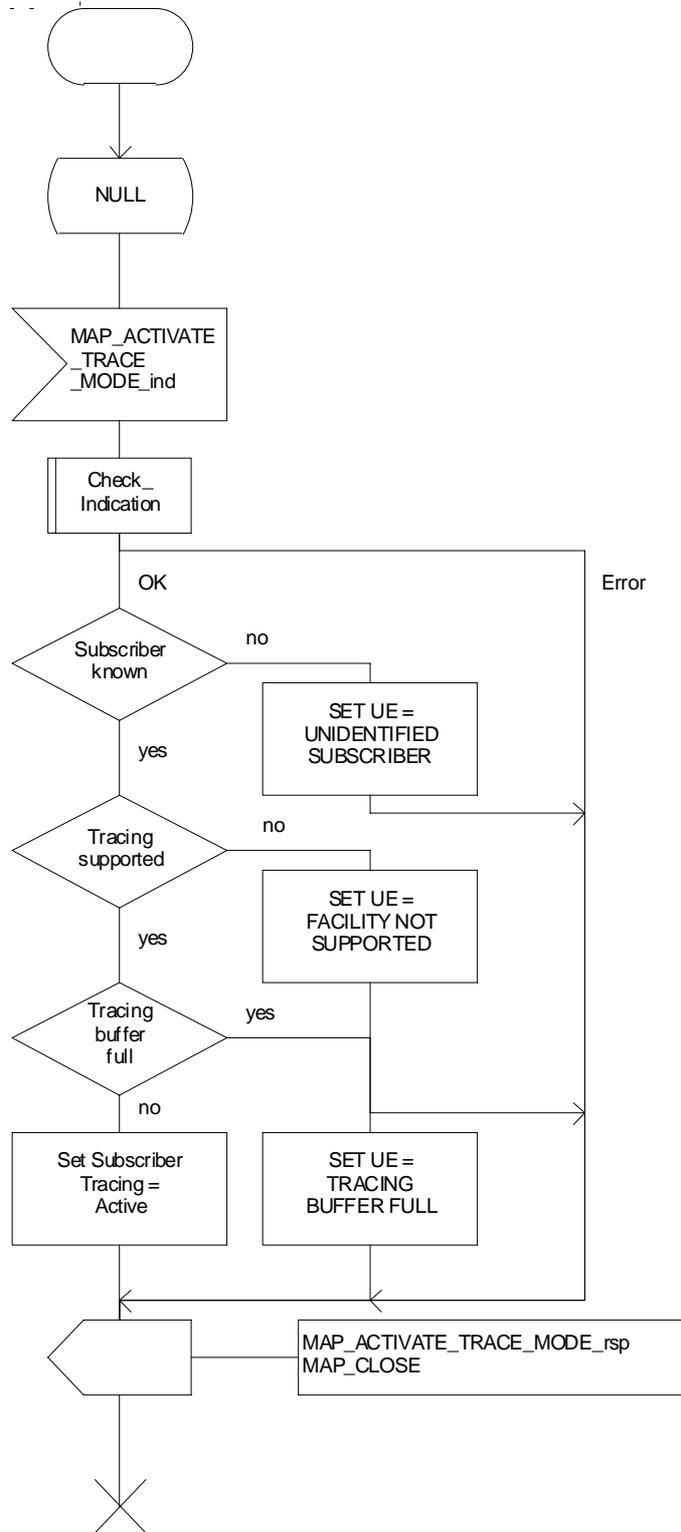


Figure 20.2/16: Process ATM_SGSN_Standalone

Figure 20.2/17: The subscriber tracing deactivation process in the SGSN

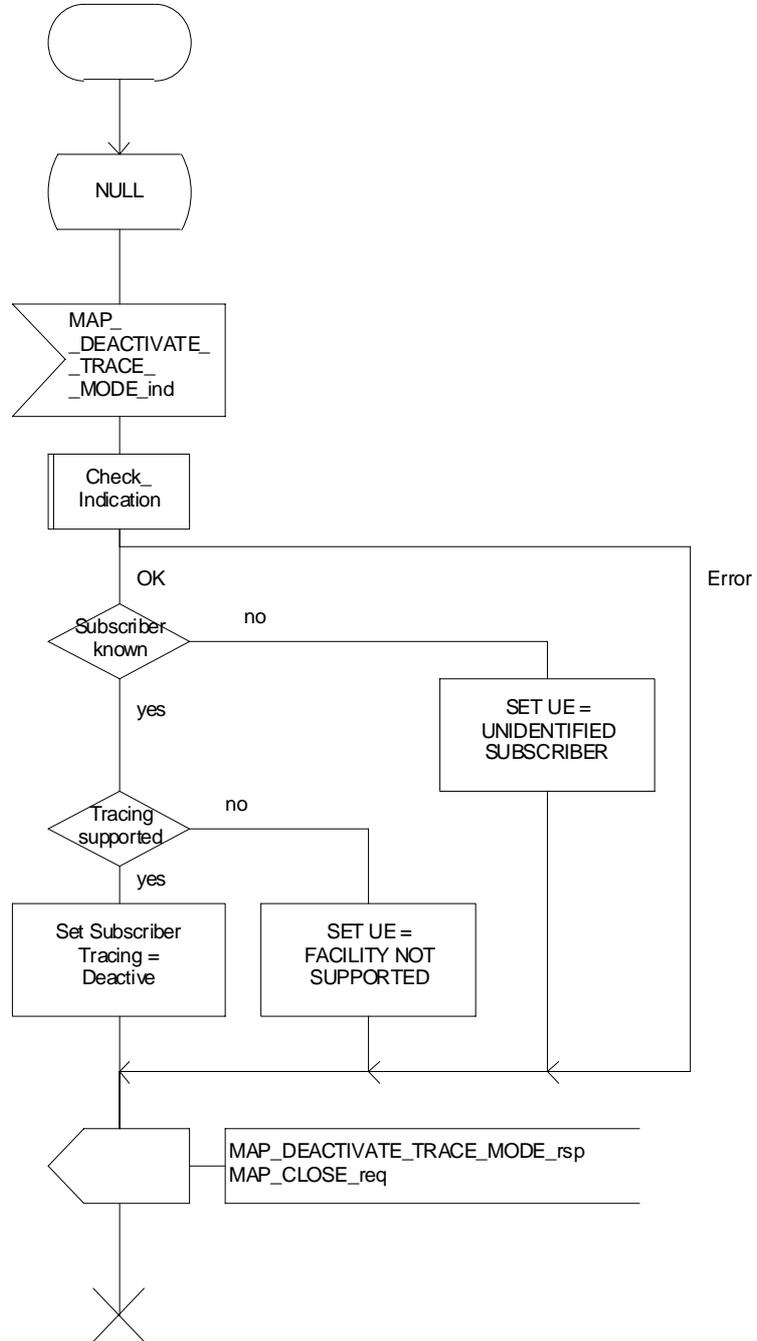


Figure 20.2/17: Process DTM_SGSN_Standalone

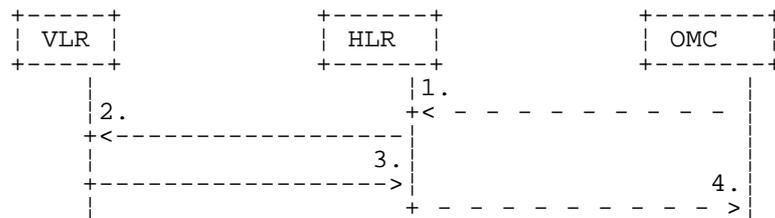
20.3 Subscriber data management procedures

Two types of subscriber data management procedures exist in the Mobile Application Part

- i) Subscriber Deletion;
- ii) Subscriber Data Modification.

No requirements have been identified for the Subscriber creation and subscriber data interrogation procedures.

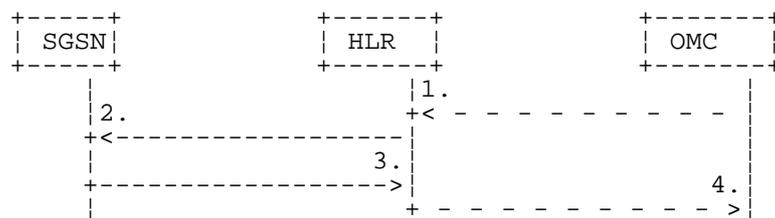
The subscriber deletion and subscriber data modification procedures are initiated by the OMC (see figures 20.3/1 , 20.3/2, 20.3/8 and 20.3/9).



- 1) Delete Subscriber
- 2) MAP_CANCEL_LOCATION
- 3) MAP_CANCEL_LOCATION_ACK
- 4) Subscriber Deleted

Figure 20.3/1: Subscriber deletion procedure

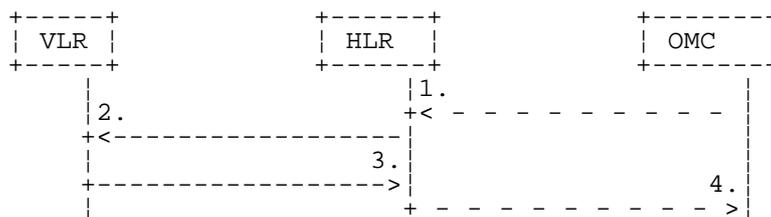
In the subscriber deletion procedure the subscriber data should be removed from the VLR and from the HLR. The HLR uses the MAP_CANCEL_LOCATION service.



- 1) Delete GPRS Subscriber
- 2) MAP_CANCEL_LOCATION
- 3) MAP_CANCEL_LOCATION_ACK
- 4) GPRS Subscriber Deleted

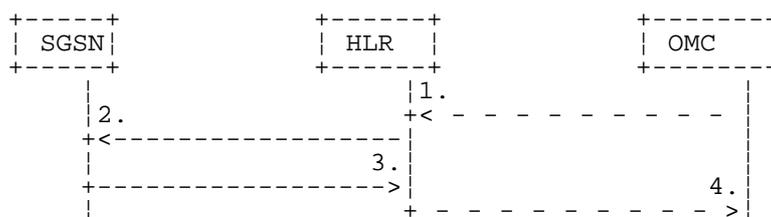
Figure 20.3/8: Subscriber deletion procedure for GPRS

In the subscriber deletion procedure the subscriber data should be removed from the SGSN and from the HLR. The HLR uses the MAP_CANCEL_LOCATION service.



- 1) Modify Subscriber Data
- 2) MAP_CANCEL_LOCATION, MAP_INSERT_SUBSCRIBER_DATA or MAP_DELETE_SUBSCRIBER_DATA
- 3) MAP_CANCEL_LOCATION_ACK, MAP_INSERT_SUBSCRIBER_DATA_ACK or MAP_DELETE_SUBSCRIBER_DATA_ACK
- 4) Subscriber Data Modified

Figure 20.3/2: Subscriber data modification procedure



- 1) Modify Subscriber Data
- 2) MAP_CANCEL_LOCATION, MAP_INSERT_SUBSCRIBER_DATA or MAP_DELETE_SUBSCRIBER_DATA
- 3) MAP_CANCEL_LOCATION_ACK, MAP_INSERT_SUBSCRIBER_DATA_ACK or MAP_DELETE_SUBSCRIBER_DATA_ACK
- 4) Subscriber Data Modified

Figure 20.3/9: Subscriber data modification procedure for GPRS

In the subscriber data modification procedure the subscriber data is modified in the HLR and when necessary also in the VLR or in the SGSN. The HLR initiates either the MAP_INSERT_SUBSCRIBER_DATA, MAP_DELETE_SUBSCRIBER_DATA or MAP_CANCEL_LOCATION service depending on the modified data.

20.3.1 Procedures in the HLR

20.3.1.1 Subscriber deletion procedure

When the subscriber deletion request is received from the OMC, the HLR shall delete the subscriber data from the HLR and initiate the MAP_CANCEL_LOCATION request to the VLR or to the SGSN where the subscriber is registered.

The subscriber deletion procedure in the HLR is shown in the figure 20.3/3.

Process Delete_Subscriber_HLR

20.3_3(1)

Figure 17.3/3: The subscriber deletion process in the HLR

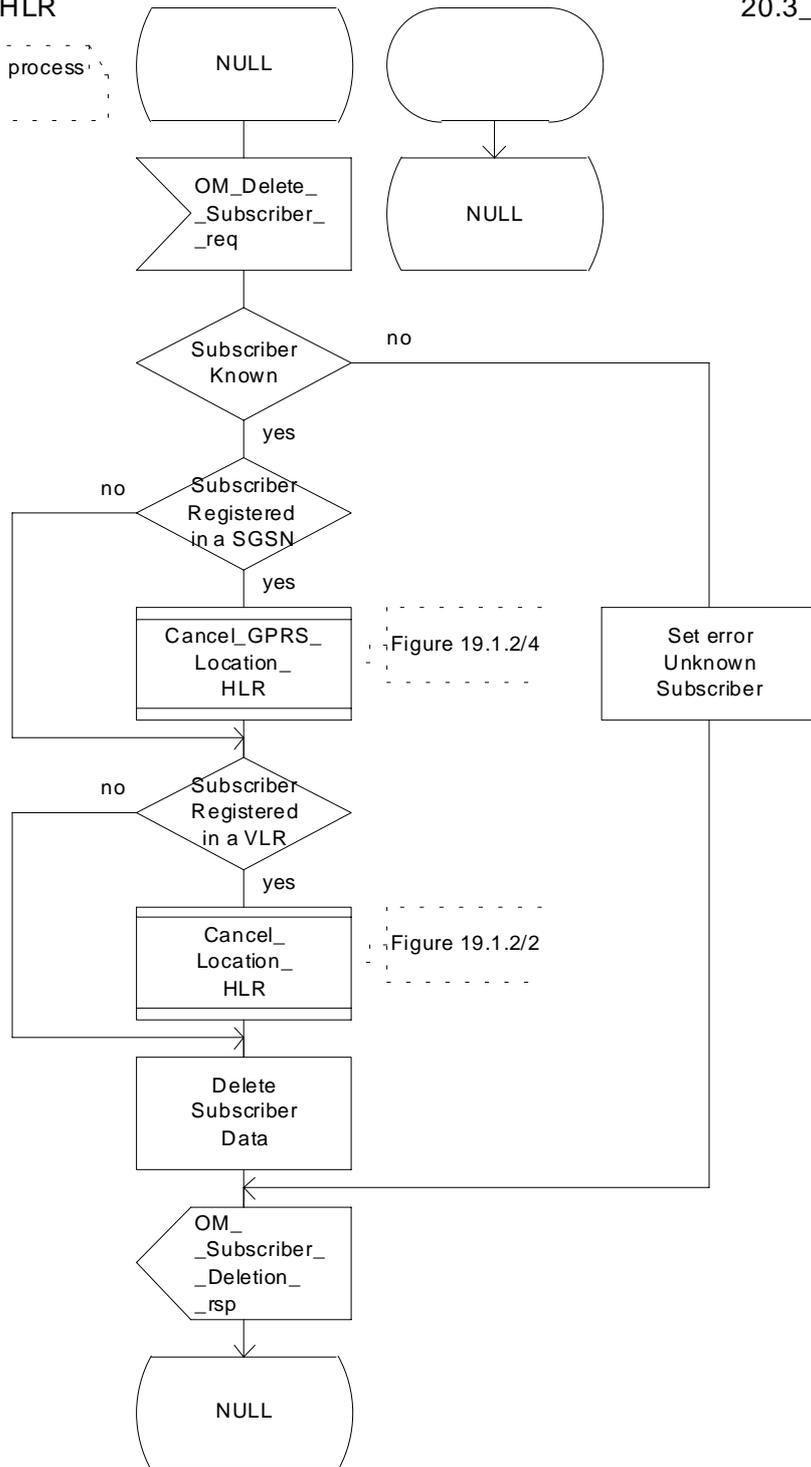


Figure 20.3/3: Process Delete_Subscriber_HLR

20.3.1.2 Subscriber data modification procedure

The OMC can modify the subscriber data in several different ways. The modifications can be categorized in following groups:

- a) no effect in the VLR;
- b) data shall be modified in both the HLR and the VLR;
- c) withdrawal of a basic service or a supplementary service requiring change to VLR data;
- d) modification affects on the roaming of the subscriber and the subscriber shall be removed from the VLR data base;
- e) authentication algorithm or authentication key of the subscriber is modified;
- f) no effect in the SGSN;
- g) data shall be modified in both the HLR and the SGSN;
- h) withdrawal of a GPRS subscription data or a basic service or both requiring change to SGSN data;
- i) modification affects on the roaming of the subscriber and the subscriber shall be removed from the SGSN data base;
- j) withdrawal of GPRS Subscription related to Network Access Mode;
- k) withdrawal of non-GPRS Subscription related to Network Access Mode;

In case "b" and "g" the MAP_INSERT_SUBSCRIBER_DATA service is initiated in the HLR.

In case "c" and "h" the MAP_DELETE_SUBSCRIBER_DATA service is initiated in the HLR.

In cases "d", "e", "i", "j" and "k" the MAP_CANCEL_LOCATION service is initiated in the HLR.

If the result of a primitive received from the VLR or from the SGSN is unsuccessful, the HLR may initiate re-attempts; the number of repeat attempts and the time in between are HLR operator options, depending on the error returned by the VLR or by the SGSN.

The subscriber data modification procedure in the HLR is shown in the figures 20.3/4, 20.3/5 and 25.7/2.

Process Modify_Data_HLR

20.3_4.1(2)

Figure 20.3/4: The subscriber data modification process in the HLR

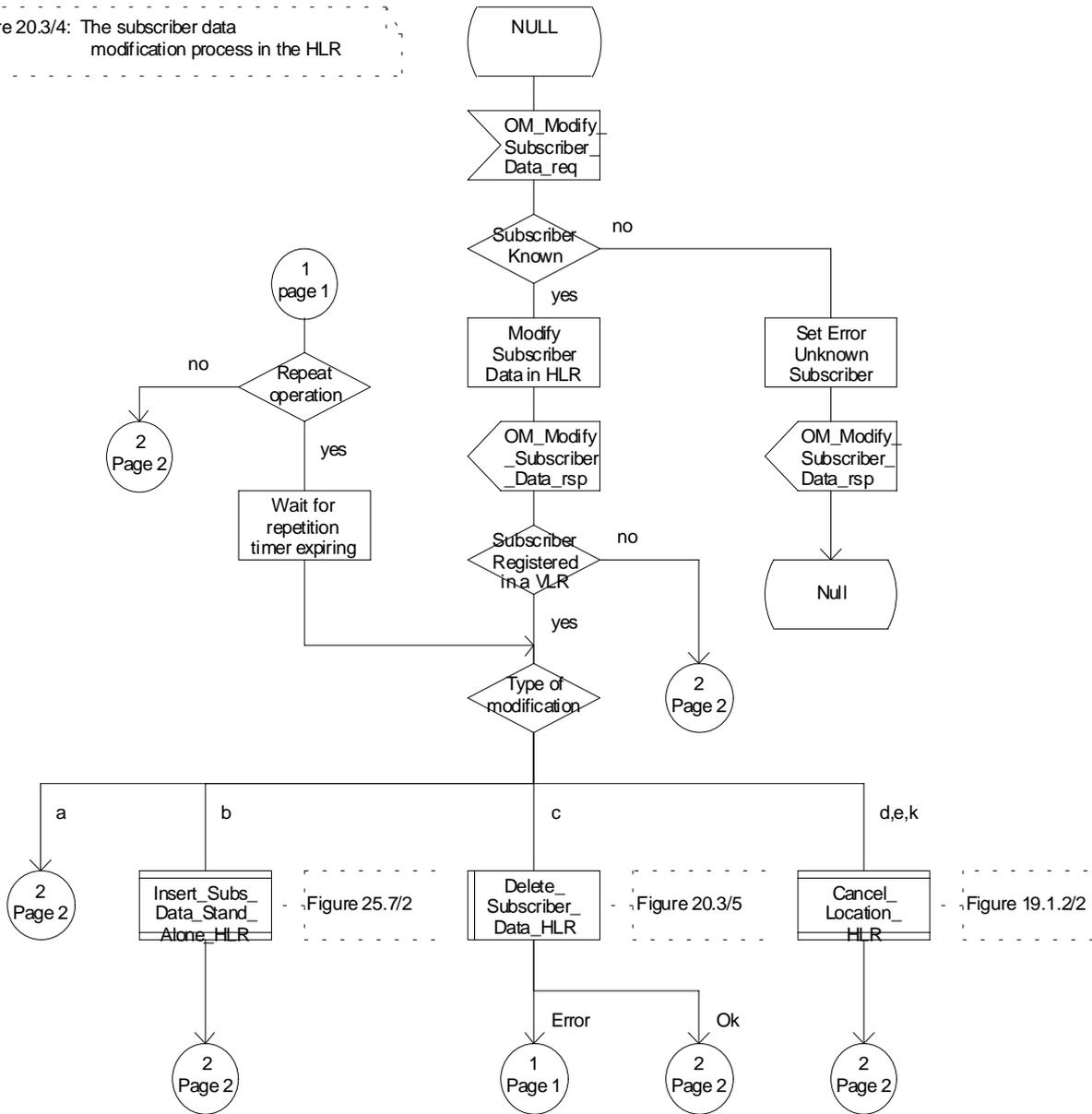


Figure 20.3/4 (sheet 1 of 2): Process Modify_Data_HLR

Figure 20.3/4: The subscriber data modification process in the HLR

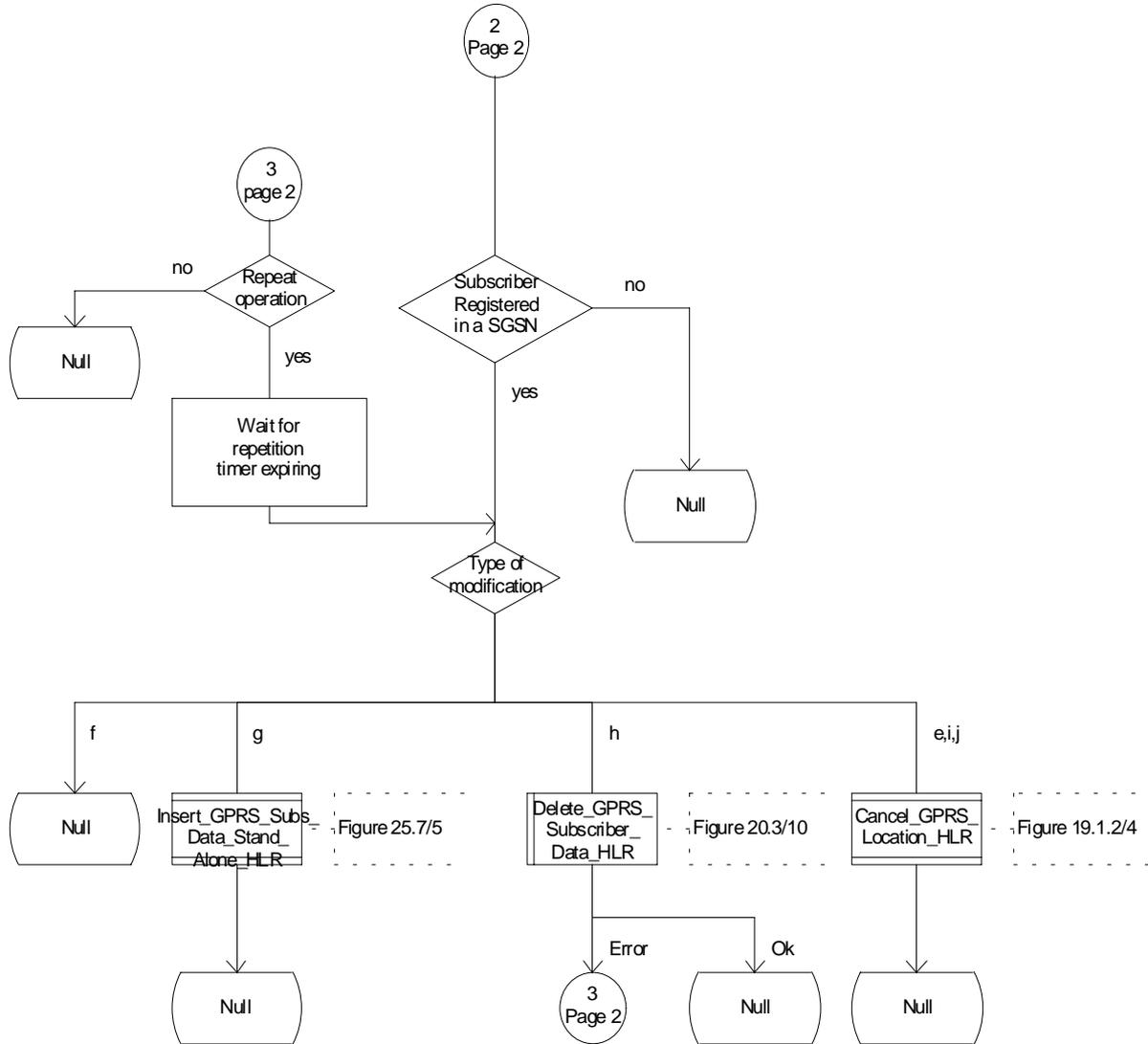


Figure 20.3/4 (sheet 2 of 2): Process Modify_Data_HLR

Figure 20.3/10: The delete GPRS subscriber data macro in the HLR

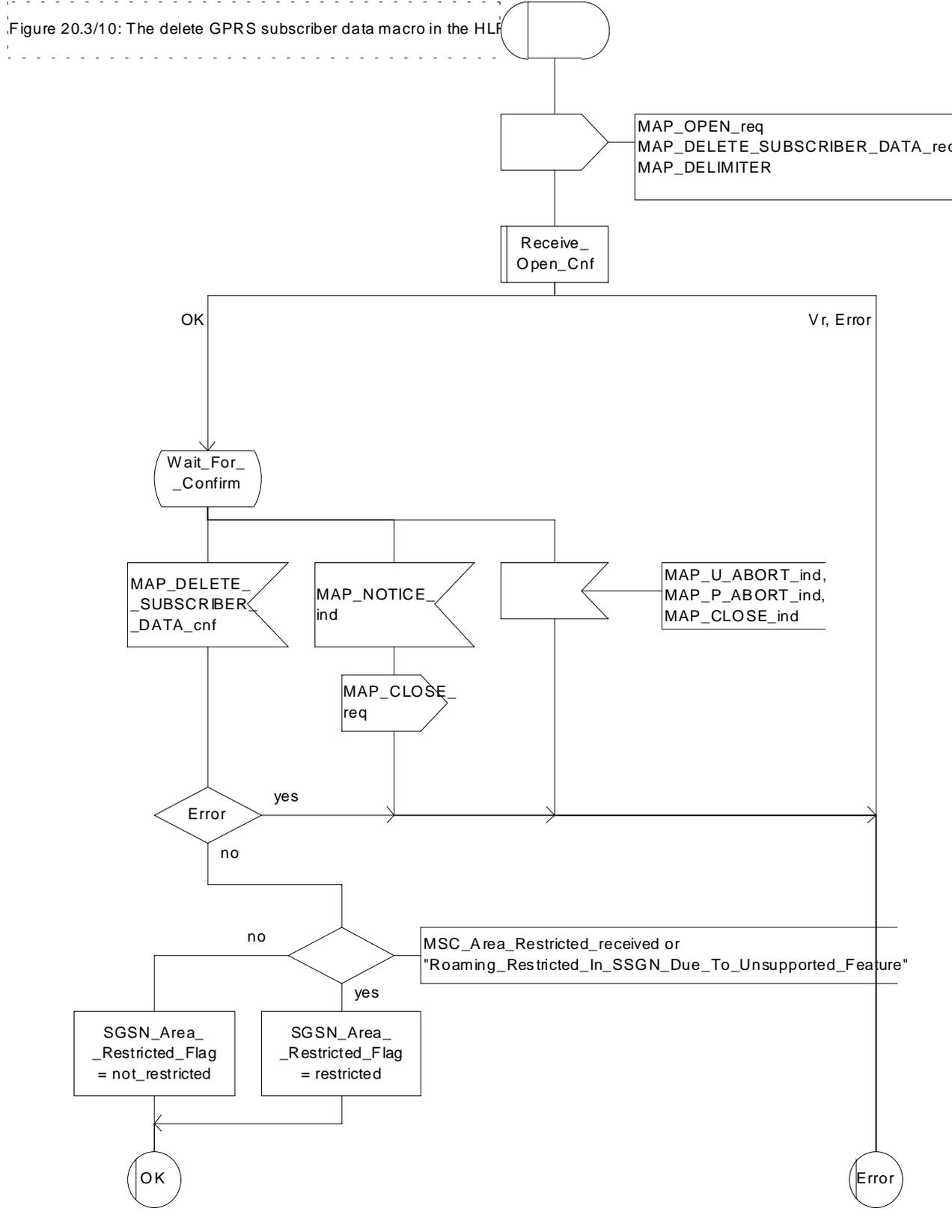


Figure 20.3/10: Macro Delete_GPRS_Subscriber_Data_HLR

Figure 17.3/5: The delete subscriber data macro in the HLR

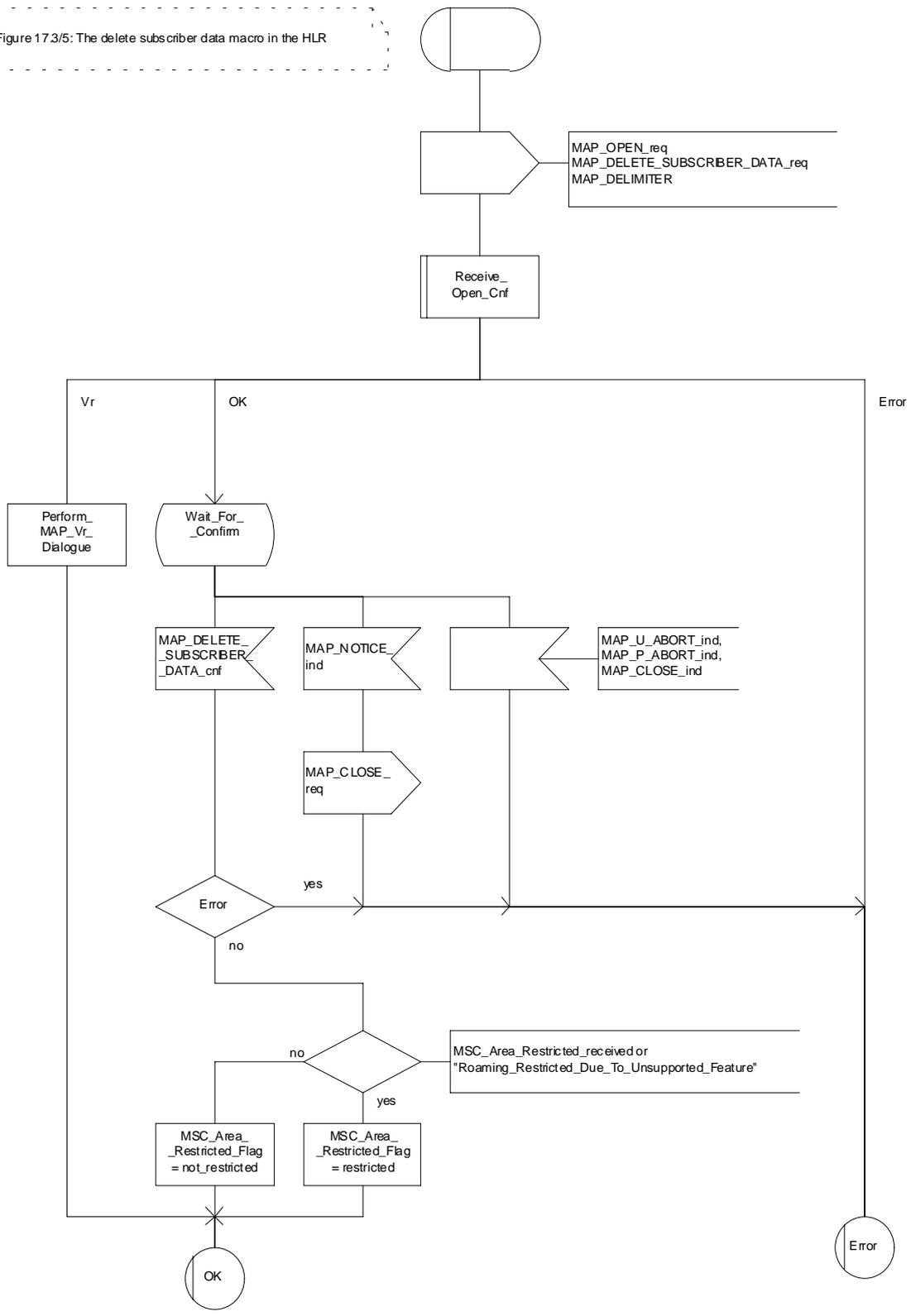


Figure 20.3/5: Macro Delete_Subscriber_Data_HLR

20.3.2 Procedures in the VLR

20.3.2.1 Subscriber deletion procedure

The subscriber deletion procedure in the VLR is described in the subclause 19.1.

20.3.2.2 Subscriber data modification procedure

When receiving either the MAP_INSERT_SUBSCRIBER_DATA indication or the MAP_DELETE_SUBSCRIBER_DATA indication, the VLR check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or a data missing error depending on the nature of the error.

After receiving the first MAP_INSERT_SUBSCRIBER_DATA indication, the VLR will check the IMSI that is included in the primitive. If the IMSI is unknown, the error "Unidentified subscriber" is returned.

If the VLR does not support received basic or supplementary services or the network feature Operator Determined Barring, or there is a problem with Regional Subscription Data then it reports it to the HLR.

If the entire MSC area is restricted due to regional subscription, this is reported to the HLR.

If the updating of the subscriber data is not possible, the VLR will initiate the MAP_U_ABORT request primitive. If the updating is successful, the MAP_CLOSE indication is received from the HLR.

The subscriber data modification procedure in the VLR is shown in the figures 20.3/6, 20.3/7 and 25.7/1.

Process INS_SUBS_DATA_VLR

20.3_6(1)

Figure 20.3/6: The insert subscriber data process in the VLR

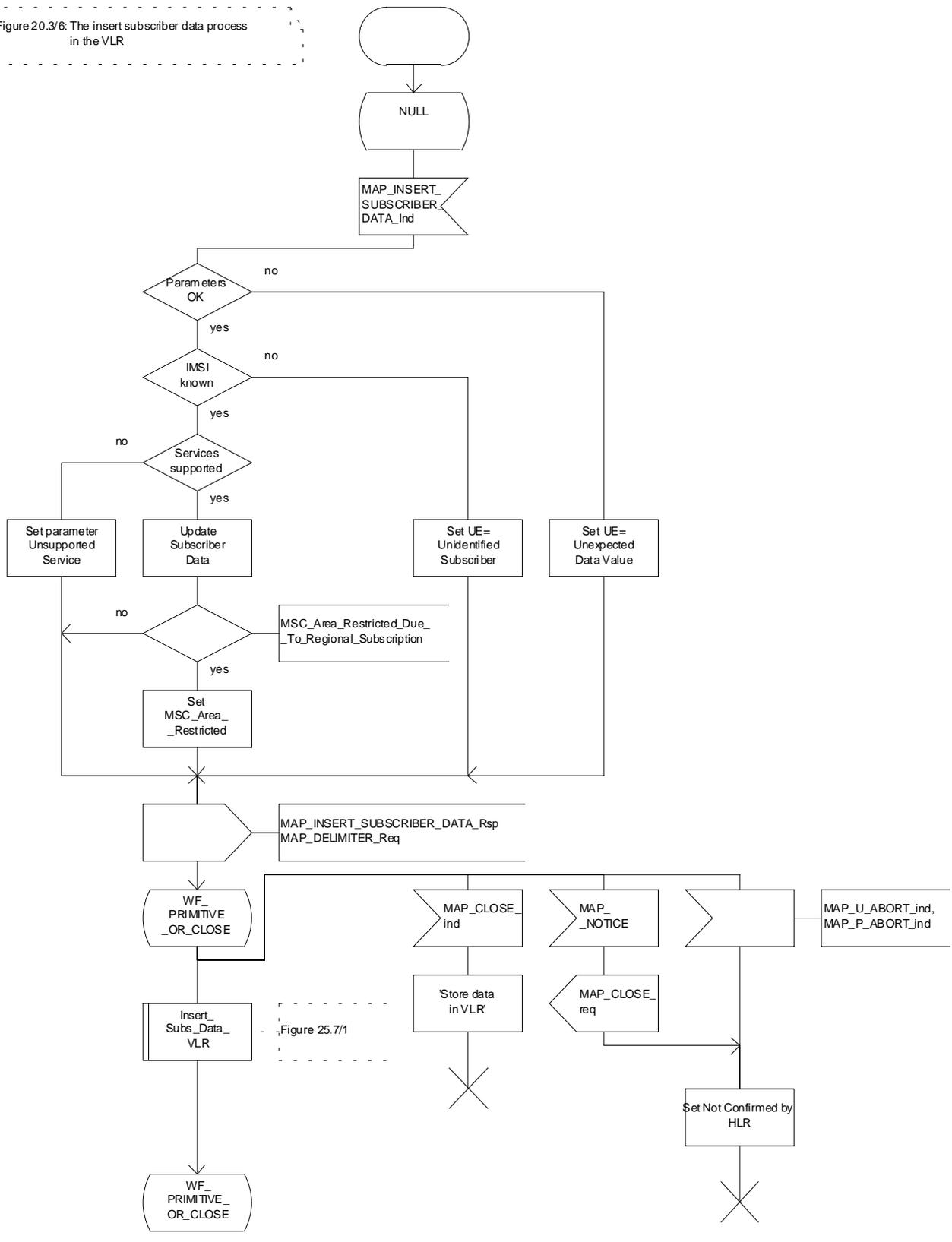


Figure 20.3/6: Process INS_SUBS_DATA_VLR

Figure 20.3/7: The delete subscriber data process in the VLR

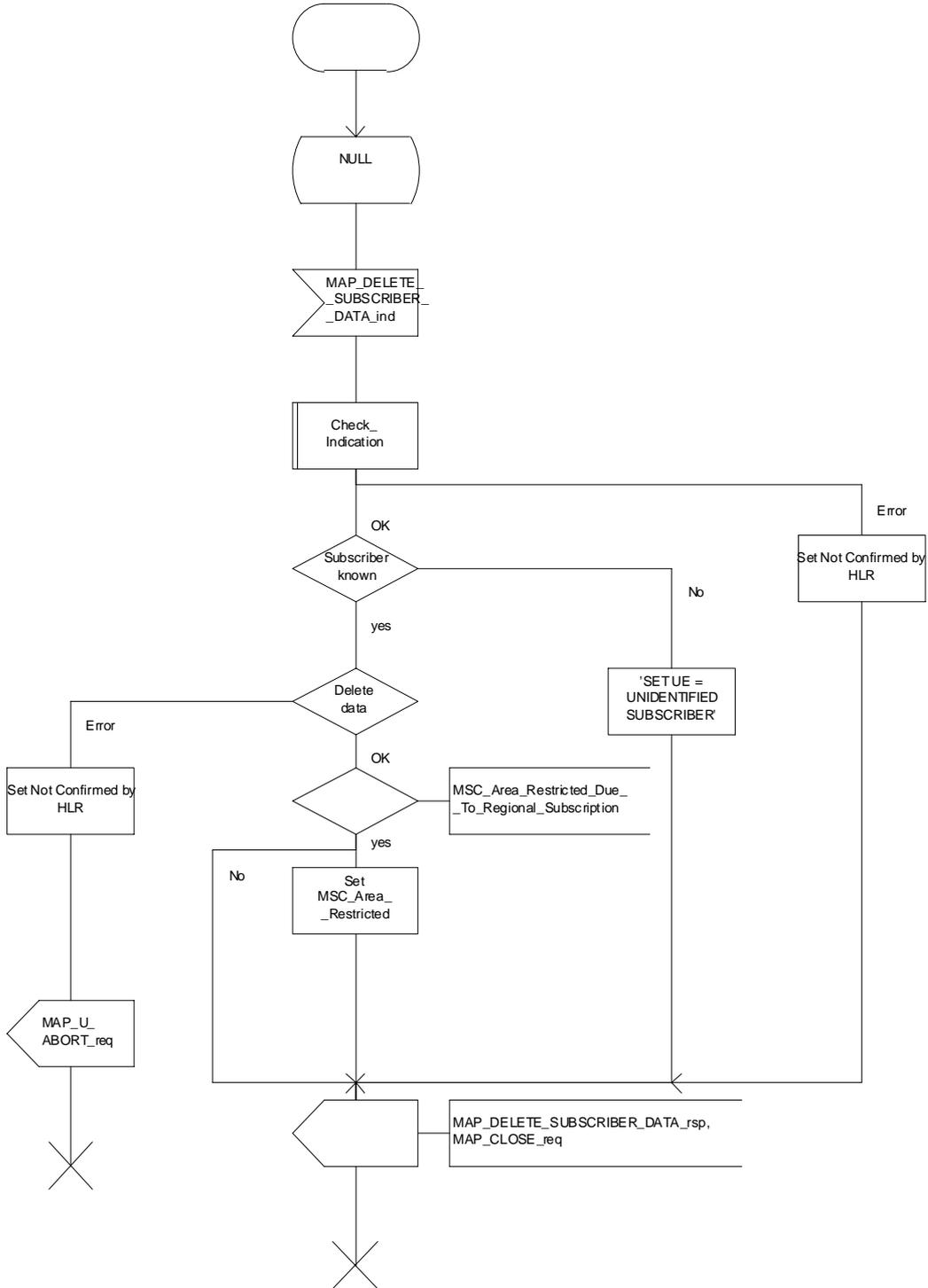


Figure 20.3/7: Process Delete_Subscriber_Data_VLR

20.3.3 Procedures in the SGSN

20.3.3.1 Subscriber deletion procedure

The subscriber deletion procedure in the SGSN is described in the subclause 19.1.

20.3.3.2 Subscriber data modification procedure

When receiving either the MAP_INSERT_SUBSCRIBER_DATA indication or the MAP_DELETE_SUBSCRIBER_DATA indication, the SGSN check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or a data missing error depending on the nature of the error.

After receiving the first MAP_INSERT_SUBSCRIBER_DATA indication, the SGSN will check the IMSI that is included in the primitive. If the IMSI is unknown, the error "Unidentified subscriber" is returned.

If the SGSN does not support received basic services or the network feature Operator Determined Barring, or there is a problem with Regional Subscription Data then it reports it to the HLR.

If the entire SGSN area is restricted due to regional subscription, this is reported to the HLR.

If the updating of the subscriber data is not possible, the SGSN will initiate the MAP_U_ABORT request primitive. If the updating is successful, the MAP_CLOSE indication is received from the HLR.

The subscriber data modification procedure in the SGSN is shown in the figures 20.3/11, 20.3/12 and 25.7/5.

Figure 20.3/11: The insert subscriber data process in the SGSN

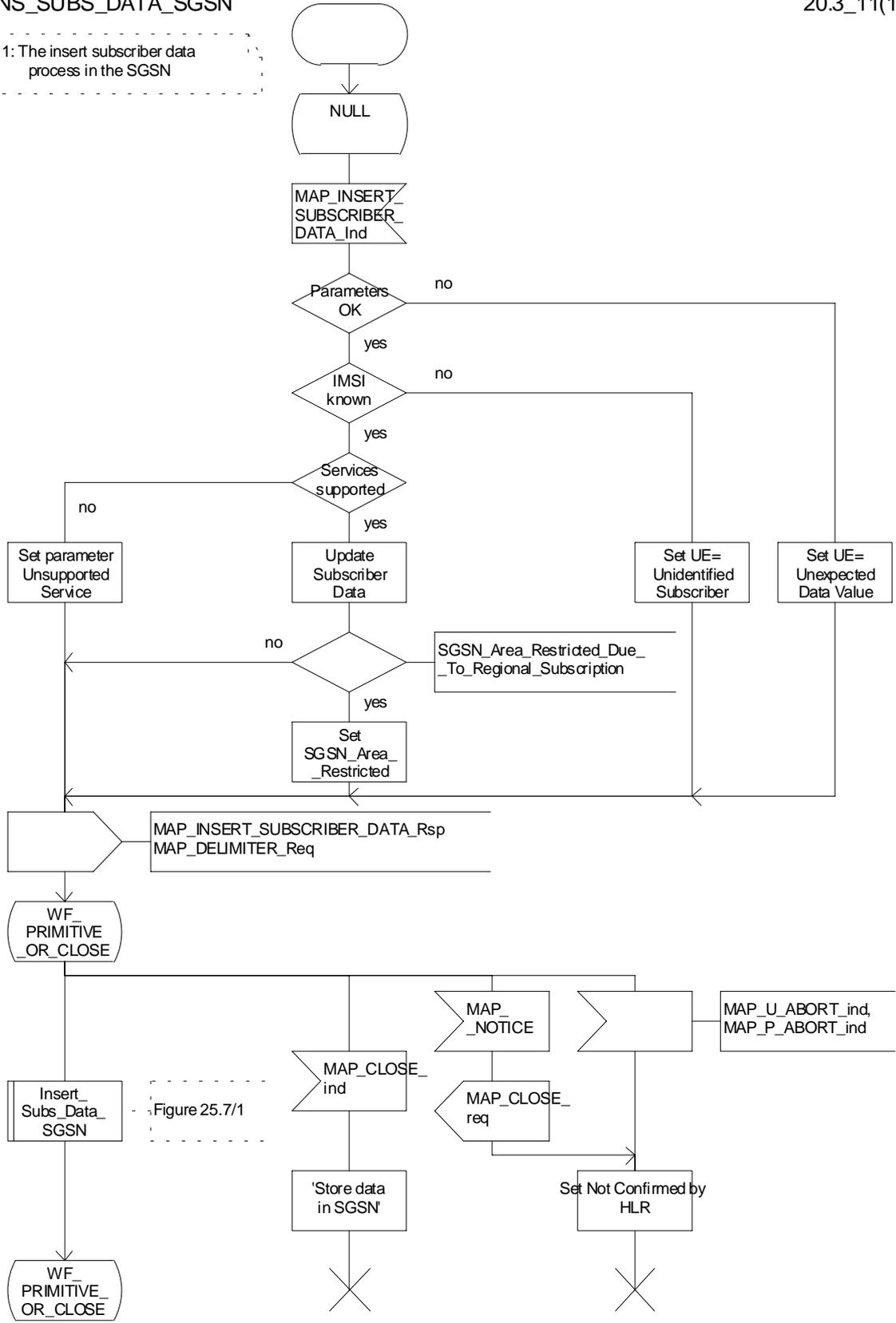


Figure 20.3/11: Process INS_SUBS_DATA_SGSN

Figure 20.3/12: The delete subscriber data process in the SGSN

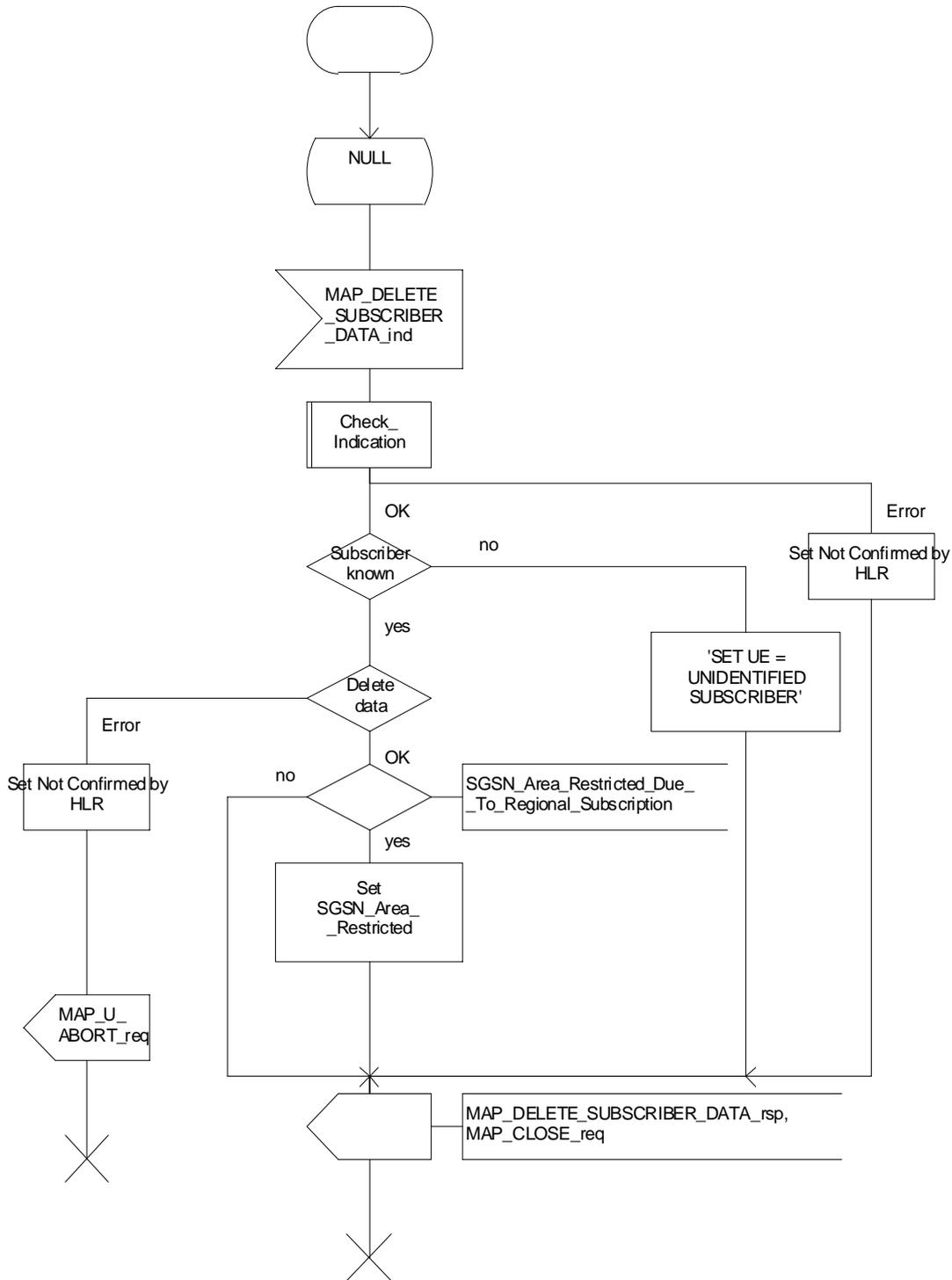
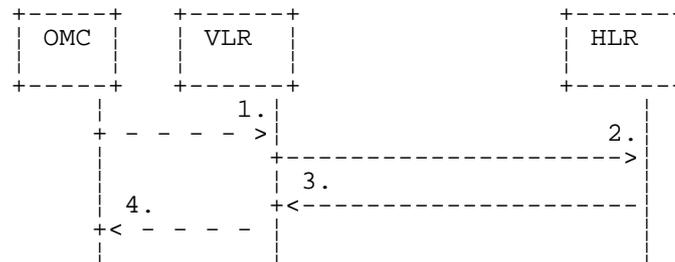


Figure 20.3/12: Process Delete_Subscriber_Data_SGSN

20.4 Subscriber Identity procedure

In the subscriber identity procedure the IMSI of the subscriber is retrieved from the HLR. The procedure is shown in figure 20.4/1.



- 1) Identity request
- 2) MAP_SEND_IMSI
- 3) MAP_SEND_IMSI_ACK
- 4) Identity confirm

Figure 20.4/1: The subscriber identity procedure

20.4.1 Subscriber identity procedure in the HLR

Opening of the dialogue is described in the macro Receive_Open_Ind in subclause 25.1, with outcomes:

- procedure termination; or
- dialogue acceptance, with proceeding as below.

When receiving the MAP_SEND_IMSI indication, the HLR will check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or a data missing error depending on the nature of the error.

If the subscriber is known in the HLR, the IMSI is fetched from the database and sent to the VLR. If the MSISDN cannot be identified, unknown subscriber indication is passed to the VLR.

The subscriber identity procedure in the HLR is shown in figure 20.4/2.

Figure 20.4/2: The send IMSI process in the HLR

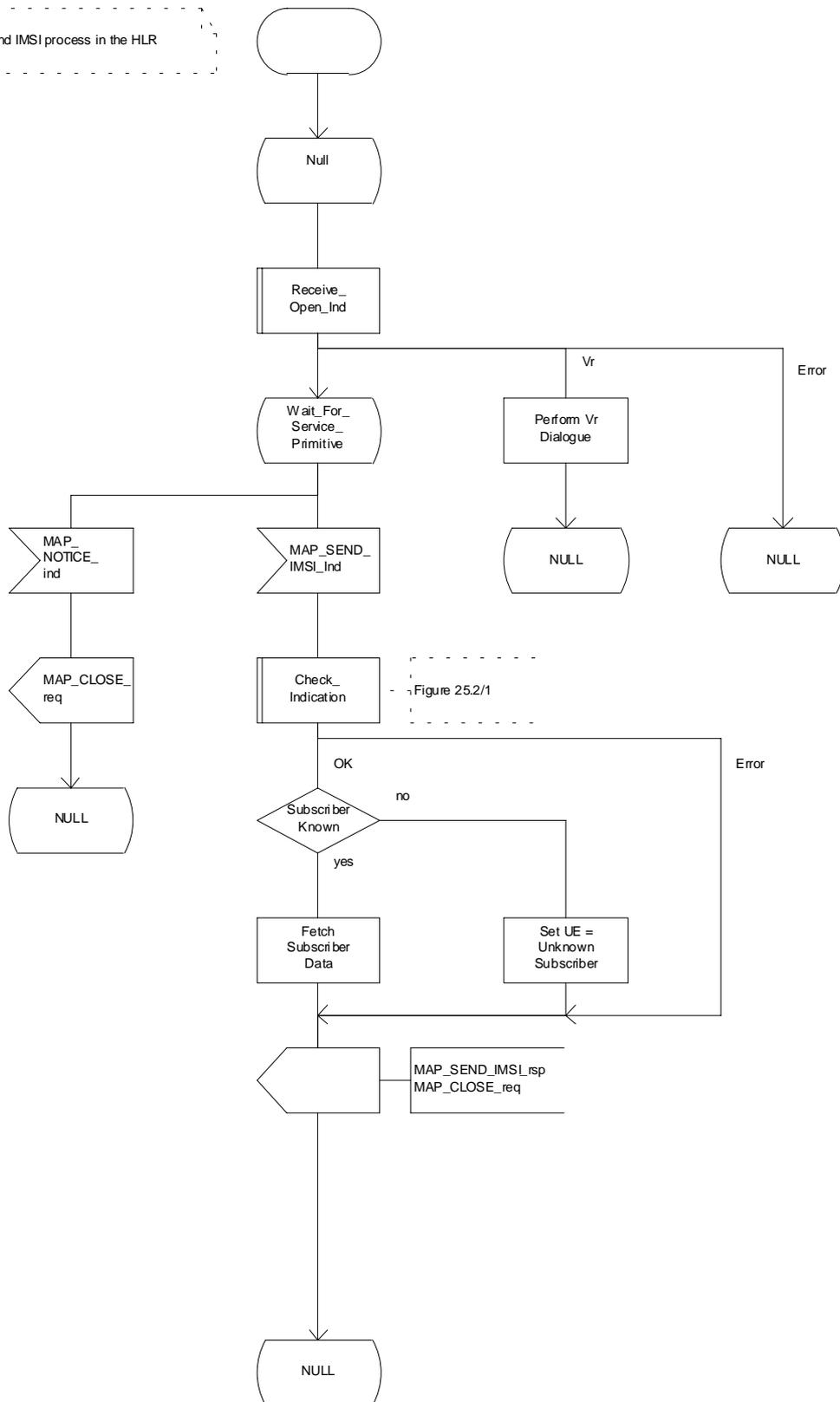


Figure 20.4/2: Process Send_IMSI_HLR

20.4.2 Subscriber identity procedure in the VLR

When the IMSI request is received from the OMC, the VLR will send the MAP_SEND_IMSI request to the HLR. The contents of the response is sent to the OMC.

The subscriber identity procedure in the VLR is shown in figure 20.4/3.

Process Send_IMSI_VLR

20.4_3(1)

Figure 20.4/3: The send IMSI process in the VLR

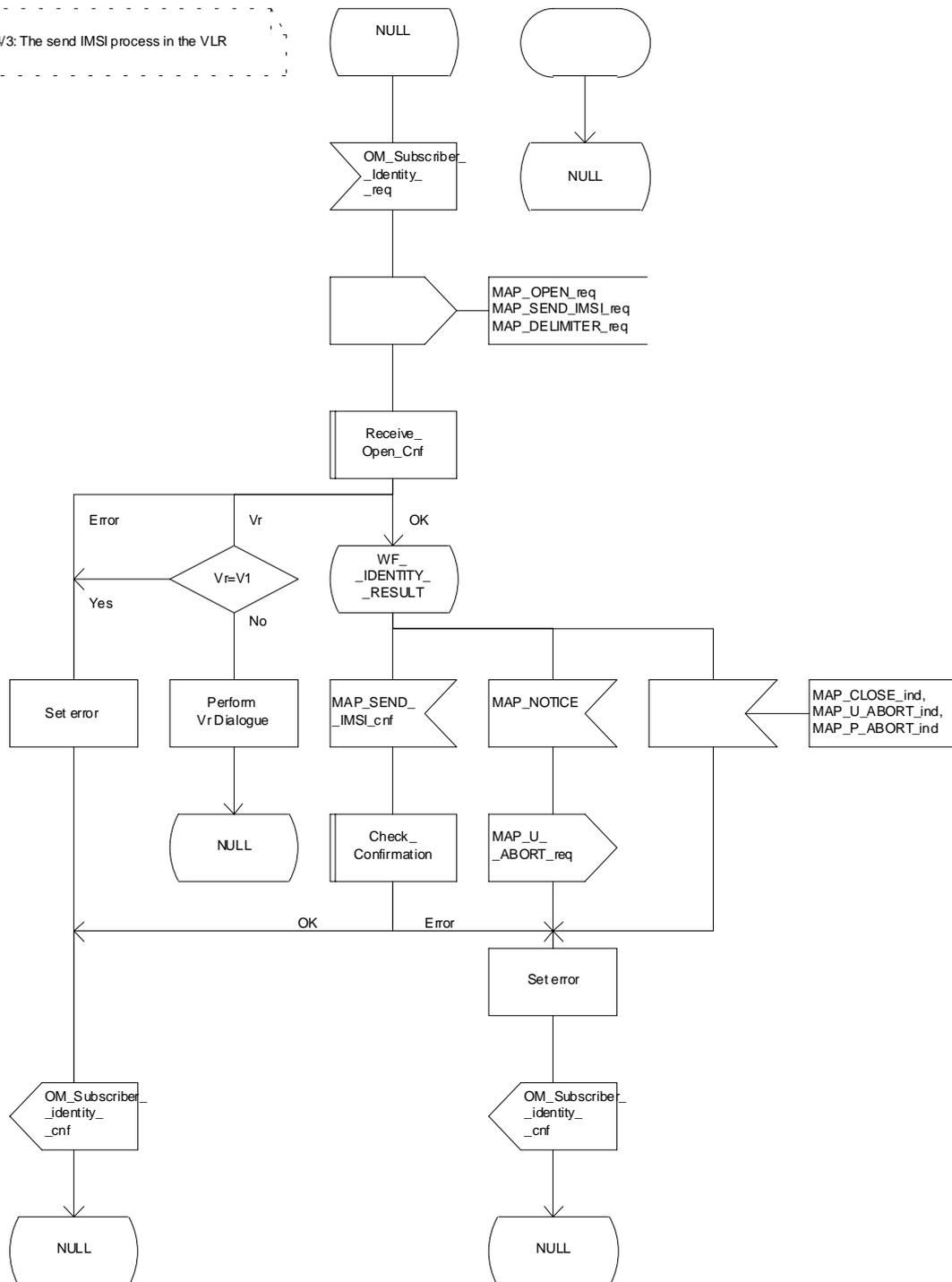


Figure 20.4/3: Process Send_IMSI_VLR

21 Call handling procedures

21.1 General

The MAP call handling procedures are used:

- to retrieve routing information to handle a mobile terminating call;
- to transfer control of a call back to the GMSC if the call is to be forwarded;
- to retrieve and transfer information between anchor MSC and relay MSC for inter MSC group calls / broadcast calls;
- to allocate resources in an SIWFS;
- to handle the reporting of MS status for call completion services;
- to handle the notification of remote user free for CCBS;
- to handle the alerting and termination of ongoing call activities for a specific subscriber.

The procedures to handle a mobile originating call and a mobile terminating call after the call has arrived at the destination MSC do not require any signalling over a MAP interface. These procedures are specified in GSM 03.18 [97].

The stage 2 specification for the retrieval of routing information to handle a mobile terminating call is in GSM 03.18 [97]; modifications to this procedure for CAMEL are specified in 3G TS 23.078 [98], for optimal routing of a basic mobile-to-mobile call in GSM 03.79 [99] and for CCBS in GSM 03.93. The interworking between the MAP signalling procedures and the call handling procedures for each entity (GMSC, HLR and VLR) is shown by the transfer of signals between these procedures.

The stage 2 specification for the transfer of control of a call back to the GMSC if the call is to be forwarded is in GSM 03.79 [99]. The interworking between the MAP signalling procedures and the call handling procedures for each entity (VMSC and GMSC) is shown by the transfer of signals between these procedures.

The stage 2 specifications for inter MSC group calls / broadcast calls are in GSM 03.68 and GSM 03.69. The interworking between the MAP signalling procedures and the group call /broadcast call procedures for each entity (Anchor MSC and Relay MSC) is shown by the transfer of signals between these procedures.

The stage 2 specification for the allocation of resources in an SIWFS is in GSM 03.54. The interworking between the MAP signalling procedures and the call handling procedures for each entity (VMSC and SIWFS) is shown by the transfer of signals between these procedures.

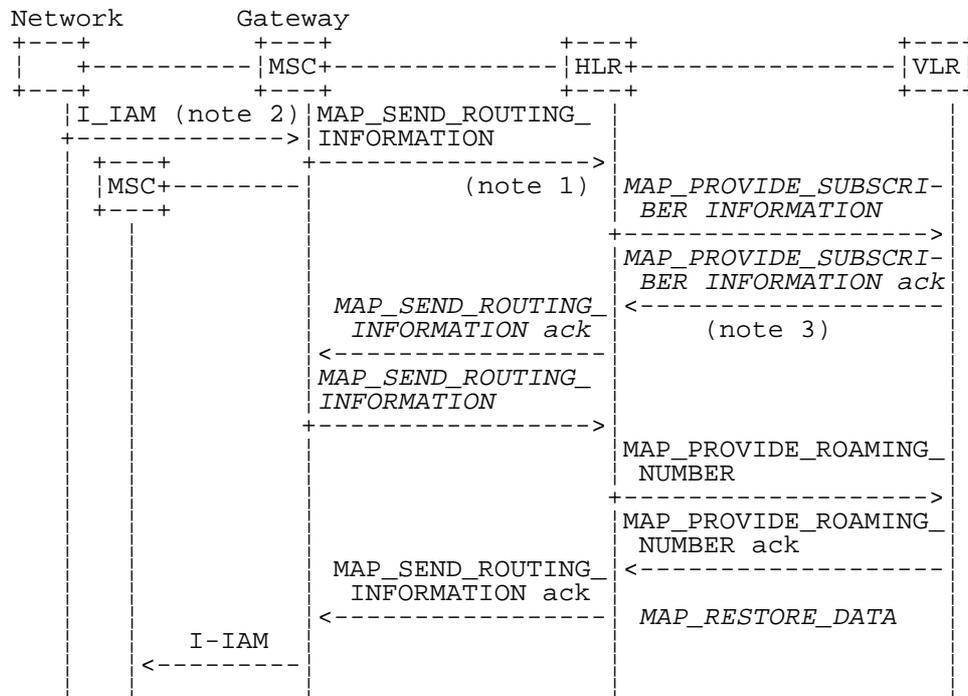
The interworking between the call handling procedures and signalling protocols other than MAP is shown in GSM 03.18, 3G TS 23.078 and GSM 03.79.

The stage 2 specification for the handling of reporting of MS status for call completion services and notification of remote user free for CCBS is in GSM 03.93.

21.2 Retrieval of routing information

21.2.1 General

The message flows for successful retrieval of routing information for a mobile terminating call are shown in figure 21.2/1 (mobile terminating call which has not been optimally routed) and 21.2/2 (mobile-to-mobile call which has been optimally routed).



Notes:

xxx = Optional Procedure

NOTE 1: This service may also be used by an ISDN exchange for obtaining routing information from the HLR.

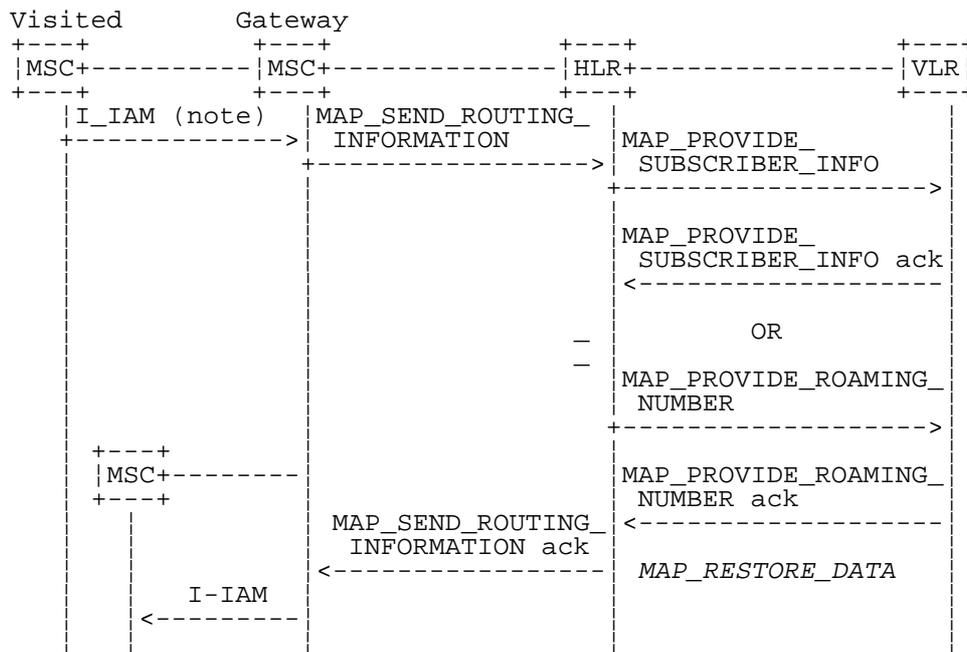
NOTE 2: TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. For further details on the TUP and ISUP procedures refer to the following ITU-T Recommendations and ETSI specification:

Q.721-725 - Telephone User Part (TUP);

ETS 300 356-1 - Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services.

NOTE 3: As a network operator option, the HLR sends MAP_PROVIDE_SUBSCRIBER_INFORMATION to the VLR. For further details on the CAMEL procedures refer to GSM TS 03.78;

Figure 21.2/1: Message flow for retrieval of routing information (non-optimally routed call)



Notes:

xxx = Optional Procedure

For Optimal Routeing phase 1, only one of the information flows for Provide Subscriber Info and Provide Roaming Number is used. For later phases of Optimal Routeing, the HLR may return a MAP_SEND_ROUTEING_INFORMATION ack after the Provide Subscriber Info information flow, and the GMSC may send a second MAP_SEND_ROUTEING_INFORMATION, which will trigger the Provide Roaming Number information flow.

TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. For further details on the TUP and ISUP procedures refer to the following CCITT Recommendations & ETSI specification:

Q.721-725 - Telephone User Part (TUP);

ETS 300 356-1 - Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services.

Figure 21.2/2: Message flow for retrieval of routeing information (optimally routed call)

The following MAP services are used to retrieve routing information:

MAP_SEND_ROUTING_INFORMATION	see subclause 10.1;
MAP_PROVIDE_ROAMING_NUMBER	see subclause 10.2;
MAP_PROVIDE_SUBSCRIBER_INFO	see subclause 8.11.2;
MAP_RESTORE_DATA	see subclause 8.10.3.

21.2.2 Process in the GMSC

The MAP process in the GMSC to retrieve routing information for a mobile terminating call is shown in figure 21.2/3. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see subclause 25.1.2;
------------------	-----------------------

Check_Confirmation see subclause 25.2.2.

Successful Outcome

When the MAP process receives a Send Routeing Info request from the call handling process in the GMSC, it requests a dialogue with the HLR whose identity is contained in the Send Routeing Info request by sending a MAP_OPEN service request, requests routing information using a MAP_SEND_ROUTING_INFORMATION service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_SEND_ROUTING_INFORMATION service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm. If the MAP_SEND_ROUTING_INFORMATION confirm from the HLR cannot be carried in a single TC-Result component, it is carried in one or more TC-Result-NL components (each sent in a TC-CONTINUE), followed by a TC-Result-L component in a TC-END message.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Send Routeing Info ack containing the routing information received from the HLR to the call handling process in the GMSC and returns to the idle state.

Earlier version MAP dialogue with the HLR

If the macro Receive_Open_Cnf takes the Vr exit, the MAP process checks whether this is an OR interrogation (indicated by the inclusion of the OR interrogation parameter in the MAP_SEND_ROUTING_INFORMATION service request).

If this is not an OR interrogation, the GMSC performs the earlier version MAP dialogue as specified in [51] or [96] and the process returns to the idle state.

If this is an OR interrogation, the MAP process sends a Send Routeing Info negative response indicating OR not allowed to the call handling process in the GMSC and returns to the idle state.

Dialogue opening failure

If the macro Receive_Open_Cnf indicates that the dialogue with the HLR could not be opened, the MAP process sends an Abort to to the call handling process in the GMSC and returns to the idle state.

Error in MAP_SEND_ROUTING_INFORMATION confirm

If the MAP_SEND_ROUTING_INFORMATION service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Send Routeing Info negative response to the call handling process in the GMSC and returns to the idle state.

Call release

If the call handling process in the GMSC indicates that the call has been aborted (i.e. prematurely released by the calling subscriber), the MAP process returns to the idle state. Any response from the HLR will be discarded.

Abort of HLR dialogue

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the HLR may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process sends a Send Routeing Info negative response to the call handling process in the GMSC and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR, sends a Send Routeing Info negative response indicating system failure to the call handling process in the GMSC and returns to the idle state.

Process SRI_GMSC

21.2_3.1(2)

Figure 21.2/3: Process in the GMSC for retrieval of routing information

Signals to/from the left are to/from the GMSC call handling process; signals to/from the right are to/from the HLR

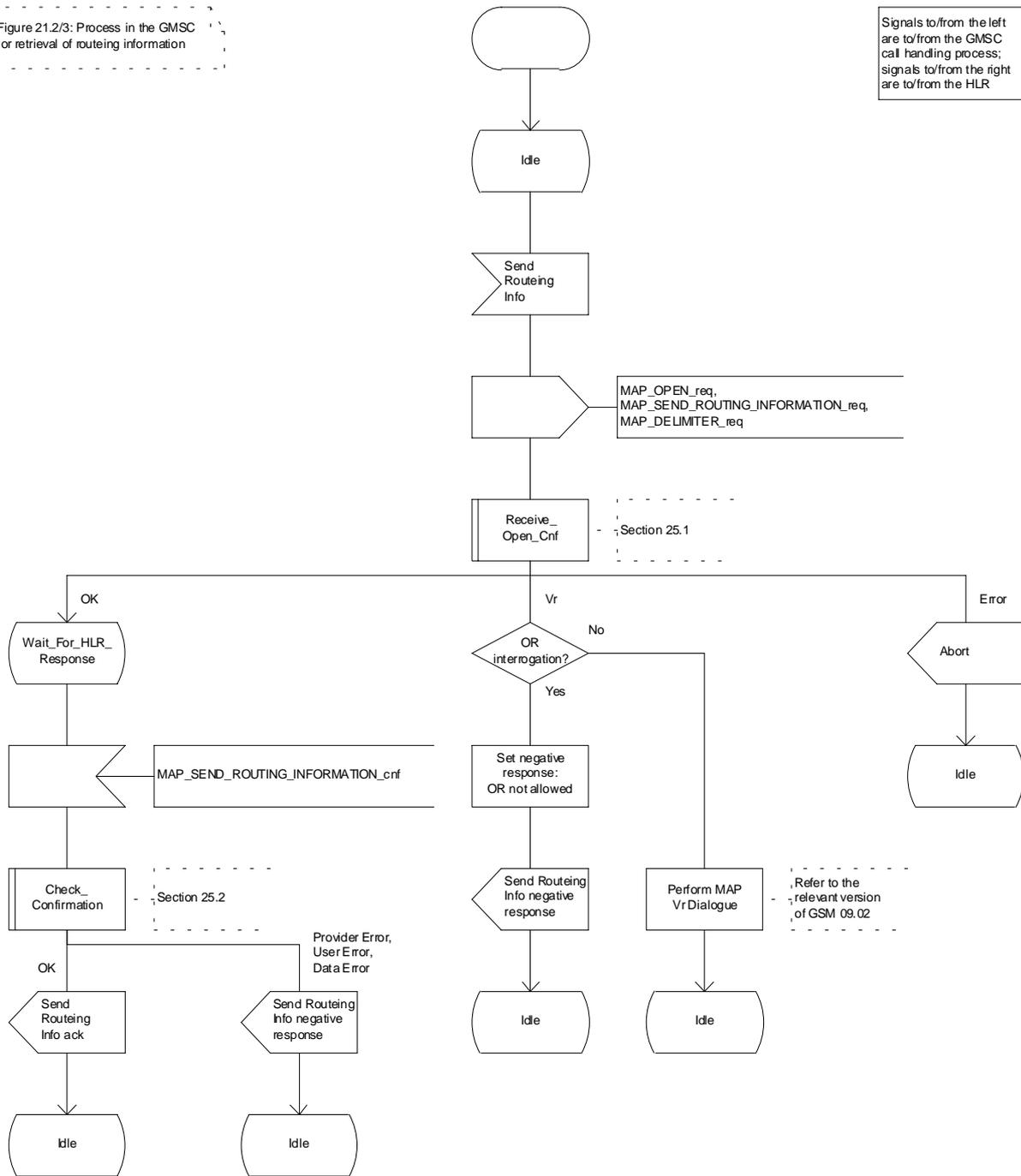


Figure 21.2/3 (sheet 1 of 2): Process SRI_GMSC

Process SRI_GMSC

21.2_3.2(2)

Figure 21.2/3: Process in the GMSC for retrieval of routing information

Signals to/from the left are to/from the GMSC call handling process; signals to/from the right are to/from the HLR

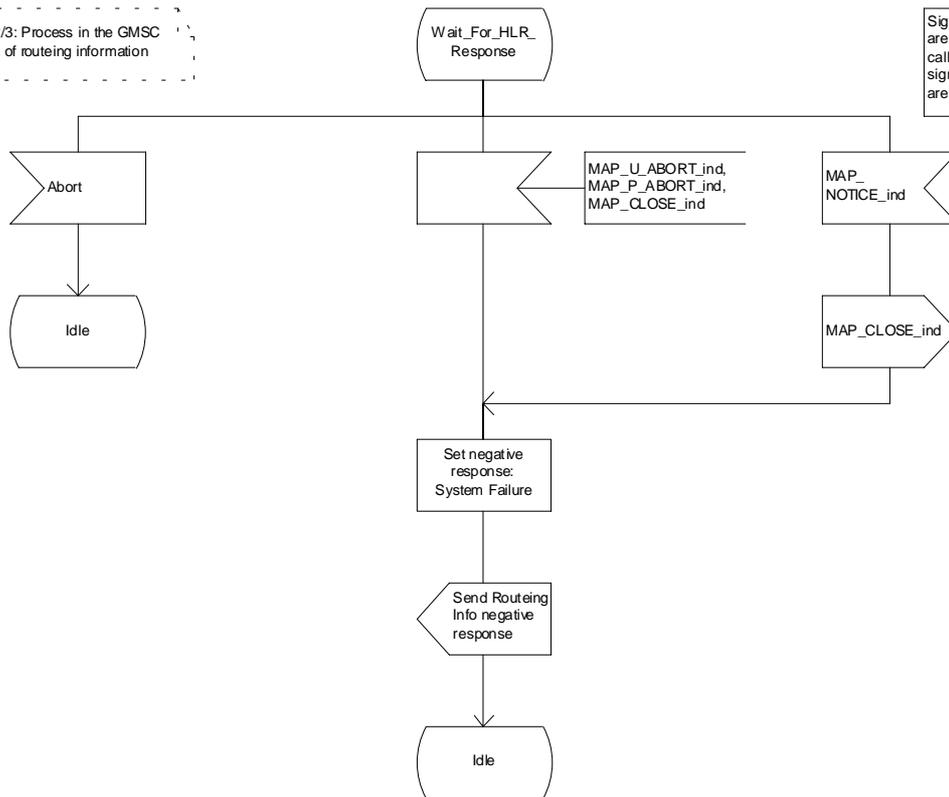


Figure 21.2/3 (sheet 2 of 2): Process SRI_GMSC

21.2.3 Procedures in the HLR

The MAP process in the HLR to retrieve routing information for a mobile terminating call is shown in figure 21.2/4. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Receive_Open_Cnf	see subclause 25.1.2;
Check_Confirmation	see subclause 25.2.2.

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context locInfoRetrieval, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_SEND_ROUTING_INFORMATION service indication is received, the MAP process sends a Send Routing Info request to the call handling process in the HLR, and waits for a response. The Send Routing Info request contains the parameters received in the MAP_SEND_ROUTING_INFORMATION service indication.

If the call handling process in the HLR returns a Send Routing Info ack, the MAP process constructs a MAP_SEND_ROUTING_INFORMATION service response containing the routing information contained in the Send Routing Info ack, constructs a MAP_CLOSE service request, sends them to the GMSC and returns to the idle state. If the MAP_SEND_ROUTING_INFORMATION response cannot be carried in a single TC-Result component, it is carried in one or more TC-Result-NL components (each sent in a TC-CONTINUE), followed by a TC-Result-L component in a TC-END message.

If the call handling process in the HLR returns a Provide Subscriber Info request, the MAP process requests a dialogue with the VLR whose identity is contained in the Provide Subscriber Info request by sending a MAP_OPEN service request, requests the subscriber status using a MAP_PROVIDE_SUBSCRIBER_INFO service request, and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request.

If the macro takes the OK exit, the MAP process waits for the response from the VLR.

If the MAP process receives a MAP_PROVIDE_SUBSCRIBER_INFO service confirm, it invokes the macro Check_Confirmation to check the content of the confirm.

If the Check_Confirmation macro takes the OK exit, the MAP process sends a Provide Subscriber Info ack containing the information received in the MAP_PROVIDE_SUBSCRIBER_INFO service confirm to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

If the MAP_PROVIDE_SUBSCRIBER_INFO service confirm contains a provider error or a data error, the MAP process sends a Provide Subscriber Info negative response indicating the type of error to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

NOTE: The 'User Error' exit from the macro Check_Confirmation is shown for formal completeness; the MAP_PROVIDE_SUBSCRIBER_INFO_cnf primitive cannot contain a user error.

If the call handling process in the HLR returns a Provide Roaming Number request, the MAP process requests a dialogue with the VLR whose identity is contained in the Provide Roaming Number request by sending a MAP_OPEN service request, requests a roaming number using a MAP_PROVIDE_ROAMING_NUMBER service request, and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request.

If the macro takes the OK exit, the MAP process waits for the response from the VLR.

If the MAP process receives a MAP_PROVIDE_ROAMING_NUMBER service confirm, it invokes the macro Check_Confirmation to check the content of the confirm.

If the Check_Confirmation macro takes the OK exit, the MAP process sends a Provide Roaming Number ack containing the MSRN received in the MAP_PROVIDE_ROAMING_NUMBER service confirm to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

If the MAP_PROVIDE_ROAMING_NUMBER service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Provide Roaming Number negative response indicating the type of error to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

Negative response from HLR call handling process

If the call handling process in the HLR returns a negative response, either before or after a dialogue with the VLR to obtain a roaming number, the MAP process constructs a MAP_SEND_ROUTING_INFORMATION service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the GMSC and returns to the idle state.

Earlier version MAP Provide Roaming Number dialogue with the VLR

If the macro Receive_Open_Cnf takes the Vr exit after the MAP process has requested opening of a Provide Roaming Number dialogue with the VLR, the MAP process checks whether this is an OR interrogation (indicated by the inclusion of the OR interrogation parameter in the MAP_PROVIDE_ROAMING_NUMBER service request).

If this is not an OR interrogation, the HLR performs the earlier version MAP dialogue as specified in [51] or [96], relays the result of the dialogue to the HLR call handling process, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

If this is an OR interrogation, the MAP process sends a Provide Roaming Number negative response indicating OR not allowed to the call handling process in the HLR and waits for a response. The handling of the response from the call handling process in the HLR is described above.

Failure of Provide Subscriber Info dialogue with the VLR

If the Receive_Open_Cnf macro takes the Vr exit or the Error exit after the MAP process has requested opening of a Provide Subscriber Info dialogue with the VLR, the MAP process sends a Provide Subscriber Info negative response indicating system failure to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

Failure of Provide Roaming Number dialogue with the VLR

If the Receive_Open_Cnf macro takes the Error exit after the MAP process has requested opening of a Provide Roaming Number dialogue with the VLR, the MAP process sends a Provide Roaming Number negative response indicating system failure to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

If the MAP process receives a MAP_U_ABORT, a MAP_P_ABORT or a premature MAP_CLOSE from the MAP provider, it sends a Provide Roaming Number negative response indicating system failure to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

If the MAP process receives a MAP_NOTICE from the MAP provider, it returns a MAP_CLOSE request to the MAP provider, sends a Provide Roaming Number negative response indicating system failure to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

Earlier version MAP dialogue with the GMSC

If the macro Receive_Open_Ind takes the Vr exit, the the HLR performs the earlier version MAP dialogue as specified in [51] or [96] and the process returns to the idle state.

Failure of dialogue opening with the GMSC

If the macro Receive_Open_Ind takes the Error exit, the MAP process returns to the idle state.

If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Process SRI_HLR

21.2_4.1(3)

Figure 21.2/4: Process in the HLR to respond to a request for routing information

Signals to/from the left are to/from the GMSC; signals to/from the right are to/from the VLR unless specified otherwise

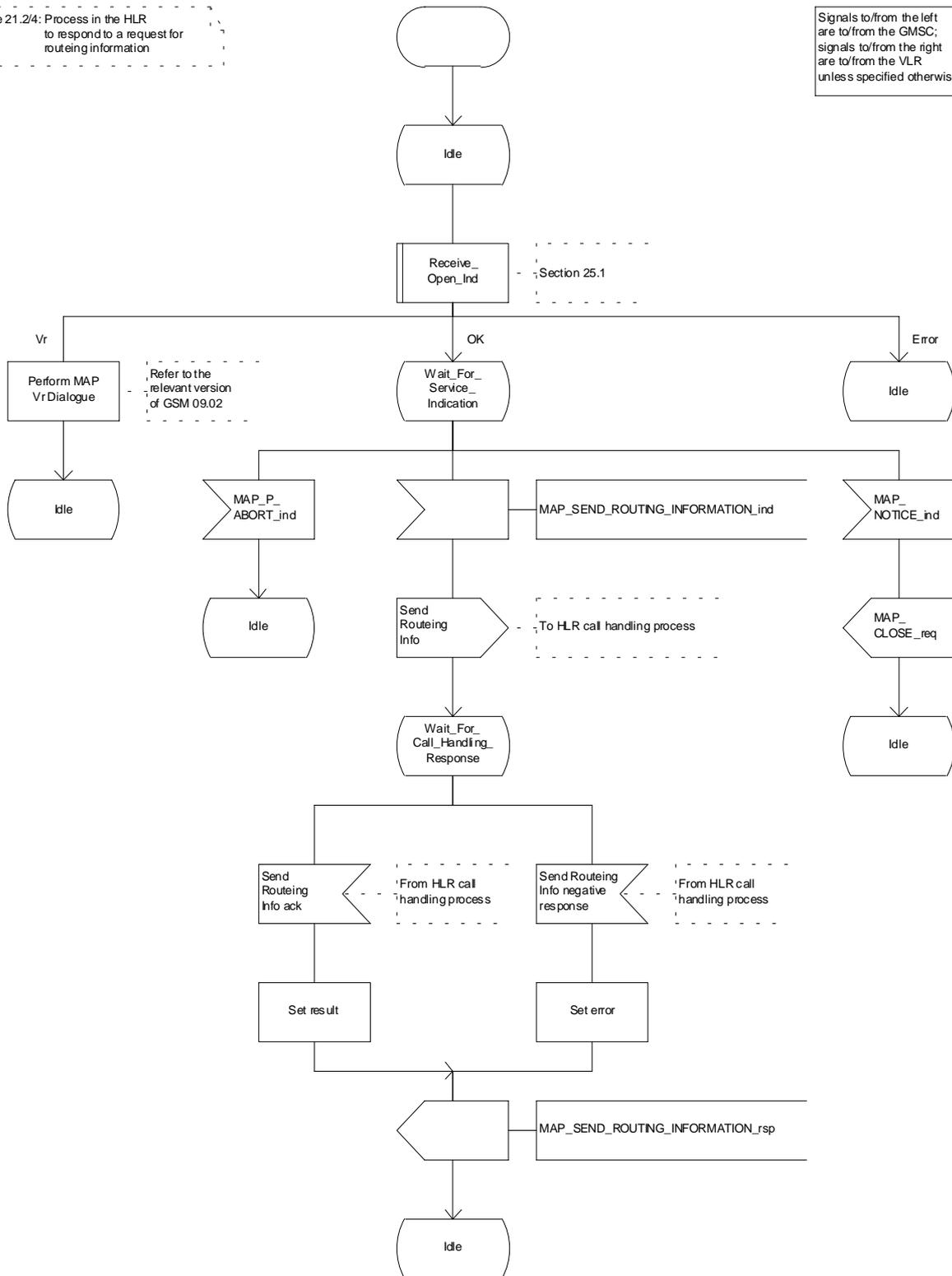


Figure 21.2/4 (sheet 1 of 3): Process SRI_HLR

Process SRI_HLR

21.2_4.2(3)

Figure 21.2/4: Process in the HLR to respond to a request for routing information

Signals to/from the left are to/from the GMSC; signals to/from the right are to/from the VLR unless specified otherwise

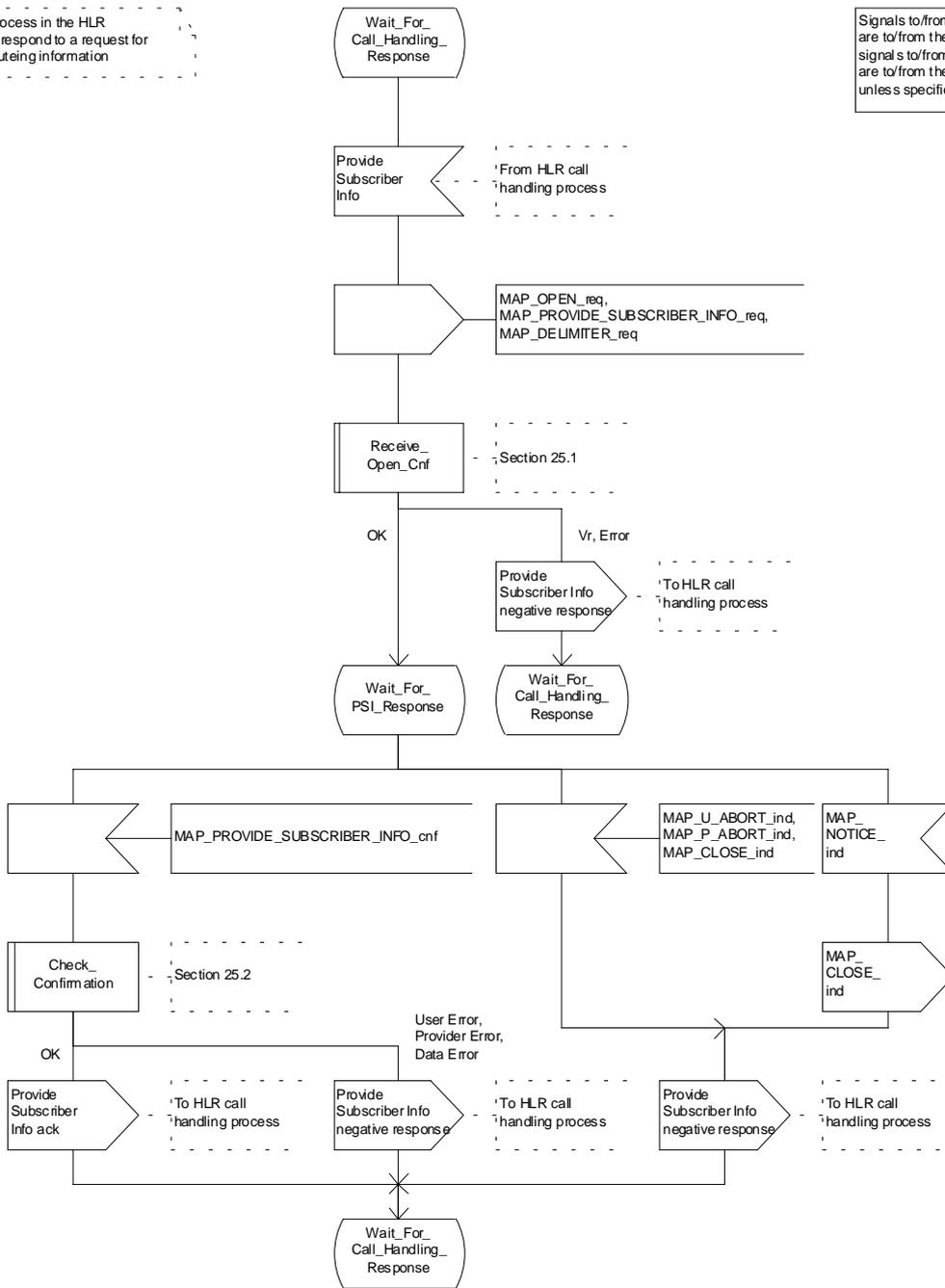


Figure 21.2/4 (sheet 2 of 3): Process SRI_HLR

Process SRI_HLR

21.2_4.3(3)

Figure 21.2/4: Process in the HLR to respond to a request for routing information

Signals to/from the left are to/from the GMSC; signals to/from the right are to/from the VLR unless specified otherwise

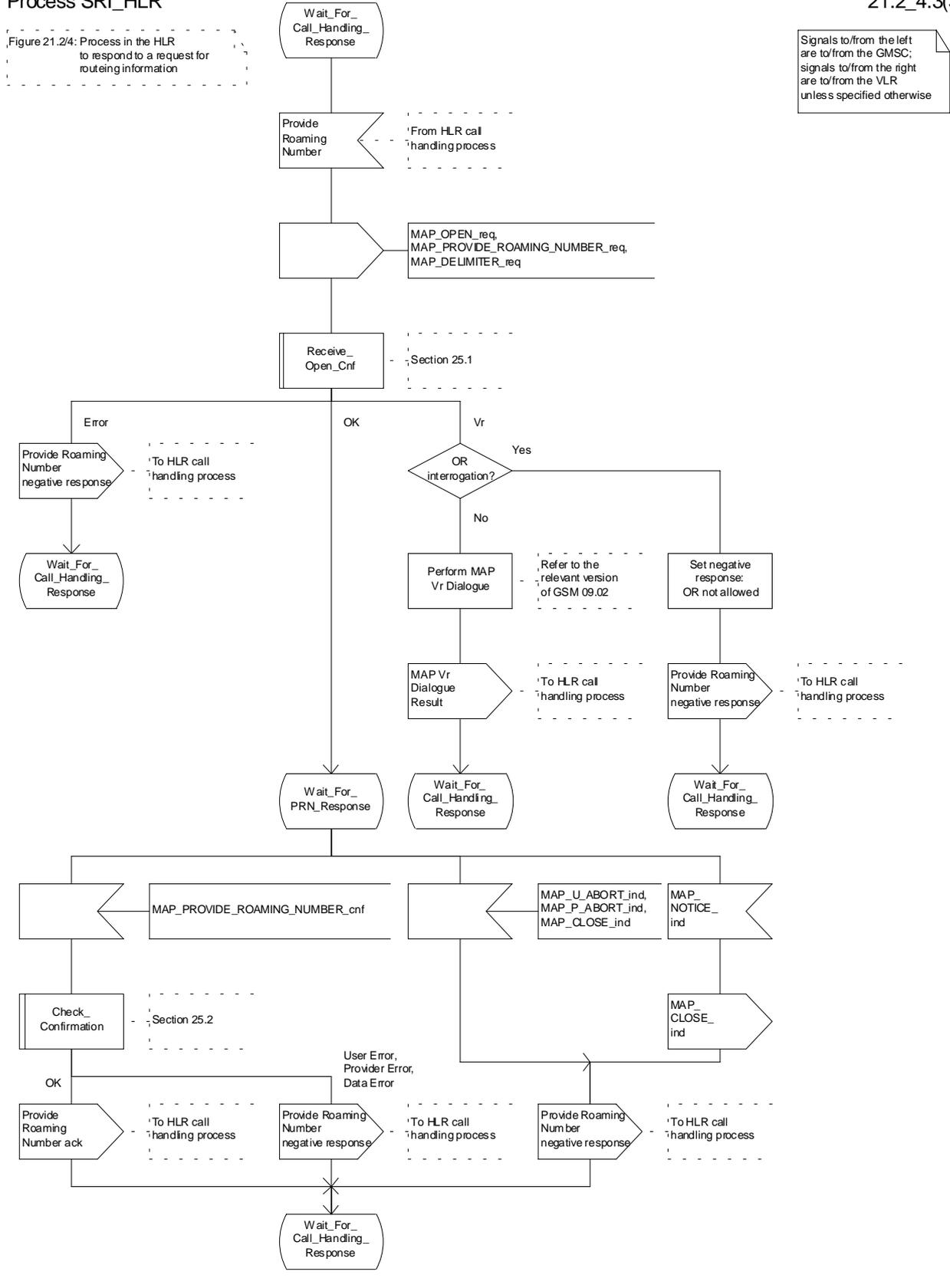


Figure 21.2/4 (sheet 3 of 3): Process SRI_HLR

21.2.4 Process in the VLR to provide a roaming number

The MAP process in the VLR to provide a roaming number for a mobile terminating call is shown in figure 21.2/5. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context roamingNbEnquiry, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_PROVIDE_ROAMING_NUMBER service indication is received, the MAP process sends a Provide Roaming Number request to the call handling process in the VLR, and waits for a response. The Provide Roaming Number request contains the parameters received in the MAP_PROVIDE_ROAMING_NUMBER service indication.

If the call handling process in the VLR returns a Provide Roaming Number ack, the MAP process constructs a MAP_PROVIDE_ROAMING_NUMBER service response containing the roaming number contained in the Send Routeing Info ack, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Earlier version MAP dialogue with the HLR

If the macro Receive_Open_Ind takes the Vr exit, the the VLR performs the earlier version MAP dialogue as specified in [51] or [96] and the process returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Ind takes the Error exit, the MAP process returns to the idle state.

If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Negative response from VLR call handling process

If the call handling process in the HLR returns a negative response, the MAP process constructs a MAP_PROVIDE_ROAMING_NUMBER service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Process PRN_VLR

21.2_5(1)

Figure 21.2/5: Process in the VLR to handle a request for a roaming number

Signals to/from the left are to/from the HLR; signals to/from the right are to/from the VLR call handling process

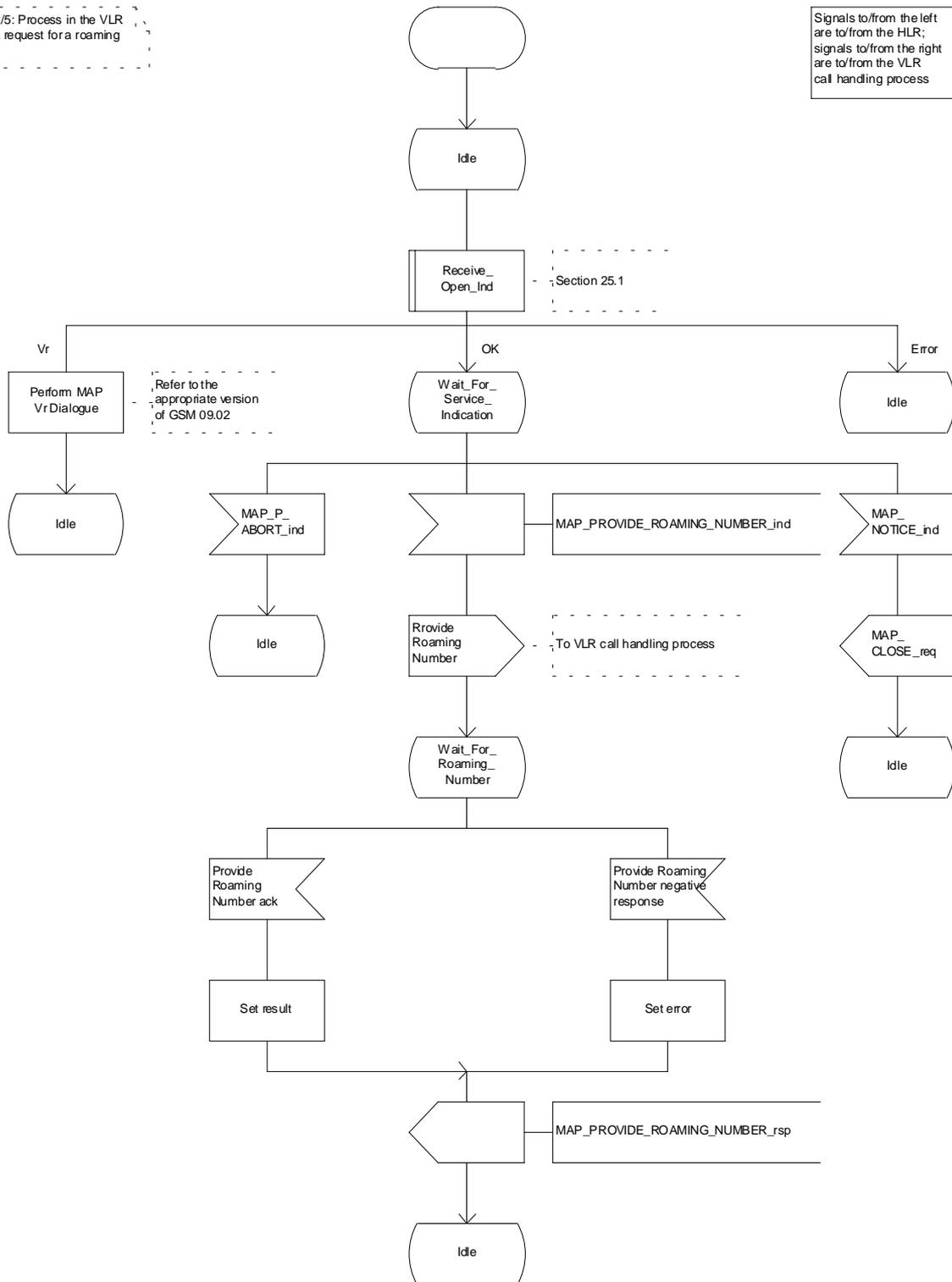


Figure 21.2/5: Process PRN_VLR

21.2.5 Process in the VLR to restore subscriber data

The MAP process in the HLR to restore subscriber data is shown in figure 21.2/6. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see subclause 25.1.2;
Check_Confirmation	see subclause 25.2.2;
Insert_Subscriber_Data_VLR	see subclause 25.7.1;
Activate_Tracing_VLR	see subclause 25.9.3.

Successful outcome

When the MAP process receives a Restore Data request from the data restoration process in the VLR, it requests a dialogue with the HLR whose identity is contained in the Restore Data request by sending a MAP_OPEN service request, requests data restoration using a MAP_RESTORE_DATA service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

The VLR may receive a MAP_INSERT_SUBSCRIBER_DATA service indication from the HLR; this is handled by the macro Insert_Subscriber_Data_VLR as described in subclause 25.7.1, and the MAP process waits for a further response from the HLR.

The VLR may receive a MAP_ACTIVATE_TRACE_MODE service indication from the HLR; this is handled by the macro Activate_Tracing_VLR as described in subclause 25.9.3, and the MAP process waits for a further response from the HLR.

If the MAP process receives a MAP_RESTORE_DATA service confirm, it invokes the macro Check_Confirmation to check the content of the confirm.

If the Check_Confirmation macro takes the OK exit, the MAP process sends a Restore Data ack containing the information received from the HLR to the data restoration process in the VLR and returns to the idle state.

Error in MAP_RESTORE_DATA confirm

If the MAP_RESTORE_DATA service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Restore Data negative response indicating the type of error to the call handling process in the HLR, and returns to the idle state.

Earlier version MAP dialogue with the HLR

If the macro Receive_Open_Cnf takes the Vr exit, the VLR performs the earlier MAP version dialogue as specified in [51] or [96] and the process terminates.

Dialogue opening failure

If the macro Receive_Open_Cnf indicates that the dialogue with the HLR could not be opened, the MAP process sends a negative response indicating system failure to the data restoration process in the GMSC and returns to the idle state.

Process Restore_Data_VLR

21.2_6(1)

Figure 21.2/6: Process in the VLR to trigger restoration of subscriber data

Signals to/from the left are to/from the VLR data restoration process; signals to/from the right are to/from the HLR

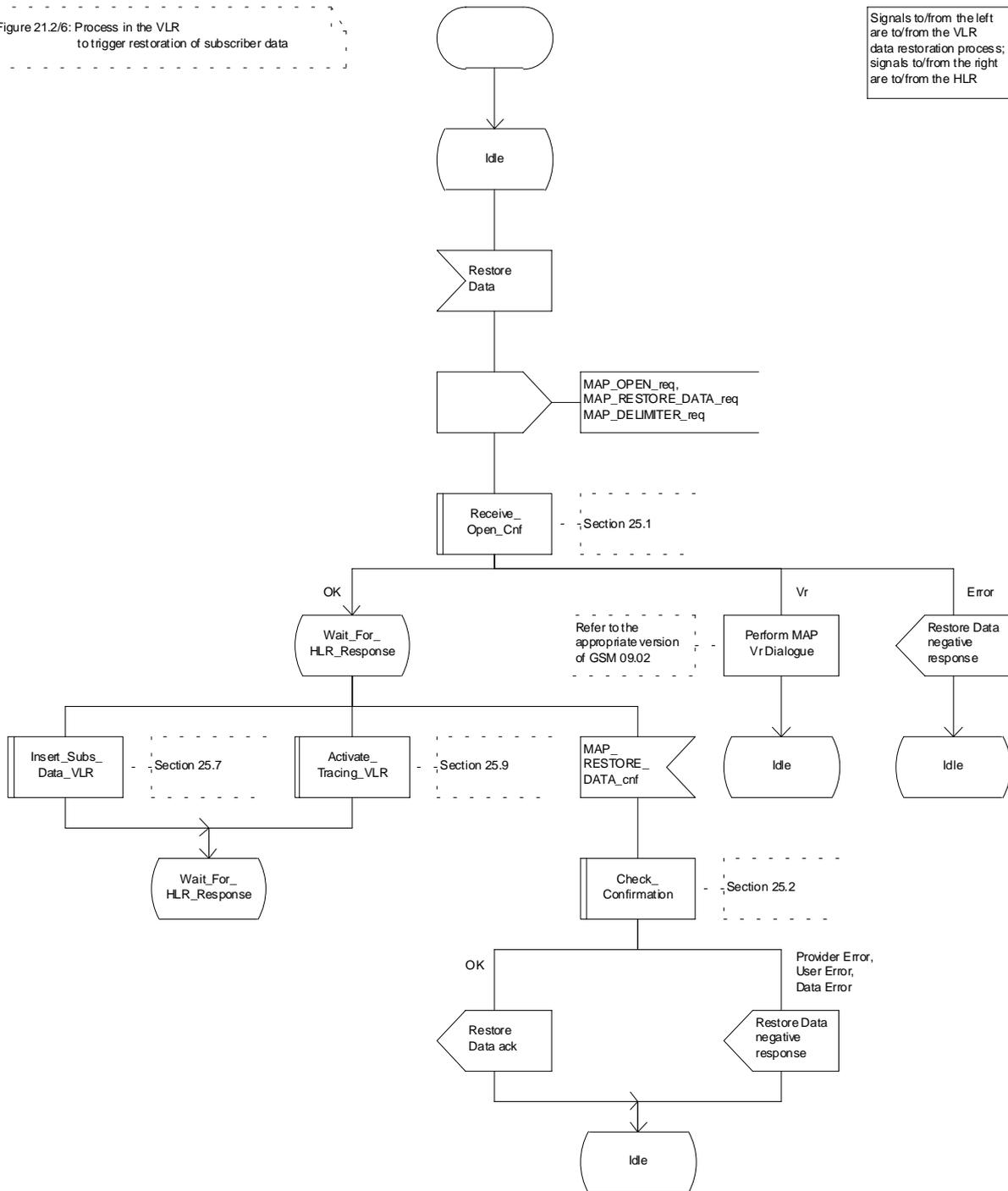


Figure 21.2/6: Process Restore_Data_VLR

21.2.6 Process in the VLR to provide subscriber information

The MAP process in the VLR to provide subscriber information for a mobile terminating call subject to CAMEL invocation is shown in figure 21.2/6. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context subscriberInfoEnquiry, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_PROVIDE_SUBSCRIBER_INFO service indication is received, the MAP process sends a Provide Subscriber Info request to the subscriber information request process in the VLR, and waits for a response. The Provide Subscriber Info request contains the parameters received in the MAP_PROVIDE_SUBSCRIBER_INFO service indication.

If the subscriber information request process in the VLR returns a Provide Subscriber Info ack, the MAP process constructs a MAP_PROVIDE_SUBSCRIBER_INFO service response containing the information contained in the Provide Subscriber Info ack, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Ind takes the Vr exit or the Error exit, the MAP process returns to the idle state.

If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Process PSI_VLR

21.2_7(1)

Figure 21.2/7: Process in the VLR to handle a request for subscriber information

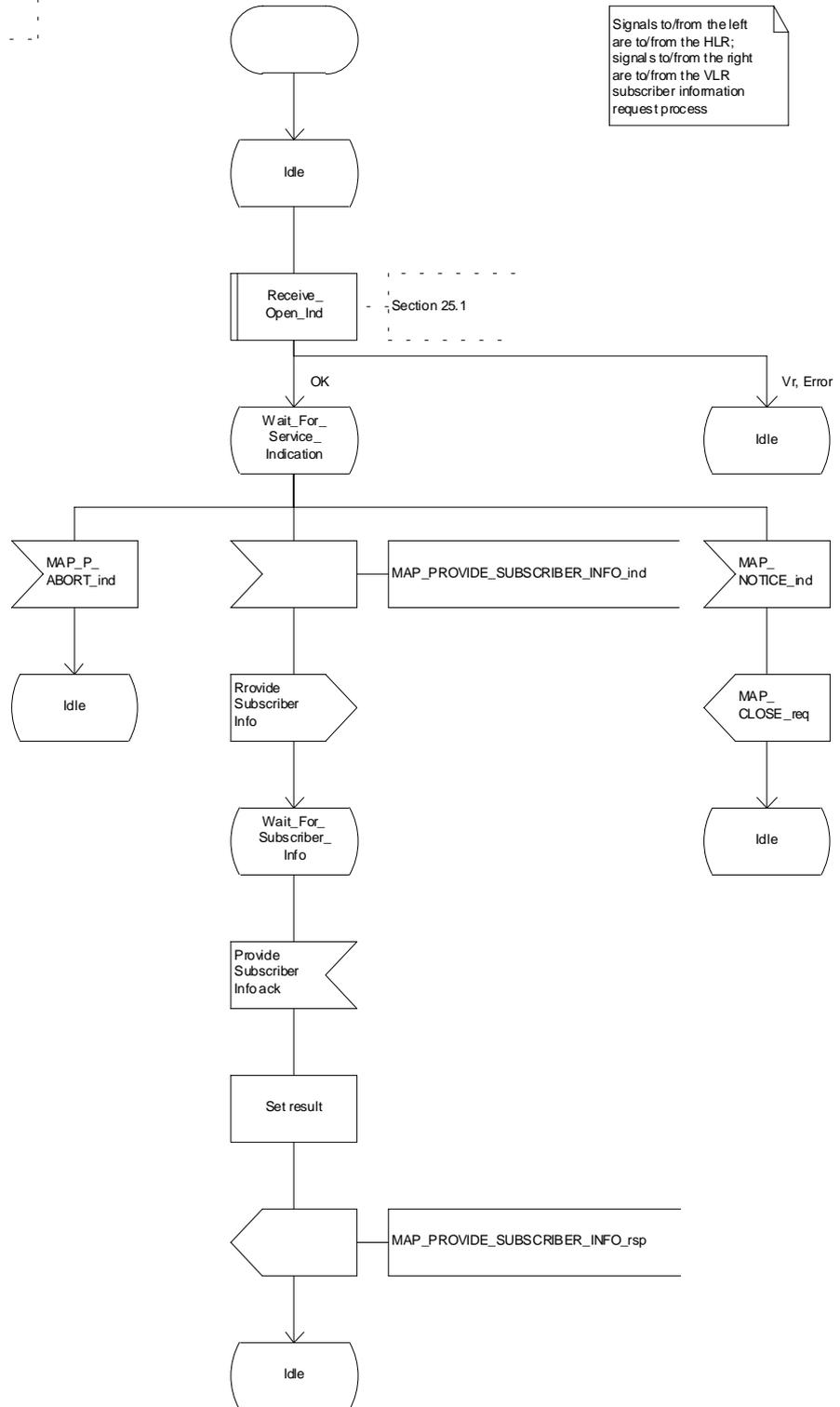


Figure 21.2/7: Process PSI_VLR

21.2.7 Process in the HLR for Any Time Interrogation

The message flows for successful retrieval of subscriber information related to an any time interrogation from the CAMEL server are shown in figure 21.2/8.

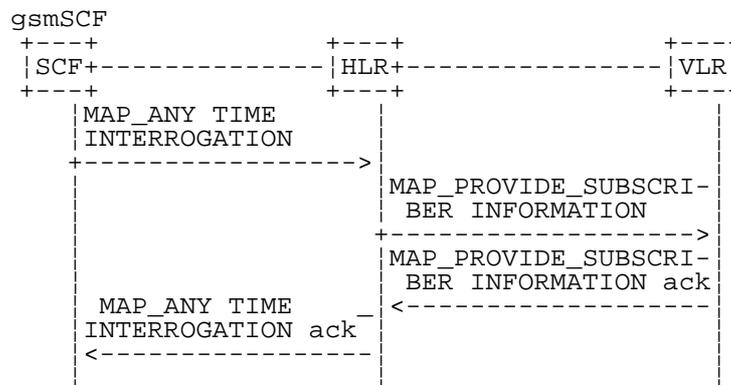


Figure 21.2/8: Message flow for any time interrogation

The following MAP services are used to retrieve routing information:

MAP_ANY_TIME_INTERROGATION see subclause 8.11.1;

MAP_PROVIDE_SUBSCRIBER_INFO see subclause 8.11.2;

21.2.7.1 Process in the gsmSCF

Out of the scope of the MAP specification.

21.2.7.2 Process in the HLR

The MAP process in the HLR to provide subscriber information in response to an interrogation from the CAMEL server is shown in figure 21.2/8. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context anyTimeInterrogationEnquiry, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_ANY_TIME_INTERROGATION service indication is received, the MAP process sends an Any Time Interrogation request to the call handling process in the HLR (described in 3G TS 23.078), and waits for a response. The Any Time Interrogation request contains the parameters received in the MAP_ANY_TIME_INTERROGATION service indication.

If the call handling process in the HLR returns an Any Time Interrogation response, the MAP process constructs a MAP_ANY_TIME_INTERROGATION service response containing the subscriber information contained in the Any Time Interrogation response, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state.

If the call handling process in the HLR returns a Provide Subscriber Info request, the MAP process requests a dialogue with the VLR whose identity is contained in the Provide Subscriber Info request by sending a MAP_OPEN service

request, requests the subscriber status using a MAP_PROVIDE_SUBSCRIBER_INFO service request, and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request.

If the macro takes the OK exit, the MAP process waits for the response from the VLR.

If the MAP process receives a MAP_PROVIDE_SUBSCRIBER_INFO service confirm, it invokes the macro Check_Confirmation to check the content of the confirm.

If the Check_Confirmation macro takes the OK exit, the MAP process sends a Provide Subscriber Info ack containing the information received in the MAP_PROVIDE_SUBSCRIBER_INFO service confirm to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

If the MAP_PROVIDE_SUBSCRIBER_INFO service confirm contains a provider error or a data error, the MAP process sends a Provide Subscriber Info negative response indicating the type of error to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

NOTE: The 'User Error' exit from the macro Check_Confirmation is shown for formal completeness; the MAP_PROVIDE_SUBSCRIBER_INFO_cnf primitive cannot contain a user error.

Negative response from HLR call handling process

If the call handling process in the HLR returns a negative response, either before or after a dialogue with the VLR to obtain subscriber information, the MAP process constructs a MAP_ANY_TIME_INTERROGATION service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state.

Failure of Provide Subscriber Info dialogue with the VLR

If the Receive_Open_Cnf macro takes the Vr exit or the Error exit after the MAP process has requested opening of a Provide Subscriber Info dialogue with the VLR, the MAP process sends a Provide Subscriber Info negative response indicating system failure to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

Failure of dialogue opening with the CAMEL server

If the macro Receive_Open_Ind takes the Vr or Error exit, the MAP process returns to the idle state.

If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Process ATI_HLR

21.2_9.1(2)

Figure 21.2/9: Process in the HLR to respond to a request for any time interrogation

Signals to/from the left are to/from the gsmSCF; signals to/from the right are to/from the VLR unless specified otherwise

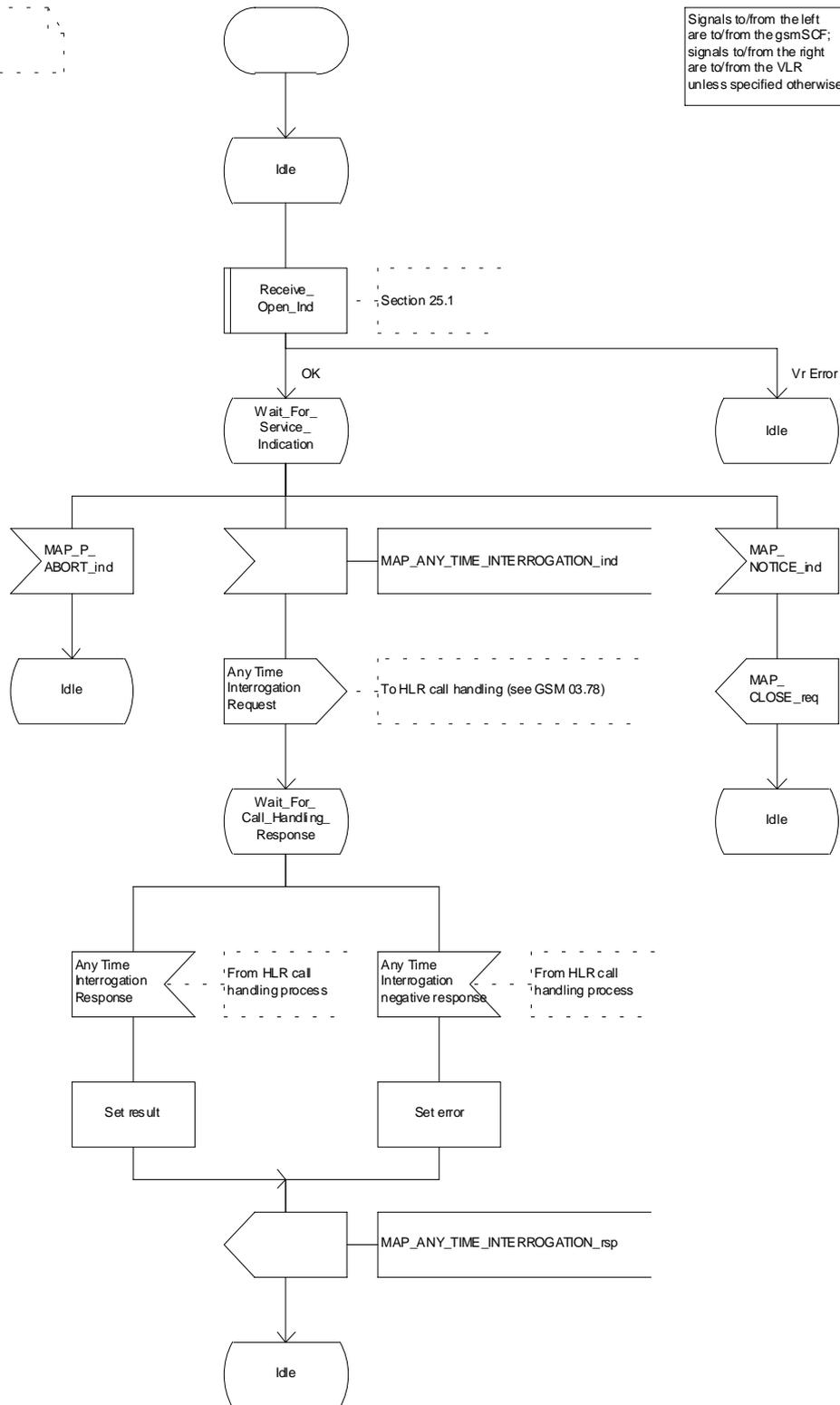


Figure 21.2/9 (sheet 1 of 2): Process ATI_HLR (New)

Process ATI_HLR

21.2_9.2(2)

Figure 21.2/9: Process in the HLR to respond to a request for any time interrogation

Signals to/from the left are to/from the gsmSCF; signals to/from the right are to/from the VLR unless specified otherwise

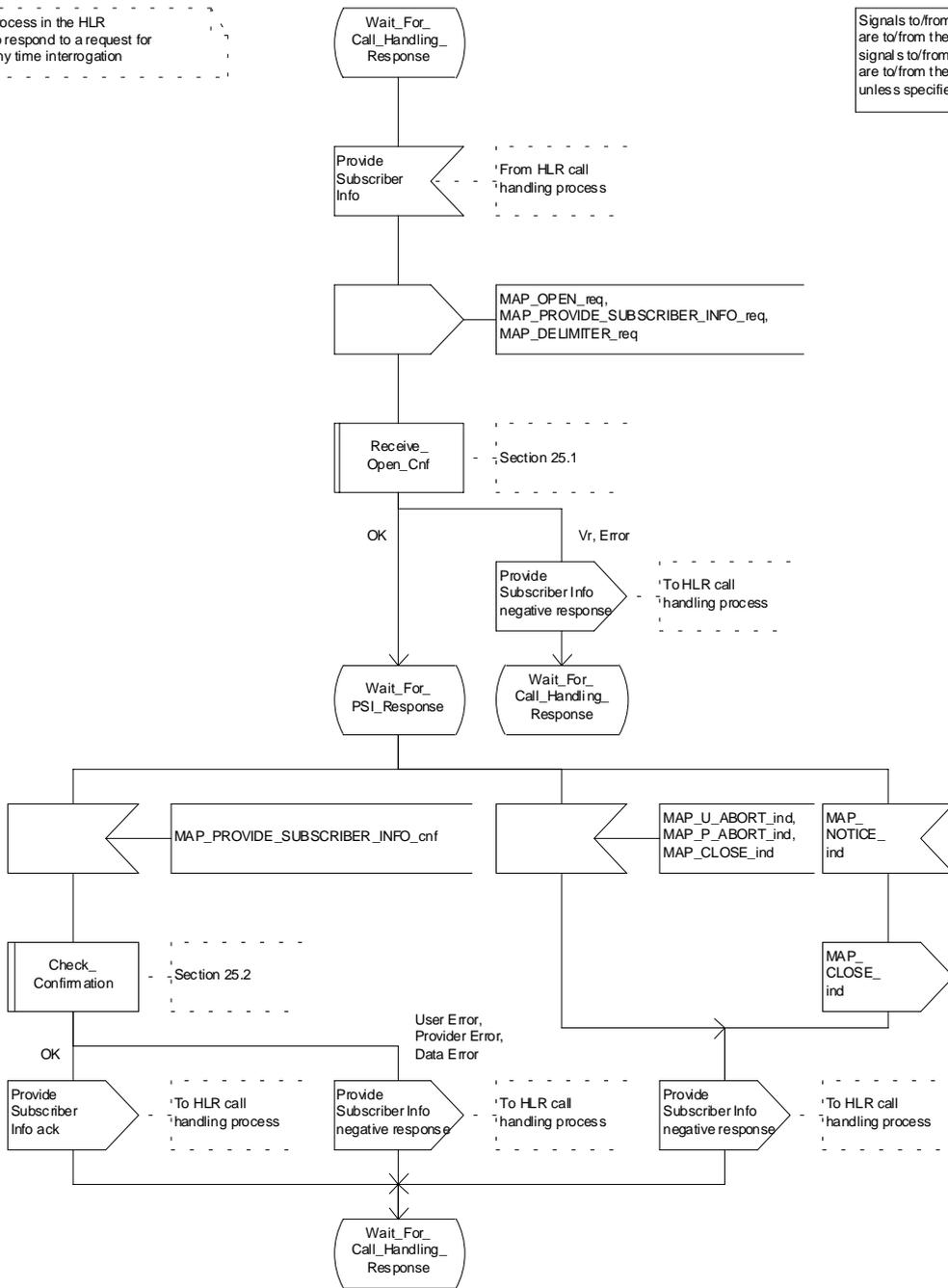
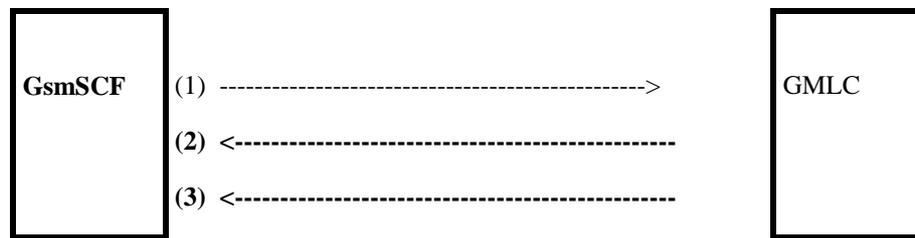


Figure 21.2/9 (sheet 2 of 2): Process ATI_HLR (New)

21.2.8 Process in the GMLC for Any Time Interrogation

The message flows for successful retrieval of subscriber information related to an any time interrogation from the CAMEL server are shown in figure 21.2.8/1.



(1) Any Time Interrogation (gsmSCF to GMLC)

(2) Any Time Interrogation Result (GMLC to gsmSCF)

(3) Any Time Interrogation Error (GMLC to gsmSCF) The following MAP services are used to retrieve routing information:

MAP_ANY_TIME_INTERROGATION see subclause 8.11.1;

In addition, the GMLC may use Location Services specific MAP Services.

21.2.8.1 Process in the gsmSCF

The process in the gsmSCF to request location information from the GMLC is shown in figure 21.2.8/2.

The process is started with internal signal Request_Subscriber_Info_GMLC. This signal is sent by the Service Logic in the gsmSCF.

The process responds with 'Request_Subscriber_Info_GMLC positive response' or 'Request_Subscriber_Info_GMLC negative response'.

21.2.8.2 Process in the GMLC

The MAP process in the GMLC to provide location information in response to a request from the gsmSCF is shown in figure 21.2.8/3.

Successful outcome

When the GMLC has successfully received the MAP Any_Time_Interrogation MAP Message, it will send an internal signal to the Location Service process in the GMLC to obtain the subscriber's Location Information. The result received from that process is sent back to the gsmSCF, in the Any_Time_Interrogation Result MAP Message.

Unsuccessful outcome

In the case of a Provider Error received, the process will terminate.

When a User error is received from the Location Services process in the GMLC, then a User Abort is sent to the gsmSCF.

If a negative response is received from the Location Services process in the GMLC, then this response is forwarded to the gsmSCF.

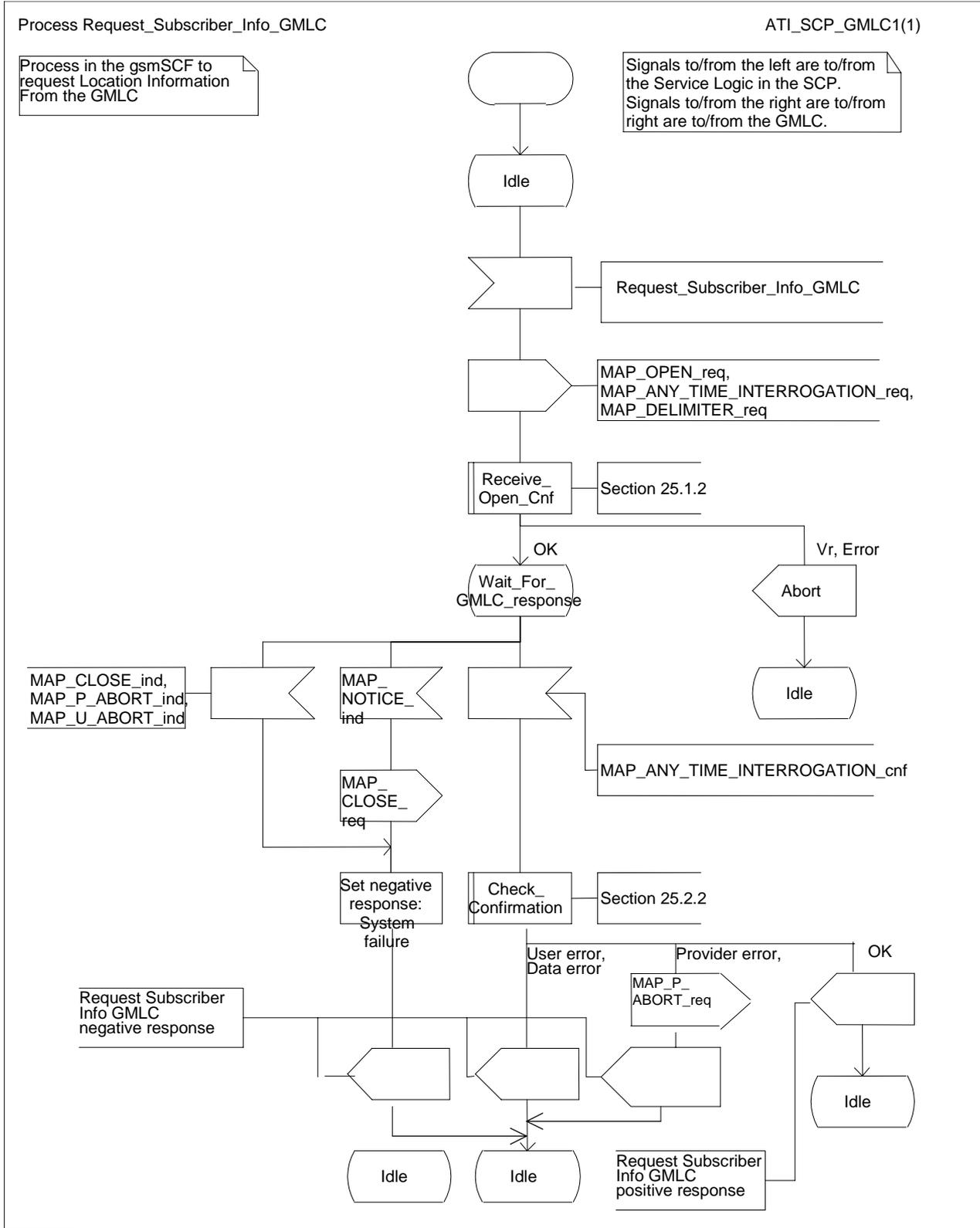


Figure 21.2.8/2: Process Request_Subscriber_Info_GMLC

Process ATI_GMLC

21.2/9.2

Figure 21.2/9.2: Process in the GMLC to respond to a request for any time interrogation

Signals to/from the left are to/from the gsmSCF; signals to/from the right are to/from the GMLC Location services

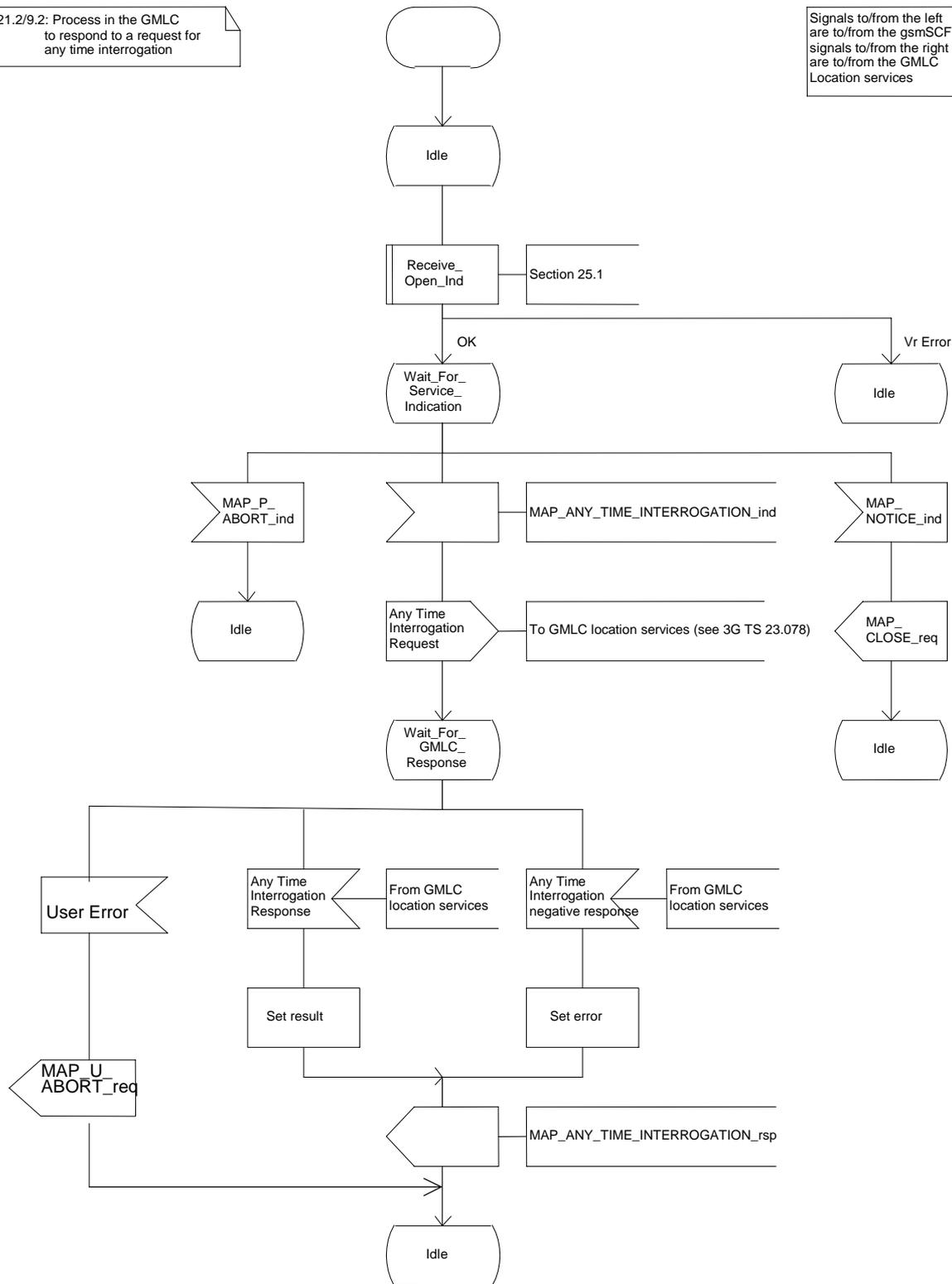
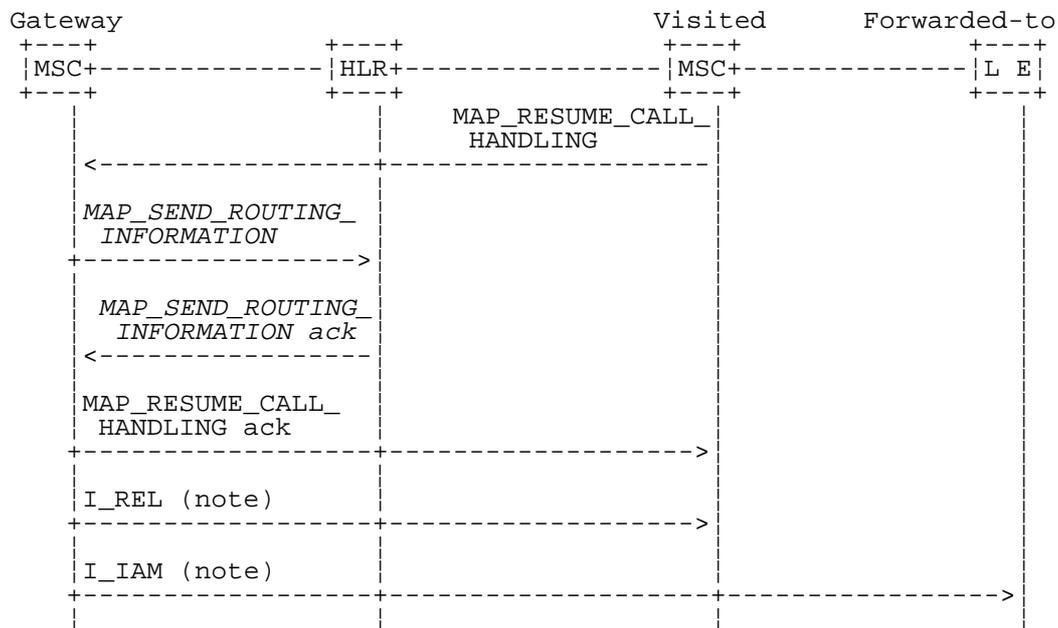


Figure 21.2.8/3: Process ATI_GMLC

21.3 Transfer of call handling

21.3.1 General

The message flow for successful transfer of call handling to forward a call is shown in figure 21.3/1.



NOTES:

xxx = Optional Procedure

TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. For further details on the TUP and ISUP procedures refer to the following CCITT Recommendations & ETSI specification:

Q.721-725 - Telephone User Part (TUP);

ETS 300 356-1 - Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services.

Figure 21.3/1: Message flow for transfer of call handling

If the HLR indicated in the response to the original request for routing information that forwarding interrogation is required, the GMSC executes the Send Routing Information procedure with the HLR to obtain forwarding information; otherwise the GMSC uses the forwarding data which were sent in the `MAP_RESUME_CALL_HANDLING` req/ind.

21.3.2 Process in the VMSC

The MAP process in the VMSC to retrieve routing information for a mobile terminating call is shown in figure 21.3/2. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

Successful Outcome

When the MAP process receives a Resume Call Handling request from the call handling process in the VMSC, it requests a dialogue with the GMSC whose identity is contained in the Resume Call Handling request by sending a

MAP_OPEN service request, requests routing information using a MAP_RESUME_CALL_HANDLING service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the GMSC. VMSC shall not send any duplicate data to the GMSC.

If the VMSC notices after receiving a Resume Call Handling request that the segmentation is needed the VMSC does not set the “All Information Sent” indicator. Otherwise the indicator is set and the process returns to the Wait For GMSC Response state.

If the MAP process receives a MAP_RESUME_CALL_HANDLING service confirm from the GMSC, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process checks if the “All Information Sent” indicator is set. If it is set the MAP process sends a Resume Call Handling ack to the call handling process in the VMSC and returns to the idle state. If the “All Information Sent” indicator is not set the MAP process checks if the further segmentation is needed. If segmentation is needed the VMSC does not set the indicator and sends MAP_RESUME_CALL_HANDLING service request to the GMSC. Otherwise the indicator is set and the MAP_RESUME_CALL_HANDLING service request is sent to the GMSC.

Dialogue opening failure

If the macro Receive_Open_Cnf indicates that the dialogue with the GMSC could not be opened or that the dialogue can be opened only at an earlier version, the MAP process sends an Resume Call Handling negative response indicating system failure to the call handling process in the VMSC and returns to the idle state.

Error in MAP_RESUME_CALL_HANDLING confirm

If the MAP_RESUME_CALL_HANDLING service confirm contains a user error or a provider error, the MAP process sends a Resume Call Handling negative response to the call handling process in the VMSC and returns to the idle state.

NOTE: the 'Data Error' exit from the macro Check_Confirmation is shown for formal completeness; the result is empty, so the MAP_PROVIDE_SUBSCRIBER_INFO_cnf primitive cannot contain a data error.]

Abort of GMSC dialogue

After the dialogue with the GMSC has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the GMSC may send a MAP_CLOSE indication. In either of these cases, the MAP process sends a Resume Call Handling negative response to the call handling process in the GMSC and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the GMSC, sends a Resume Call Handling negative response indicating system failure to the call handling process in the VMSC and returns to the idle state.

Process RCH_VMSC

21.3_2(1)

Figure 21.3/2: Process in the VMSC to request the GMSC to resume call handling

Signals to/from the left are to/from the GMSC; signals to/from the right are to/from the call handling process in the VMSC

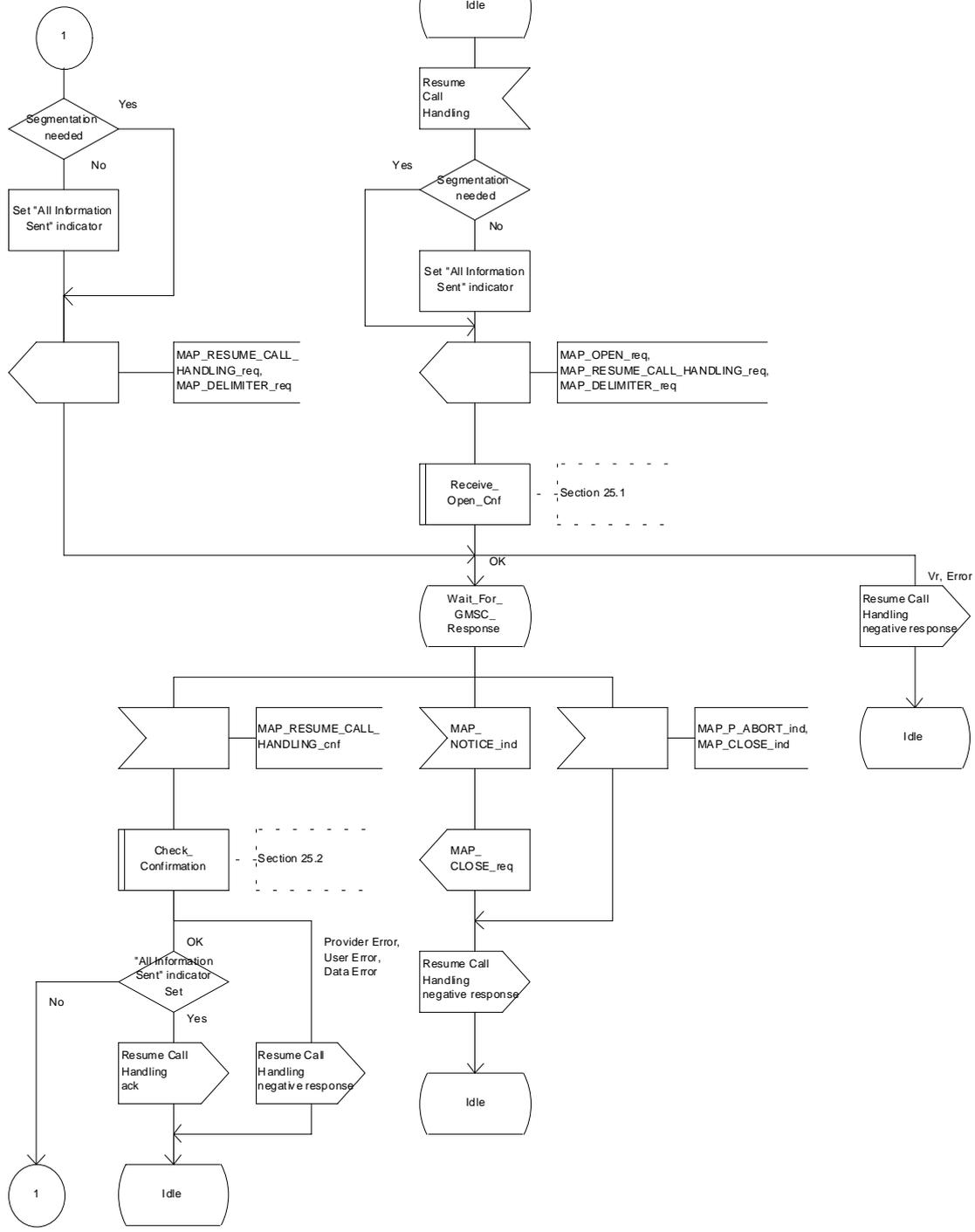


Figure 21.3/2: Process RCH_VMSC

21.3.3 Process in the GMSC

The MAP process in the GMSC to handle a request for the GMSC to resume call handling is shown in figure 21.3/3. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context callControlTransfer, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_RESUME_CALL_HANDLING service indication is received, the MAP process checks if the “All Information Sent” indicator is set and if so it sends a Resume Call Handling request including all the stored data to the call handling process in the GMSC, and waits for a response. The Resume Call Handling request contains the parameters received in the MAP_RESUME_CALL_HANDLING service indication. If the “All Information Sent” indicator is not set, the received data is stored and the MAP process constructs an empty MAP_RESUME_CALL_HANDLING service response, sends it to the VMSC and returns to the Wait For Service Indication state.

If the call handling process in the GMSC returns a Resume Call Handling ack, the MAP process constructs a MAP_RESUME_CALL_HANDLING service response, constructs a MAP_CLOSE service request, sends them to the VMSC and returns to the idle state.

Failure of dialogue opening with the VMSC

If the macro Receive_Open_Ind takes the Vr exit or the Error exit, the MAP process returns to the idle state.

If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Process RCH_GMSC

21.3_3(1)

Figure 21.3/3: Process in the GMSC to handle a request to resume call handling

Signals to/from the left are to/from the GMSC call handling process; signals to/from the right are to/from the VMSC

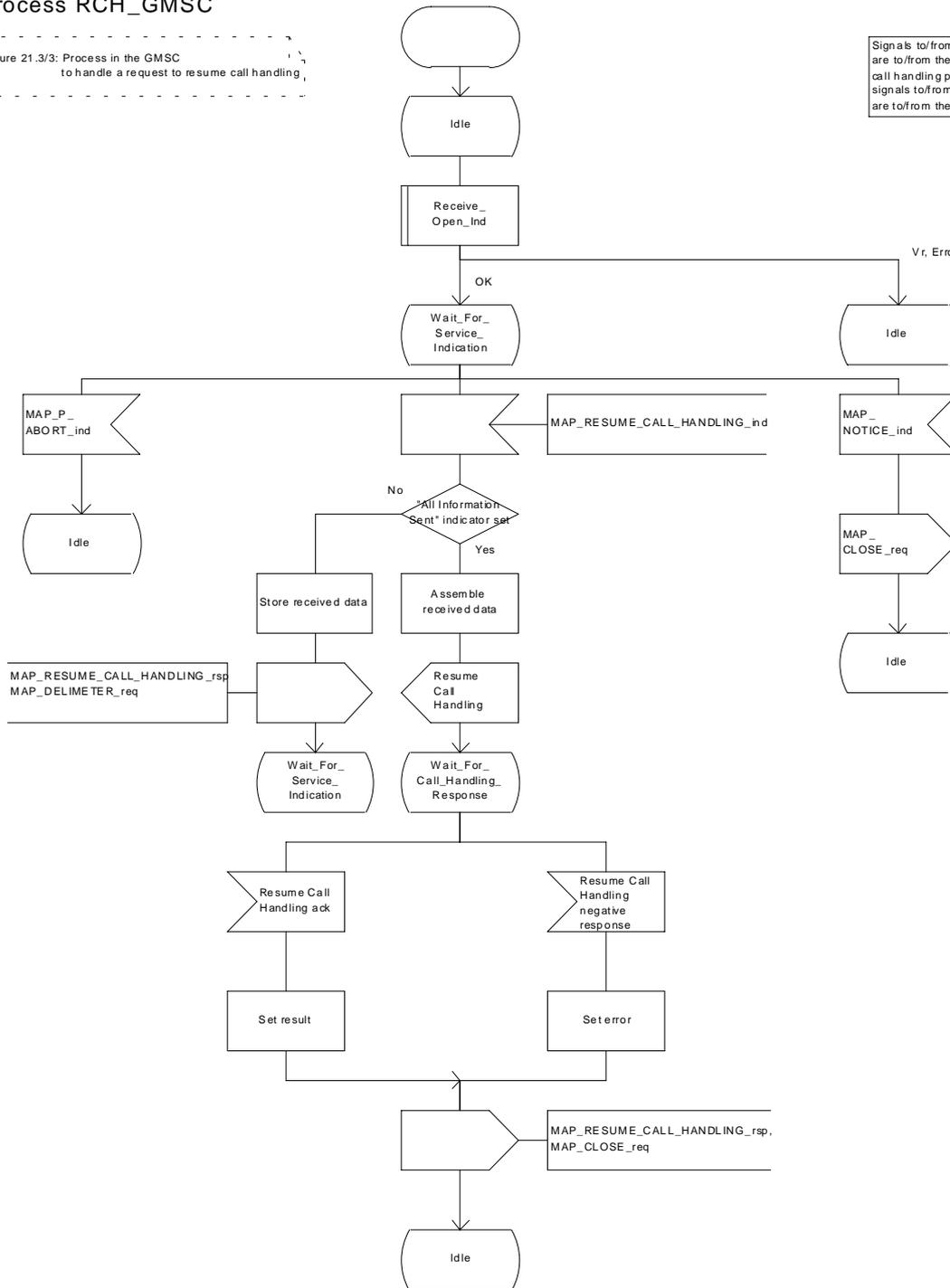
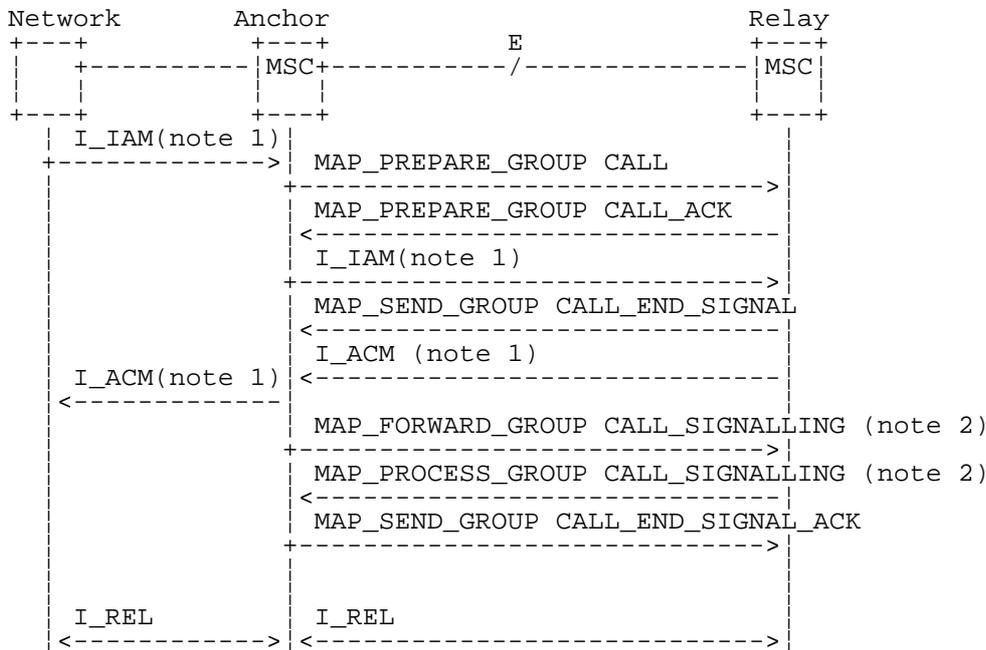


Figure 21.3/3: Process RCH_GMSC

21.4 Inter MSC Group Call Procedures

21.4.1 General

The message flows for successful inter MSC group call / broadcast call setup is shown in figure 21.4/1.



NOTE 1: TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. For further details on the TUP and ISUP procedures refer to the following ITU-T Recommendations and ETSI specification:

Q.721-725 - Telephone User Part (TUP);

ETS 300 356-1 - Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services.

NOTE 2: The MAP_FORWARD_GROUP_CALL_SIGNALLING and MAP_PROCESS_GROUP_CALL_SIGNALLING services are not applicable for voice broadcast calls.

Figure 21.4/1: Message flow for inter MSC group call / broadcast call

21.4.2 Process in the Anchor MSC

The MAP process in the Anchor MSC to retrieve and transfer information from / to the Relay MSC for VBS and VGCS calls is shown in figure 21.4/2. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Indication see subclause 25.2.1;

Check_Confirmation see subclause 25.2.2.

Successful Outcome

When the MAP process receives a Prepare Group Call request from the ASCII handling process in the anchor MSC, it requests a dialogue with the relay MSC whose identity is contained in the Prepare Group Call request by sending a MAP_OPEN service request, requests an Group Call number by using a MAP_PREPARE_GROUP_CALL service

request and invokes the macro `Receive_Open_Cnf` to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the relay MSC.

If the MAP process receives a `MAP_PREPARE_GROUP_CALL` service confirm from the relay MSC, the MAP process invokes the macro `Check_Confirmation` to check the content of the confirm.

If the macro `Check_Confirmation` takes the OK exit, the MAP process sends a Prepare Group Call ack containing the Group Call number received from the relay MSC to the ASCI handling process in the anchor MSC and waits for completion of call setup in the relay MSC.

On receipt of a `MAP_SEND_GROUP_CALL_END_SIGNAL` service indication from the relay MSC the MAP process invokes the macro `Check_Indication` to check the content of the indication.

If the macro `Check_Indication` takes the OK exit, the MAP process sends a Send Group Call End Signal to the ASCI handling process in the anchor MSC and waits for uplink management signals. In this state the following events are processed:

- Reception of a Send Group Call End Signal ack from the ASCI handling process in the anchor MSC;
- Reception of a Forward Group Call Signalling request from the ASCI handling process in the anchor MSC;
- Reception of a `MAP_PROCESS_GROUP_CALL_SIGNALLING` service indication from the relay MSC.

On reception of a Send Group Call End Signal ack from the ASCI handling process in the anchor MSC, the MAP process constructs a `MAP_SEND_GROUP_CALL_END_SIGNAL` service response, constructs a `MAP_CLOSE` service request, sends them to the relay MSC and returns to the idle state.

On reception of a Forward Group Call Signalling request from the ASCI handling process in the anchor MSC, the MAP process constructs a `MAP_FORWARD_GROUP_CALL_SIGNALLING` service request, sends it to the relay MSC and returns to the uplink management state.

On reception of a `MAP_PROCESS_GROUP_CALL_SIGNALLING` service indication from the relay MSC, the MAP process invokes the macro `Check_Indication` to check the content of the indication.

If the macro `Check_Indication` takes the OK exit, the MAP process sends a Process Group Call Signalling to the ASCI handling process in the anchor MSC and returns to the uplink management state.

Dialogue opening failure

If the macro `Receive_Open_Cnf` indicates that the dialogue with the relay MSC could not be opened, the MAP process sends an Abort to the ASCI handling process and returns to the idle state.

Error in MAP_PREPARE_GROUP_CALL confirm

If the `MAP_PREPARE_GROUP_CALL` service confirm contains a user error or a provider error, or the macro `Check_Confirmation` indicates that there is a data error, the MAP process sends a Prepare Group Call negative response to the ASCI handling process in the anchor MSC, sends a `MAP_U_ABORT` request to the relay MSC and returns to the idle state.

Abort of MAP dialogue

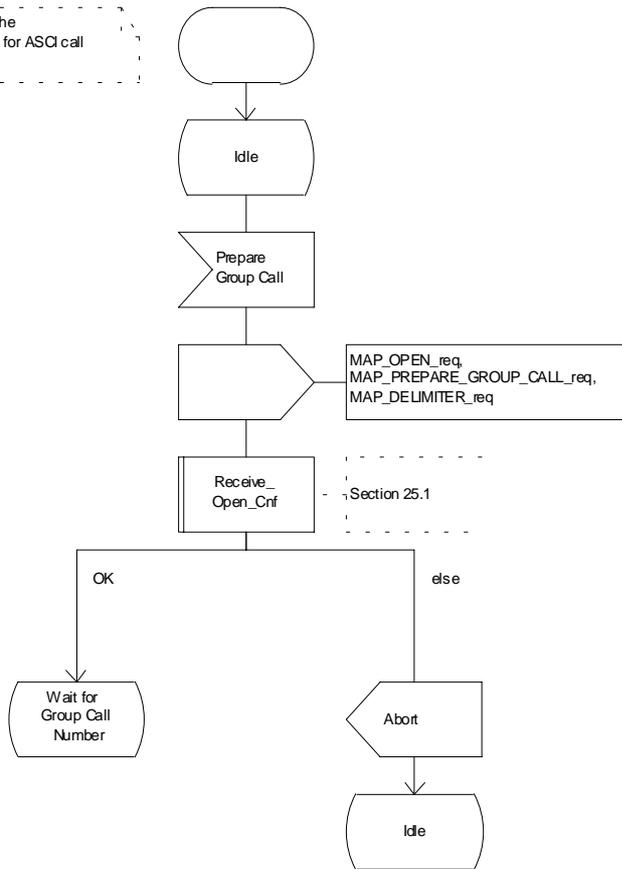
After the dialogue with the relay MSC has been established, the MAP service provider may abort the dialogue by issuing a `MAP_P_ABORT` indication, or the relay MSC may send a `MAP_U_ABORT` indication or a `MAP_CLOSE` indication. In any of these cases, the MAP process sends an Abort to the ASCI handling process in the anchor MSC and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a `MAP_NOTICE` indication, the MAP process closes the dialogue with the relay MSC, sends an Abort to the ASCI handling process in the anchor MSC and returns to the idle state.

Process ASCI_Anchor_MSC

21.4_2.1(4)

Figure 21.4/2: Process in the Anchor MSC for ASCI call handling



Signals to/from the left are to/from the A-MSC ASCI process; signals to/from the right are to/from the R-MSC

Figure 21.4/2 (sheet 1 of 4): Process ASCI_Anchor_MSC

Process ASCI_Anchor_MSC

21.4_2.2(4)

Figure 21.4/2: Process in the Anchor MSC for ASCI call handling

Signals to/from the left are to/from the A-MSC ASCI process; signals to/from the right are to/from the R-MSC

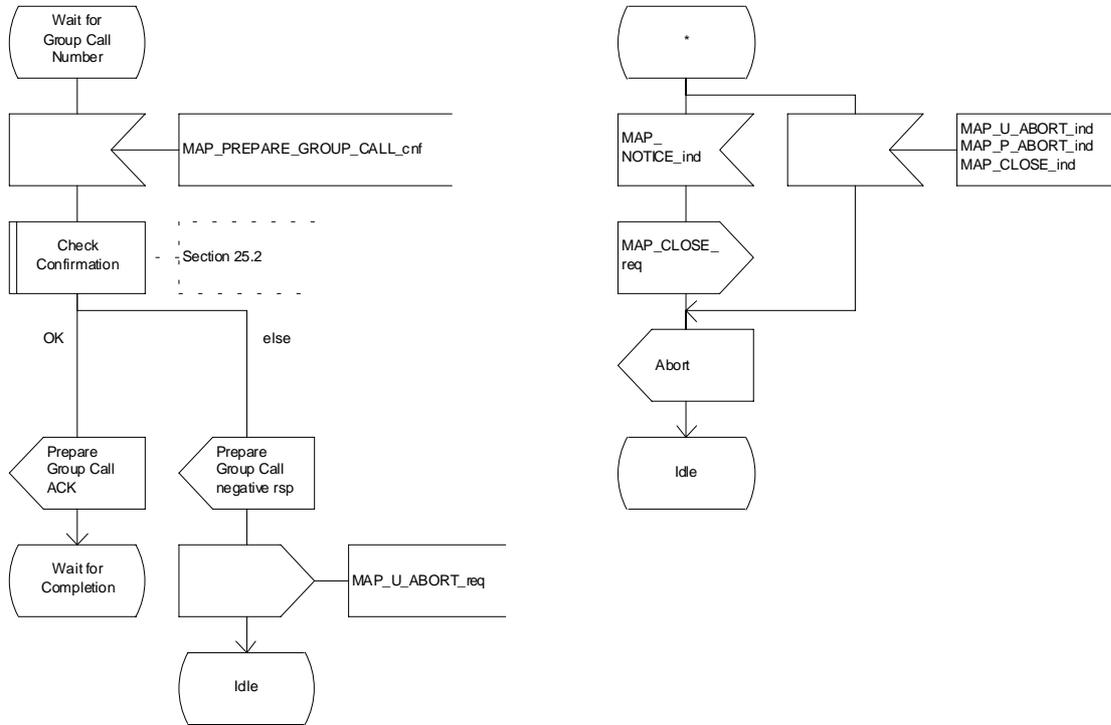


Figure 21.4/2 (sheet 2 of 4): Process ASCI_Anchor_MSC

Process ASCI_Anchor_MSC

21.4_2.3(4)

Figure 21.4/2: Process in the Anchor MSC for ASCI call handling

Signals to/from the left are to/from the A-MSC ASCI process; signals to/from the right are to/from the R-MSC

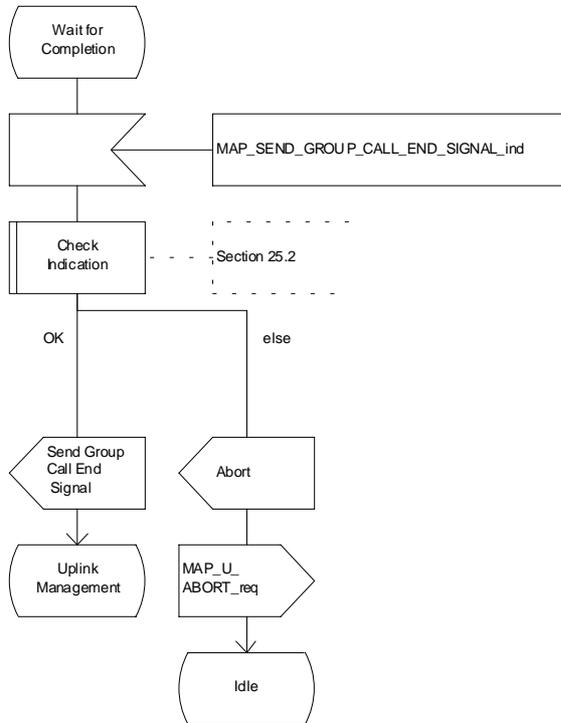


Figure 21.4/2 (sheet 3 of 4): Process ASCI_Anchor_MSC

Process ASCI_Anchor_MSC

21.4_2.4(4)

Figure 21.4/2: Process in the Anchor MSC for ASCI call handling

Signals to/from the left are to/from the A-MSC ASCI process; signals to/from the right are to/from the R-MSC

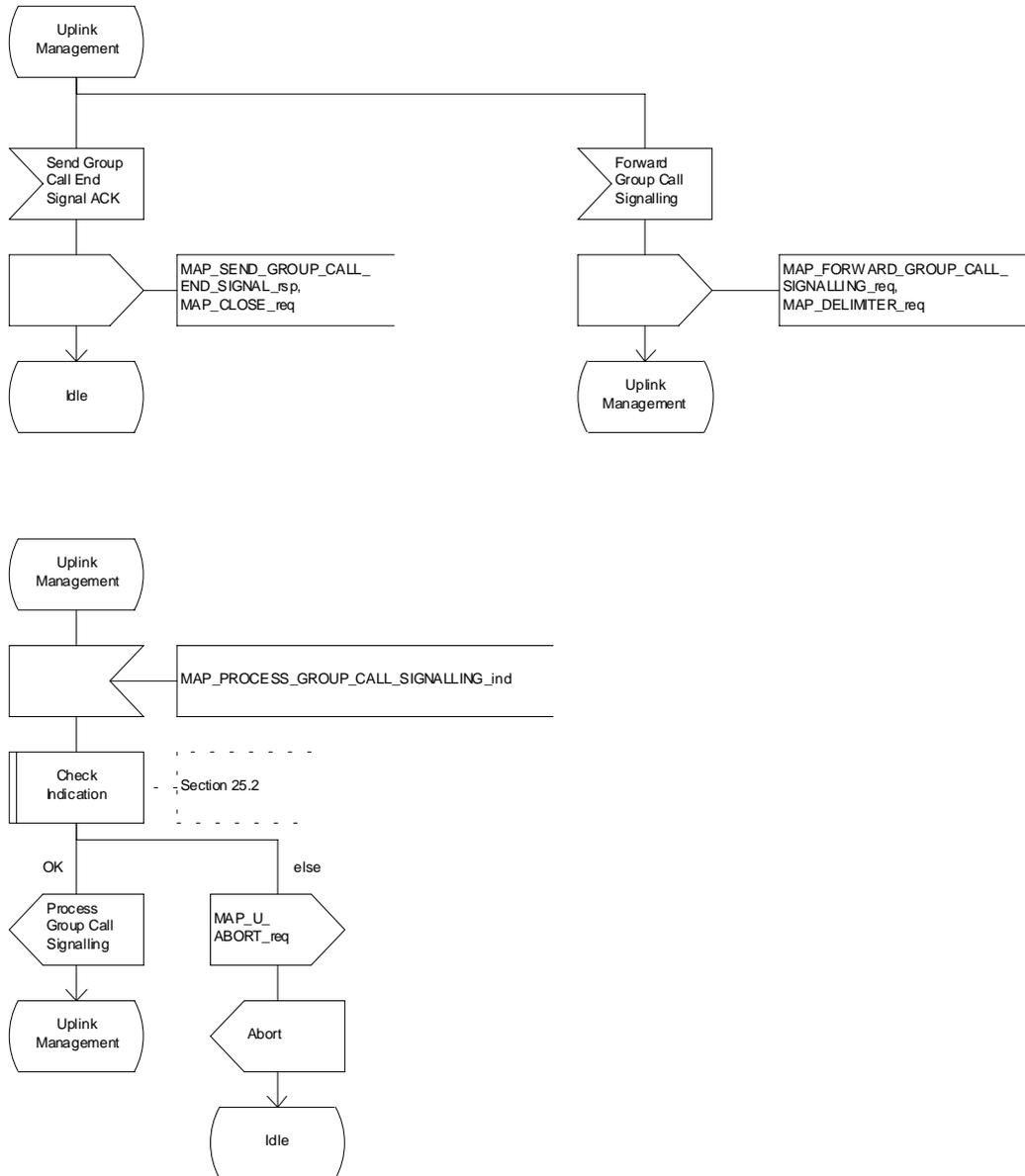


Figure 21.4/2 (sheet 4 of 4): Process ASCI_Anchor_MSC

21.4.3 Process in the Relay MSC

The MAP process in the Relay MSC to receive and transfer information from / to the Anchor MSC for VBS and VGCS calls is shown in figure 21.4/3. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Ind	see subclause 25.1.2;
Check_Indication	see subclause 25.2.1.

Successful Outcome

When the MAP process receives a MAP_OPEN indication with the application context groupCallControl, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_PREPARE_GROUP_CALL service indication is received, the MAP process invokes the macro Check_Indication.

If the macro takes the OK exit, the MAP process sends a Prepare Group Call request to the ASCI handling process in the relay MSC and waits for a response. The Prepare Group Call request contains the parameters received in the MAP_PREPARE_GROUP_CALL service indication.

If the ASCI handling process in the relay MSC returns a Prepare Group Call ack, the MAP process constructs a MAP_PREPARE_GROUP_CALL service response containing the information contained in the Prepare Group Call ack, constructs a MAP_DELIMITER service request, sends them to the anchor MSC and waits for the GROUP CALL END SIGNAL.

If the ASCI handling process in the relay MSC sends a Send Group Call End Signal request to the MAP process, the MAP process constructs a MAP_SEND_GROUP_CALL_END_SIGNAL service request containing the information contained in the SEND GROUP CALL End Signal request, constructs a MAP_DELIMITER service request, sends them to the anchor MSC and waits for uplink management signals. In this state the following events are processed:

- Reception of a MAP_SEND_GROUP_CALL_END_SIGNAL service confirmation from the anchor MSC;
- Reception of a MAP_FORWARD_GROUP_CALL_SIGNALLING service indication from the anchor MSC;
- Reception of a Process Group Call Signalling request from the ASCI handling process in the relay MSC.

On reception of a MAP_SEND_GROUP_CALL_END_SIGNAL service confirmation from the anchor MSC, the MAP process returns to the idle state.

On reception of a MAP_FORWARD_GROUP_CALL_SIGNALLING service indication from the anchor MSC, the MAP process invokes the macro Check Indication. If the macro takes the OK exit, the MAP process sends a Forward Group Call Signalling request to the ASCI handling process in the relay MSC and waits for further uplink management signals.

On reception of a Process Group Call Signalling request from the ASCI handling process in the relay MSC, the MAP process constructs a MAP_PROCESS_GROUP_CALL_SIGNALLING service request containing the information received in the Process Group Call Signalling request, constructs a MAP_DELIMITER service request, sends them to the anchor MSC and waits for further uplink management signals.

Failure of dialogue opening with the anchor MSC

If the macro Receive_Open_Ind takes the Error exit, the MAP process returns to the idle state.

If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Error in MAP_PREPARE_GROUP_CALL indication

If the macro Check Indication takes the Error exit, the MAP process sends a MAP_U_ABORT request to the anchor MSC and returns to the idle state.

Negative response received from the ASCI handling process

If the ASCI handling process in the relay MSC returns a negative response to the Prepare Group Call request, the MAP process constructs a MAP_PREPARE_GROUP_CALL service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the anchor MSC and returns to the idle state.

Error in MAP_FORWARD_GROUP_CALL_SIGNALLING indication

If the macro Check Indication takes the Error exit, the MAP process sends a MAP_U_ABORT request to the anchor MSC, sends an Abort to the ASCI handling process in the relay MSC and returns to the idle state.

Abort of MAP dialogue

After the dialogue with the anchor MSC has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the anchor MSC may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process sends an Abort to the ASCI handling process in the relay MSC and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the anchor MSC, sends an Abort to the ASCI handling process in the anchor MSC and returns to the idle state.

Figure 21.4/3: Process in the Relay MSC for ASCI call handling

Signals to/from the left are to/from the A-MSC;
Signals to/from the right are to/from the R-MSC ASCI process

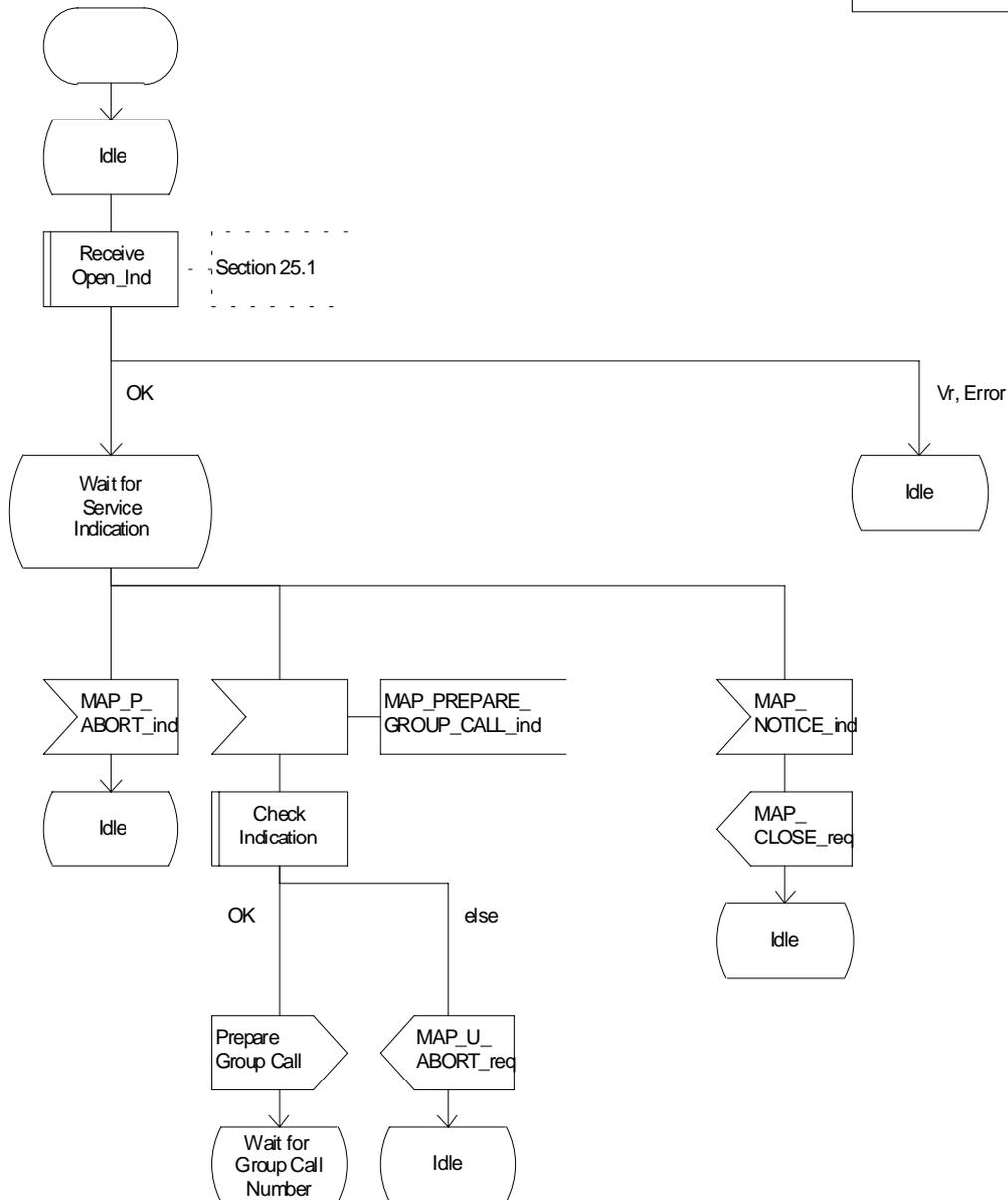


Figure 21.4/3 (sheet 1 of 3): Process ASCI_Relay_MSC

Figure 21.4/3: Process in the Relay MSC for ASCII call handling

Signals to/from the left are to/from the A-MSC;
Signals to/from the right are to/from the R-MSC ASCII process

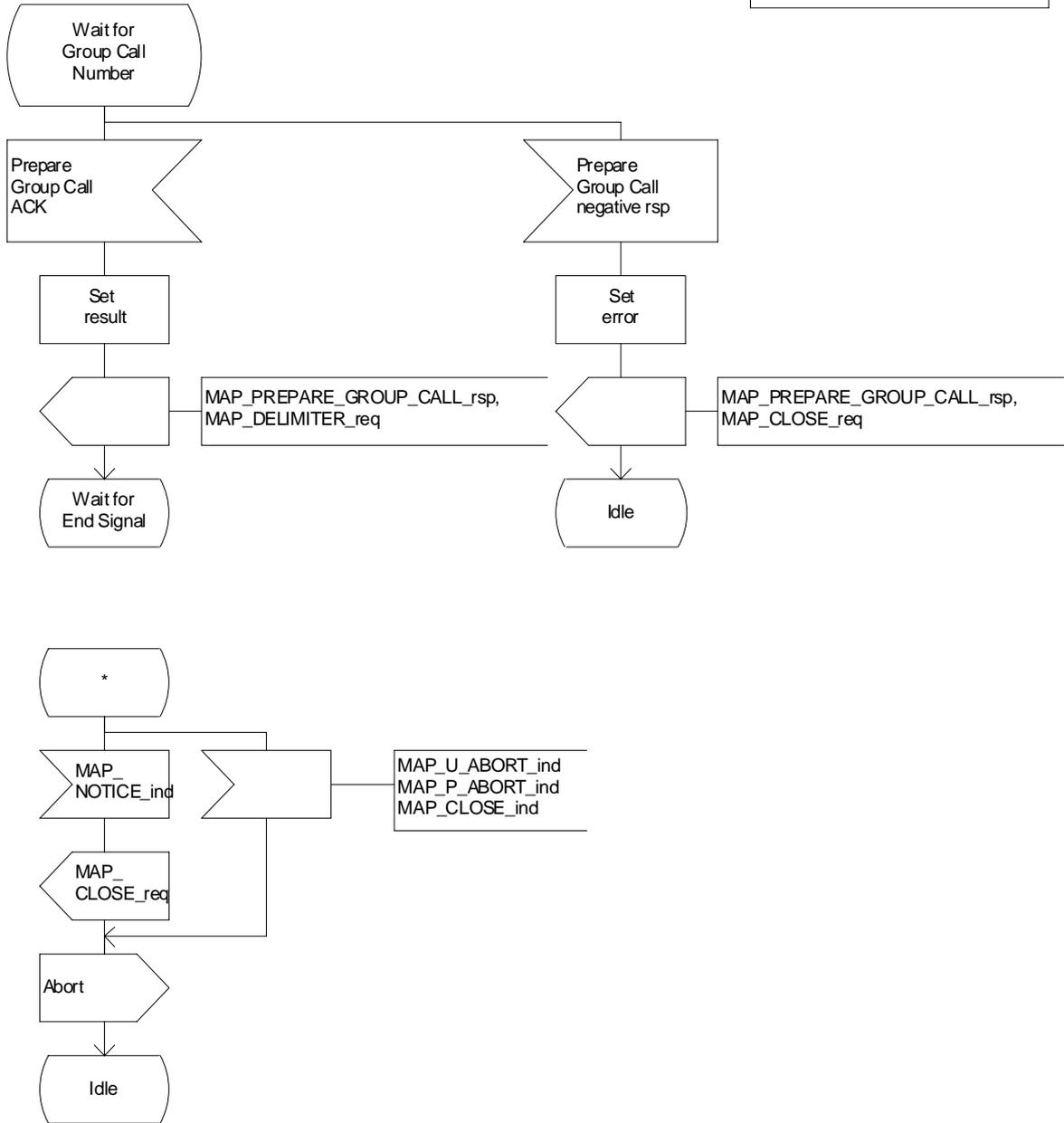


Figure 21.4/3 (sheet 2 of 3): Process ASCII_Relay_MSC

Figure 21.4/3: Process in the Relay MSC for ASCII call handling

Signals to/from the left are to/from the A-MSC;
Signals to/from the right are to/from the R-MSC ASCII process

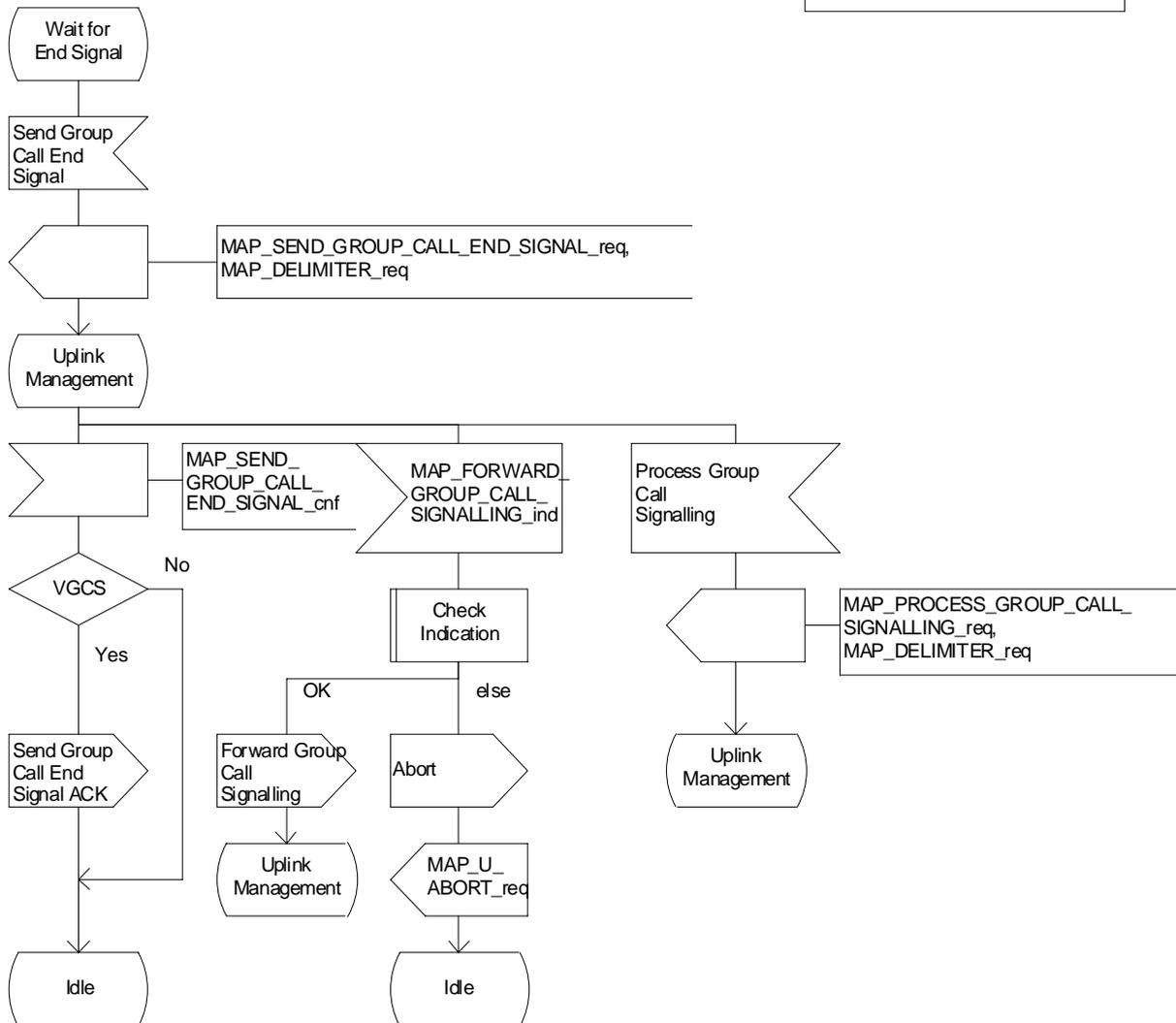
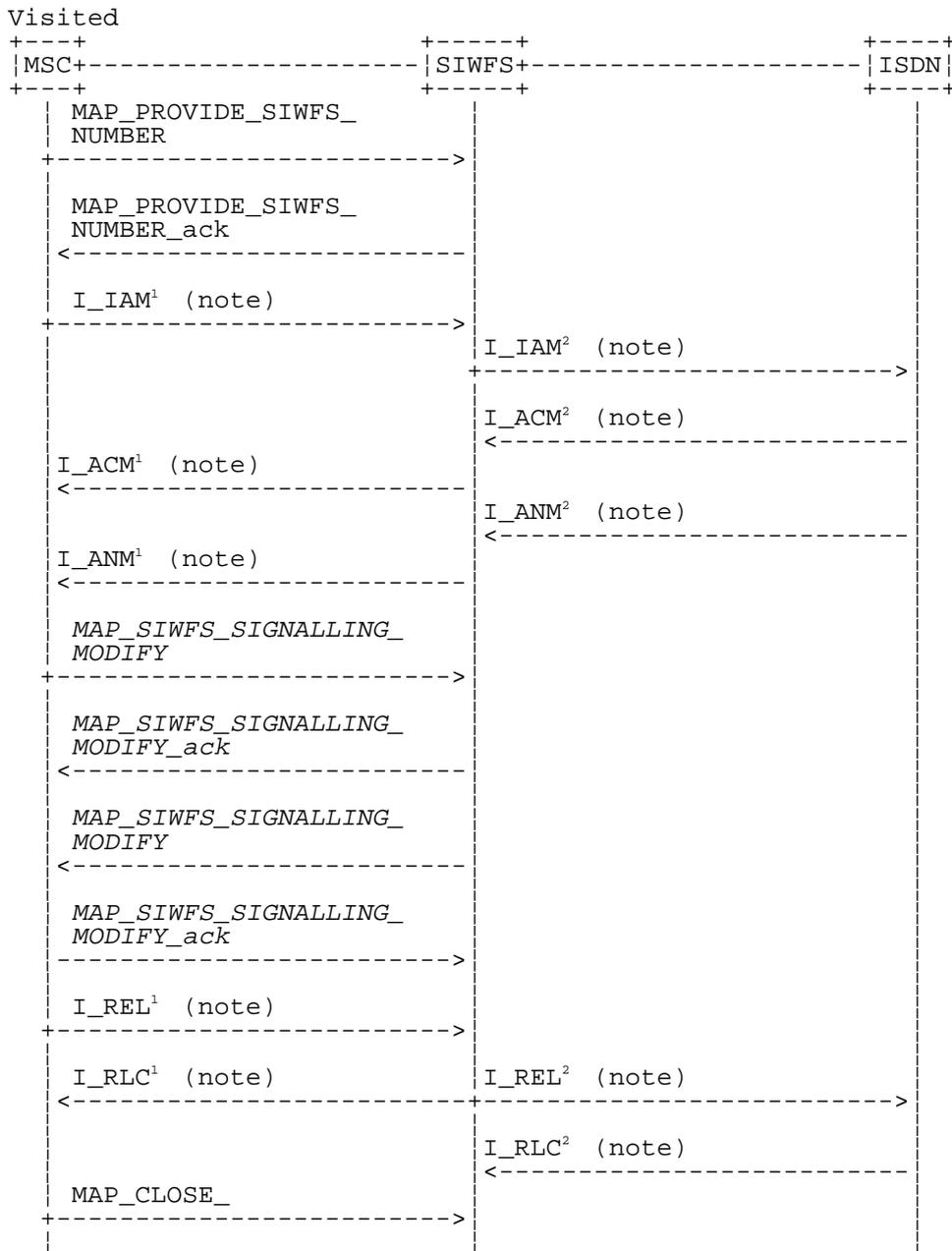


Figure 21.4/3 (sheet 3 of 3): Process ASCII_Relay_MSC

21.5 Allocation and modifications of resources in an SIWFS

21.5.1 General

The message flow for successful allocation and modification of resources in an SIWFS is shown in figure 21.5/1 (mobile originating call non-loop method), 21.5/2 (mobile originating call loop method) and 21.5/3 (mobile terminating call loop method).



Notes: xxx = *Optional Procedure*

TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. The Release message can be initiated either by the calling or called subscriber. For further details on the TUP and ISUP procedures refer to the following CCITT Recommendations & ETSI specification:

Q.721-725 - Telephone User Part (TUP);

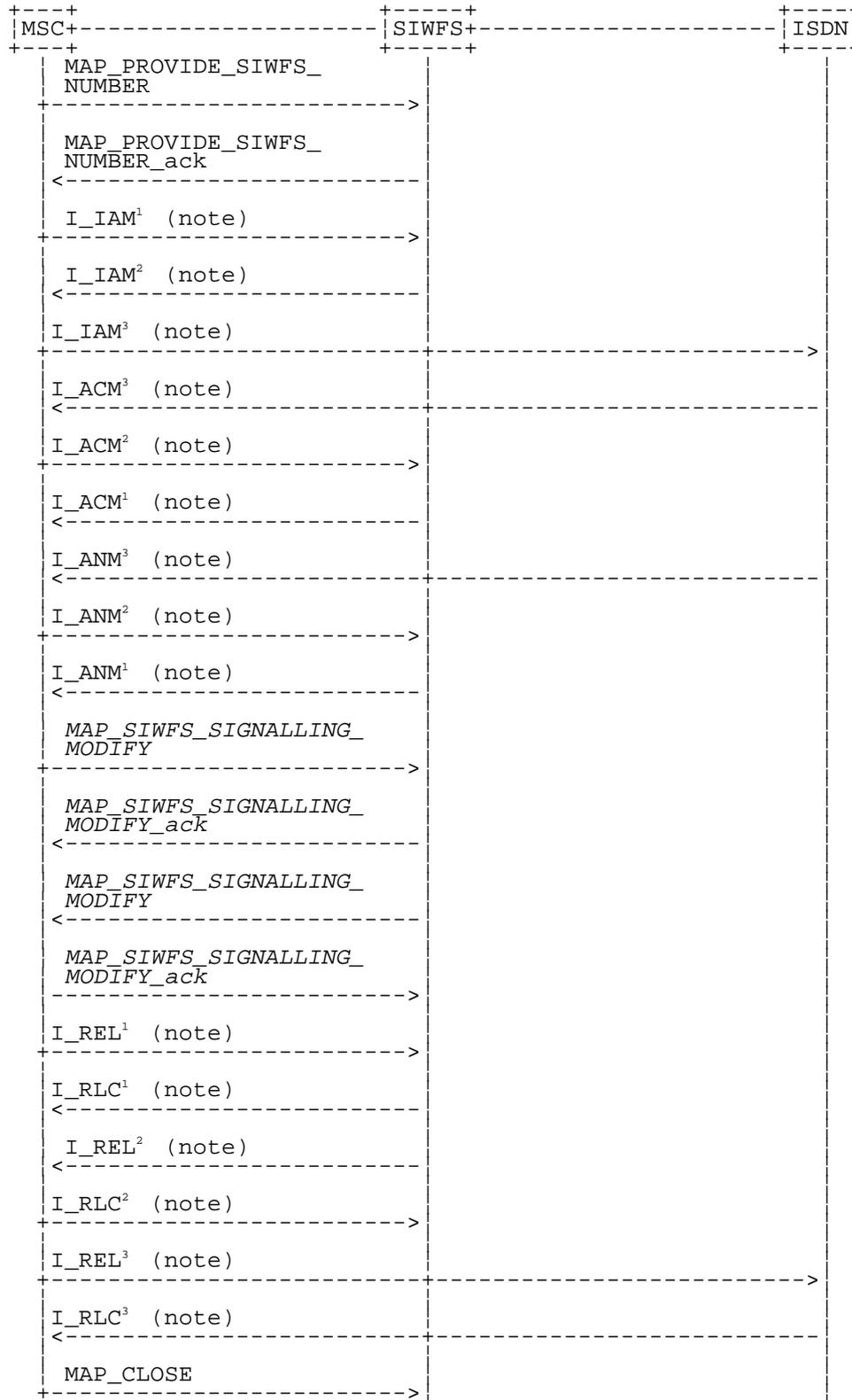
ETS 300 356-1 - Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services.

The number on the ISUP messages have been added to link the messages to respective signalling sequence.

The modification of SIWF resources could be initiated any time during the call either by the VMSC or the SIWFS.

Figure 21.5/1: Message flow for mobile originating call non-loop method

Visited



Notes:

xxx = Optional Procedure

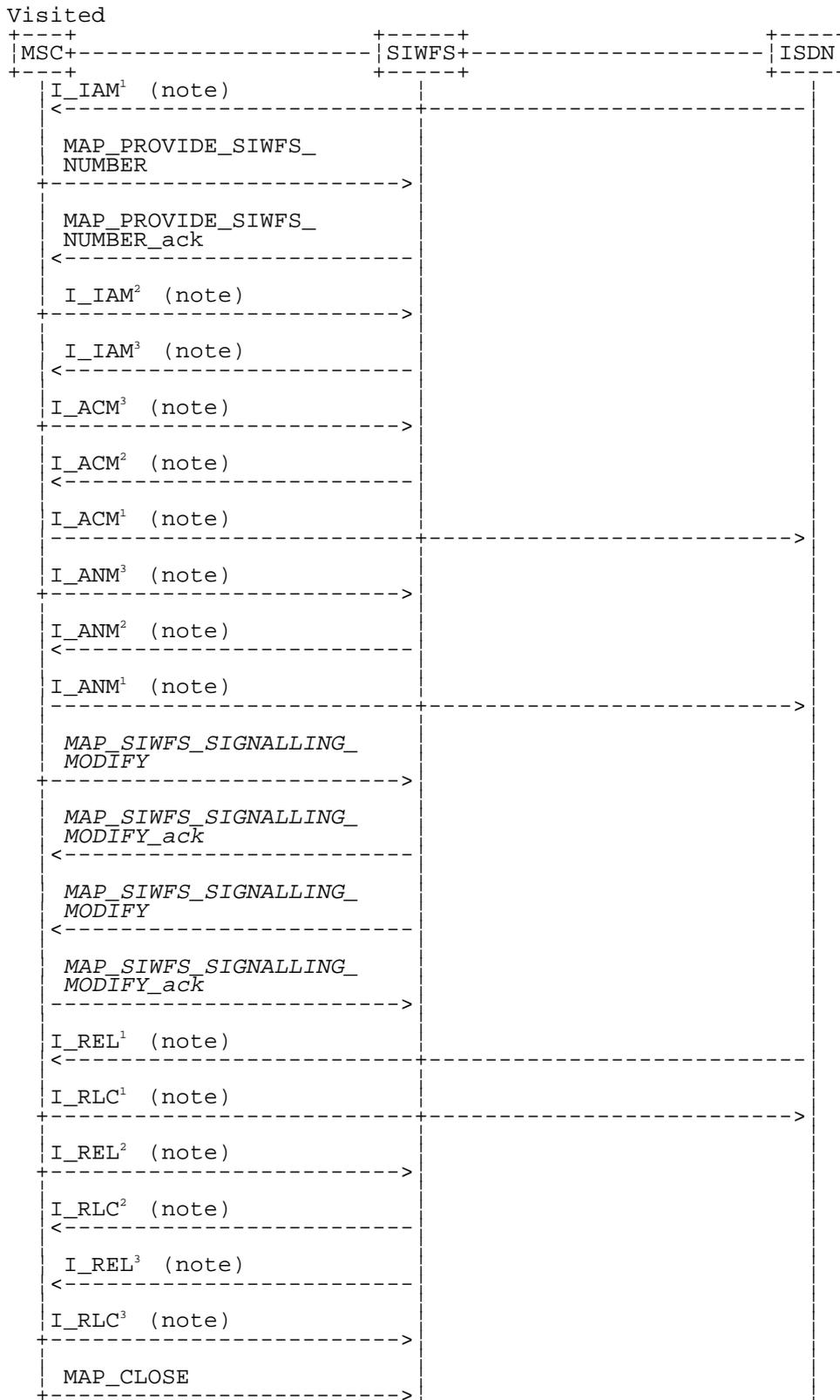
TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. The Release message can be initiated either by calling or called subscriber. For further details on the TUP and ISUP procedures refer to the following CCITT Recommendations & ETSI specification: Q.721-725 - Telephone User Part (TUP);

ETS 300 356-1 - Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services.

The number on the ISUP messages have been added to link the messages to respective signalling sequence.

The modification of SIWFS resources could be initiated any time during the call either by the VMSC or the SIWFS.

Figure 21.5/2: Message flow for mobile originating call loop method



Notes:

xxx = Optional Procedure

TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. The Release message can be initiated either by calling or called subscriber. For further details on the TUP and ISUP procedures refer to the following CCITT Recommendations & ETSI specification: Q.721-725 - Telephone User Part (TUP);

ETS 300 356-1 - Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services.

The number on the ISUP messages have been added to link the messages to respective signalling sequence.

The modification of SIWF resources could be initiated any time during the call either by the VMSC or the SIWFS.

Figure 21.5/3: Message flow for mobile terminating call loop method

The following MAP services are used to allocate resources in an SIWFS:

MAP_PROVIDE_SIWFS_NUMBER see subclause 10.4.

The following MAP services are used to modify resources in an SIWFS:

MAP_SIWFS_SIGNALLING_MODIFY see subclause 10.5.

21.5.2 Process in the VMSC

The MAP process in the VMSC to allocate and modify resources in an SIWFS for a mobile call is shown in figure 21.5/4. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

21.5.2.1 Allocation of SIWFS resources

Successful Outcome

When the MAP process receives a Provide SIWFS Number request from the call handling process in the VMSC, it requests a dialogue with the SIWF whose identity is contained in the Provide SIWFS Number request by sending a MAP_OPEN service request, requests resources in the SIWFS using a MAP_PROVIDE_SIWFS_NUMBER service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the SIWFS.

If the MAP process receives a MAP_PROVIDE_SIWFS_NUMBER service confirm from the SIWFS, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Provide SIWFS Number ack containing the SIWFS Number received from the SIWFS to the call handling process in the VMSC and go to Wait_For_Modification state.

Earlier version MAP dialogue with the SIWFS

If the macro Receive_Open_Cnf takes the Vr exit, the MAP process sends an Abort to the call handling process in the VMSC and returns to the idle state.

Dialogue opening failure

If the macro Receive_Open_Cnf indicates that the dialogue with the SIWFS could not be opened, the MAP process sends an Abort to the call handling process in the VMSC and returns to the idle state.

Error in MAP_PROVIDE_SIWFS_NUMBER confirm

If the MAP_PROVIDE_SIWFS_NUMBER service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Provide SIWFS number negative response to the call handling process in the VMSC and returns to the idle state.

Call release

If the call handling process in the VMSC indicates that the call has been aborted, the MAP process returns to the idle state. Any response from the SIWFS will be discarded.

If the call handling process in the VMSC indicates that the traffic channel has been released (i.e. call released by a user) a MAP_CLOSE_req is sent and the process is returned to the idle state.

Abort of SIWFS dialogue

During the time an answer is expected from the SIWFS, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the SIWFS may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process sends a Provide SIWFS number negative response to the call handling process in the VMSC and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the SIWFS, sends a Provide SIWFS number negative response indicating system failure to the call handling process in the VMSC and returns to the idle state.

After the dialogue with the SIWFS has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the SIWFS may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the SIWFS, and returns to the idle state.

21.5.2.2 Modification of SIWFS resources initiated by the user

Successful Outcome

When the MAP process receives an SIWFS Signalling Modify request from the call handling process in the VMSC, it requests a dialogue with the SIWFS whose identity is contained in the SIWFS Signalling Modify request by sending a MAP_SIWFS_SIGNALLING_MODIFY service request and waits for a response from the SIWFS.

If the MAP process receives a MAP_SIWFS_SIGNALLING_MODIFY service confirm from the SIWFS, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends an SIWFS Signalling Modify ack containing the response received from the SIWFS to the call handling process in the VMSC and go to Wait_For_Modification state.

Error in MAP_SIWFS_SIGNALLING_MODIFY confirm

If the MAP_SIWFS_SIGNALLING_MODIFY service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends an SIWFS Signalling Modify negative response to the call handling process in the VMSC and go to Wait_For_Modification state.

Abort of SIWFS dialogue

During the time an answer is expected from the SIWFS, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the SIWFS may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process sends an SIWFS Signalling Modify negative response to the call handling process in the VMSC and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the SIWFS, sends an SIWFS Signalling Modify negative response indicating system failure to the call handling process in the VMSC and returns to the idle state.

21.5.2.3 Modification of SIWFS resources initiated by the SIWFS

Successful outcome

If a MAP_SIWFS_SIGNALLING_MODIFY service indication is received, the MAP process sends an SIWFS signalling modify Info request to the call handling process in the VMSC, and waits for a response. The SIWFS signalling modify request contains the parameters received in the MAP_SIWFS_SIGNALLING_MODIFY service indication.

If the call handling process in the VMSC returns an SIWFS signalling modify ack, the MAP process constructs a MAP_SIWFS_SIGNALLING_MODIFY service response contained in the Provide SIWFS Number ack, send it to the SIWFS and go to Wait_For_Modification state.

Negative response from VMSC call handling process

If the call handling process in the VMSC returns a negative response the MAP process constructs a MAP_SIWFS_SIGNALLING_MODIFY service response containing the appropriate error, send it to the SIWFS and go to Wait_For_Modification state.

Process SRA_VMSC

21.5_4.1(6)

Figure 21.5/4: Process in the VMSC for administration of SIWFS resources

Signals to/from the left are to/from the VMSC call handling process; signals to/from the right are to/from the SIWFS

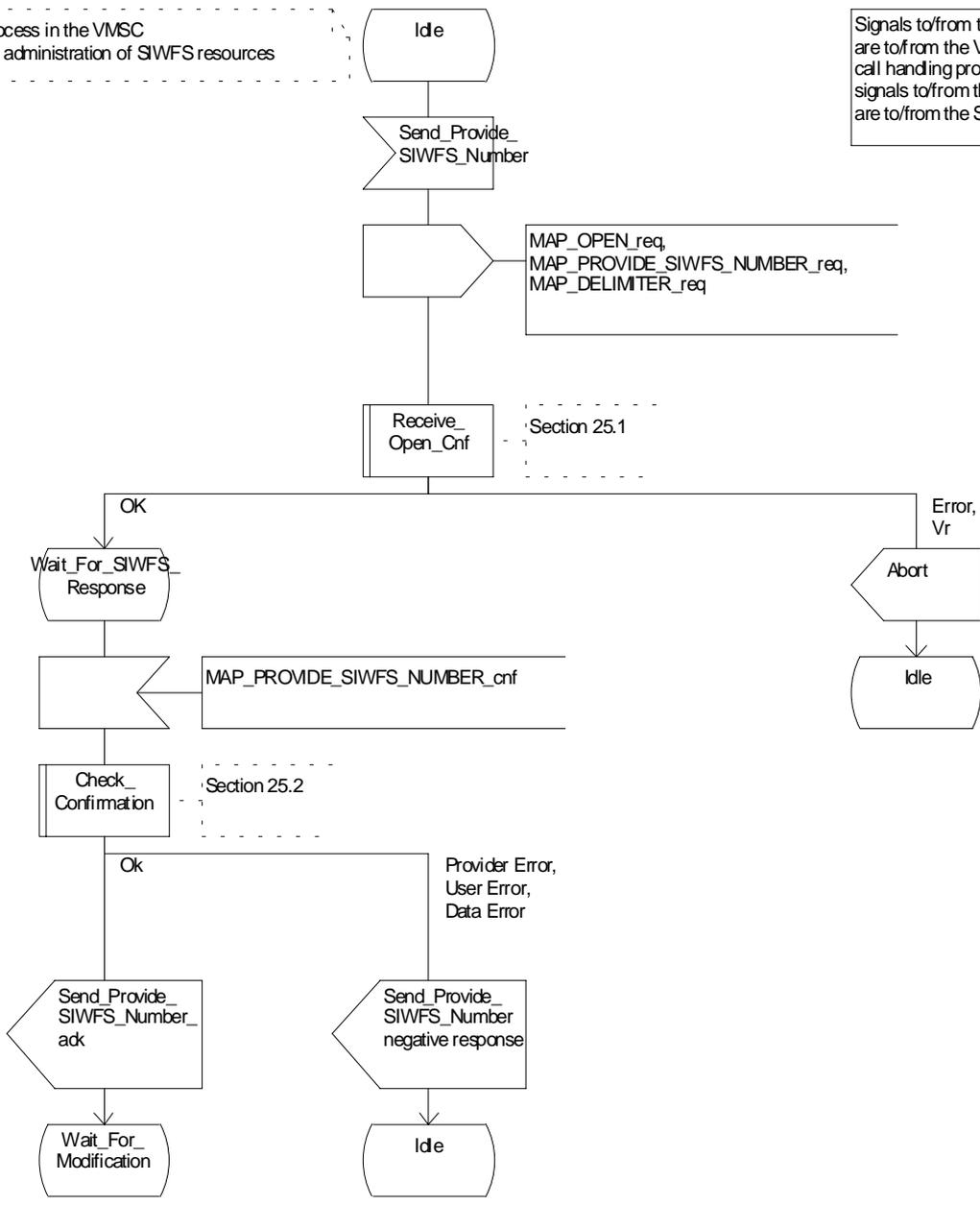


Figure 21.5/4 (sheet 1 of 6): Process SRA (SIWFS_RESOURCE_ADMINISTRATION)_VMSC

Process SRA_VMSC

21.5_4.2(6)

Figure 21.5/4: Process in the VMSC for administration of SIWFS resources

Signals to/from the left are to/from the VMSC call handling process; signals to/from the right are to/from the SIWFS

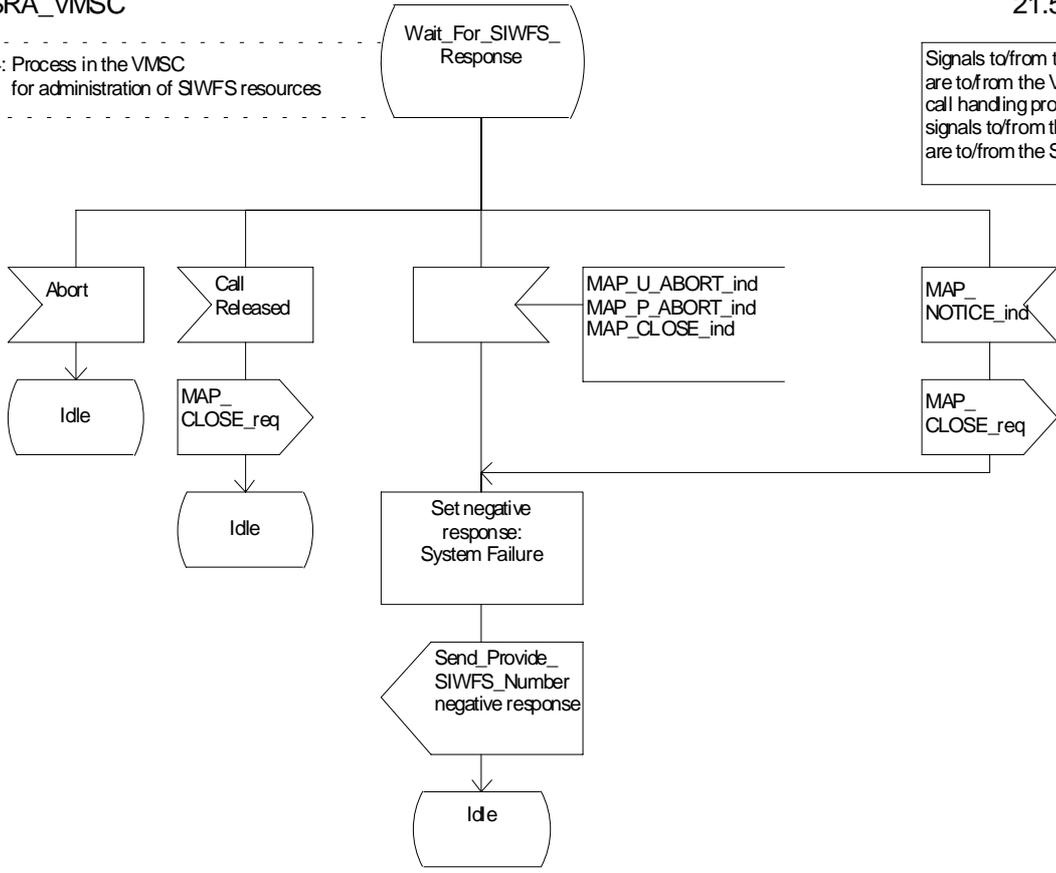


Figure 21.5/4 (sheet 2 of 6): Process SRA_VMSC

Process SRA_VMSC

21.5_4.3(6)

Figure 21.5/4: Process in the VMSC for administration of SIWFS resources

Signals to/from the left are to/from the VMSC call handling process; signals to/from the right are to/from the SIWFS

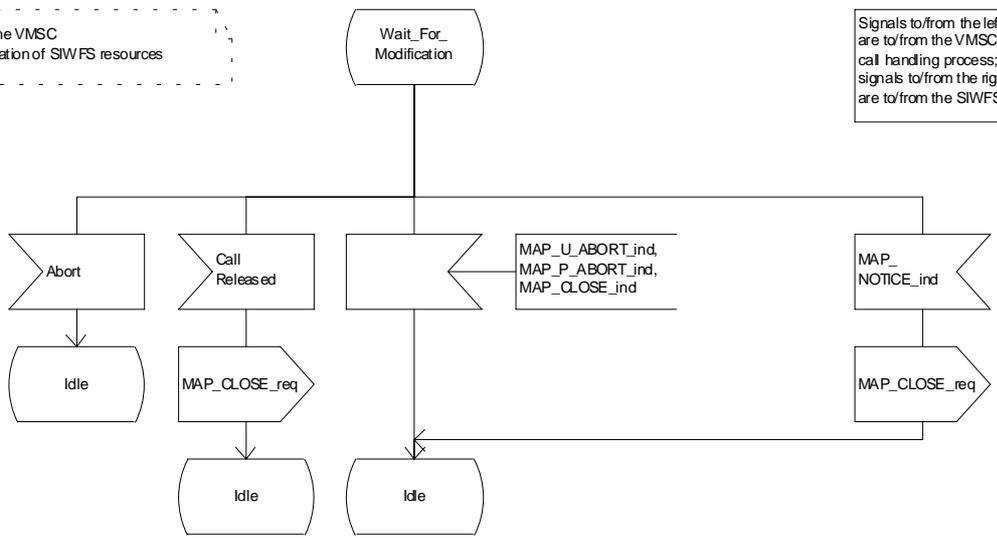


Figure 21.5/4 (sheet 3 of 6): Process SRA_VMSC

Process SRA_VMSC

21.5_4.4(6)

Figure 21.5/4: Process in the VMSC for administration of SIWFS resources

Signals to/from the left are to/from the VMSC call handling process; signals to/from the right are to/from the SIWFS

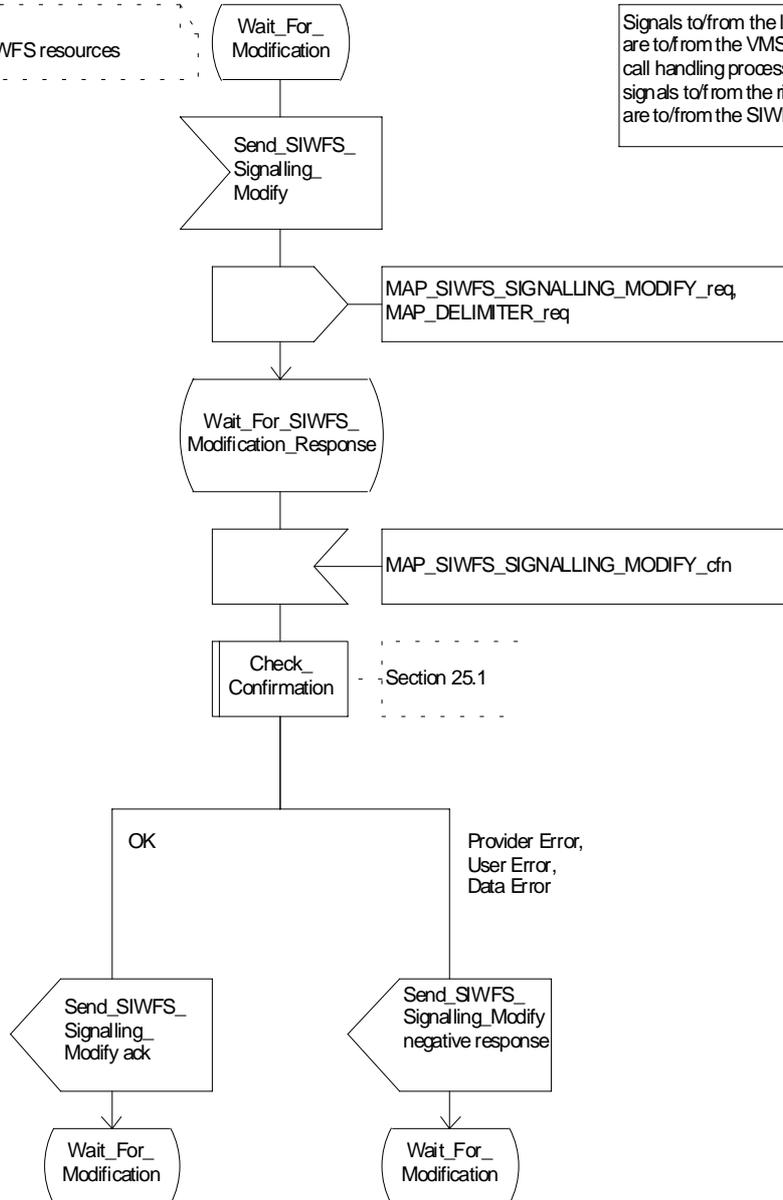


Figure 21.5/4 (sheet 4 of 6): Process SRA_VMSC

Process SRA_VMSC

21.5_4.5(6)

Figure 21.5/4: Process in the VMSC for administration of SIWFS resources

Signals to/from the left are to/from the VMSC call handling process; signals to/from the right are to/from the SIWFS

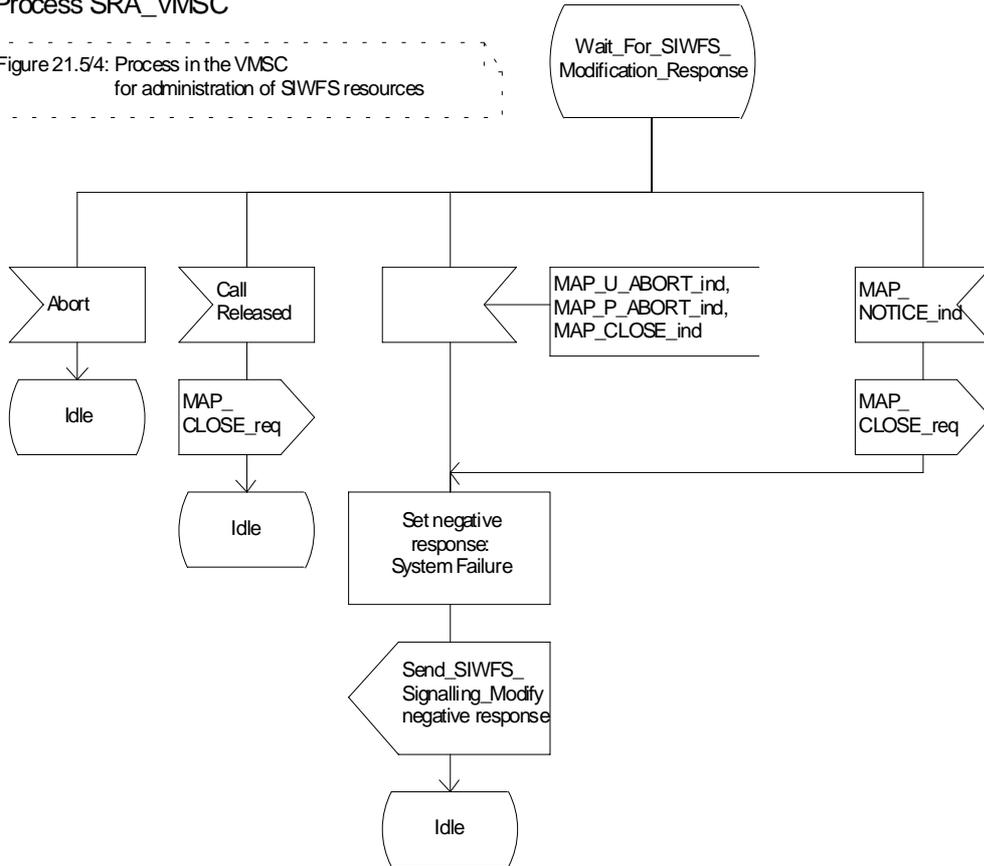


Figure 21.5/4 (sheet 5 of 6): Process SRA_VMSC

Figure 21.5/4: Process in the VMSC for administration of SIWFS resources

Signals to/from the left are to/from the VMSC call handling process; signals to/from the right are to/from the SIWFS

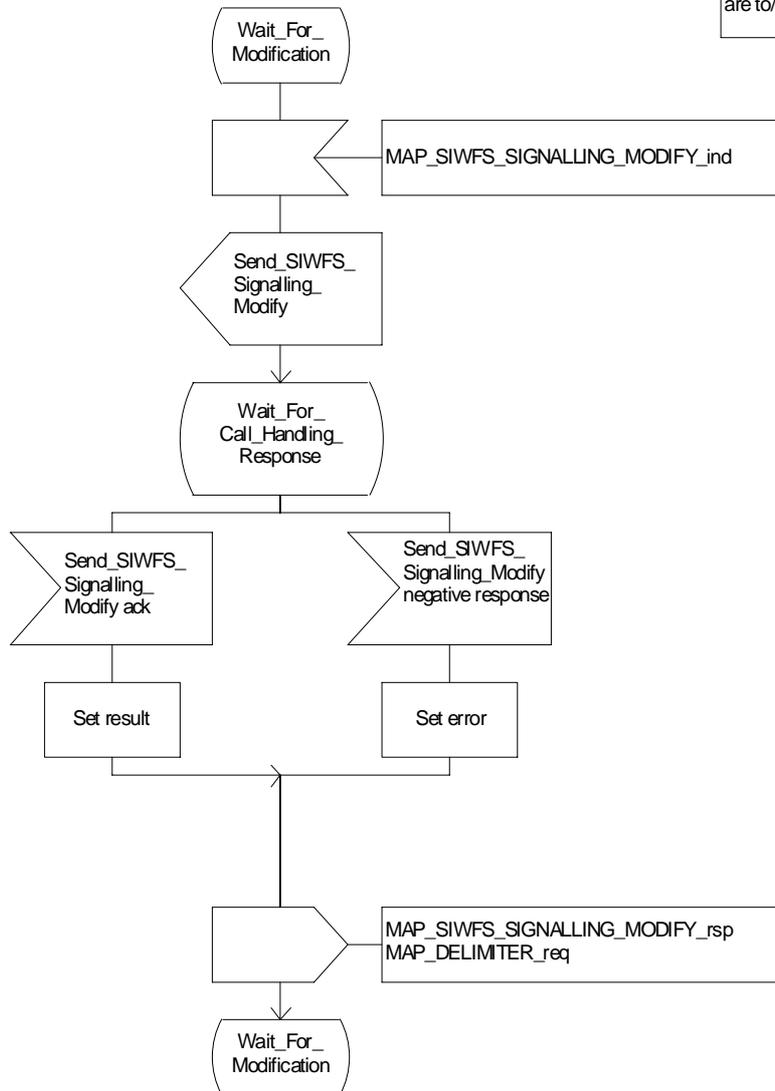


Figure 21.5/4 (sheet 6 of 6): Process SRA_VMSC

21.5.3 Process in the SIWFS

The MAP process in the SIWFS to allocate and modify SIWFS resources for a mobile call is shown in figure 21.5/5. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Ind	see subclause 25.1.1.
Check_Confirmation	see subclause 25.2.2.

21.5.3.1 Procedures for allocation of SIWFS resources

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context locInfoRetrieval, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_PROVIDE_SIWFS_NUMBER service indication is received, the MAP process sends a Provide SIWFS number Info request to the call handling process in the SIWFS, and waits for a response. The Provide SIWFS number request contains the parameters received in the MAP_PROVIDE_SIWFS_NUMBER service indication.

If the call handling process in the SIWFS returns a Provide SIWFS number ack, the MAP process constructs a MAP_PROVIDE_SIWFS_NUMBER service response containing the routing information contained in the Provide SIWFS Number ack, constructs a MAP_DELIMITER service request, sends them to the VMSC and go to Wait_For_Modification state.

Earlier version MAP dialogue with the VMSC

If the macro Receive_Open_Ind takes the Vr exit, the MAP process returns to the idle state.

Dialogue opening failure

If the macro Receive_Open_Ind takes the Error exit, the MAP process returns to the idle state.

If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Negative response from SIWFS call handling process

If the call handling process in the SIWFS returns a negative response the MAP process constructs a MAP_PROVIDE_SIWFS_NUMBER service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the VMSC and returns to the idle state.

Call release

If the call handling process in the SIWFS indicates that the call has been aborted, the MAP process returns to the idle state. Any response from the VMSC will be discarded.

If the call handling process in the SIWFS indicates that the traffic channel has been released (i.e.call released by a user) a MAP_CLOSE_req is sent and the process is returned to the idle state.

Abort of VMSC dialogue

After the dialogue with the VMSC has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the VMSC may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the VMSC, and returns to the idle state.

21.5.3.2 Process for modification of SIWFS resources initiated by the user

Successful outcome

If a MAP_SIWFS_SIGNALLING_MODIFY service indication is received, the MAP process sends an SIWFS signalling modify Info request to the call handling process in the SIWFS, and waits for a response. The SIWFS signalling modify request contains the parameters received in the MAP_SIWFS_SIGNALLING_MODIFY service indication.

If the call handling process in the SIWFS returns an SIWFS signalling modify ack, the MAP process constructs a MAP_SIWFS_SIGNALLING_MODIFY service response contained in the Provide SIWFS Number ack, send it to the VMSC and go to Wait_For_Modification state.

Negative response from SIWFS call handling process

If the call handling process in the SIWFS returns a negative response the MAP process constructs a MAP_SIWFS_SIGNALLING_MODIFY service response containing the appropriate error, send it to the VMSC and go to Wait_For_Modification state.

21.5.3.3 Process for modification of SIWFS resources initiated by the SIWFS

Successful Outcome

When the MAP process receives an SIWFS Signalling Modify request from the call handling process in the SIWF, it requests a dialogue with the VMSC whose identity is contained in the VMSC Signalling Modify request by sending a MAP_DELIMITER service request, requests resources in the VMSC using a MAP_SIWFS_SIGNALLING_MODIFY service request, the MAP process waits for a response from the VMSC.

If the MAP process receives a MAP_SIWFS_SIGNALLING_MODIFY service confirm from the VMSC, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends an SIWFS Signalling Modify ack containing the response received from the VMSC to the call handling process in the SIWF and go to Wait_For_Modification state.

Error in MAP_SIWFS_SIGNALLING_MODIFY confirm

If the MAP_SIWFS_SIGNALLING_MODIFY service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends an SIWFS Signalling Modify negative response to the call handling process in the SIWFS and go to Wait_For_Modification state.

Abort of SIWFS dialogue

During the time an answer is expected from the VMSC, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the VMSC may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process sends an SIWFS Signalling Modify negative response to the call handling process in the SIWFS and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the VMSC, sends an SIWFS Signalling Modify negative response indicating system failure to the call handling process in the SIWFS and returns to the idle state.

Process SRA_SIWFS

21.5_5.1(5)

Figure 21.5/5: Process in the SIWFS for administration of SIWFS resources

Signals to/from the left are to/from the SIWFS call handling process; signals to/from the right are to/from the VMSC

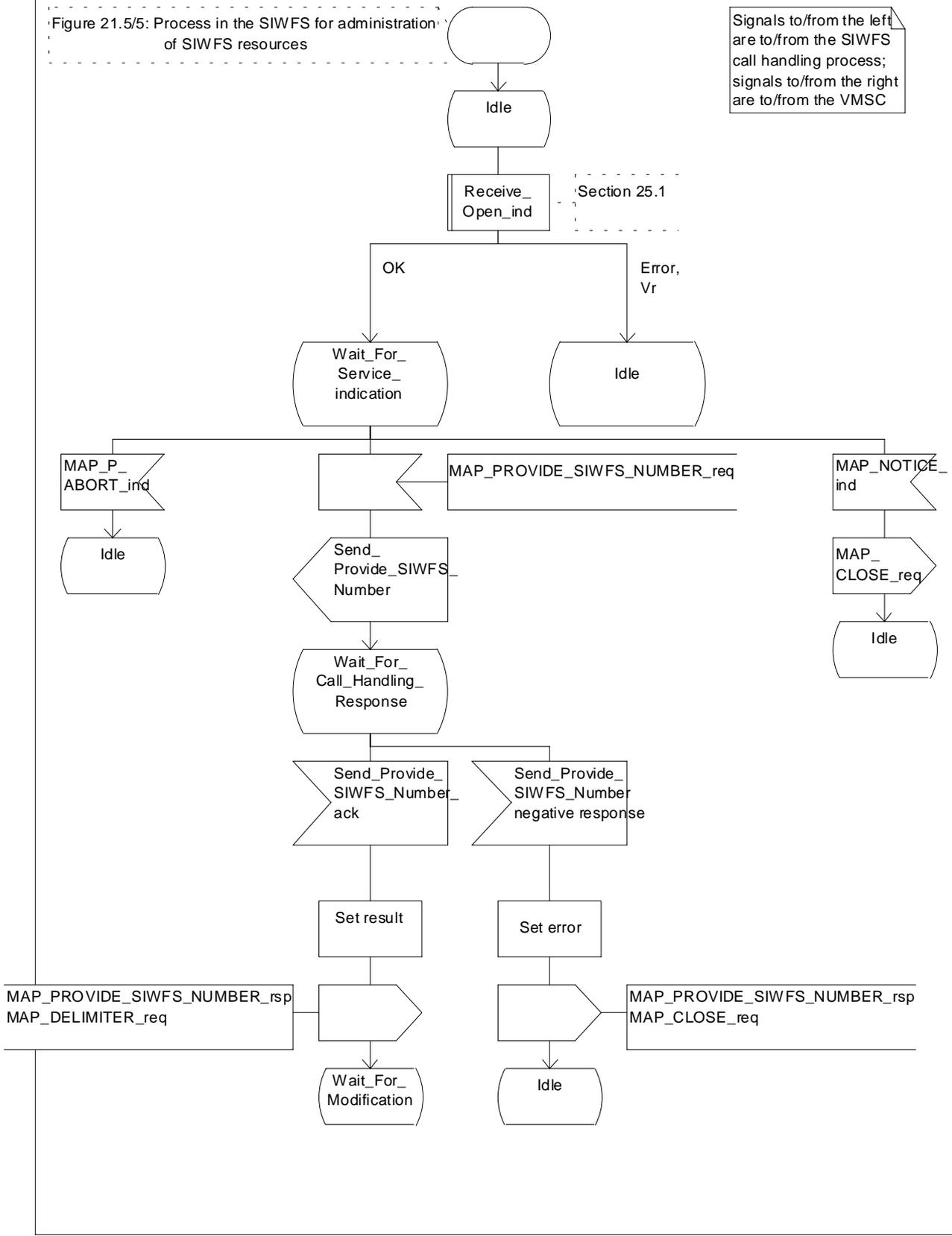


Figure 21.5/5 (sheet 1 of 5): Process SRA_SIWFS

Process SRA_SIWFS

21.5_5.2(5)

Figure 21.5/5: Process in the SIWFS for administration of SIWFS resources

Signals to/from the left are to/from the SIWFS call handling process; signals to/from the right are to/from the VMSC

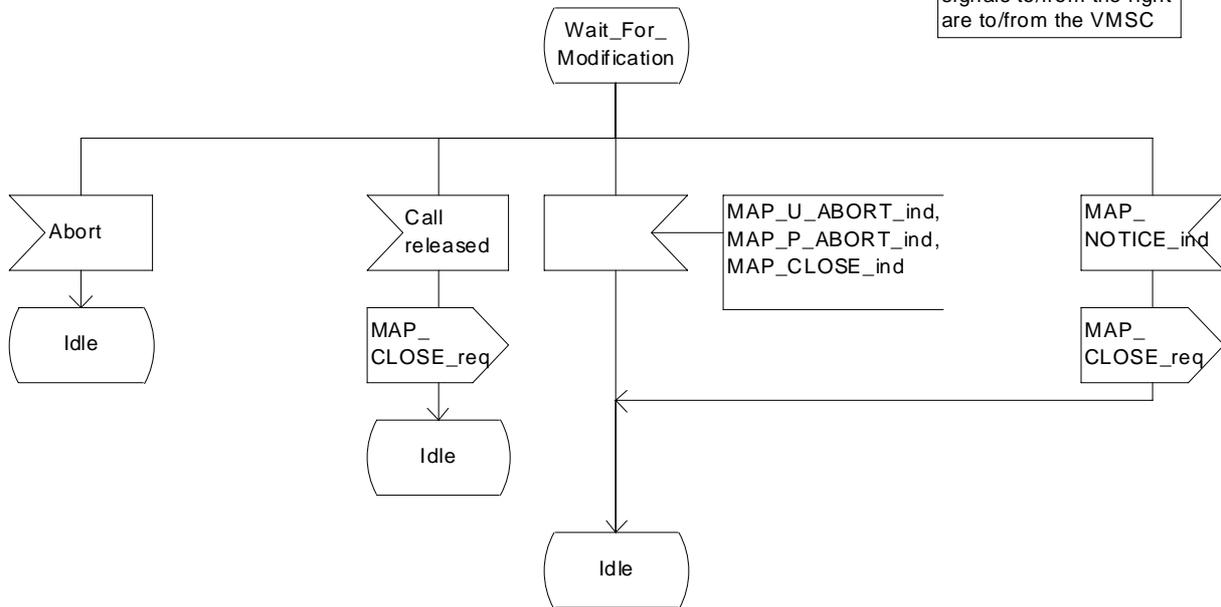


Figure 21.5/5 (sheet 2 of 5): Process SRA_SIWFS

Process SRA_SIWFS

21.5_5.3(5)

Figure 21.5/5: Process in the SIWFS for administration of SIWFS resources

Signals to/from the left are to/from the SIWFS call handling process; signals to/from the right are to/from the VMSC

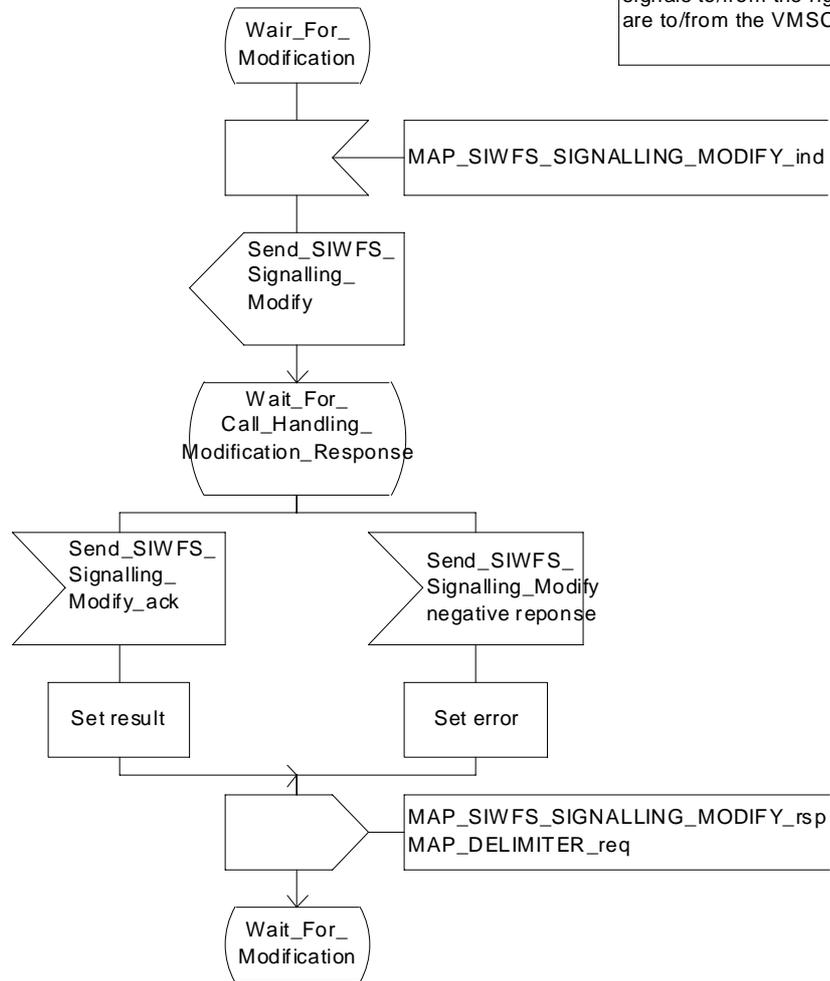


Figure 21.5/5 (sheet 3 of 5): Process SRA_SIWFS

Process SRA_SIWFS

21.5_5.4(5)

Figure 21.5/5: Process in the SIWFS for administration of SIWFS resources

Signals to/from the left are to/from the SIWFS call handling process; signals to/from the right are to/from the VMSC

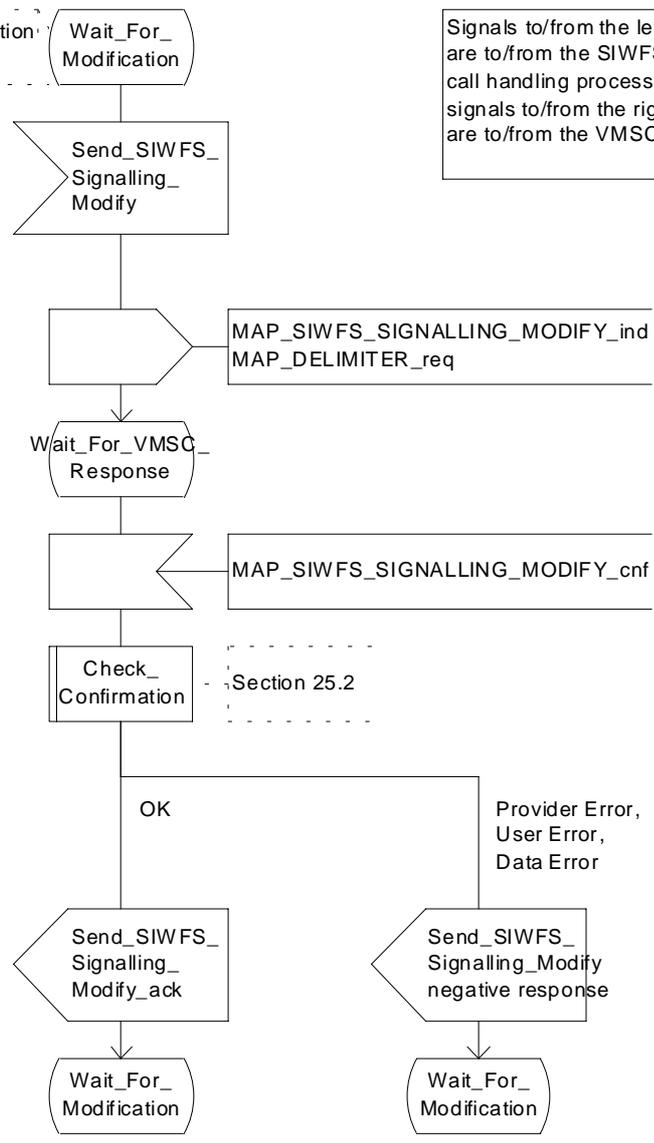


Figure 21.5/5 (sheet 4 of 5): Process SRA_SIWFS

Process SRA_SIWFS

21.5_5.5(5)

Figure 21.5/5: Process in the SIWFS for administration of SIWFS resources

Signals to/from the left are to/from the SIWFS call handling process; signals to/from the right are to/from the VMSC

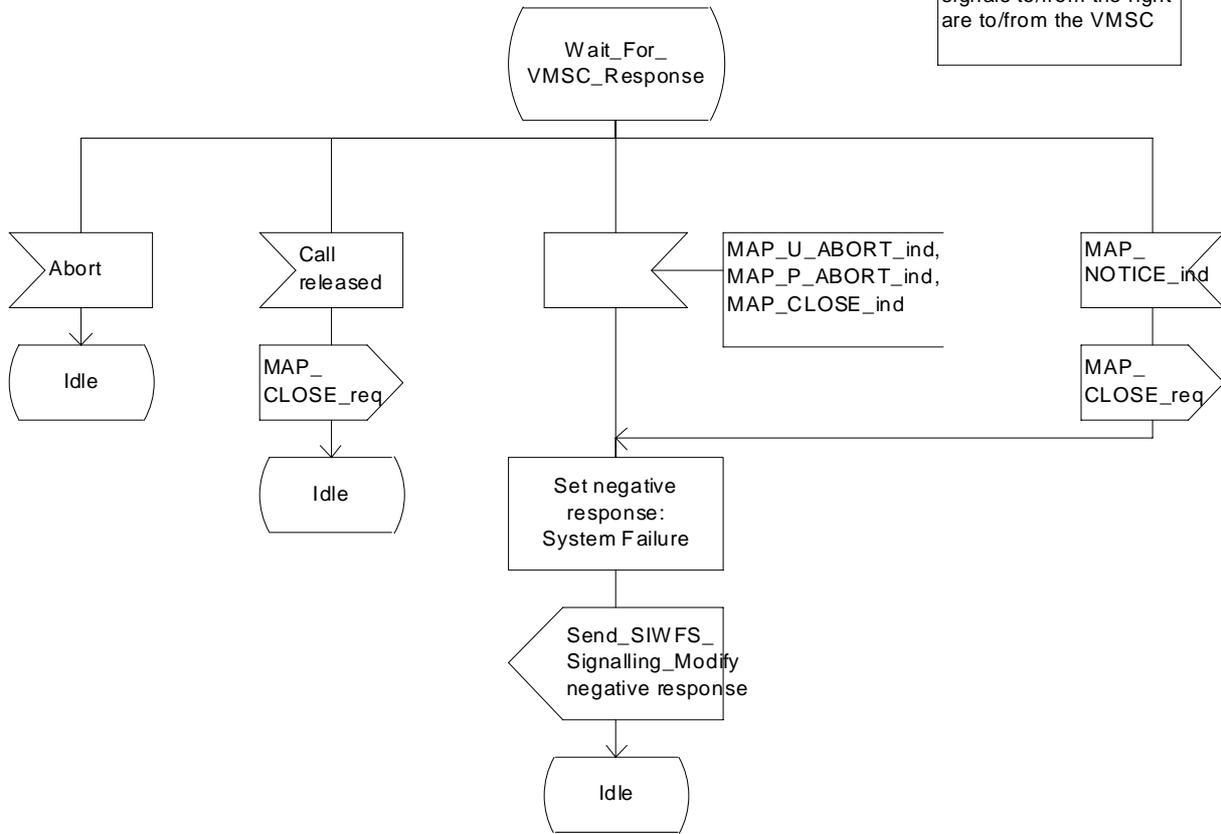


Figure 21.5/5 (sheet 5 of 5): Process SRA_SIWFS

21.6 Setting of Reporting State

21.6.1 General

The message flow for setting the reporting state in a stand-alone dialogue is shown in figure 21.6.1/1.

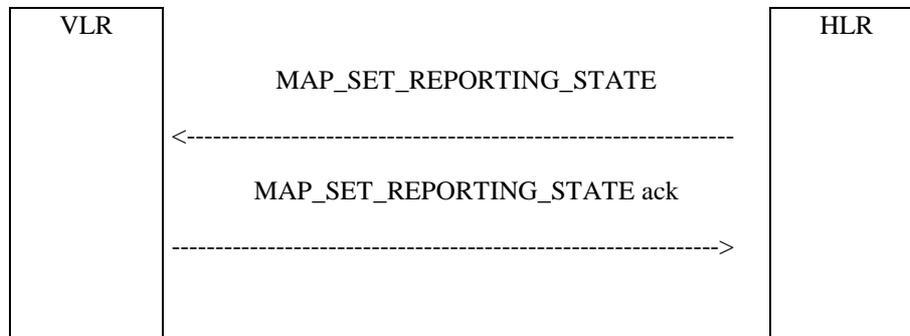


Figure 21.6/1: Message Flow for Setting the Reporting State

In Set Reporting State, the HLR can request a start or a stop of monitoring in the VLR.

21.6.2 Process in the HLR for Set Reporting State stand-alone

The MAP process in the HLR to set the reporting state in the VLR in a separate stand-alone dialogue is shown in figure 21.6/2. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see subclause 25.1.2;
Check_Confirmation	see subclause 25.2.2.

Successful Outcome

When the MAP process receives a Start Reporting or Stop Reporting request from the CCBS application process in the HLR, it requests a dialogue with the VLR whose identity is contained in the request by sending a MAP_OPEN service request and sending the necessary information using a MAP_SET_REPORTING_STATE service request. The HLR then invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the VLR.

If the MAP process receives a MAP_SET_REPORTING_STATE service confirm from the VLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit and the request was for Start Reporting, the MAP process sends a positive acknowledgement containing the information received from the VLR to the CCBS application process in the HLR and returns to the idle state. In the case of Stop Reporting the CCBS application process returns to the idle state.

Failure of dialogue opening with the VLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends (in the case of Start Reporting) a negative response to the CCBS application process in the HLR and returns to the idle state. In the case of Stop Reporting the process returns to the idle state.

Error in MAP_SET_REPORTING_STATE confirm

If the MAP_SET_REPORTING_STATE service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a negative response (in the case of Start Reporting) to the CCBS application process in the HLR and returns to the idle state. In the case of Stop Reporting the CCBS application process returns to the idle state.

Abort of VLR dialogue

After the dialogue with the VLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. If the request was for the Start Reporting, the MAP process sends a Start Reporting negative response to the CCBS application process in the HLR and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the VLR, sends a negative response (in the case of the Start Reporting) indicating system failure to the CCBS application process in the HLR and returns to the idle state. In the case of Stop Reporting the CCBS application process returns to the idle state.

Process Set_Reporting_State_HLR

21.2_2(1)

Figure 21.2/2: Process in the HLR to set the reporting state in the VLR in a separate dialogue

Signals to/from the left are to/from the VLR; signals to/from the right are to/from the CCBS application process in the HLR

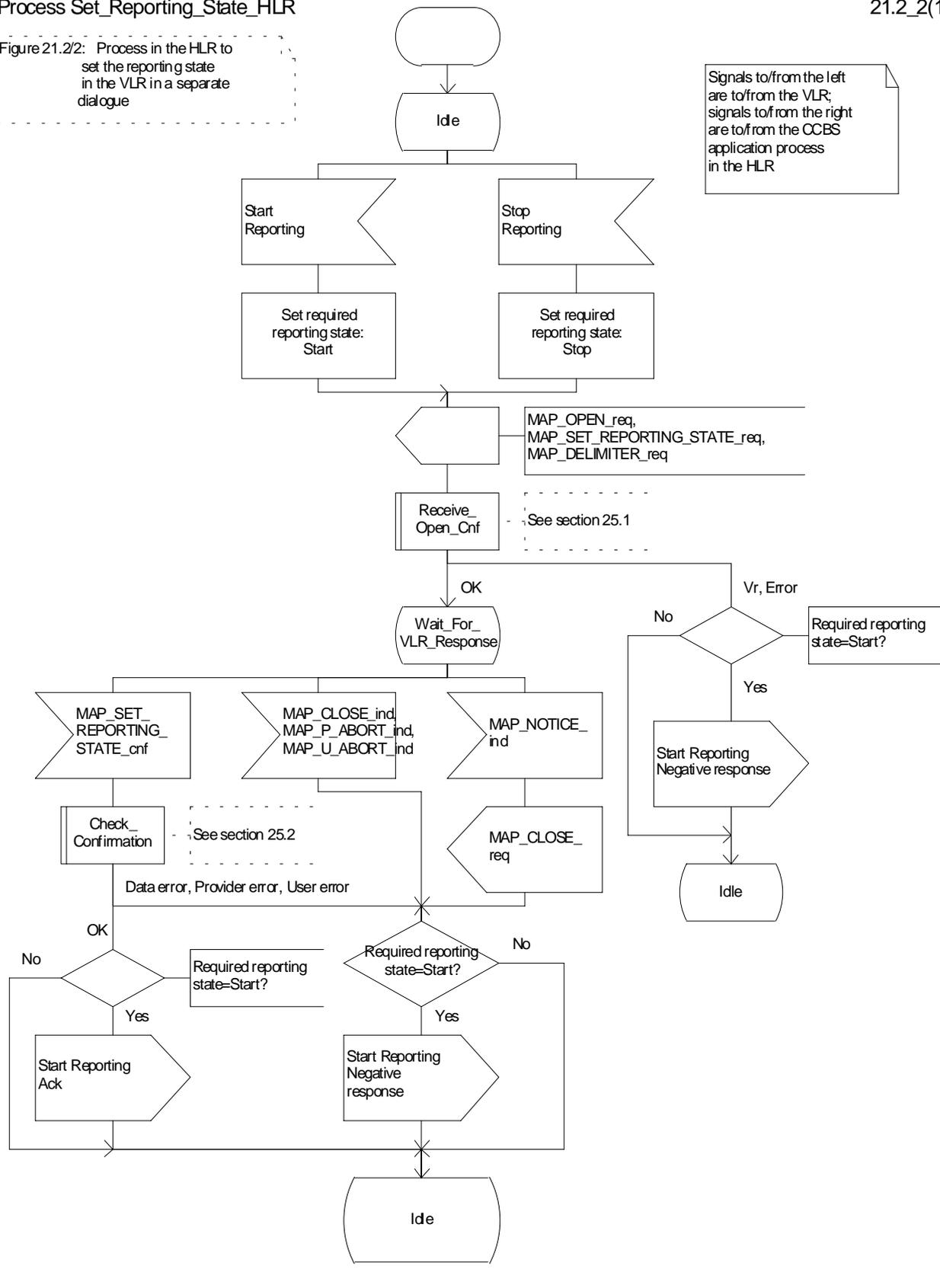


Figure 21.6/2: Process Set_Reporting_State_HLR

21.6.3 Reporting co-ordinator process in the VLR

The MAP co-ordinating process in the VLR to handle a dialogue opened with the reporting application context is shown in figure 21.6/3. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

Any reporting process in the VLR starts by the VLR receiving a MAP-OPEN service indication. If that service is successful, the VLR can handle reporting indications from the HLR. Table 21.6/1 shows the co-ordinating process' reaction on receipt of specific reporting indications from the HLR. After the relevant process is invoked, the received service indication is sent to that process.

Table 21.6/1: Relationship between received service indication and invoked process in the VLR

Service indication received	Process invoked
MAP_REMOTE_USER_FREE_ind	REMOTE_USER_FREE_VLR
MAP_SET_REPORTING_STATE_ind	SET_REPORTING_STATE_VLR

After creation of the user process the co-ordinator relays the messages between the MAP protocol machine and the invoked process until a request or an indication for dialogue termination is received.

Process Reporting_Coord_VLR

21.6_3(1)

Figure 21.6/3: Coordinating process in the VLR to handle a dialogue opened with the AC ReportingContext

Signals to/from the left are to/from the HLR via the MAP provider; signals to/from the right are to/from the child process

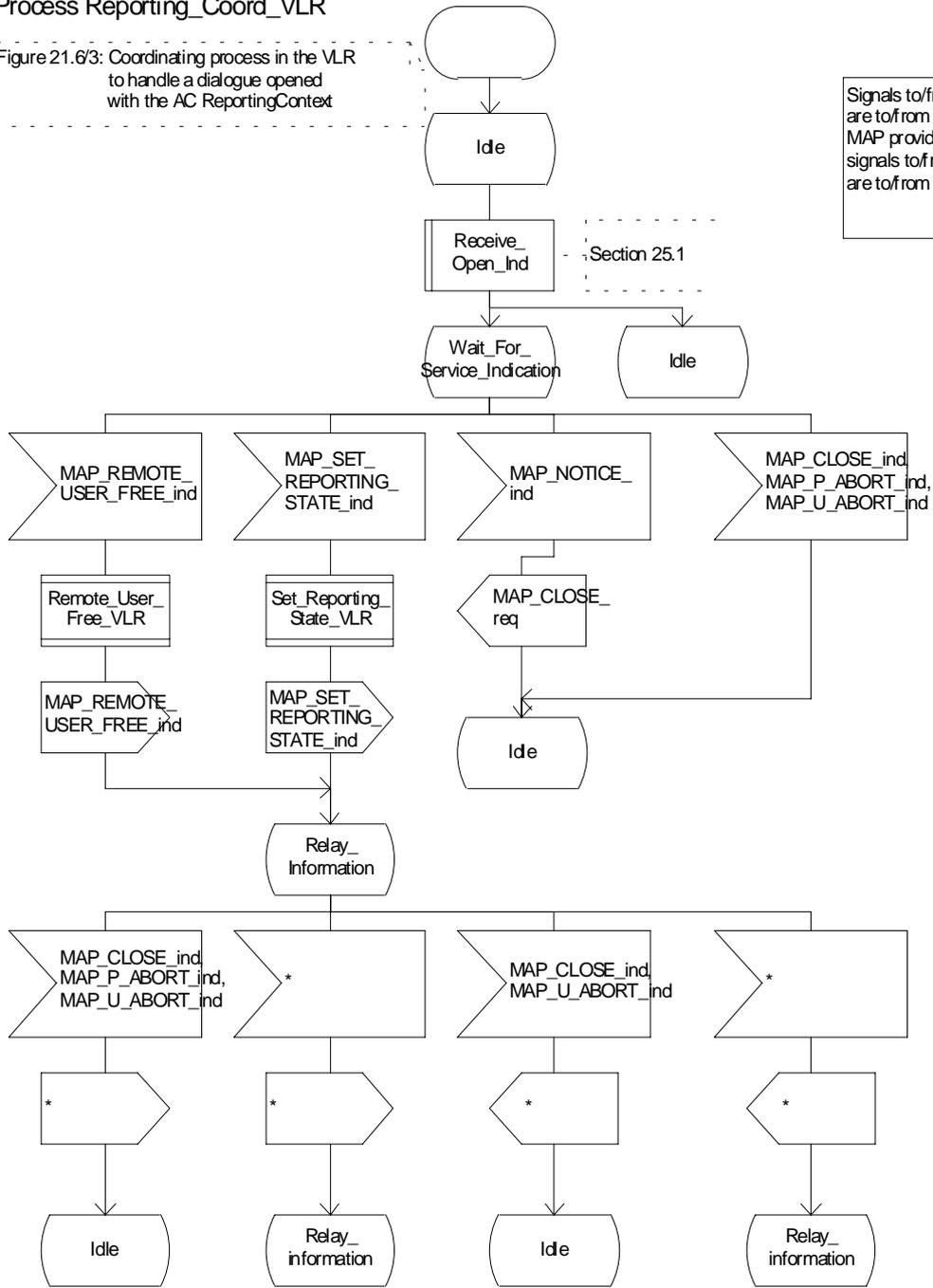


Figure 21.6/3: Process Reporting_Coord_VLR

21.6.4 Process in the VLR to set the reporting state

The MAP process in the VLR to set the reporting state is shown in figure 21.6/4.

The co-ordinator opens the process. The macro `Receive_Set_Reporting_State_VLR` handles the receipt of the request from the HLR, and the possible response from the CCBS application process in the VLR. When the macro exits, a MAP CLOSE is sent to the HLR and the process terminates.

The macro `Set_Reporting_State_VLR` is defined in figure 21.6/5.

When the VLR receives a `MAP_SET_REPORTING_STATE` service indication, it checks whether the required monitoring state is stopped.

If the required monitoring state is stopped, the MAP process sends a Stop Reporting message to the CCBS application in the VLR, sends a `MAP_SET_REPORTING_STATE` response to the HLR and exits from the macro.

If the required monitoring state is started, the MAP process sends a Start Reporting message to the CCBS application in the VLR and waits for a response.

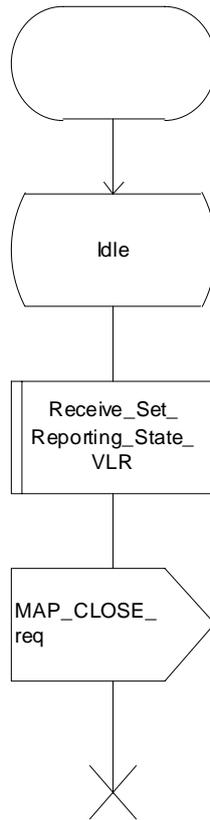
If the CCBS application sends a Start Reporting ack, the MAP process sends a `MAP_SET_REPORTING_STATE` response to the HLR and exits from the macro.

If the CCBS application sends a Start Reporting negative response, the MAP process translates the negative response into a MAP user error, sends a `MAP_SET_REPORTING_STATE` response to the HLR and exits from the macro.

Process Set_Reporting_State_VLR

21.6_4(1)

Figure 21.6/4: Process in the VLR to handle a request from the HLR to set the reporting state for a subscriber



Signals to/from the right are to/from the HLR

Figure 21.6/4: Process Set_Reporting_State_VLR

Macrodefinition Receive_Set_Reporting_State_VLR

21.6_5(1)

Figure 21.6/5: Macro in the VLR to handle a Set Reporting State instruction from the HLR

Signals to/from the left are to/from the CCBS application process in the VLR; signals to/from the right are to/from the HLR

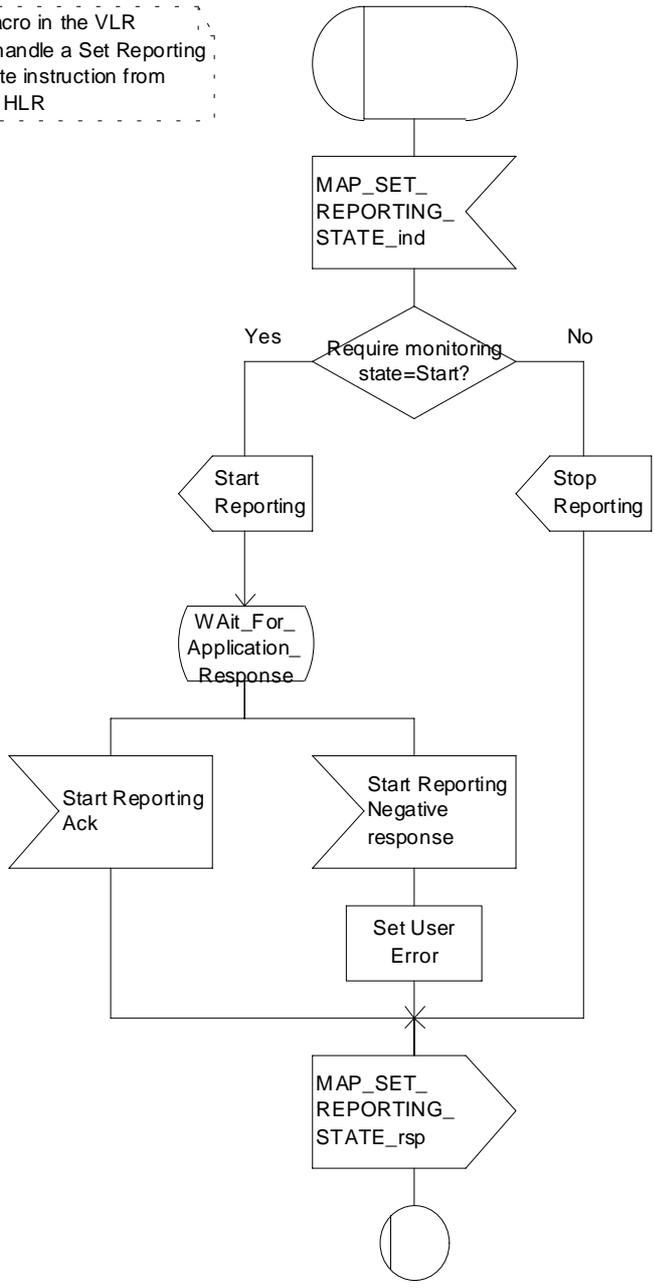


Figure 21.6/5: Macro Receive_Set_Reporting_State_VLR

21.7 Status Reporting

21.7.1 General

The message flows for reporting the status of a subscriber are shown in figures 21.7/1 and 21.7/2.

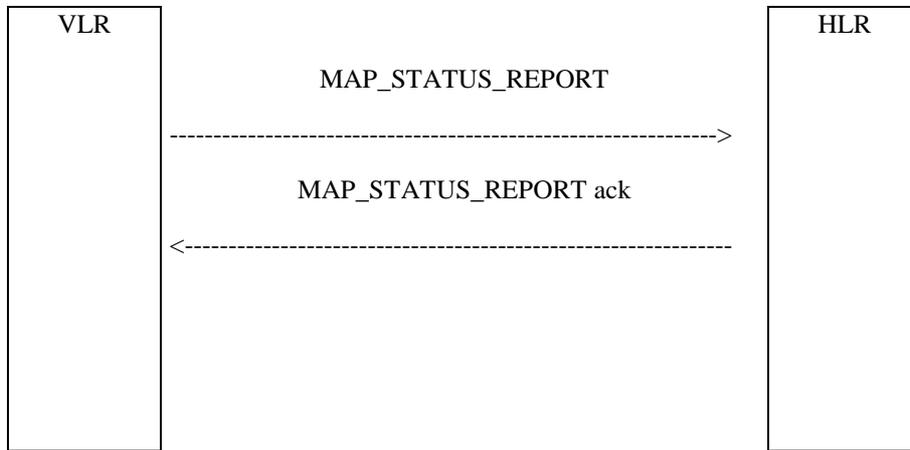


Figure 21.7/1: Status reporting, when monitoring continues in the VLR

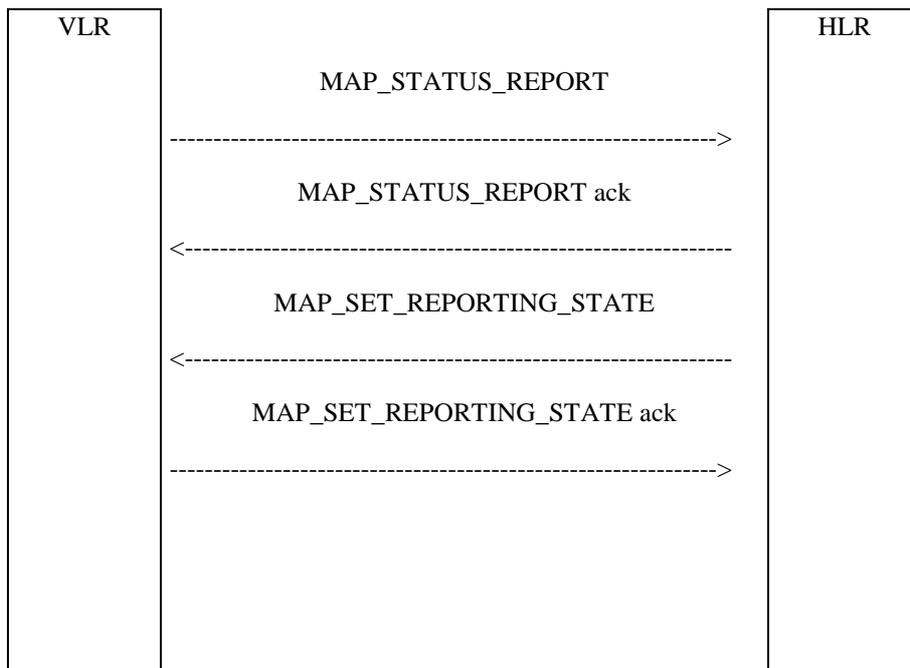


Figure 21.7/2: Status reporting, when monitoring stops

When the HLR sends a MAP_SET_REPORTING_STATE, it requests the stop of monitoring in the VLR.

21.7.2 Process in the VLR for Status Reporting

The MAP process in the VLR to send a status report to the HLR is shown in figure 21.7/3. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see subclause 25.1.2;
Check_Confirmation	see subclause 25.2.2.

Successful Outcome

When the MAP process receives a Event Report or CCBS Call Report from the CCBS application process in the VLR, it requests a dialogue with the HLR whose identity is contained in the request by sending a MAP_OPEN service request, and requests status report using a MAP_STATUS_REPORT service request. The VLR then invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_STATUS_REPORT service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends an Event Report ack or a CCBS Call Report ack containing the information received from the HLR to the CCBS application process in the VLR and waits for a possible instruction from the HLR to set the reporting state.

If the HLR requests the VLR to set a reporting state (in the macro Receive_Set_Reporting_State_VLR), the VLR closes the dialogue with the HLR by sending a MAP_CLOSE to the HLR.

If the HLR requires monitoring in the VLR to continue, it closes the dialogue by sending a MAP_CLOSE, and the MAP process in the VLR sends Continue Monitoring message to the CCBS application process in the VLR and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a Event Report negative response or CCBS Call Report negative response to the CCBS application process in the VLR and returns to the idle state.

Error in MAP_STATUS_REPORT confirm

If the MAP_STATUS_REPORT service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends an Event Report negative response or CCBS Call Report negative response to the CCBS application process in the VLR and returns to the idle state.

Abort of HLR dialogue in State Wait_For_HLR_Response

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process sends a Event Report or CCBS Call Report negative response to the CCBS application process in the VLR and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR. The VLR sends an Event Report negative response or CCBS Call Report negative response indicating system failure to the CCBS application process in the VLR and returns to the idle state.

Abort of HLR dialogue in State Wait_For_Set_Reporting

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the VLR returns to the idle state

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR and returns to the idle state.

Process Send_Status_Report_VLR

21.7_3(2)

Figure 21.7/3: Process in the VLR to send a status report to the HLR

Signals to/from the left are to/from the CCBS application process in the VLR; signals to/from the right are to/from the HLR

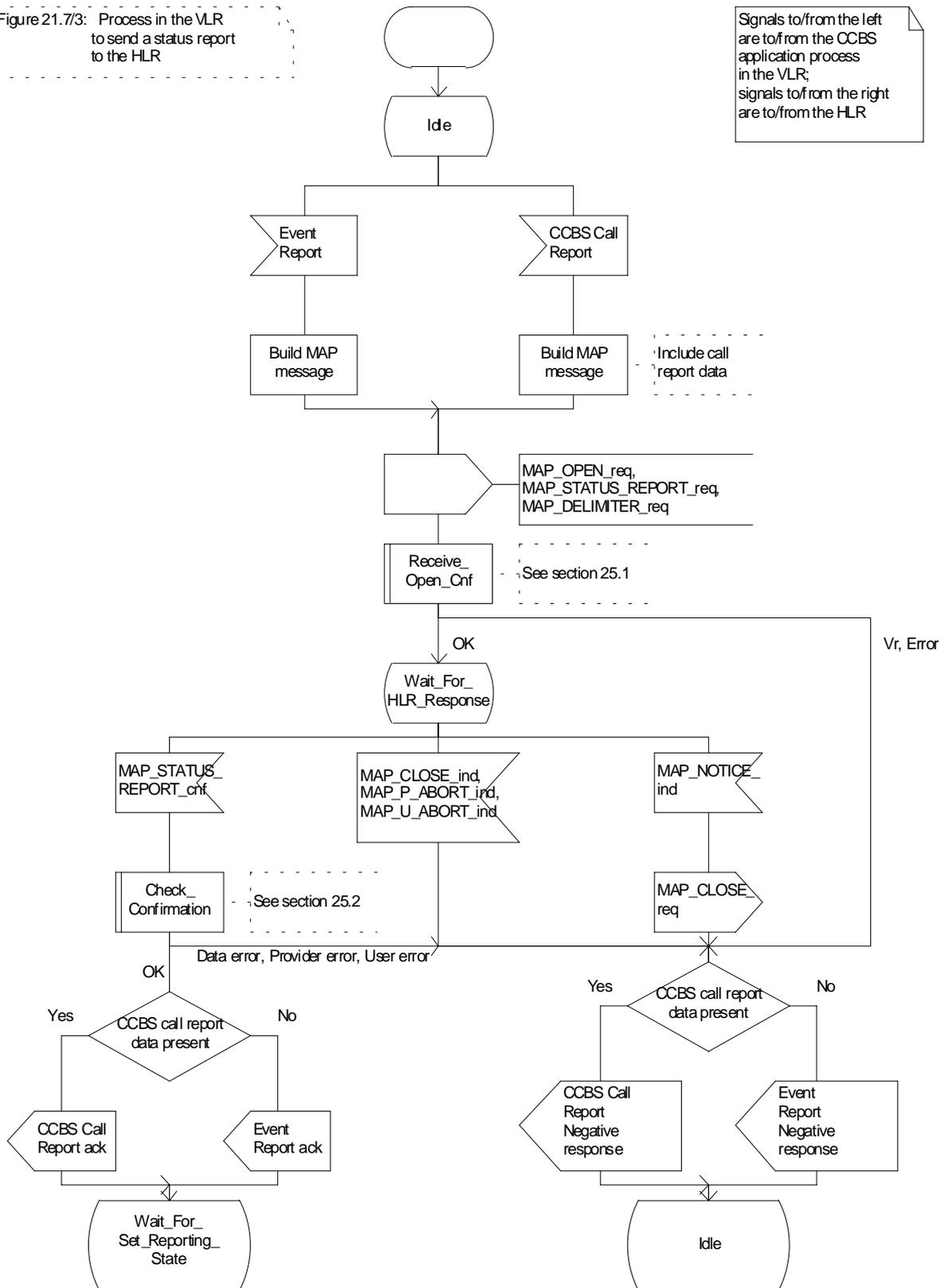


Figure 21.7/3 (sheet 1 of 2): Process Send_Status_Report_VLR

Process Send_Status_Report_VLR

21.7_3.2(2)

Figure 21.7/3: Process in the VLR to send a status report to the HLR

Signals to/from the right are to/from the HLR

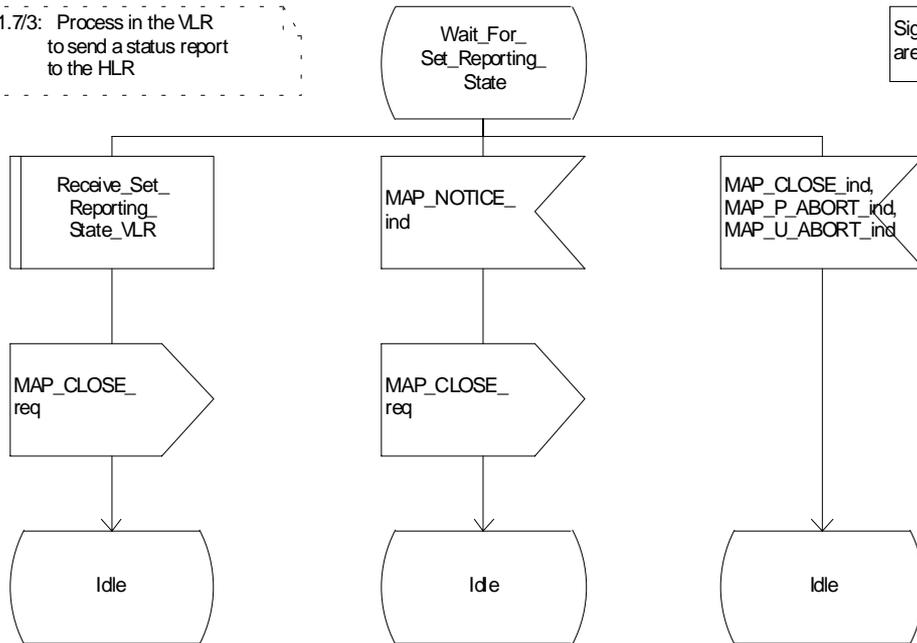


Figure 21.7/3 (sheet 2 of 2): Process Send_Status_Report_VLR

21.7.3 Process in the HLR for Status Reporting

The MAP process in the HLR to handle a status report is shown in figure 21.7/4. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Check_Confirmation	see subclause 25.2.2;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context reporting, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

The MAP process invokes the macro Receive_Status_Report_HLR to handle a MAP_STATUS_REPORT service indication; this macro is defined in figure 21.7/5. The MAP process then waits for a response from the CCBS application in the HLR.

If the MAP process receives a Stop Reporting message from the CCBS process, it sets the required monitoring state to stop, and may send a MAP_DELIMITER service request to the VLR. The HLR then invokes the macro Set_Reporting_State_HLR. After exiting the macro, the MAP process returns to the idle state.

If the MAP process receives a Continue Reporting from the CCBS process, it sends a MAP_CLOSE Request to VLR and returns to the idle state.

Failure of dialogue opening with the VLR

If the macro Receive_Open_Ind takes the Vr exit or the Error exit, the MAP process returns to the idle state.

Abort of VLR dialogue in State Wait_For_Service_Indication

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication. In this case, the MAP process returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the VLR and returns to the idle state.

Macro Receive_Status_Report_HLR

The macro Receive_Status_Report_HLR is shown in figure 21.7/5.

When a MAP_STATUS_REPORT service indication is received, the HLR checks whether call report data are present.

If call report data are present, the MAP process sends a CCBS Call Report message to the CCBS application process in the HLR and waits for a response; otherwise it sends an Event Report message to the CCBS application process in the HLR and waits for a response.

If the MAP process receives a CCBS Call Report ack or Event Report ack from the CCBS application process in the HLR, it sends a MAP_STATUS_REPORT service confirm to the VLR and exits from the macro.

If the MAP process receives a CCBS Call Report negative response or Event Report negative response from the CCBS application process in the HLR, it sets the User Error according to the negative response, sends a MAP_STATUS_REPORT service confirm to the VLR and exits from the macro.

Macro Set_Reporting_State_HLR

The macro Set_Reporting_State_HLR is shown in figure 21.7/6.

The MAP process in the HLR sends a MAP_SET_REPORTING_STATE service request to the VLR and waits for a response.

If the MAP process receives a MAP_SET_REPORTING_STATE service confirm from the VLR, it invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the macro Set_Reporting_State_HLR takes the OK exit.

If the macro Check_Confirmation takes the Data error, Provider error or User error exit, the macro Set_Reporting_State_HLR takes the Error exit.

While the MAP process is waiting for a response from the VLR, the MAP provider may terminate the dialogue by sending a MAP_CLOSE, MAP_P_ABORT or MAP_U_ABORT. In this case the macro takes the Aborted exit.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the VLR and the macro takes the Aborted exit.

Process Status_Report_HLR

SR_HLR1(1)

Process in the HLR to handle a status report from the VLR

Signals to/from the left are to/from the VLR; signals to/from the right are to/from the COBS application process in the HLR

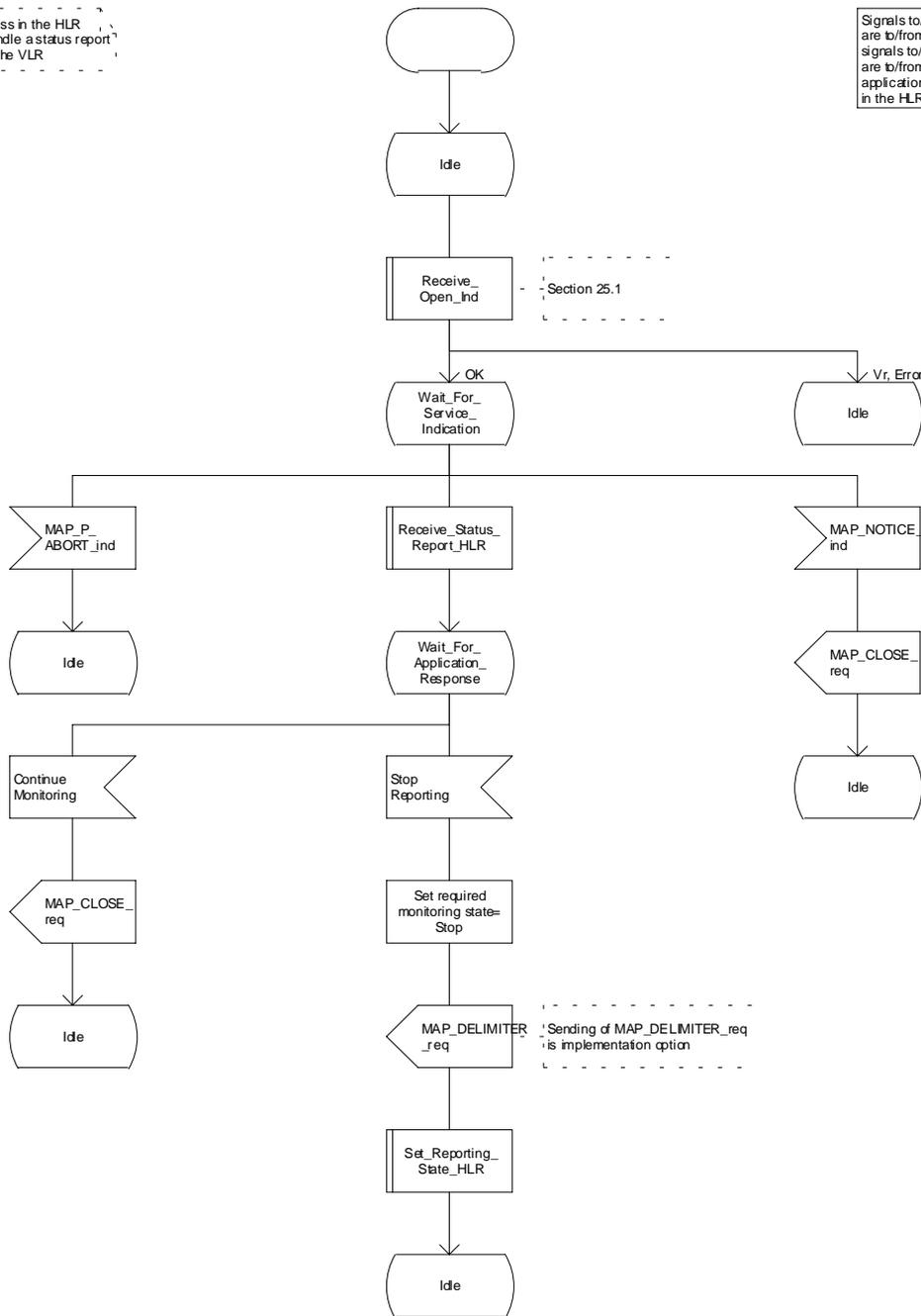


Figure 21.7/4: Process Status_Report_HLR

Macrodefinition Receive_Status_Report_HLR

21.7_5(1)

Figure 21.7/5: Macro in the HLR to receive a status report from the VLR

Signals to/from the left are to/from the VLR; signals to/from the right are to/from the CCBS application process in the HLR

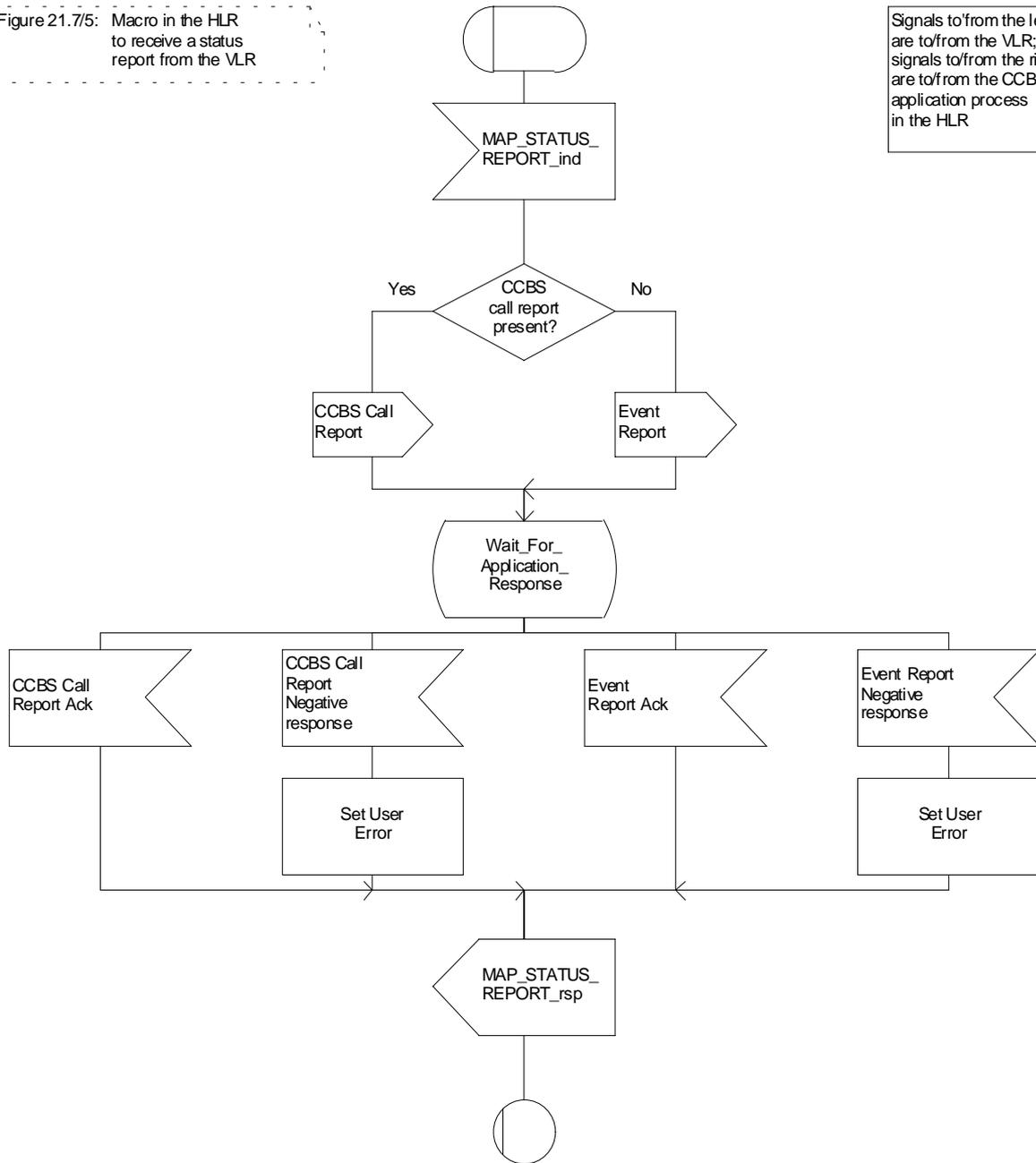


Figure 21.7/5: Macro Receive_Status_Report_HLR

Macrodefinition Set_Reporting_State_HLR

21.7_6(1)

Figure 21.7/6: Macro in the HLR to instruct the VLR to set the reporting state for a subscriber

Signals to/from the left are to/from the VLR

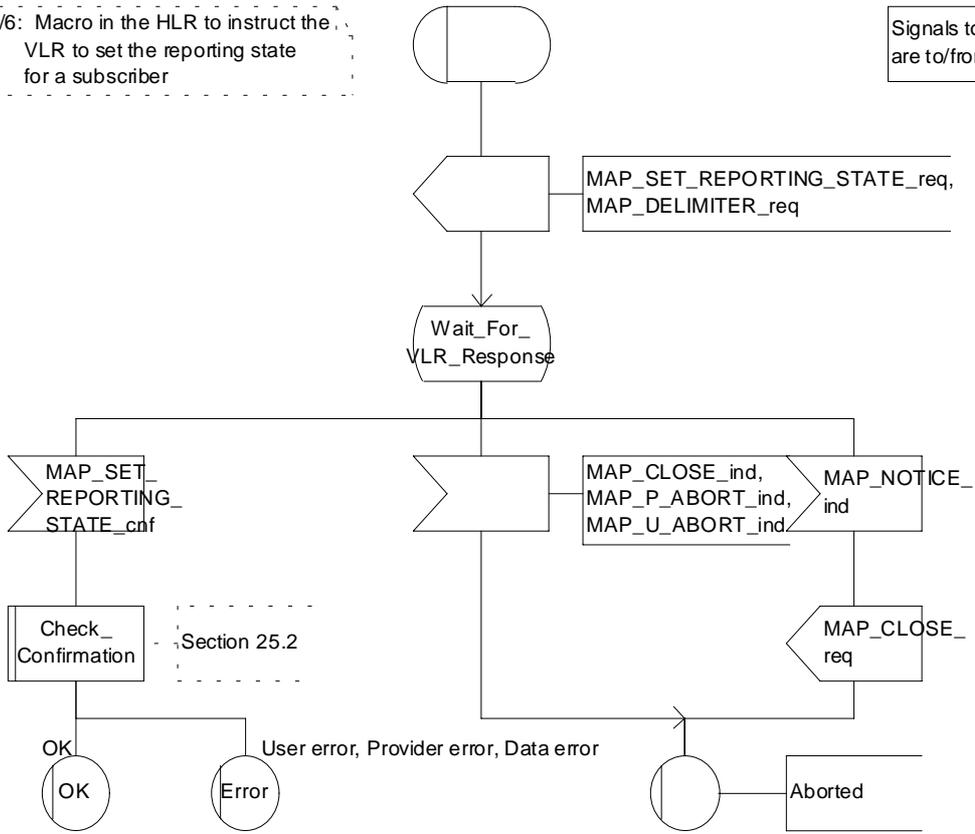


Figure 21.7/6: Macro Set_Reporting_State_HLR

21.8 Remote User Free

21.8.1 General

The message flows for handling remote user free are shown in figures 21.8/1 and 21.8/2.

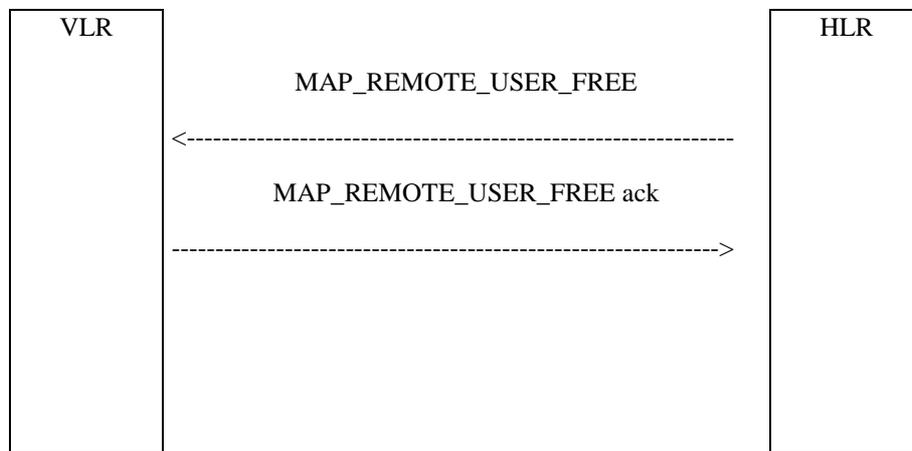


Figure 21.8/1: Remote User Free: recall not accepted

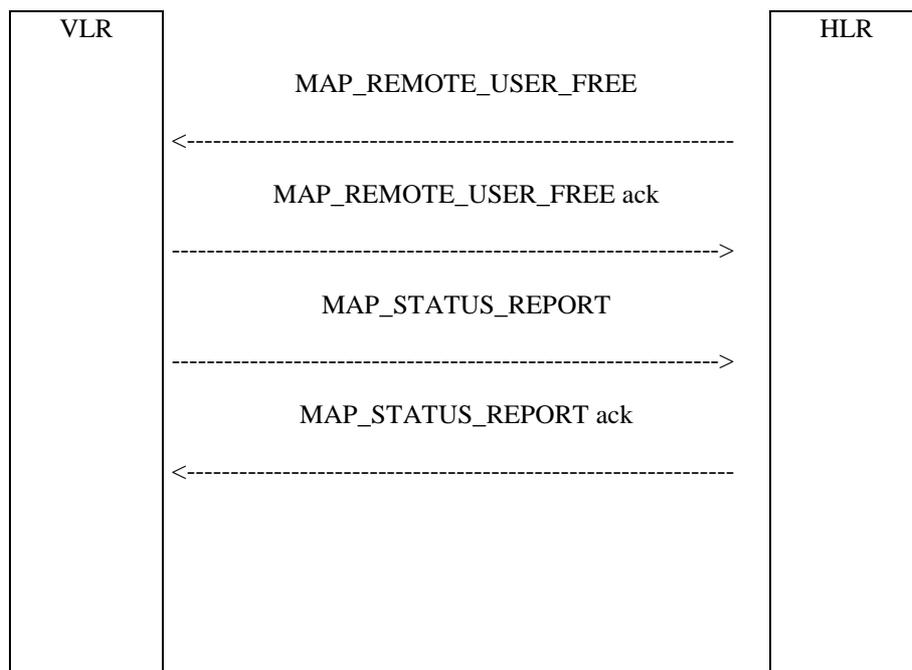


Figure 21.8/2: Remote User Free: recall accepted

21.8.2 Process in the HLR for Remote User Free

The MAP process in the HLR to handle Remote User Free is shown in figure 21.8/3. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

- Receive_Open_Cnf see subclause 25.1.2;
- Check_Confirmation see subclause 25.2.2;

Successful Outcome

When the MAP process receives a CCBS RUF request from the CCBS application process in the HLR, it requests a dialogue with the VLR whose identity is contained in the request by sending a MAP_OPEN service request and sending the necessary information using a MAP_REMOTE_USER_FREE service request. The HLR then invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the VLR.

If the MAP process receives a MAP_REMOTE_USER_FREE service confirm from the VLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a CCBS RUF ack containing the information received from the VLR to the CCBS application process in the HLR and waits for a MAP_STATUS_REPORT service indication from the VLR. If in this state a MAP_CLOSE service indication is received, the MAP process returns to the idle state. If in this state a MAP_STATUS_REPORT service indication is received, further processing is described by the macro Receive_Status_Report_HLR (described in subclause 21.7.3). When the macro exits, the MAP process constructs a MAP_CLOSE service request, sends it to the VLR and returns to the idle state.

Failure of dialogue opening with the VLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a negative response to the CCBS application process in the HLR and returns to the idle state.

Error in MAP_REMOTE_USER_FREE confirm

If the MAP_REMOTE_USER_FREE service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a CCBS RUF negative response to the CCBS application process in the HLR and returns to the idle state.

Abort of VLR dialogue

When the MAP process is waiting for a VLR response to the MAP_REMOTE_USER_FREE, the MAP service provider may abort the dialogue by issuing a MAP_CLOSE, a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process sends a CCBS RUF negative response to the CCBS application process in the HLR and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication when the MAP process is waiting for a VLR response to the MAP_REMOTE_USER_FREE, the MAP process closes the dialogue with the VLR, sends a CCBS RUF negative response indicating system failure to the CCBS application process in the HLR and returns to the idle state.

When the MAP process is waiting for a possible MAP_STATUS_REPORT from the VLR, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication when the MAP process is waiting for a possible MAP_STATUS_REPORT from the VLR, the MAP process closes the dialogue with the VLR and returns to the idle state.

If the CCBS application in the HLR decides to abort the dialogue, it sends an Abort message to the MAP process, which closes the dialogue with the VLR and returns to the idle state.

Process Remote_User_Free_HLR

21.8_3(1)

Figure 21.8/3: Process in the HLR to handle a Remote User Free notification to the VLR

Signals to/from the left are to/from the VLR; signals to/from the right are to/from the CCBS application process in the HLR

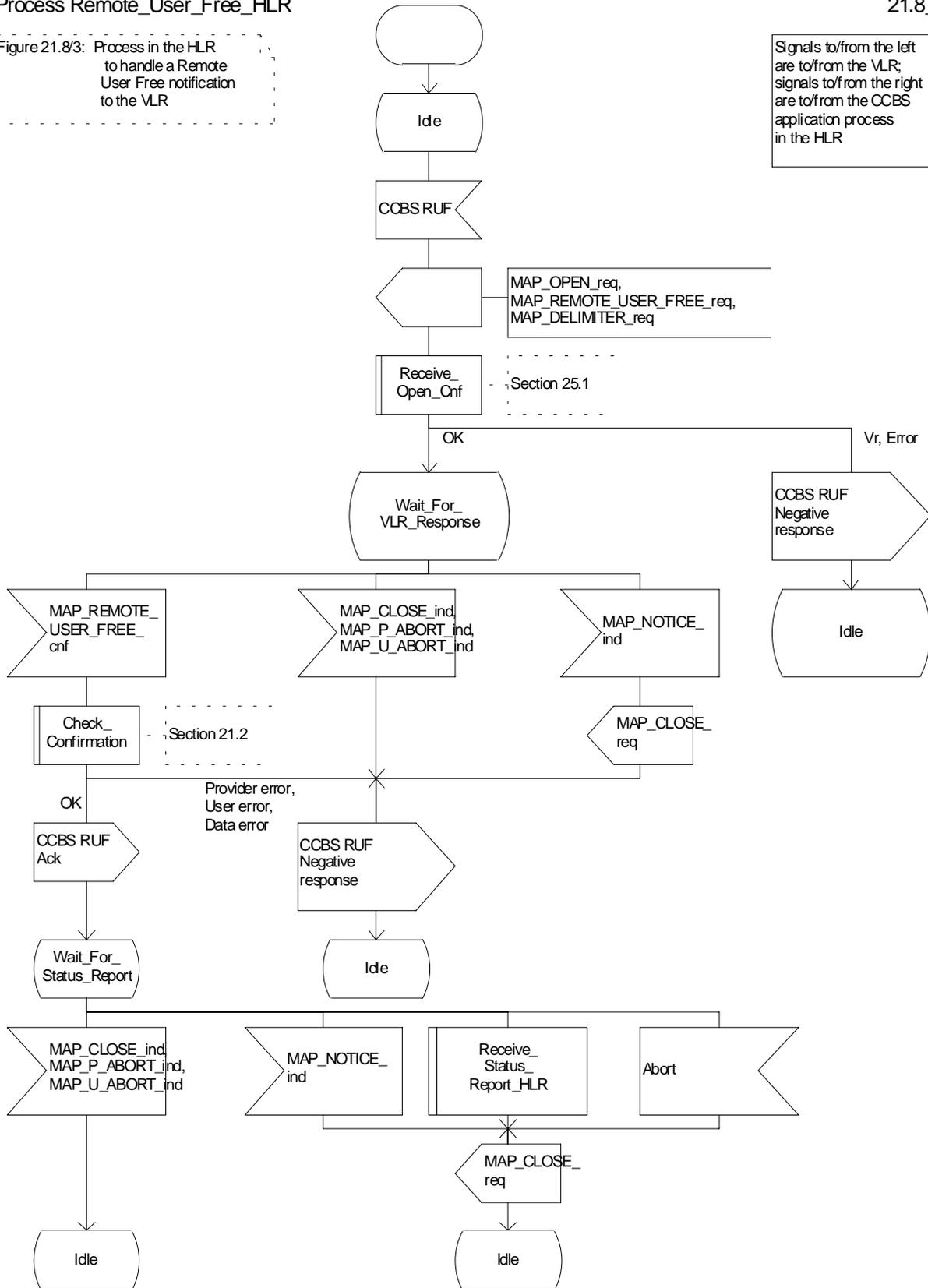


Figure 21.8/3: Process Remote_User_Free_HLR

21.8.3 Process in the VLR for Remote User Free

The MAP process in the VLR to handle Remote User Free is shown in figure 21.8/4. The MAP process invokes a macro not defined in this subclause; the definitions of this macro can be found as follows:

Check_Confirmation see subclause 25.2.2;

Successful outcome (Recall accepted)

When the MAP process receives a MAP_REMOTE_USER_FREE service indication, the VLR sends a CCBS RUF request to the CCBS application process in the VLR, and waits for a response. The request contains the parameters received in the MAP_REMOTE_USER_FREE service indication.

If the CCBS application process in the VLR returns a positive response indicating "recall accepted", the MAP process constructs a MAP_REMOTE_USER_FREE service response and a MAP_DELIMITER service request, sends them to the VLR and waits for a CCBS Call Report message from the CCBS application process in the VLR. When the MAP process receives the CCBS Call Report from the CCBS application process in the VLR, it constructs a MAP_STATUS_REPORT service request and a MAP_DELIMITER service request, sends them to the HLR and waits for a response. If the MAP process receives a MAP_STATUS_REPORT service confirm, the VLR calls the macro Check_Confirmation. If this macro takes the OK exit, the MAP process sends a CCBS Call Report ack to the CCBS application process in the VLR and the MAP process terminates.

Successful outcome (Recall not accepted)

If the CCBS application process in the VLR returns a positive response indicating "recall not accepted", the MAP process constructs a MAP_REMOTE_USER_FREE service response and a MAP_CLOSE service request, sends them to the HLR and terminates.

Negative response from VLR CCBS application process

If the CCBS application process in the VLR returns a negative response, the MAP process constructs a MAP_REMOTE_USER_FREE service response containing the appropriate error and a MAP_CLOSE service request, sends them to the HLR and terminates.

Failure of dialogue with the HLR

When waiting for a response or a call result from the CCBS application process in the VLR, the MAP process may receive a MAP_CLOSE service indication, a MAP_U_ABORT service indication or a MAP_P_ABORT service indication from the co-ordinating process, in which case the MAP process terminates.

When waiting for a call result from the CCBS application process in the VLR, the MAP process may receive a MAP_NOTICE indication from the co-ordinating process, in which case the MAP process constructs a MAP_CLOSE service request, sends it to the co-ordinating process and terminates.

When waiting for a response from the HLR, the MAP process may receive a MAP_CLOSE indication, a MAP_U_ABORT indication or a MAP_P_ABORT indication from the co-ordinating process, in which case the MAP process sends a CCBS Call Report negative response to the CCBS application process in the VLR and terminates.

When waiting for a response from the HLR, the MAP process may receive a MAP_NOTICE indication from the co-ordinating process, in which case the MAP process constructs a MAP_CLOSE service request, sends it to the co-ordinating process, sends a CCBS Call Report negative response to the CCBS application process in the VLR and terminates.

Error in MAP_STATUS_REPORT confirm

If the MAP_STATUS_REPORT service confirm contains a user error or a provider error, the MAP process sends a CCBS Call Report negative response to the CCBS application process in the VLR and terminates.

Process Remote_User_Free_VLR

21.8_4.1(2)

Figure 21.8/4: Process in the VLR to handle a Remote User Free notification

Signals to/from the left are to/from the CCBS application process in the VLR; signals to/from the right are to/from the HLR via the coordinating process

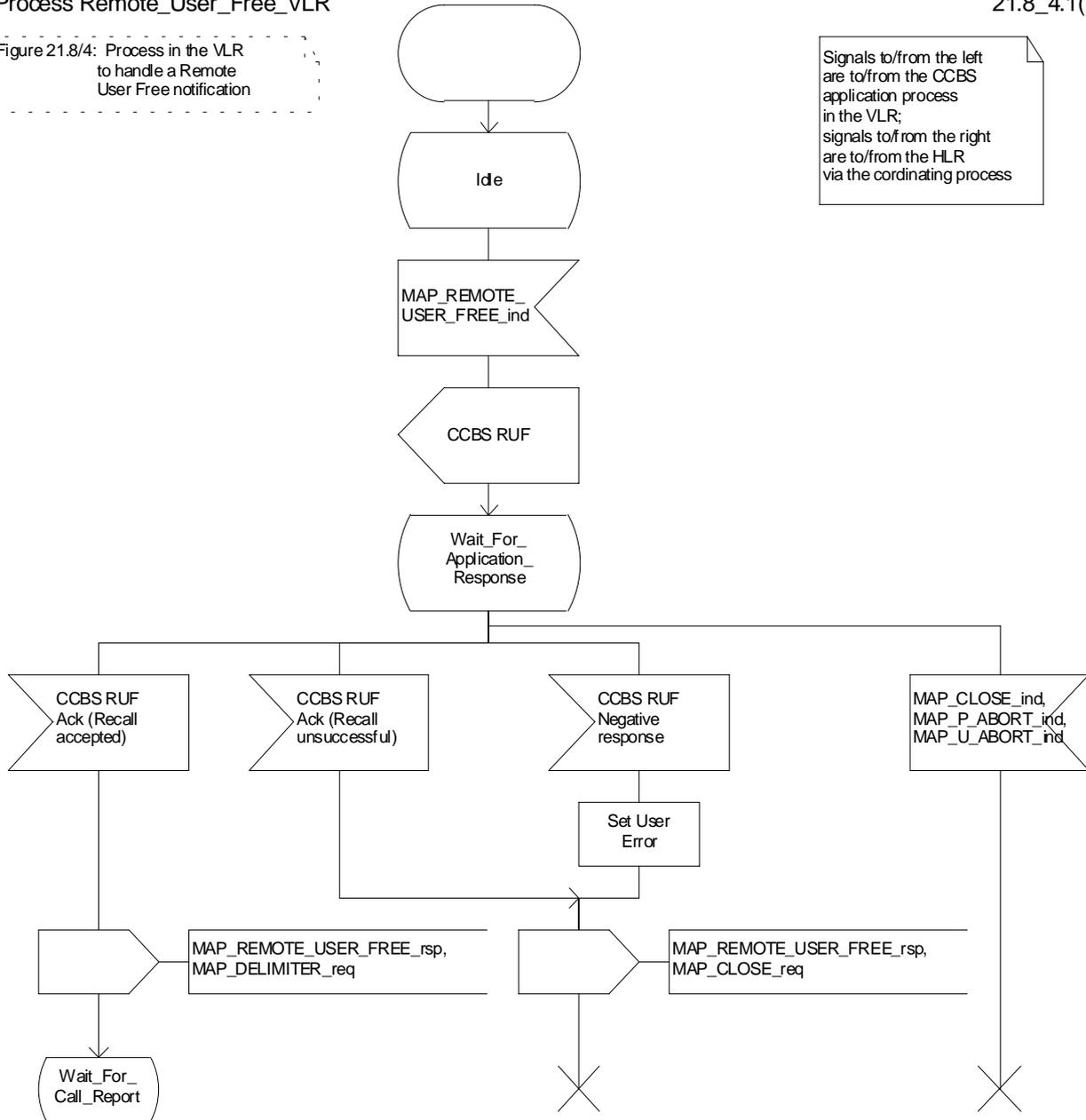


Figure 21.8/4 (sheet 1 of 2): Process Remote_User_Free_VLR

Process Remote_User_Free_VLR

21.8_4.2(2)

Figure 21.8/4: Process in the VLR to handle a Remote User Free notification

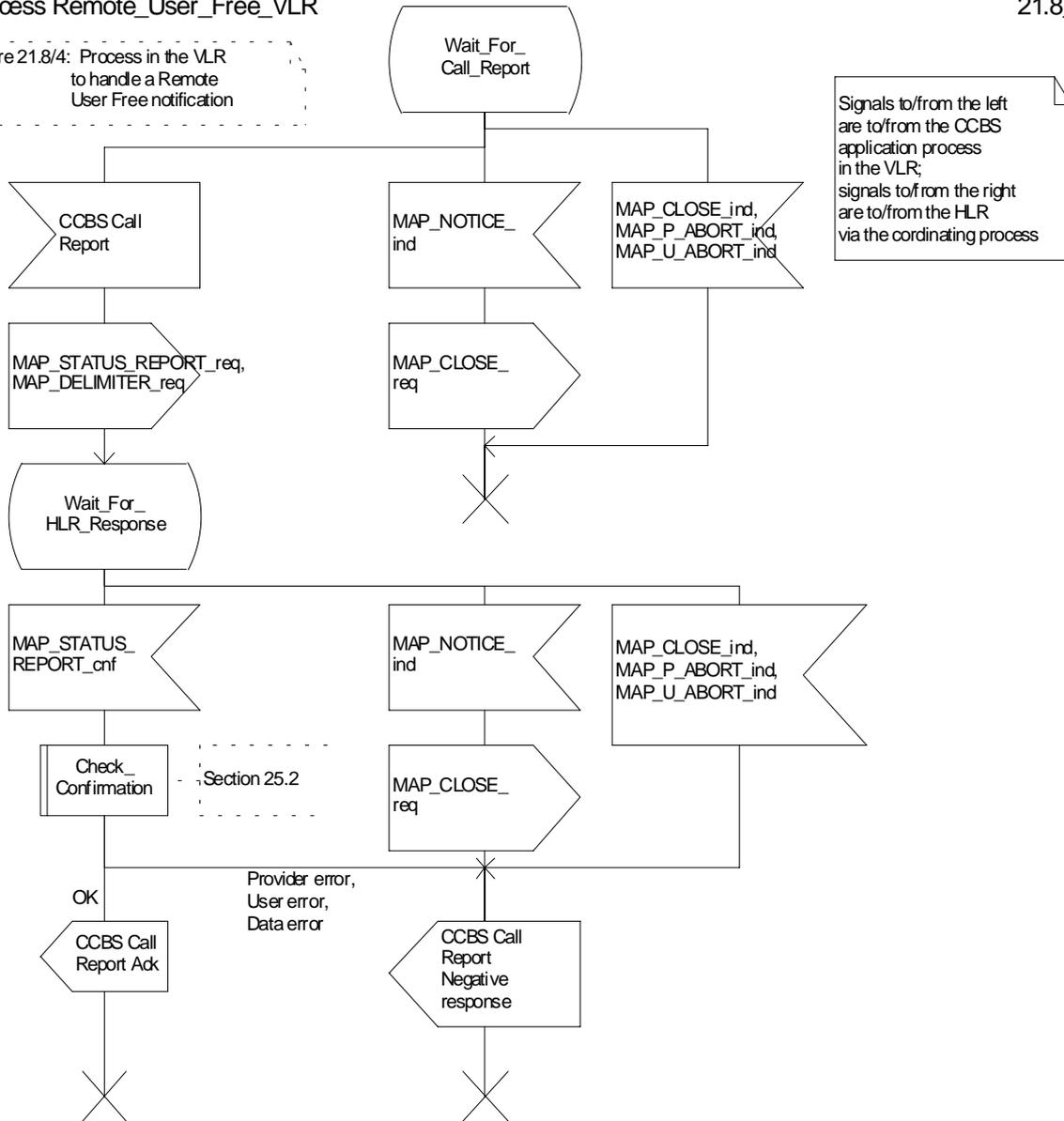


Figure 21.8/4 (sheet 2 of 2): Process Remote_User_Free_VLR

21.9 IST Alert

21.9.1 General

The Immediate Service Termination Alert procedure is used to keep track of the call activities performed by IST subscribers and, eventually, to terminate the alerted call activities, or all the call activities related to the alerted subscriber.

The message flow for alerting and terminating the call(s) is shown in figure 21.9/1, where the MSC may be a Visited MSC or a Gateway MSC.

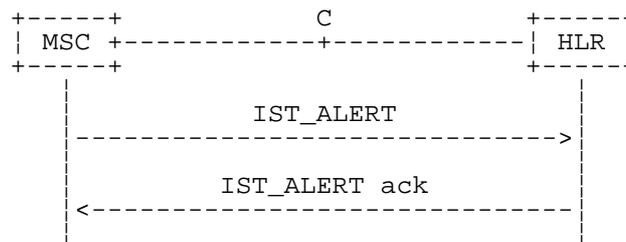


Figure 21.9/1: IST Alert

21.9.2 Procedure in the MSC

The MAP process in the MSC (Visited MSC or Gateway MSC) is shown in figure 21.9/2. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2;

Successful Outcome

When the MAP process receives an IST Alert request from a call handling process in the Visited MSC or Gateway MSC, it requests a dialogue with the HLR that the subscriber belongs to, by sending a MAP_OPEN service request, a MAP_IST_ALERT service request, and a MAP_DELIMITER service request. The MSC then invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_IST_ALERT service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a IST Alert ack containing the information received from the HLR to the call handling process in the MSC and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a negative response to the call handling process in the MSC, and returns to the idle state.

Error in MAP_IST_ALERT confirm

If the MAP_IST_ALERT service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a negative response to the call handling process in the MSC, and returns to the idle state.

Abort of HLR dialogue

When the MAP process is waiting for an HLR response to the MAP_IST_ALERT, the MAP service provider may abort the dialogue by issuing a MAP_CLOSE, a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process sends a negative response to the call handling process in the MSC, and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication when the MAP process is waiting for an HLR response to the MAP_IST_ALERT, the MAP process closes the dialogue with the HLR, sends a negative response to the call handling process in the MSC, and returns to the idle state.

Process IST_Alert_MSC

21.9_3(1)

Figure 21.9/3: Process in the MSC to handle an IST Alert to the HLR

Signals to/from the left are to/from the HLR; signals to/from the right are to/from the call handling Process in the MSC

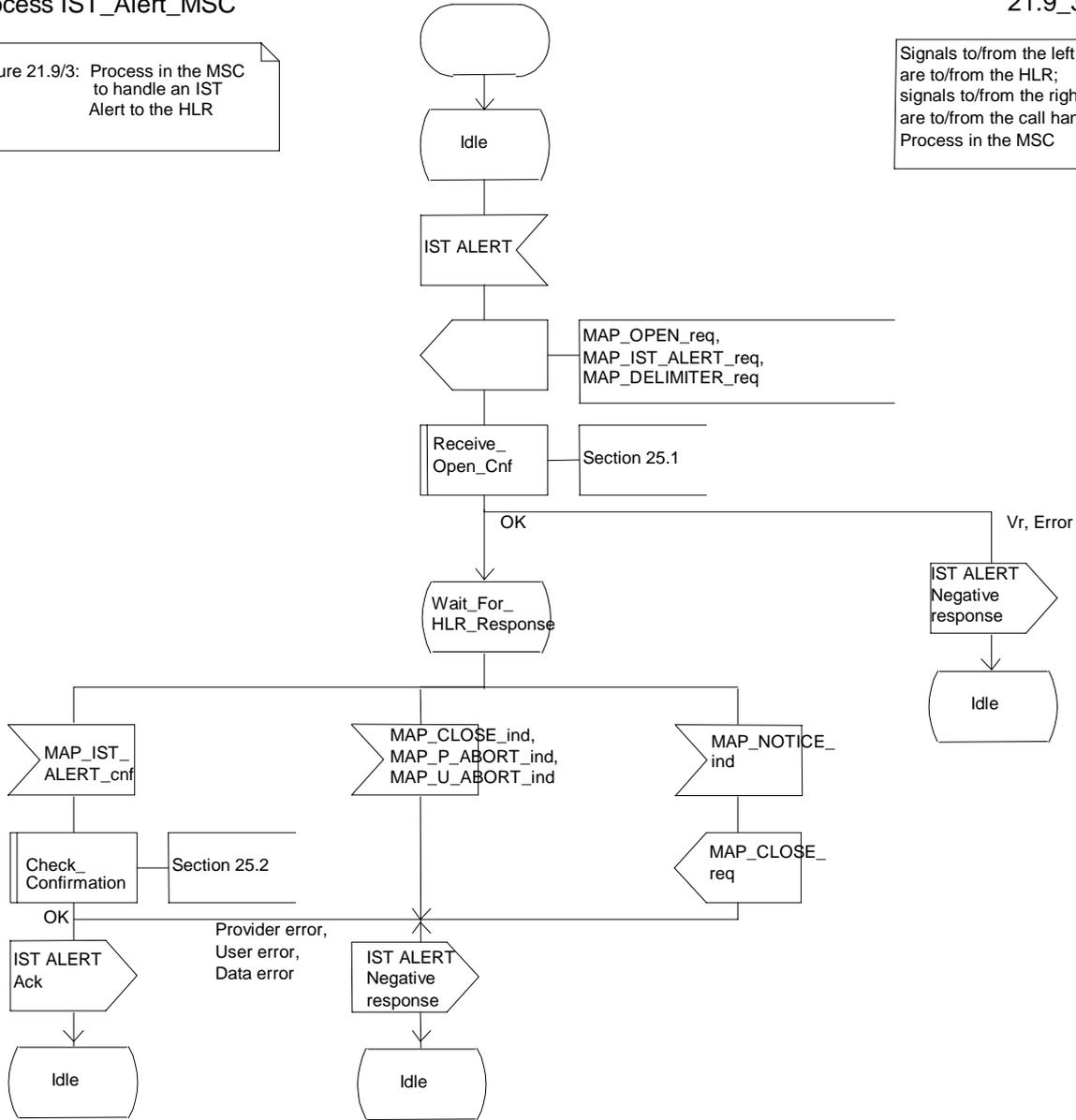


Figure 21.9/2: Process IST_Alert_MSC

21.9.3 Procedure in the HLR

The MAP process in the HLR is shown in figure 21.9/3. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Successful outcome

When the MAP process in the HLR receives a request to open a dialogue, it invokes the macro Receive_Open_Ind to check if the dialogue can be opened.

If the dialogue can be opened, and the service indication received is a MAP_IST_ALERT, the HLR then sends the IST alert indication to the call handling process in the HLR, and waits for a response.

If the call handling process in the HLR returns a positive response, the MAP process constructs a MAP_IST_ALERT service response and a MAP_CLOSE service request, sends them to the MSC, and returns to the idle state.

Negative response from HLR call handling process

If the call handling process in the HLR returns a negative response, the MAP process constructs a MAP_IST_ALERT service response containing the appropriate error and a MAP_CLOSE service request, sends them to the MSC and returns to the idle state.

Failure of dialogue opening in the HLR

If the macro Receive_Open_Ind takes the Vr exit or the Error exit, the MAP process returns to the idle state.

Abort of MSC dialogue

If the MAP process receives a MAP_P_ABORT indication before receiving a service indication, the MAP process returns to the idle state.

When the MAP process receives a MAP_NOTICE indication before receiving a service indication, the MAP process closes the dialogue with the MSC, and returns to the idle state.

When the MAP process is waiting for the application response to the IST Alert, the MAP service provider may abort the dialogue by issuing a MAP_CLOSE, a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process returns to the idle state.

Process IST_Alert_HLR

21.9_4.1(2)

Figure 21.9/4: Process in the HLR to handle an IST Alert notification

Signals to/from the left are to/from the call handling process in the HLR; signals to/from the right are to/from the MSC

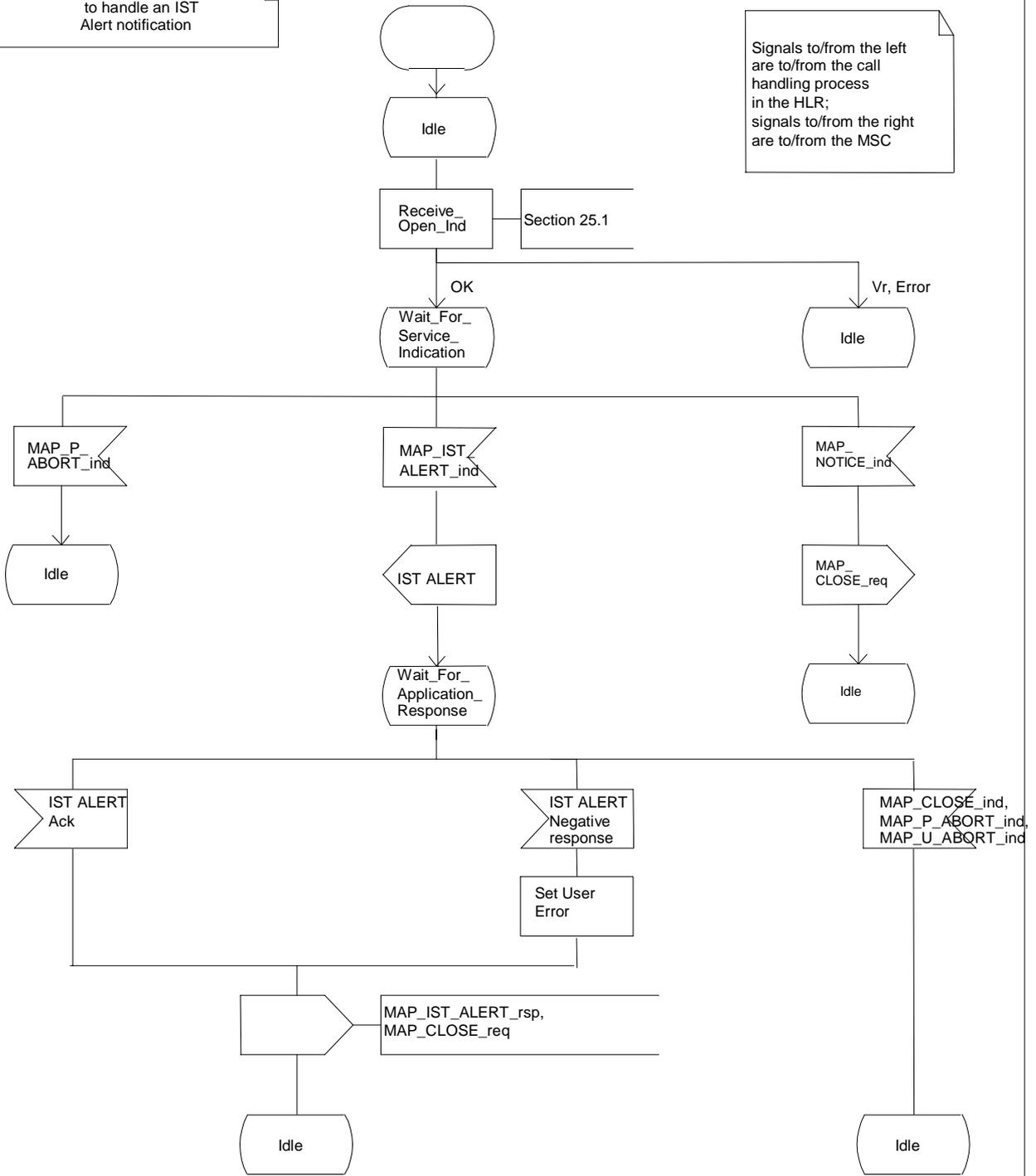


Figure 21.9/3: Process IST_Alert_HLR

21.10 IST Command

21.10.1 General

The Immediate Service Termination Command procedure is used to terminate the call activities related to a subscriber.

The message flow for the IST Command service is shown in figure 21.10/1, where the MSC may be a Visited MSC or a Gateway MSC.

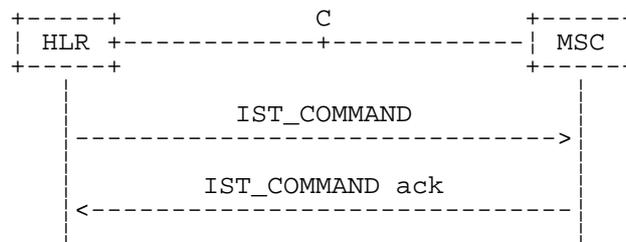


Figure 21.10/1: IST Command

21.10.2 Procedure in the HLR

The MAP process in the HLR is shown in figure 21.10/2. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2;

Successful Outcome

When the MAP process receives an IST Command request, it requests a dialogue with the MSC (Gateway MSC or Visited MSC), by sending a MAP_OPEN service request, a MAP_IST_COMMAND service request, and a MAP_DELIMITER service request. The HLR then invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the MSC.

If the MAP process receives a MAP_IST_COMMAND service confirm from the MSC, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a IST Command ack containing the information received from the MSC to the call handling process in the HLR and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a negative response to the call handling process in the HLR, and returns to the idle state.

Error in MAP_IST_COMMAND confirm

If the MAP_IST_COMMAND service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a negative response to the call handling process in the HLR, and returns to the idle state.

Abort of MSC dialogue

When the MAP process is waiting for an MSC response to the MAP_IST_COMMAND, the MAP service provider may abort the dialogue by issuing a MAP_CLOSE, a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process sends a negative response to the call handling process in the HLR, and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication when the MAP process is waiting for an MSC response to the MAP_IST_COMMAND, the MAP process closes the dialogue with the MSC, sends a negative response to the call handling process in the HLR, and returns to the idle state.

Process IST_Command_HLR

21.10_2(1)

Figure 21.9/2: Process in the HLR to handle an IST Command to the MSC

Signals to/from the left are to/from the MSC; signals to/from the right are to/from the call handling Process in the HLR

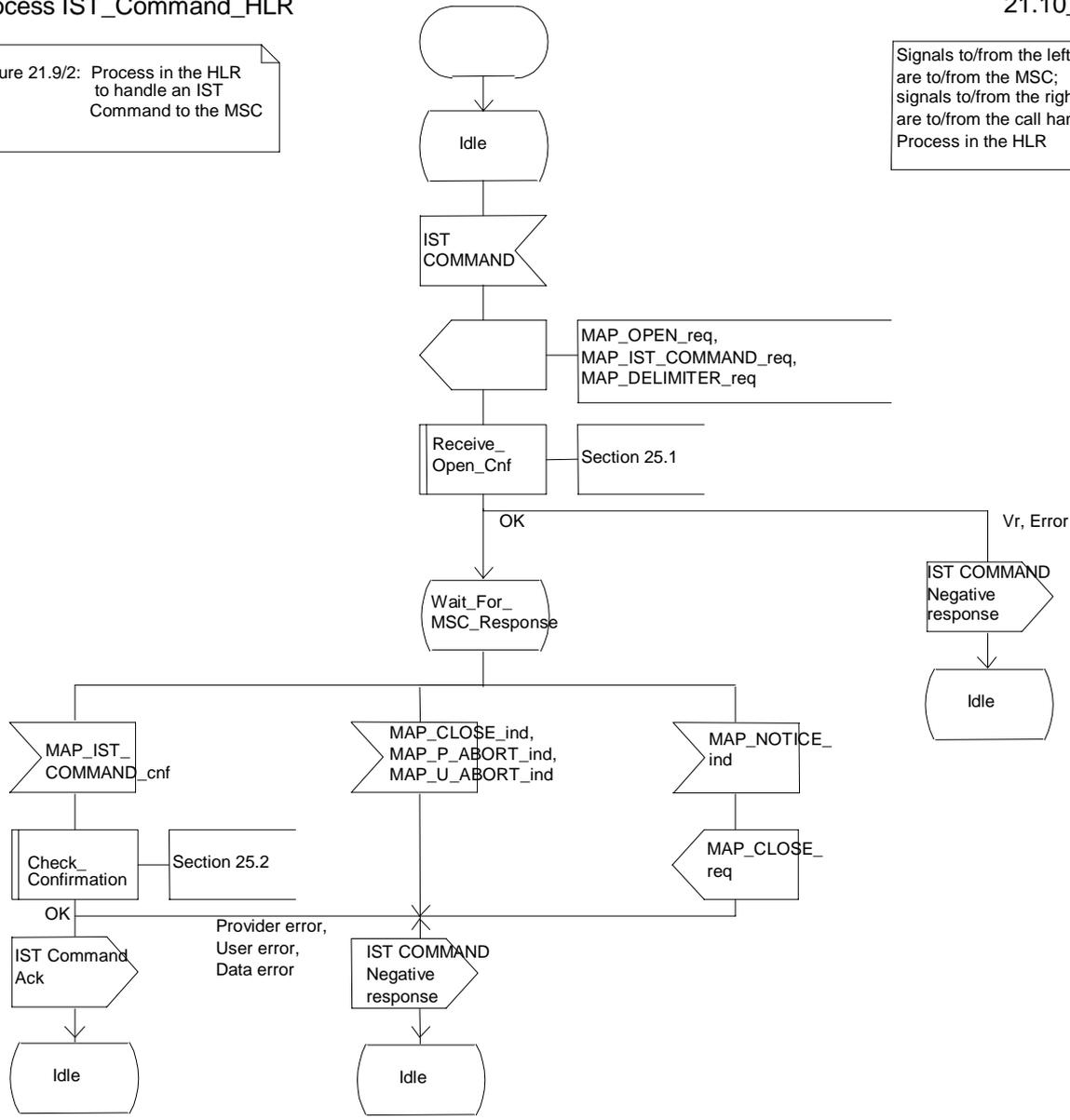


Figure 21.10/2: Process IST_Command_HLR

21.10.3 Procedure in the MSC

The MAP process in the MSC is shown in figure 21.10/3. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Successful outcome

When the MAP process in the MSC receives a request to open a dialogue, it invokes the macro Receive_Open_Ind to check if the dialogue can be opened.

If the dialogue can be opened, and the service indication received is a MAP_IST_COMMAND, the MSC then sends the IST command indication to the call handling process in the MSC, and waits for a response.

If the call handling process in the MSC returns a positive response, the MAP process constructs a MAP_IST_COMMAND service response and a MAP_CLOSE service request, sends them to the HLR, and returns to the idle state.

Negative response from MSC call handling process

If the call handling process in the MSC returns a negative response, the MAP process constructs a MAP_IST_COMMAND service response containing the appropriate error and a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Failure of dialogue opening in the MSC

If the macro Receive_Open_Ind takes the Vr exit or the Error exit, the MAP process returns to the idle state.

Abort of HLR dialogue

If the MAP process receives a MAP_P_ABORT indication before receiving a service indication, the MAP process returns to the idle state.

When the MAP process receives a MAP_NOTICE indication before receiving a service indication, the MAP process closes the dialogue with the HLR, and returns to the idle state.

When the MAP process is waiting for the application response to the IST Command, the MAP service provider may abort the dialogue by issuing a MAP_CLOSE, a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process returns to the idle state.

Figure 21.10/3: Process in the MSC to handle an IST Command notification

Signals to/from the left are to/from the call handling process in the MSC; signals to/from the right are to/from the HLR

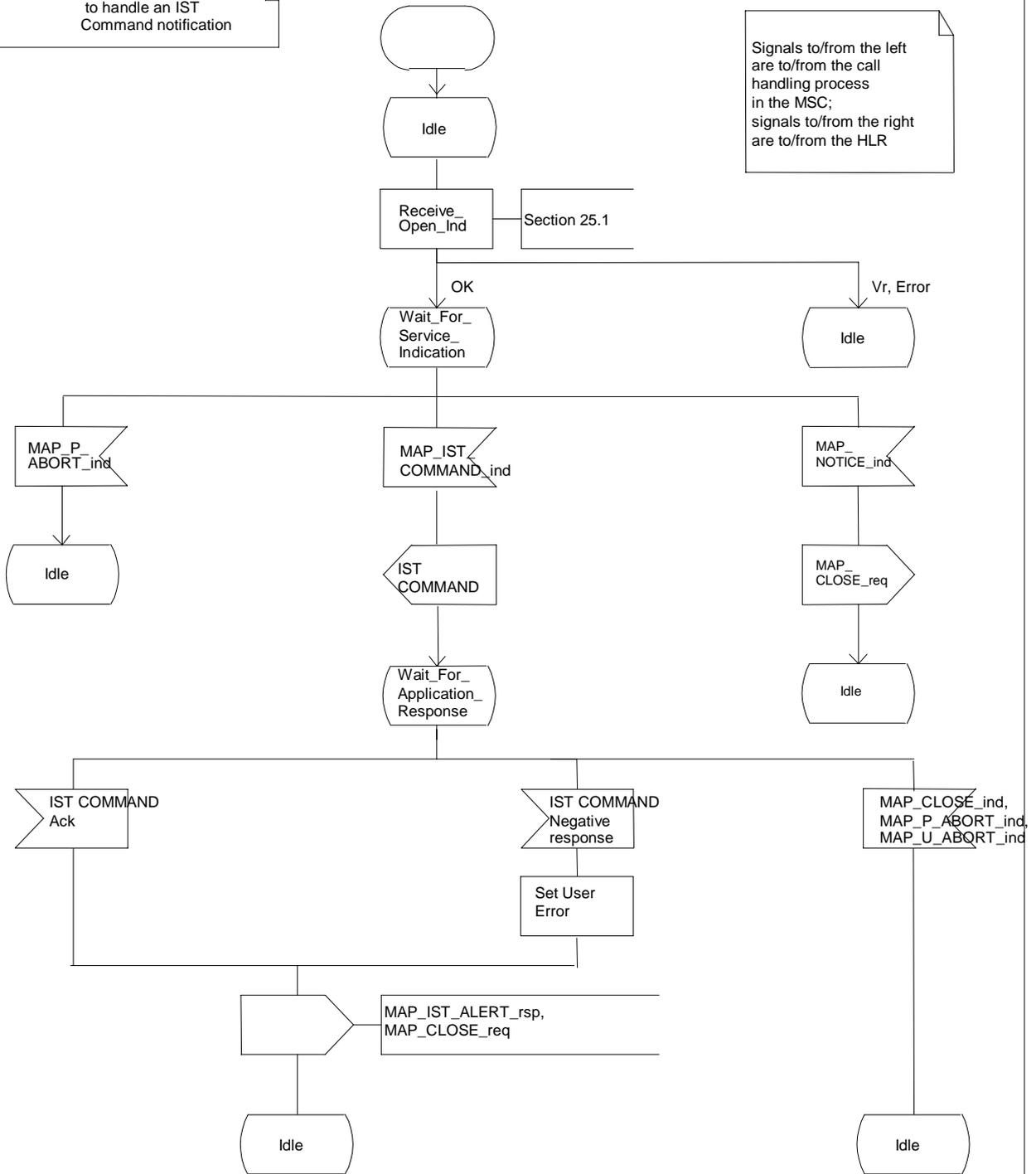


Figure 21.10/3: Process IST_Command_MSC

22 Supplementary services procedures

The following application contexts exist for handling of supplementary services:

- accessUnstructuredSsContext;
- accessFunctionalSsContext.

The accessUnstructuredSsContext refers to a simple MAP users, for which the corresponding MAP process can be identified by the MAP-Provider directly.

However, the accessFunctionalSsContext refers to a complex MAP-User consisting of several processes. For this user, a process co-ordinator is defined for each network entity, in order to identify the correct process to invoke. These processes open and validate the dialogue, then invoke the necessary operation-specific process. These processes are described below.

22.1 Functional supplementary service processes

22.1.1 Functional supplementary service process co-ordinator for MSC

Upon receipt of a CM-Service request with CM-service type = SS, the MSC initiates the process access request procedure towards the VLR as described in clause 25 of the present document.

Once a CM connection is established, the MSC can handle supplementary service indications from the MS. Table 22.1/1 shows the co-ordinating process' reaction on receipt of specific SS service indications on the air interface. After the relevant process is invoked, the received air interface service indication is sent to that process. The creation of service requests on the basis of air interface messages is described in GSM 09.11.

Table 22.1/1: Relationship between received service indication and invoked process in the MSC

Service indication received	Process invoked
A_REGISTER_SS_ind	REGISTER_SS_MSC
A_ERASE_SS_ind	ERASE_SS_MSC
A_ACTIVATE_SS_ind	ACTIVATE_SS_MSC
A_DEACTIVATE_SS_ind	DEACTIVATE_SS_MSC
A_INTERROGATE_SS_ind	INTERROGATE_SS_MSC
A_REGISTER_PASSWORD	REGISTER_PASSWORD_MSC

Figure 22.1/1 shows the co-ordinating process in the MSC.

Process SS_Coordinator_MSC

22.1_1(1)

Figure 22.1/1: Supplementary Service Coordination process in the MSC, to identify which functional supplementary service process shall be invoked.

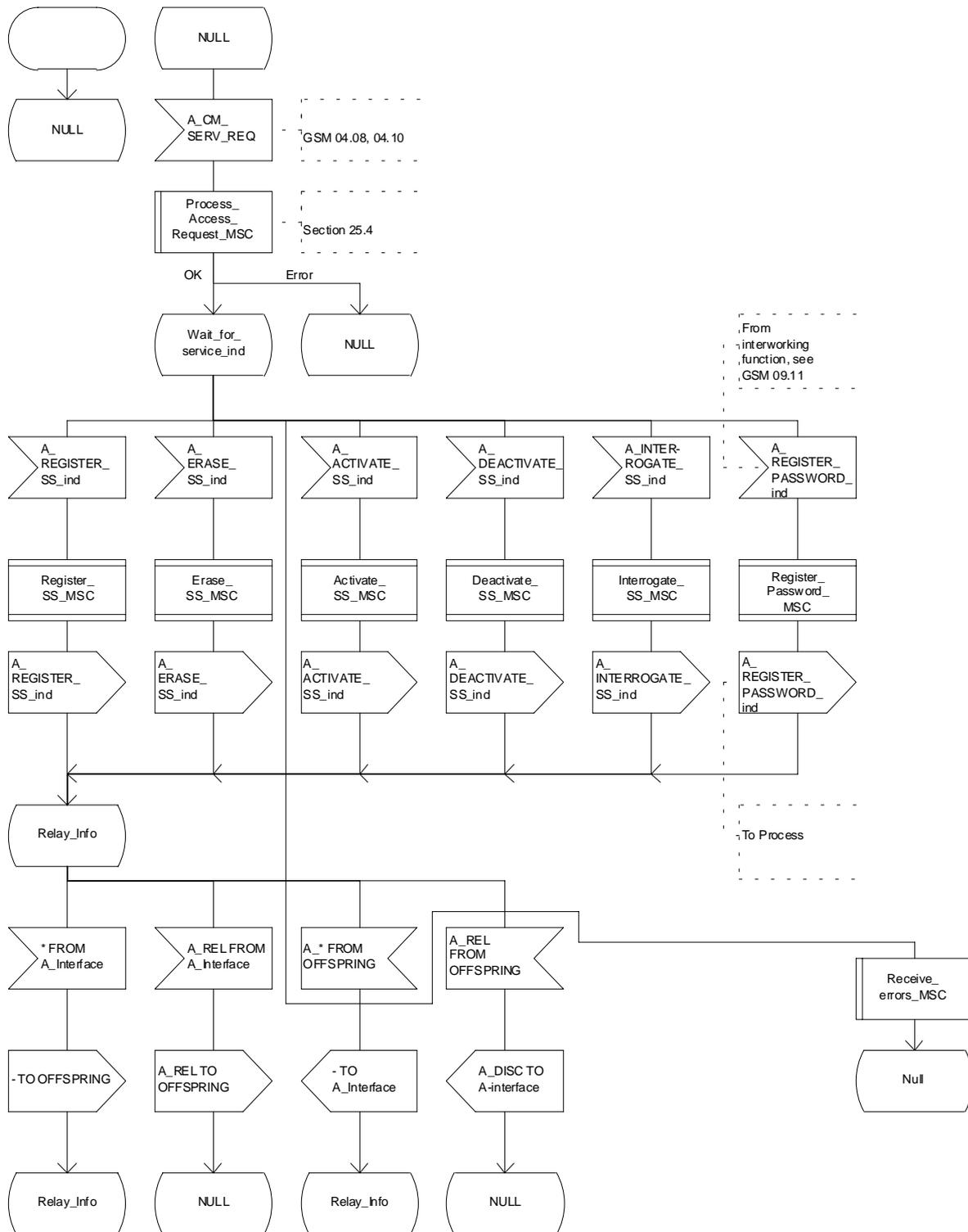


Figure 22.1/1: Process SS_Coordinator_MSC

22.1.2 Functional supplementary service process co-ordinator for VLR

Any functional SS process in the VLR starts by the VLR receiving the MAP_PROCESS_ACCESS_REQUEST indication. The VLR then acts as described in clause 25 of the present document.

If the Process Access Request was successful, the VLR can handle supplementary service indications from the MSC. Table 22.1/2 shows the co-ordinating process' reaction on receipt of specific SS service indications from the MSC. After the relevant process is invoked, the received service indication is sent to that process, and the co-ordinating process terminates.

Table 22.1/2: Relationship between received service indication and invoked process in the VLR

Service indication received	Process invoked
MAP_REGISTER_SS_ind	REGISTER_SS_VLR
MAP_ERASE_SS_ind	ERASE_SS_VLR
MAP_ACTIVATE_SS_ind	ACTIVATE_SS_VLR
MAP_DEACTIVATE_SS_ind	DEACTIVATE_SS_VLR
MAP_INTERROGATE_SS_ind	INTERROGATE_SS_VLR
MAP_REGISTER_PASSWORD	REGISTER_PASSWORD_VLR

Figure 22.1/2 shows the co-ordinating process in the VLR.

Figure 22.1/2: Supplementary Service Coordination process in the VLR, to open and process the access request from the MSC, and then identify which functional supplementary service process shall be invoked.

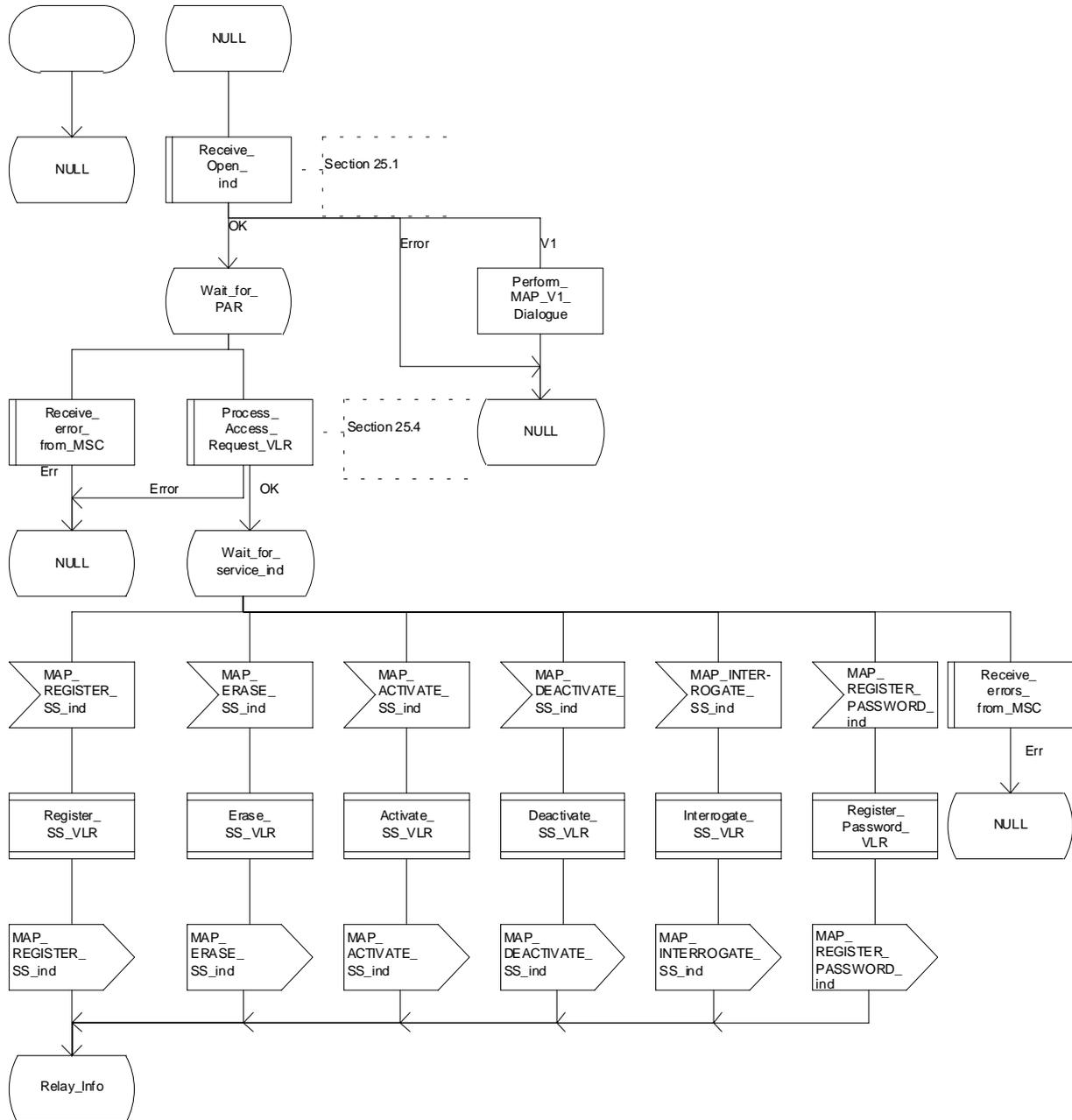


Figure 22.1/2 (sheet 1 of 2): Process SS_Coordinator_VLR

Figure 22.1/2: Supplementary Service Coordination process in the VLR, to open and process the access request from the MSC, and then identify which functional supplementary service process shall be invoked.

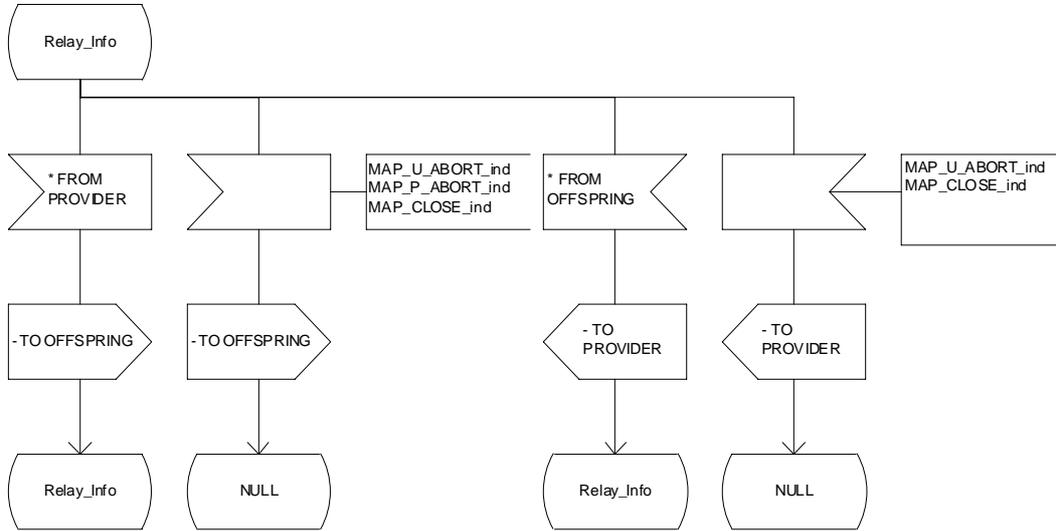


Figure 22.1/2 (sheet 2 of 2): Process SS_Coordinator_VLR

22.1.3 Functional supplementary service process co-ordinator for HLR

Any functional SS process in the HLR starts by the HLR receiving a MAP-OPEN service indication. If that service is successful, the HLR can handle supplementary service indications from the VLR. Table 22.1/3 shows the co-ordinating process' reaction on receipt of specific SS service indications from the VLR. After the relevant process is invoked, the received service indication is sent to that process, and the co-ordinating process terminates.

Table 22.1/3: Relationship between received service indication and invoked process in the HLR.

Service indication received	Process invoked
MAP_REGISTER_SS_ind	REGISTER_SS_HLR
MAP_ERASE_SS_ind	ERASE_SS_HLR
MAP_ACTIVATE_SS_ind	ACTIVATE_SS_HLR
MAP_DEACTIVATE_SS_ind	DEACTIVATE_SS_HLR
MAP_INTERROGATE_SS_ind	INTERROGATE_SS_HLR
MAP_REGISTER_PASSWORD	REGISTER_PASSWORD_HLR

Figure 22.1/3 shows the co-ordinating process in the HLR.

Figure 22.1/3: Supplementary Service Coordination process in the HLR, to identify which functional supplementary service process shall be invoked.

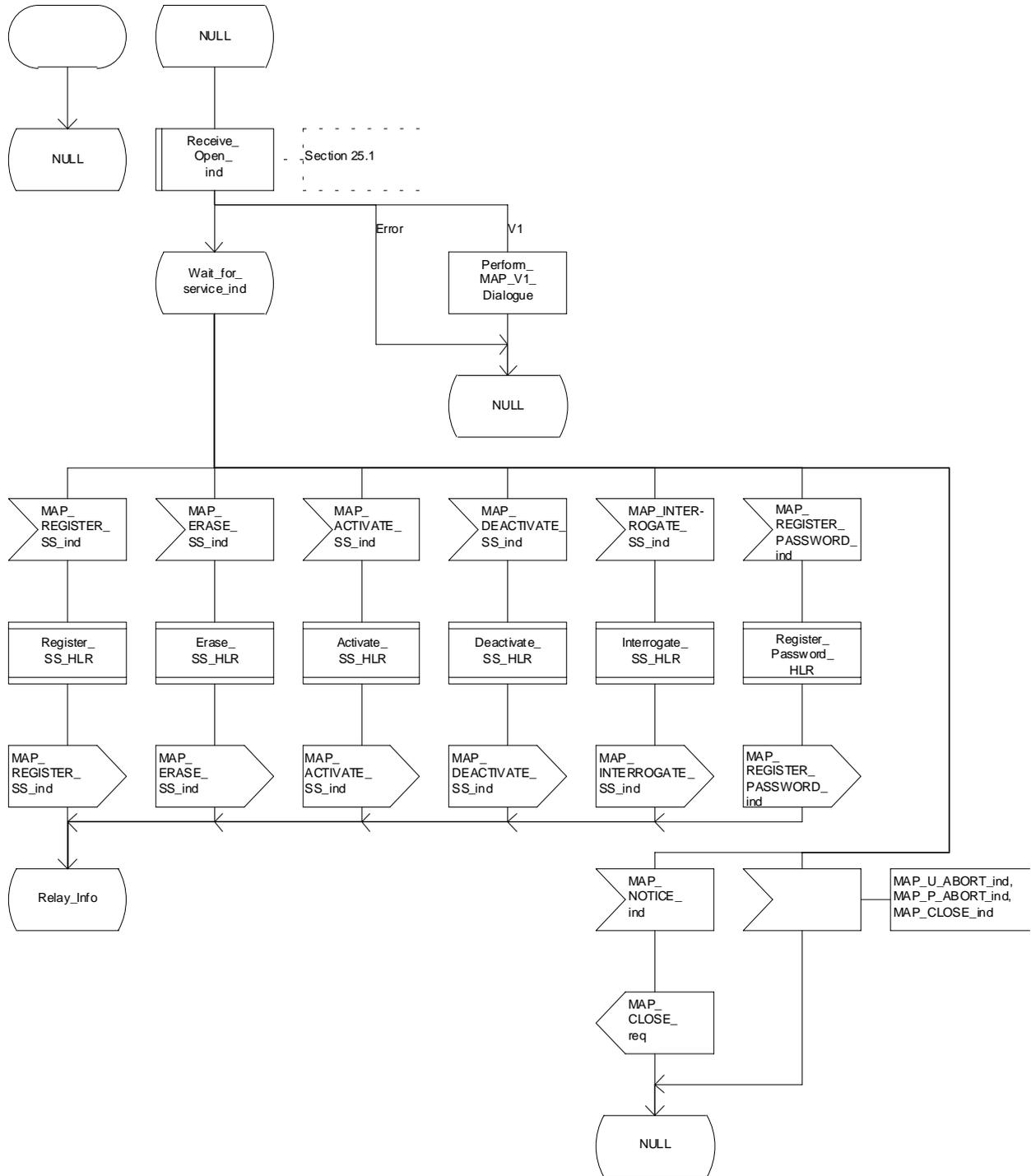


Figure 22.1/3 (sheet 1 of 2): Process SS_Coordinator_HLR

Figure 22.1/3: Supplementary Service Coordination process in the HLR, to identify which functional supplementary service process shall be invoked.

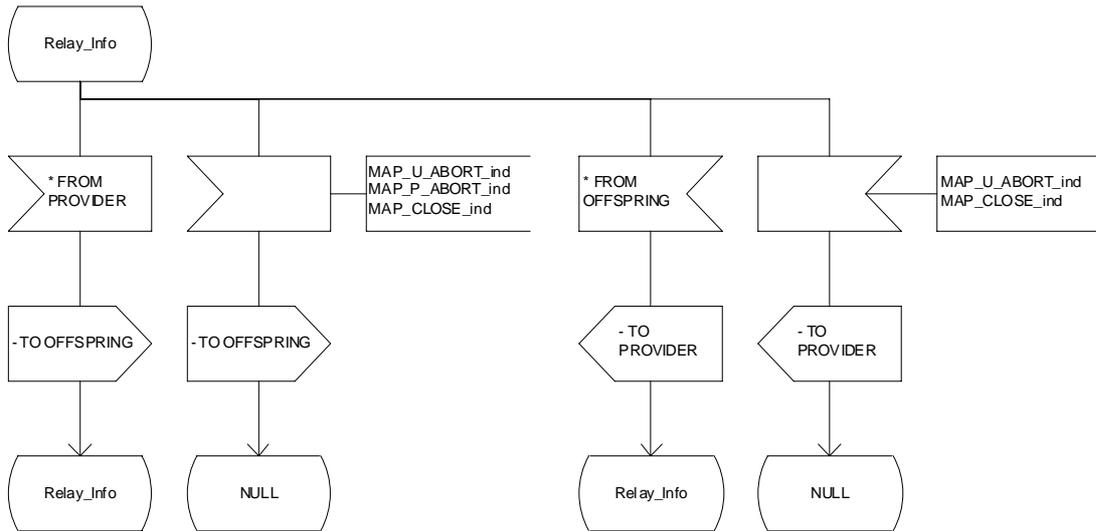


Figure 22.1/3 (sheet 2 of 2): Process SS_Coordinator_HLR

22.1.4 Call completion supplementary service process co-ordinator for HLR

The MAP co-ordinating process in the HLR to handle a dialogue opened with the callCompletion application context is shown in figure 22.1/4. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

Any call completion SS process in the HLR starts by the HLR receiving a MAP-OPEN service indication. If that service is successful, the HLR can handle call completion supplementary service indications from the VLR. Table 22.1/4 shows the co-ordinating process' reaction on receipt of specific call completion SS service indications from the VLR. After the relevant process is invoked, the received service indication is sent to that process.

Table 22.1/4: Relationship between received service indication and invoked process in the HLR.

Service indication received	Process invoked
MAP_REGISTER_CC_ENTRY_ind	REGISTER_CC_ENTRY_HLR
MAP_ERASE_CC_ENTRY_ind	ERASE_CC_ENTRY_HLR

After creation of the user process the Co-ordinator relays the messages between the MAP_PM and the invoked process until a request or an indication for dialogue termination is received.

The Call_Completion Co-ordinator is shown in figure 22.1/4.

Figure 22.1/4: Coordinating process in the HLR to handle a dialogue opened with the AC CallCompletionContext

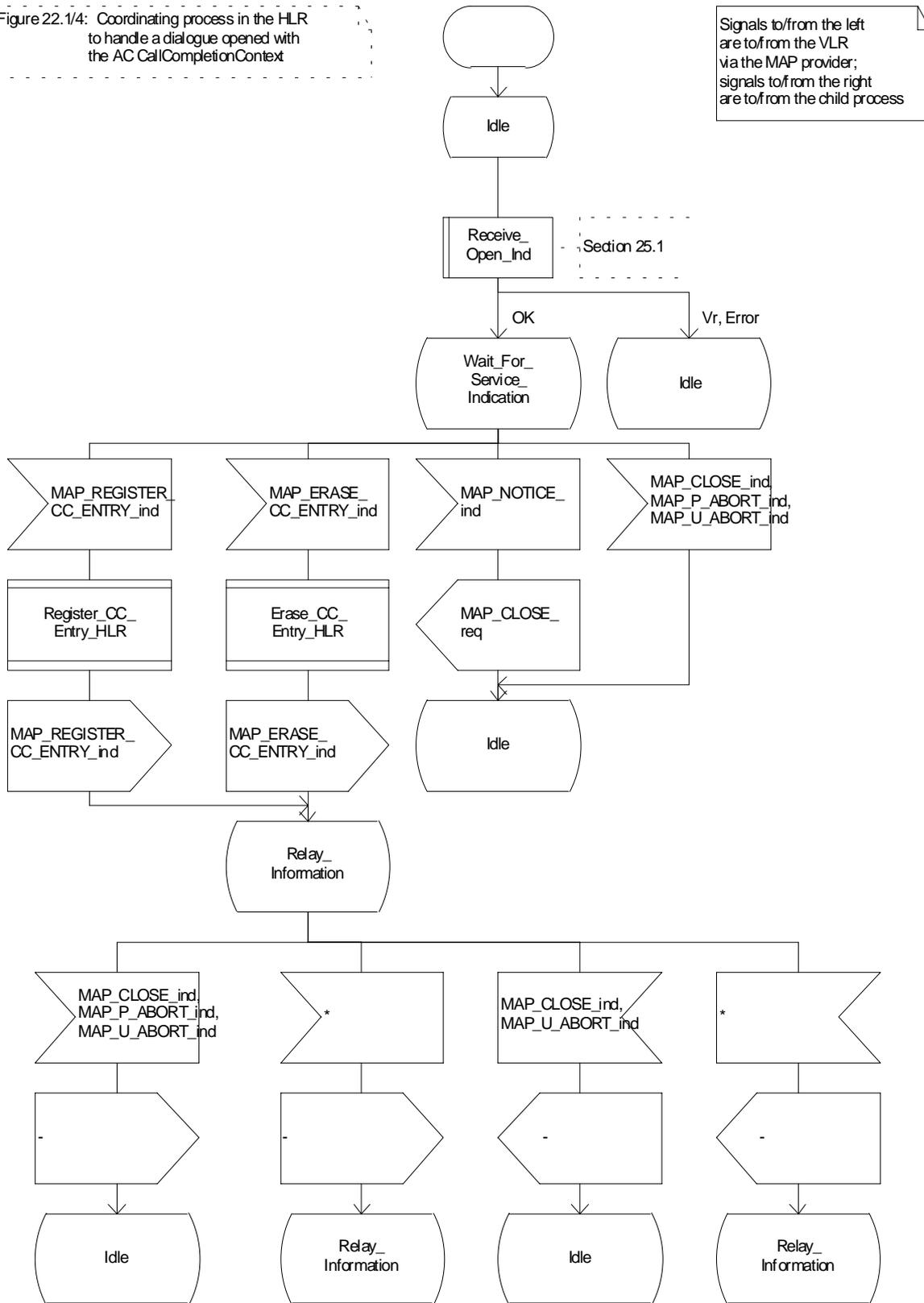


Figure 22.1/4: Process_CC_Coord_HLR

22.2 Registration procedure

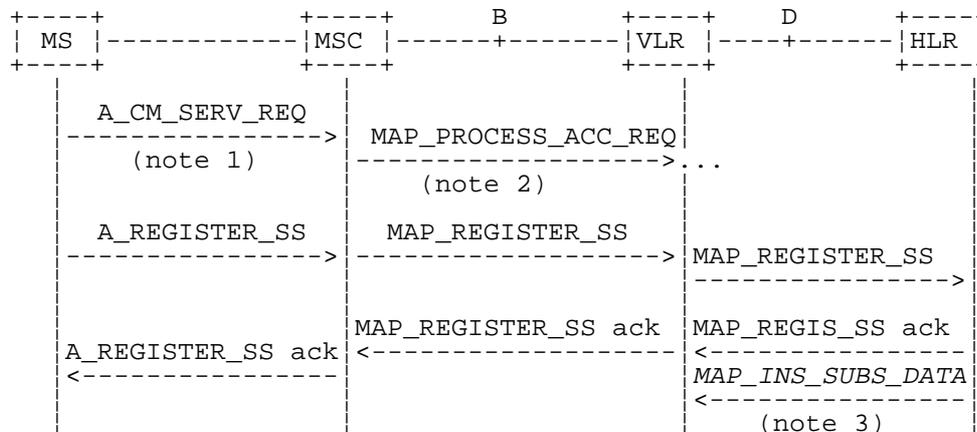
22.2.1 General

The registration procedure is used to register data related to a supplementary service in the HLR. The registration procedure is a fully transparent communication between the MS and the HLR, except that some services may be invoked as a result of the procedure, as described in the subclauses below.

The registration procedure is shown in figure 22.2.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(defined in clauses 9 and 25);
MAP_PROVIDE_IMSI	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_CHECK_IMEI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25);
MAP_INSERT_SUBSCRIBER_DATA	(defined in clauses 8 and 25);
MAP_REGISTER_SS	(defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 in the present document.

NOTE 3: Services printed in *italics* are optional.

Figure 22.2.1/1: Interfaces and services for supplementary service registration

22.2.2 Procedures in the MSC

Supplementary service registration

The A_REGISTER_SS service indication received by the MAP user in the MSC contains the SS-Code and any parameters that are related to the supplementary service.

The MAP user transfers the received information to the VLR in the MAP_REGISTER_SS request without checking the contents of the service indication. Rules for the mapping are described in GSM 09.11.

The MSC then awaits the receipt of the MAP_REGISTER_SS confirm from the VLR. The outcome of the procedure is reported to the MS in the A_REGISTER_SS response message as described in GSM 04.8x, 04.9x and 09.11. Finally the SS-connection is released.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11).

Error handling

If at any time during the supplementary service part of this procedure a MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE or unexpected MAP_CLOSE indication is received from the VLR concerning the process, a CM_RELEASE_COMPLETE indication is sent to the MS (as specified in GSM 09.11). Upon receipt of a MAP_NOTICE indication from the VLR, the MSC must close the VLR dialogue by sending a MAP_CLOSE request. The process is then terminated.

If an A_CM_RELEASE indication is received from the MS, all open transactions shall be released using the MAP_U_ABORT request indicating application procedure cancellation, and the process is terminated.

The registration procedure in the MSC is shown in figure 22.2.2/1.

Process SS_REGISTER_MSC

22.2.2_1(1)

Figure 22.2.2/1 : Mobile initiated registration of supplementary service in the MSC

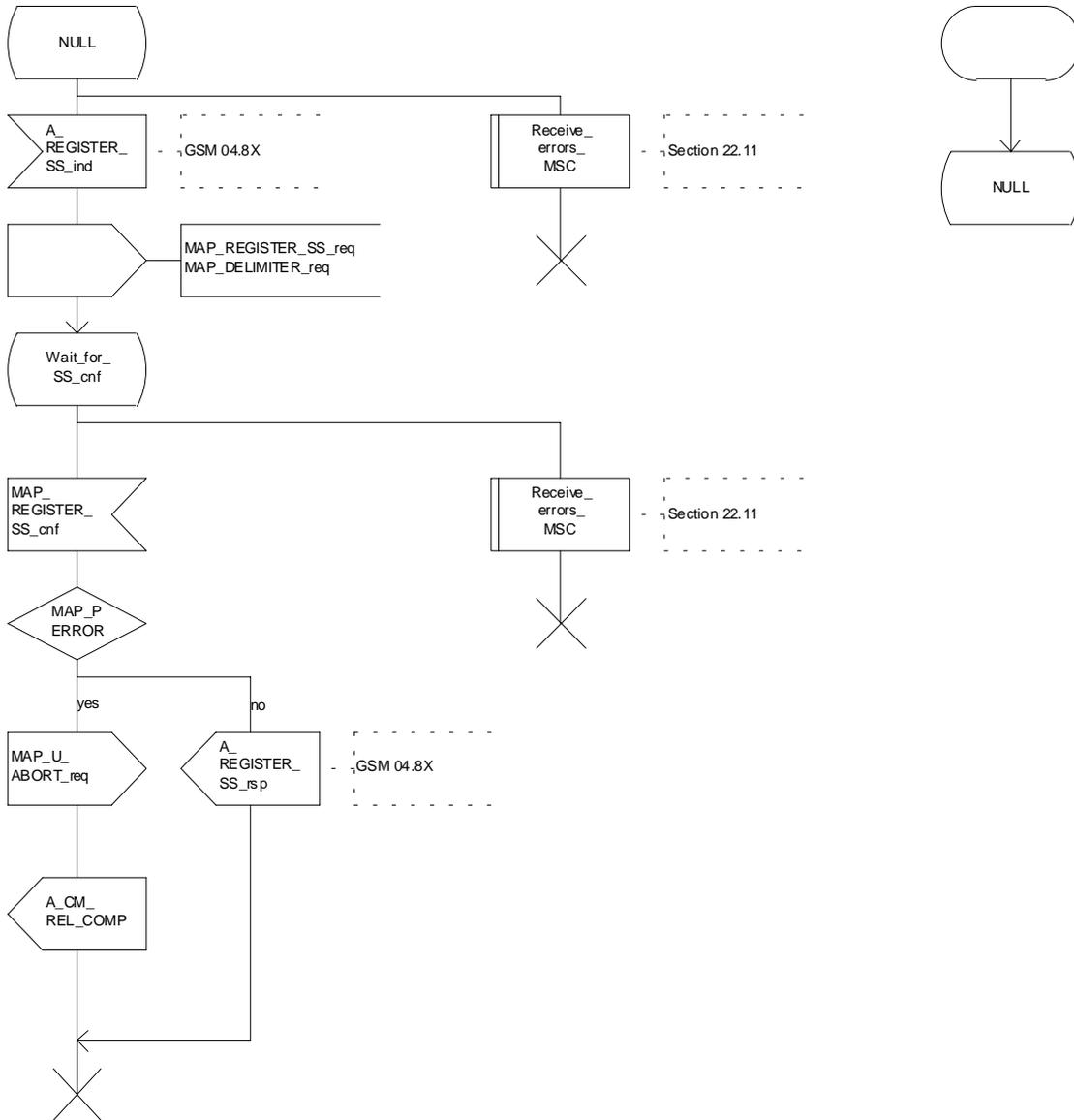


Figure 22.2.2/1: Procedure SS_Register_MSC

22.2.3 Procedures in the VLR

Supplementary service registration

When receiving the MAP_REGISTER_SS indication, the MAP user in the VLR transfers the information to the HLR in the MAP_REGISTER_SS request without checking the contents of the service indication.

The VLR then awaits the receipt of the MAP_REGISTER_SS confirm from the HLR. The MAP user in the VLR shall transfer the information contained in this primitive to the MSC in the MAP_REGISTER_SS response without checking its contents.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11).

Error handling

If at any time during this procedure a MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE or unexpected MAP_CLOSE indication is received from the MSC concerning the process, a MAP_U_ABORT request indicating application procedure cancellation is sent to the HLR (if a connection exists). If a MAP_NOTICE indication was received from the MSC, that dialogue must be closed by sending a MAP_CLOSE request towards the MSC. The process is terminated.

If a MAP_P_ABORT, MAP_U_ABORT or MAP_CLOSE indication is received from the HLR, a MAP_U_ABORT request shall be sent to the MSC terminating the process. If a MAP_NOTICE indication was received from the HLR, that dialogue must be closed by sending a MAP_CLOSE request towards the HLR. The process terminates.

The registration procedure in the VLR is shown in figure 22.2.3/1.

Figure 22.2.3/1: Mobile initiated registration of supplementary services in the VLR

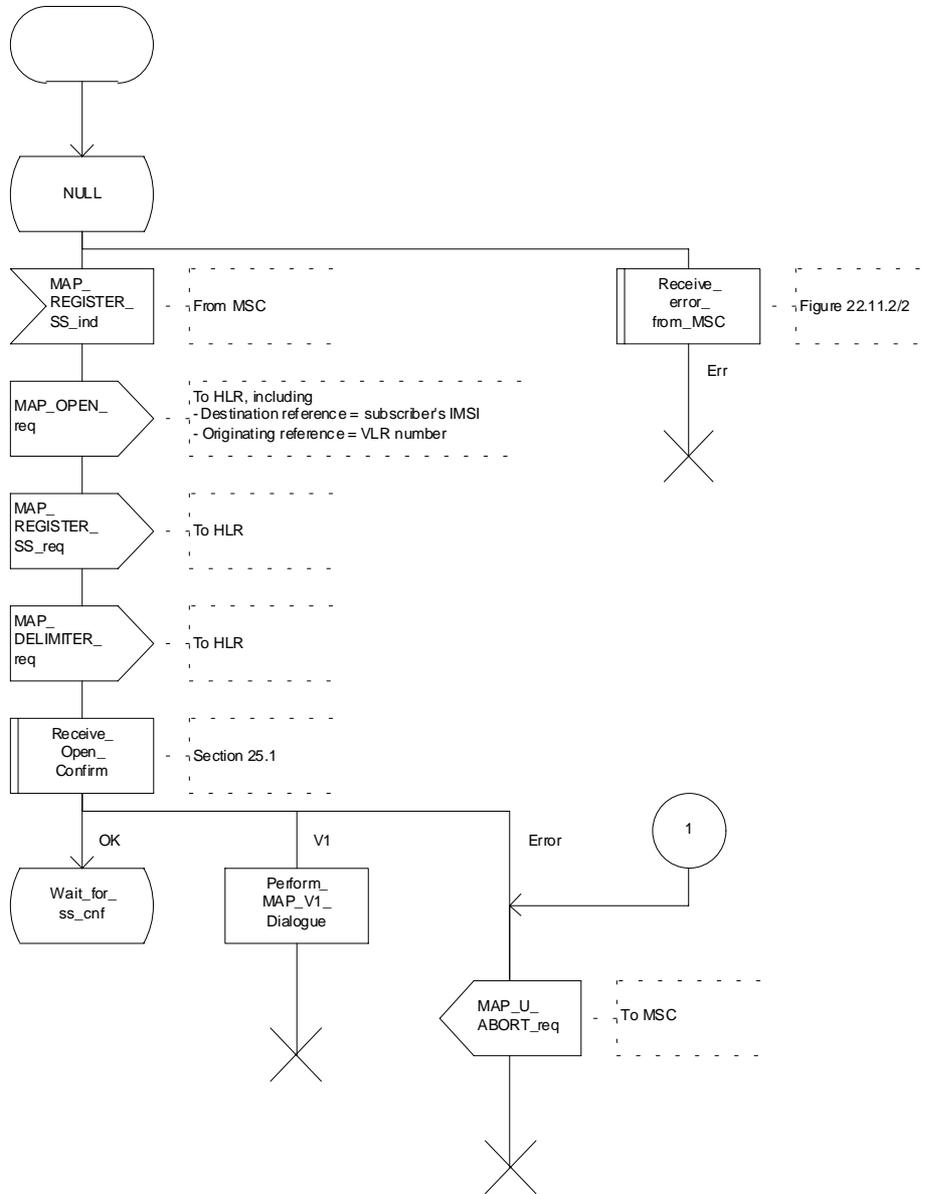


Figure 22.2.3/1 (sheet 1 of 2): Procedure SS_Register_VLR

Figure 22.2.3/1: Mobile initiated registration of supplementary services in the VLR

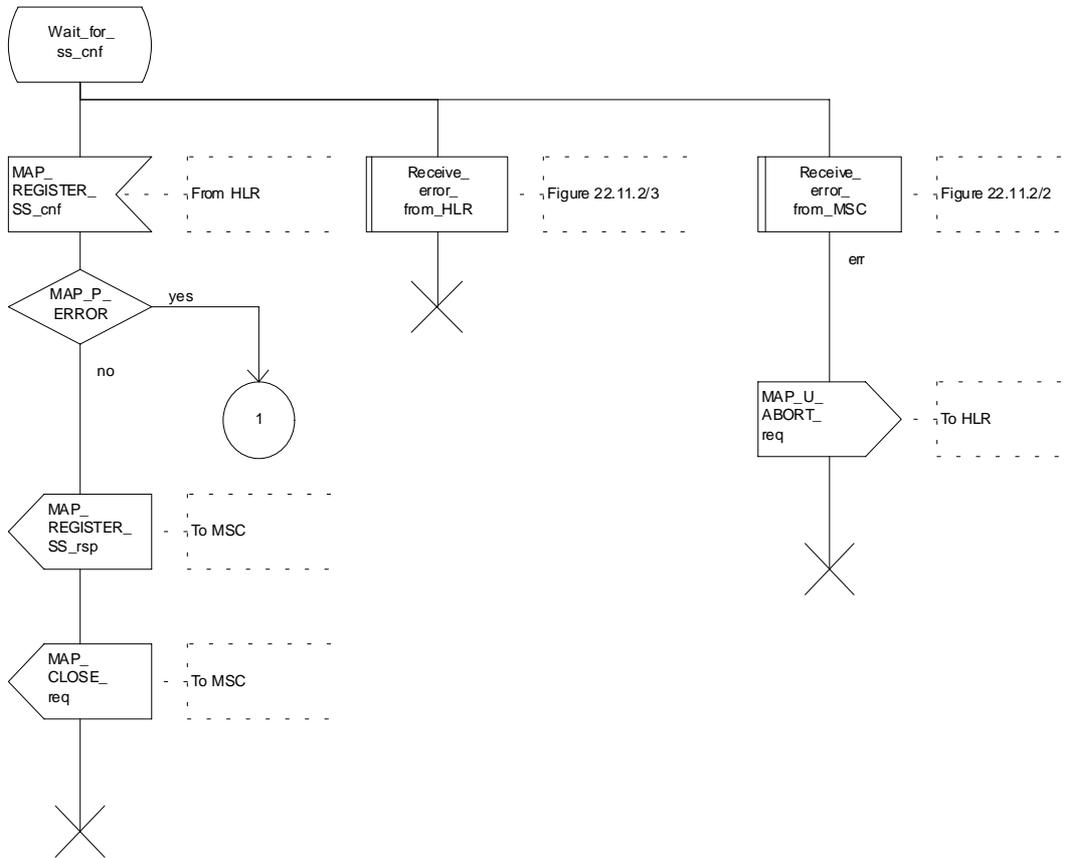


Figure 22.2.3/1 (sheet 2 of 2): Procedure SS_Register_VLR

22.2.4 Procedures in the HLR

The procedure in the HLR is initiated when it receives a MAP_REGISTER_SS indication.

The HLR acts as follows:

- if the operator has barred the subscriber from access to supplementary services, the Call Barred error should be returned to the VLR. The parameter "operatorBarring" shall be included with the error.

The supplementary service request shall then be processed according to GSM 03.11 and the 03.8x and 03.9x-series of technical specifications. This handling may lead to either a successful result, a partially successful result, or an error being returned.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11):

- if the VLR is to be updated after the supplementary service registration, the MAP_INSERT_SUBS_DATA_HLR process shall be initiated;
- if at any time during this procedure a MAP_P_ABORT, MAP_U_ABORT or MAP_CLOSE indication concerning the process is received from the VLR, the process is terminated. If a MAP_NOTICE indication is received, a MAP_CLOSE request indicating sent towards the VLR.

The registration procedure in the HLR is shown in figure 22.2.4/1.

Figure 22.2.4/1: Registration of supplementary services procedure in HLR

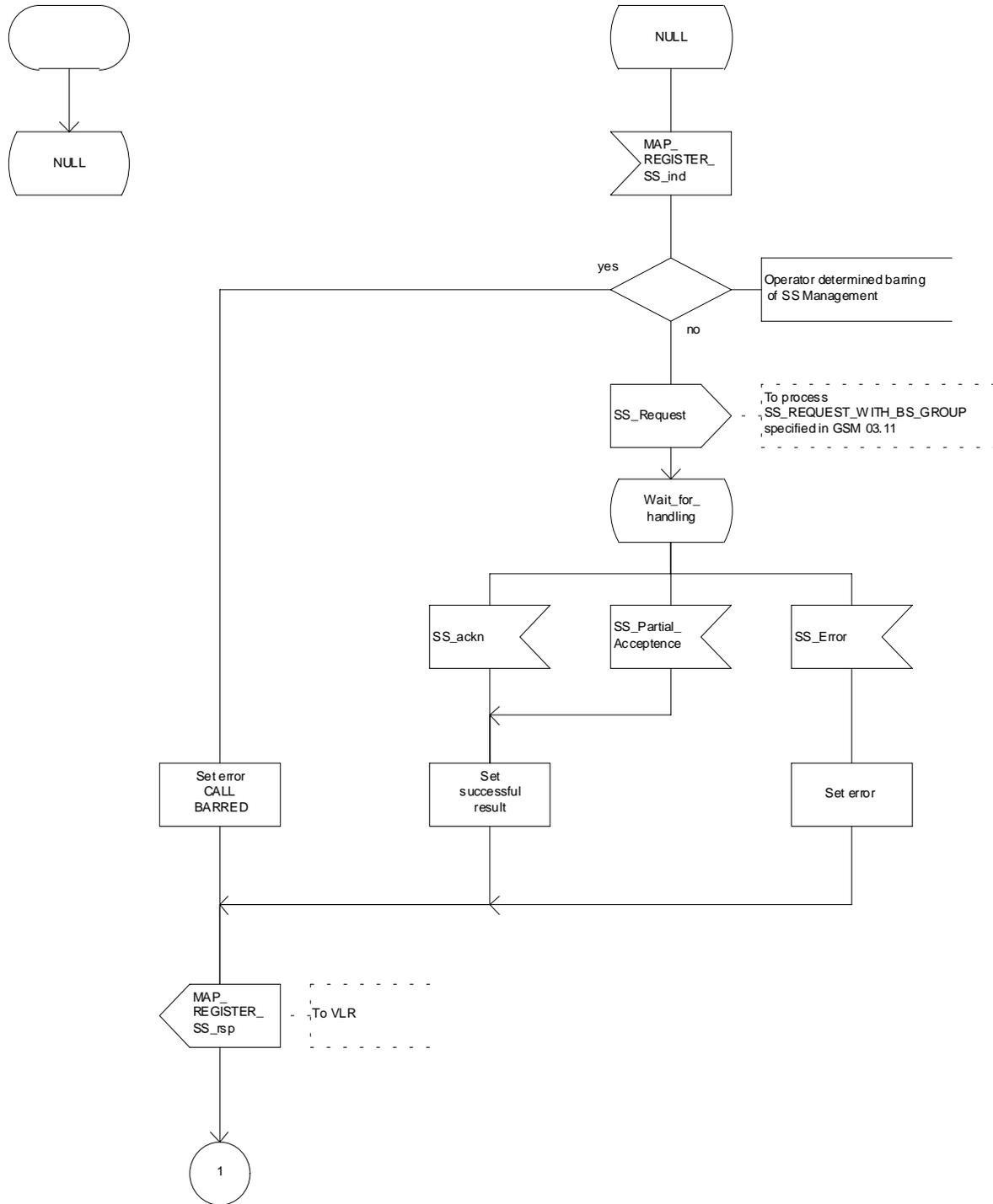


Figure 22.2.4/1 (sheet 1 of 2): Procedure SS_Register_HLR

Figure 22.2.4/1: Registration of supplementary services procedure in HLR

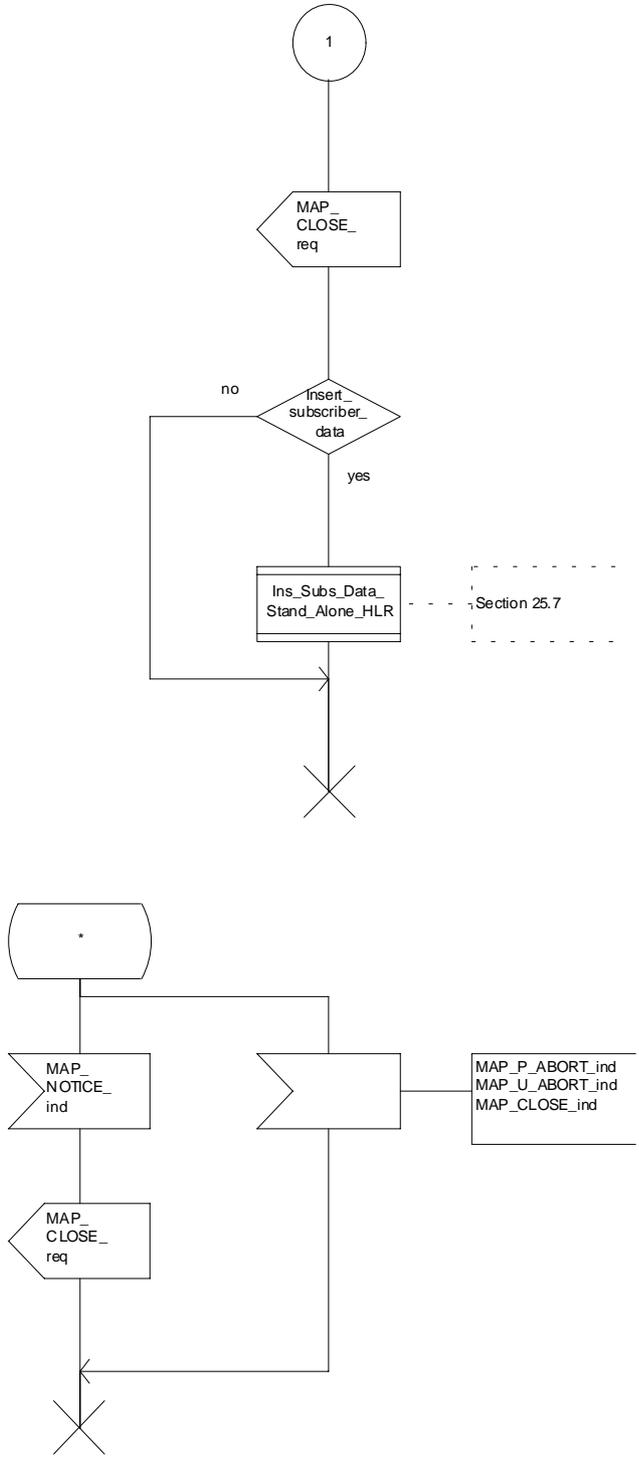


Figure 22.2.4/1 (sheet 2 of 2): Procedure SS_Register_HLR

22.3 Erasure procedure

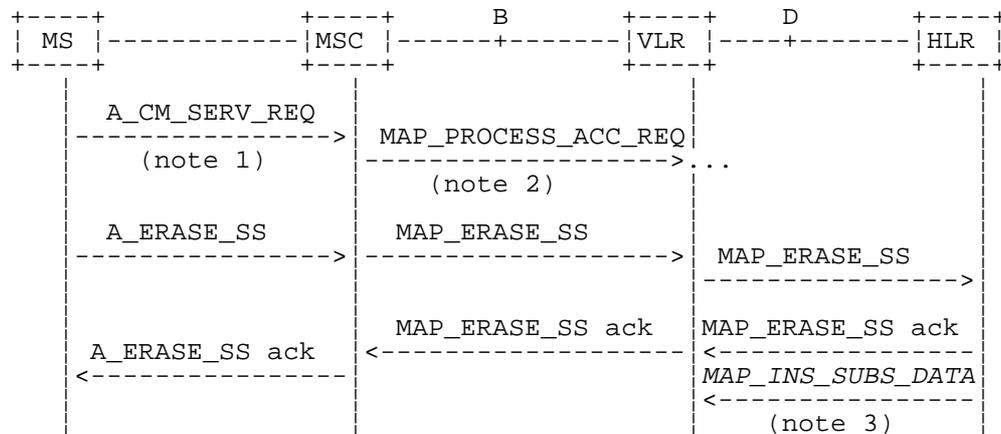
22.3.1 General

The erasure procedure is used to erase data related to a supplementary service in the HLR. The erasure procedure is a fully transparent communication between the MS and the HLR, except that some services may be invoked as a result of the procedure, as described in the subclauses below.

The erasure procedure is shown in figure 22.3.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(defined in subclauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(defined in clauses 9 and 25);
MAP_PROVIDE_IMSI	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_CHECK_IMEI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25);
MAP_INSERT_SUBSCRIBER_DATA	(defined in clauses 8 and 25);
MAP_ERASE_SS	(defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 in the present document.

NOTE 3: Services printed in *italics* are optional.

Figure 22.3.1/1: Interfaces and services for supplementary service erasure

22.3.2 Procedures in the MSC

The MSC procedures for erasure are identical to those specified for registration in subclause 22.2.2. The text and diagrams in subclause 22.2.2 apply with all references to registration changed to erasure.

22.3.3 Procedures in the VLR

The VLR procedures for erasure are identical to those specified for registration in subclause 22.2.3. The text and diagrams in subclause 22.2.3 apply with all references to registration changed to erasure.

22.3.4 Procedures in the HLR

The HLR procedure for erasure is identical to those specified for registration in subclause 22.2.4. The text and diagrams in subclause 22.2.4 apply with all references to registration changed to erasure.

22.4 Activation procedure

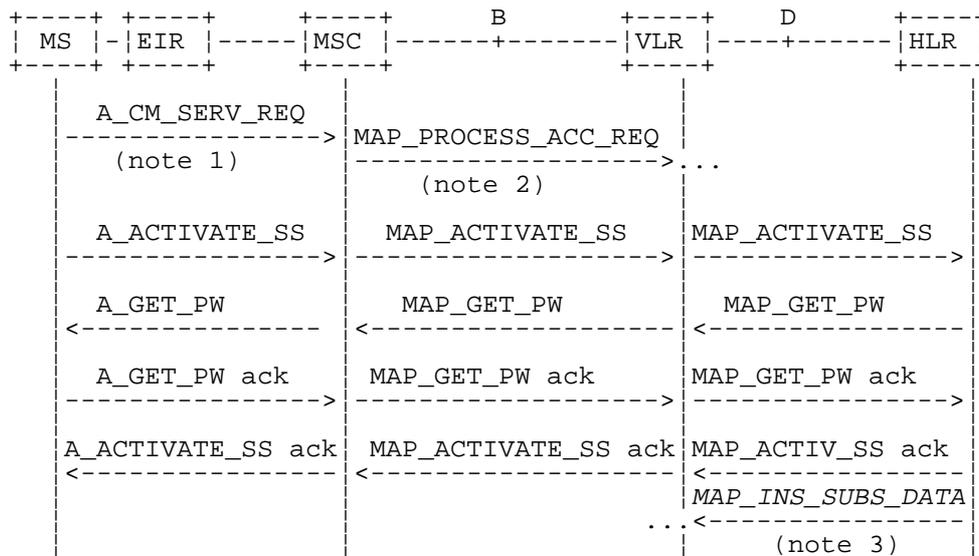
22.4.1 General

The activation procedure is used to activate a supplementary service in the HLR. The activation procedure is a fully transparent communication between the MS and the HLR, except that some services may be invoked as a result of the procedure, as described in the subclauses below.

The activation procedure is shown in figure 22.4.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(defined in clauses 9 and 25);
MAP_PROVIDE_IMSI	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_CHECK_IMEI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25);
MAP_GET_PASSWORD	(defined in clause 11);
MAP_INSERT_SUBSCRIBER_DATA	(defined in clauses 8 and 25);
MAP_ACTIVATE_SS	(defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 of this document.

NOTE 3: Services printed in italics are optional.

Figure 22.4.1/1: Interfaces and services for supplementary service activation

22.4.2 Procedures in the MSC

The A_ACTIVATE_SS service indication received by the MAP user in the MSC contains the SS-Code and any parameters related to the supplementary service.

The MSC transfers the received information to the VLR in the MAP_ACTIVATE_SS request without checking the contents of the service indication. Rules for the mapping are described in GSM 09.11.

The MAP user may subsequently receive the MAP_GET_PASSWORD indication from the VLR. Upon receipt of this indication, the MSC sends the A_GET_PASSWORD message towards the MS and then awaits the response from the MS. When an A_GET_PASSWORD confirm message is received from the MS, the MSC initiates the MAP_GET_PASSWORD response towards the VLR without checking further the contents of the indication. Also see GSM 09.11.

The MSC will receive a MAP_ACTIVATE_SS confirm from the VLR. The outcome of the procedure is reported to the MS in the A_ACTIVATE_SS response message, see GSM 04.8x, 04.9x and 09.11. Finally the SS connection is released.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11).

The handling of MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE and unexpected MAP_CLOSE or A_CM_RELEASE in this procedure is identical to the handling in the Registration procedure in the MSC, see subclause 22.2.2 of the present document.

The activation procedure in the MSC is shown in figure 22.4.2/1.

Process ACTIVATE_SS_MSC

22.4.2_1(1)

Figure 22.4.2/1: Mobile initiated activation of supplementary service in the MSC

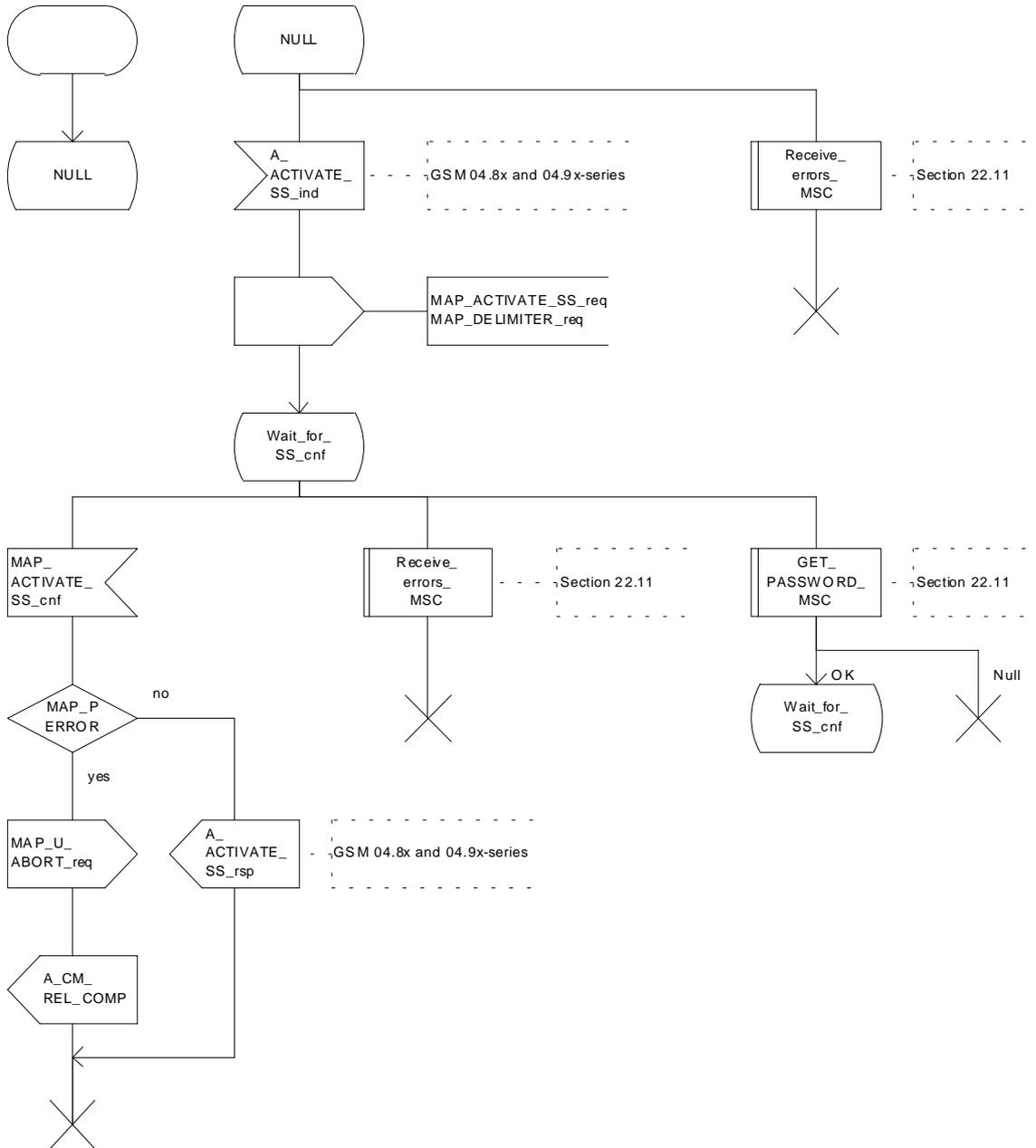


Figure 22.4.2/1: Procedure Activate_SS_MSC

22.4.3 Procedures in the VLR

Supplementary service activation

When receiving the MAP_ACTIVATE_SS indication, the MAP user in the VLR transfers the information to the HLR in the MAP_ACTIVATE_SS request without checking the contents of the service indication.

The VLR may then receive the MAP_GET_PASSWORD indication. This information is transferred to the MSC in the MAP_GET_PASSWORD request. If a MAP_GET_PASSWORD confirm primitive is received from the MSC, the VLR initiates the MAP_GET_PASSWORD response towards the HLR.

The VLR will receive the MAP_ACTIVATE_SS confirm from the HLR. The MAP user in the VLR shall transfer the information contained in this primitive to the MSC in the MAP_ACTIVATE_SS response without checking its contents.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11).

Error handling

The handling of MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE and unexpected MAP_CLOSE in this procedure is identical to the handling in the Registration procedure in the VLR, see subclause 22.2.3 of the present document.

The activation procedure in the VLR is shown in figure 22.4.3/1.

Figure 22.4.3/1: Activation of supplementary service procedure in the VLR

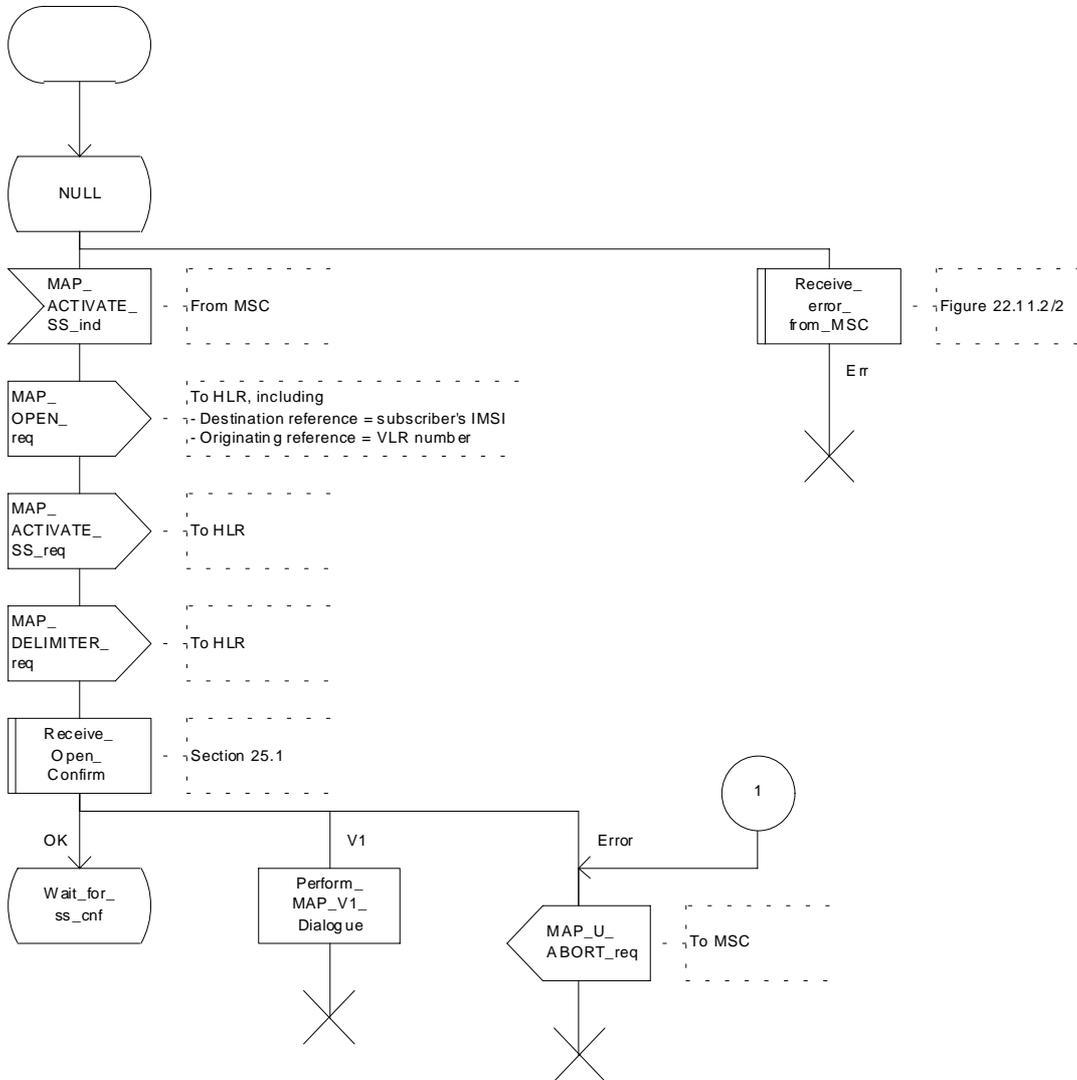


Figure 22.4.3/1 (sheet 1 of 2): Procedure Activate_SS_VLR

Figure 22.4.3/1: Activation of supplementary service procedure in the VLR

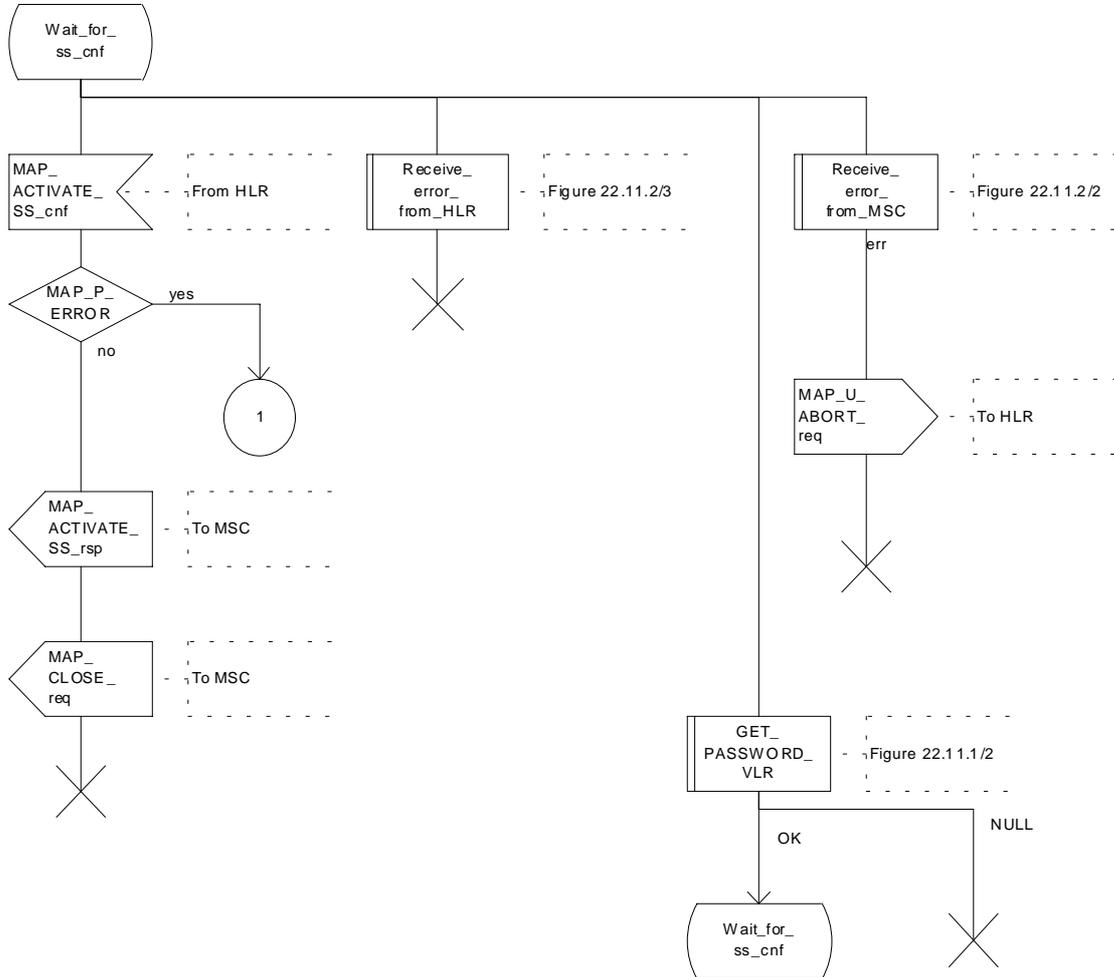


Figure 22.4.3/1 (sheet 2 of 2): Procedure SS_Activate_VLR

22.4.4 Procedures in the HLR

The procedure in the HLR is initiated when it receives a MAP_ACTIVATE_SS indication.

The HLR acts as follows:

- if the operator has barred the subscriber from access to supplementary services, the Call Barred error should be returned to the VLR. The parameter "operatorBarring" shall be included with the error.

The supplementary service request shall then be processed according to GSM 03.11 and the 03.8x and 03.9x-series of technical specifications. This handling may lead to either a successful result, a partially successful result, or an error being returned.

During the handling of activation, the get password procedure may be initiated (as specified in GSM 03.11). This will involve the sending of a MAP_GET_PASSWORD request to the VLR.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11):

- if the VLR is to be updated after the supplementary service activation, the MAP_INSERT_SUBS_DATA_HLR process is initiated;
- handling of receipt of MAP_P_ABORT, MAP_U_ABORT or MAP_CLOSE indications from the VLR is identical to their handling in the registration procedure, see subclause 22.2.4 above.

The activation procedure in the HLR is shown in figure 22.4.4/1.

Figure 22.4.4/1: Activation of supplementary services procedure in HLR.

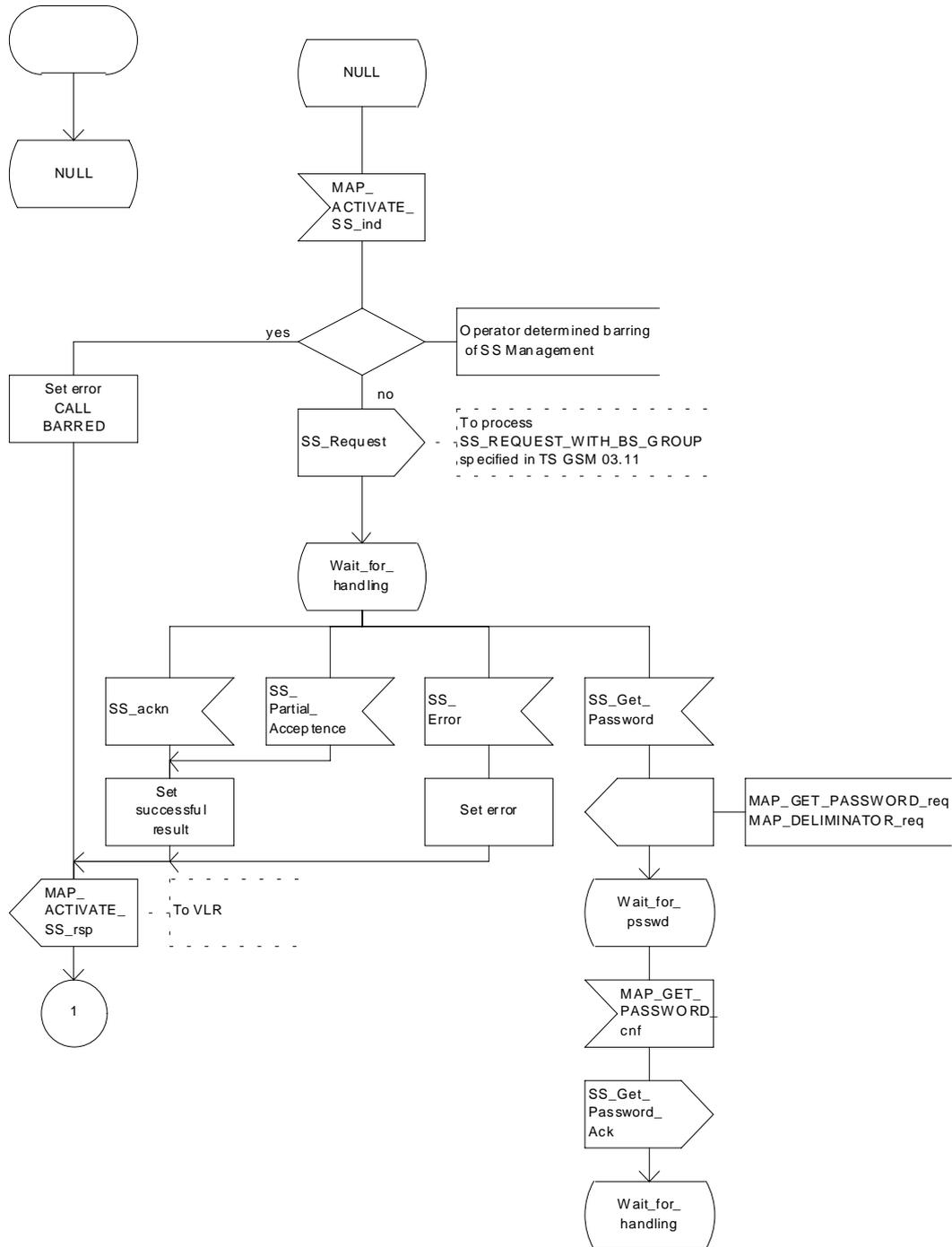


Figure 22.4.4/1 (sheet 1 of 2): Procedure Activate_SS_HLR

Figure 22.4.4/1: Activation of supplementary services procedure in HLR.

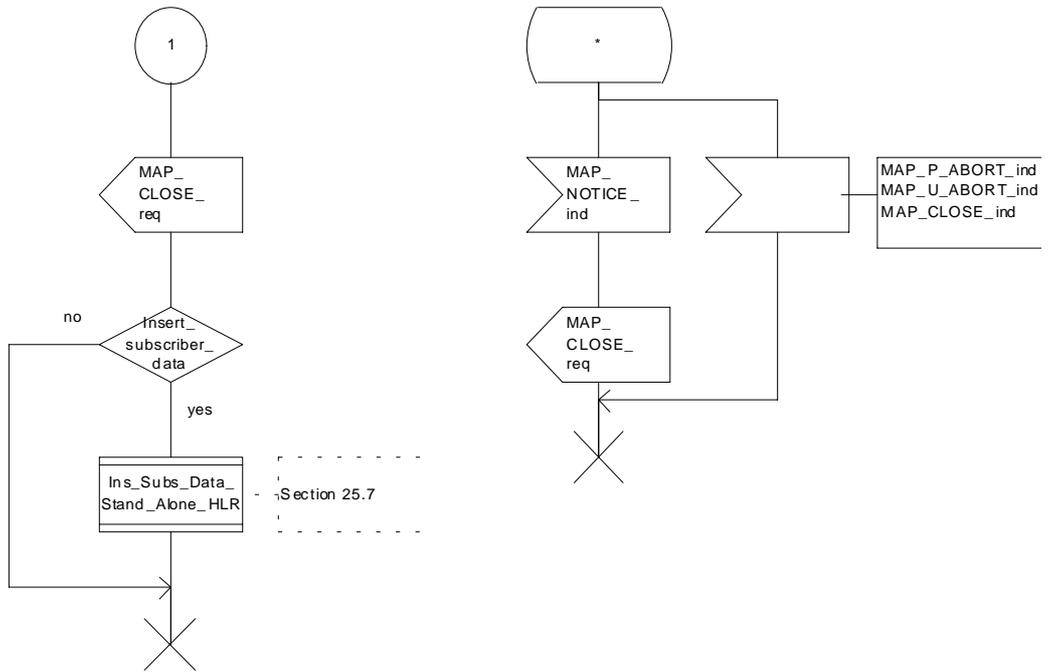


Figure 22.4.4/1 (sheet 2 of 2): Procedure Activate_SS_HLR

22.5 Deactivation procedure

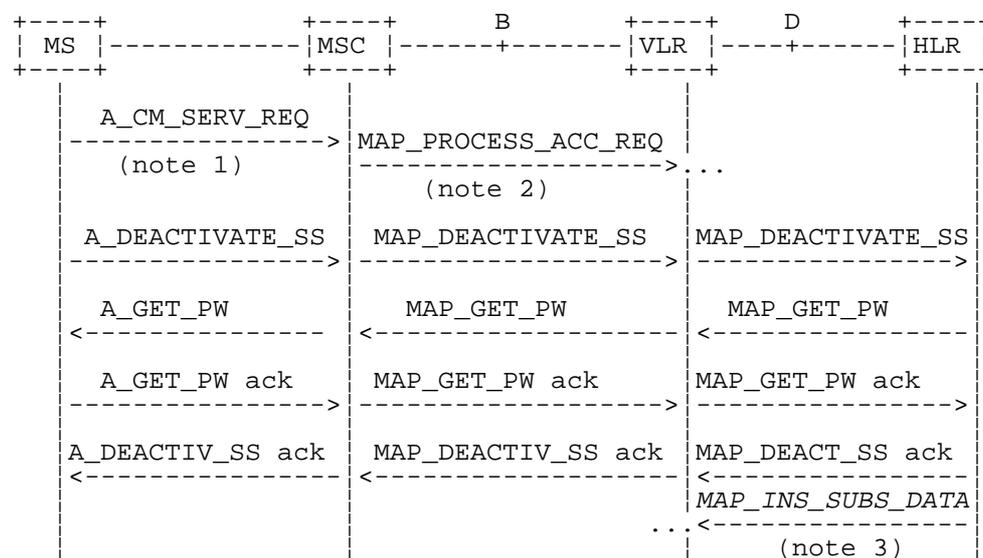
22.5.1 General

The deactivation procedure is used to deactivate a supplementary service in the HLR. The deactivation procedure is a fully transparent communication between the MS and the HLR, except that some services may be invoked as a result of the procedure, as described in the subclauses below.

The deactivation procedure is shown in figure 22.5.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(defined in clauses 9 and 25);
MAP_PROVIDE_IMSI	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_CHECK_IMEI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25);
MAP_GET_PASSWORD	(defined in clause 11);
MAP_INSERT_SUBSCRIBER_DATA	(defined in clauses 8 and 25);
MAP_DEACTIVATE_SS	(defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 in the present document.

NOTE 3: Services printed in *italics* are optional.

Figure 22.5.1/1: Interfaces and services for supplementary service deactivation

22.5.2 Procedures in the MSC

The MSC procedures for deactivation are identical to those specified for activation in subclause 22.4.2. The text and diagrams in subclause 22.4.2 apply with all references to activation changed to deactivation.

22.5.3 Procedures in the VLR

The VLR procedures for deactivation are identical to those specified for activation in subclause 22.4.3. The text and diagrams in subclause 22.4.3 apply with all references to activation changed to deactivation.

22.5.4 Procedures in the HLR

The HLR procedures for deactivation are identical to those specified for activation in subclause 22.4.4. The text and diagrams in subclause 22.4.4 apply with all references to activation changed to deactivation.

22.6 Interrogation procedure

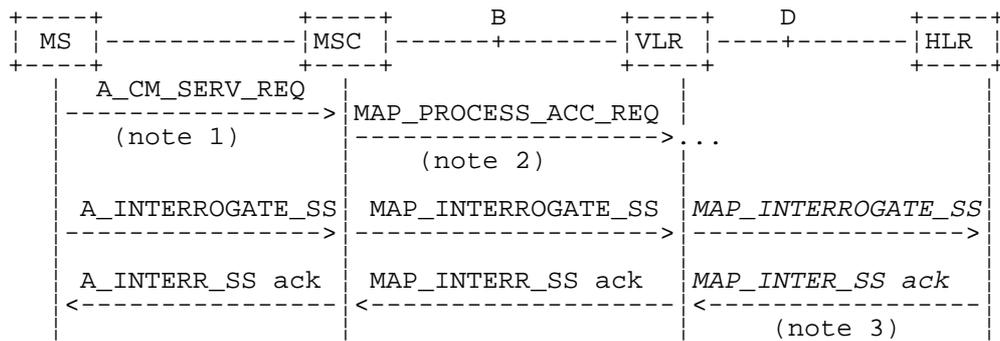
22.6.1 General

The interrogation procedure is used to retrieve information related to a supplementary service from the VLR or the HLR. It is the VLR which decides whether an interrogation request should be forwarded to the HLR or not. Some non-supplementary service related services may be invoked as a result of the procedure, as described in the subclauses below.

The interrogation procedure is shown in figure 22.6.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(defined in clauses 9 and 25);
MAP_PROVIDE_IMSI	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_CHECK_IMEI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25);
MAP_INTERROGATE_SS	(defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 in the present document.

NOTE 3: Services printed in italics are optional.

Figure 22.6.1/1: Interfaces and services for supplementary service interrogation

22.6.2 Procedures in the MSC

The MSC procedures for interrogation are identical to those specified for registration in subclause 22.2.2. The text and diagrams in subclause 22.2.2 apply with all references to registration changed to interrogation.

22.6.3 Procedures in the VLR

Supplementary service interrogation

When receiving the MAP_INTERROGATE_SS indication, the MAP user acts as follows:

- if the operator has barred the subscriber from access to supplementary services, the error Call Barred is returned to the MSC. The parameter "operatorBarring" shall be included with the error.

The interrogation is either answered by the VLR or by the HLR, depending on the service interrogated.

a) Interrogation to be handled by the VLR

The supplementary service request shall then be processed according to GSM 03.11 and the 03.8x and 03.9x-series of technical specifications. This handling may lead to either a successful result, a partially successful result, or an error being returned.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11).

b) Interrogation to be handled by HLR

If the interrogation is to be handled by the HLR, on receiving the MAP_INTERROGATE_SS indication, the MAP user in the VLR transfers the information to the HLR in the MAP_INTERROGATE_SS request without further checking the contents of the service indication.

The VLR will receive the MAP_INTERROGATE_SS confirm from the HLR. The MAP user in the VLR shall transfer the information contained in this primitive to the MSC in the MAP_INTERROGATE_SS response without checking its contents.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11).

Error handling

Handling of MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE and unexpected MAP_CLOSE in this procedure is identical to the handling in the Registration procedure in the VLR, subclause 22.2.3. The Interrogation procedure is described in figure 22.6.3/1.

Figure 22.6.3/1: Interrogation of supplementary service procedure in VLR

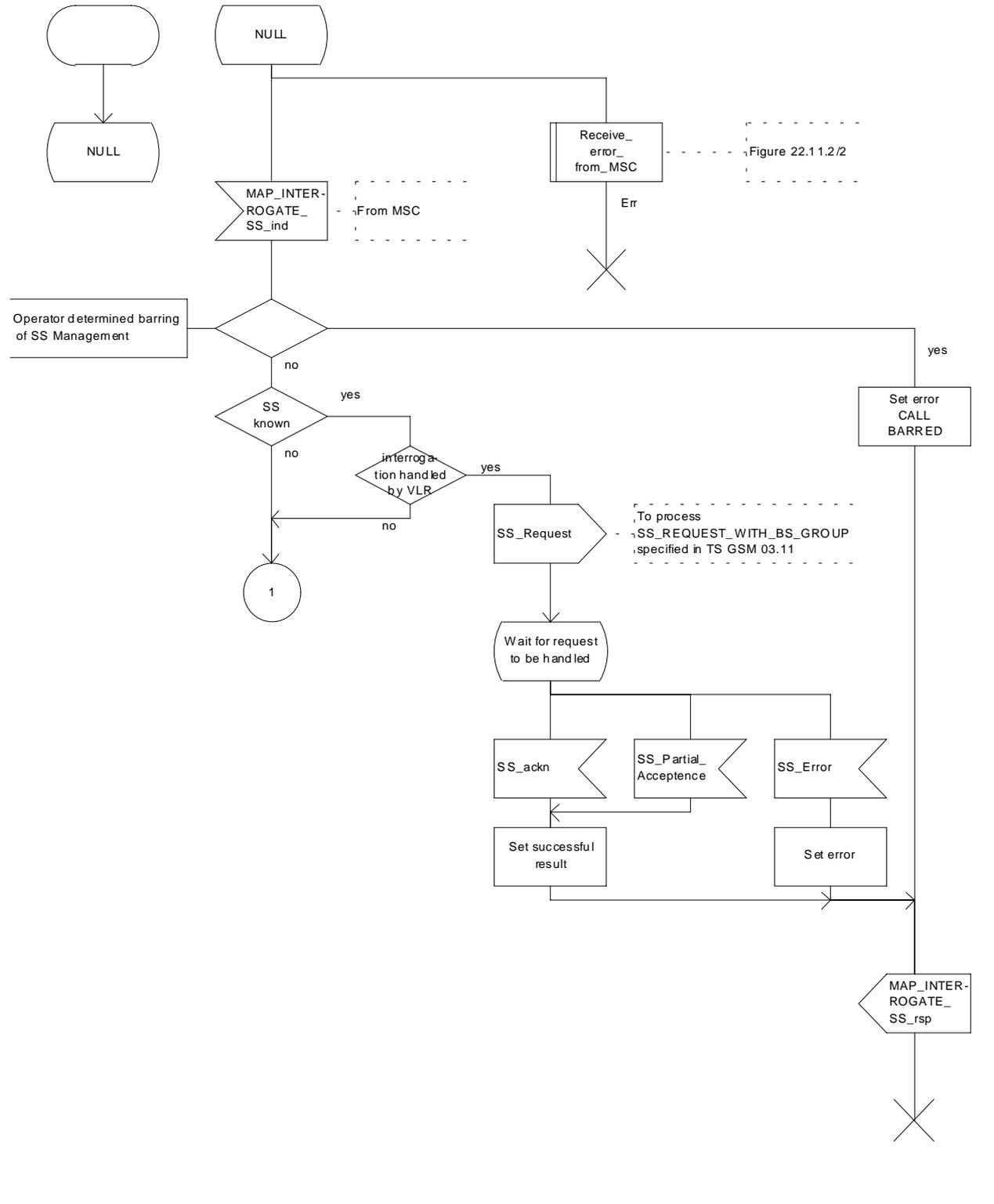


Figure 22.6.3/1 (sheet 1 of 3): Procedure Interrogate_SS_VLR

Figure 22.6.3/1: Interrogation of supplementary service procedure in VLR

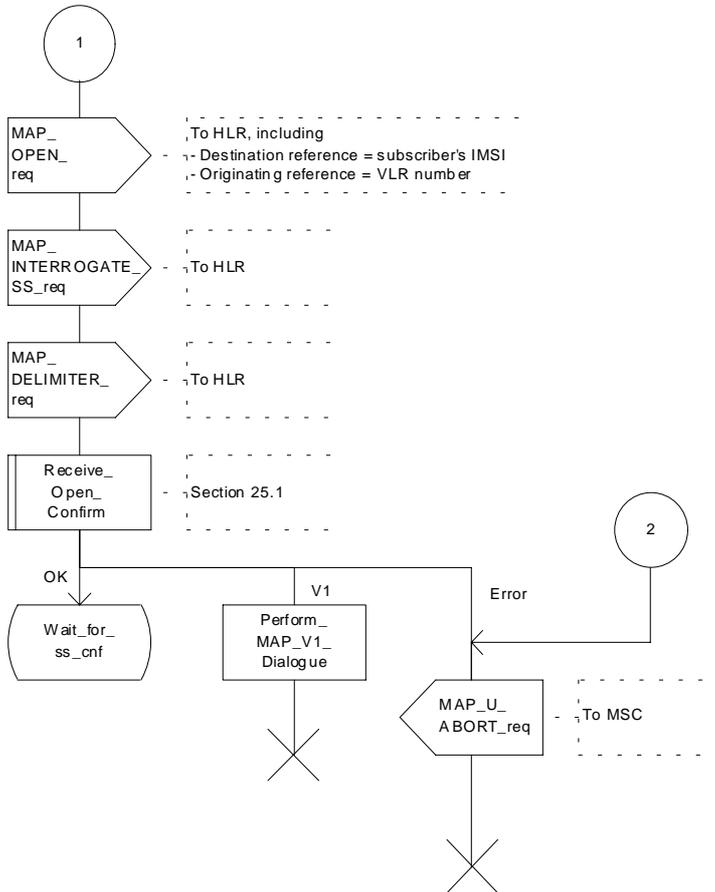


Figure 22.6.3/1 (sheet 2 of 3): Procedure Interrogate_SS_VLR

Figure 22.6.3/1: Interrogation of supplementary service procedure in VLR

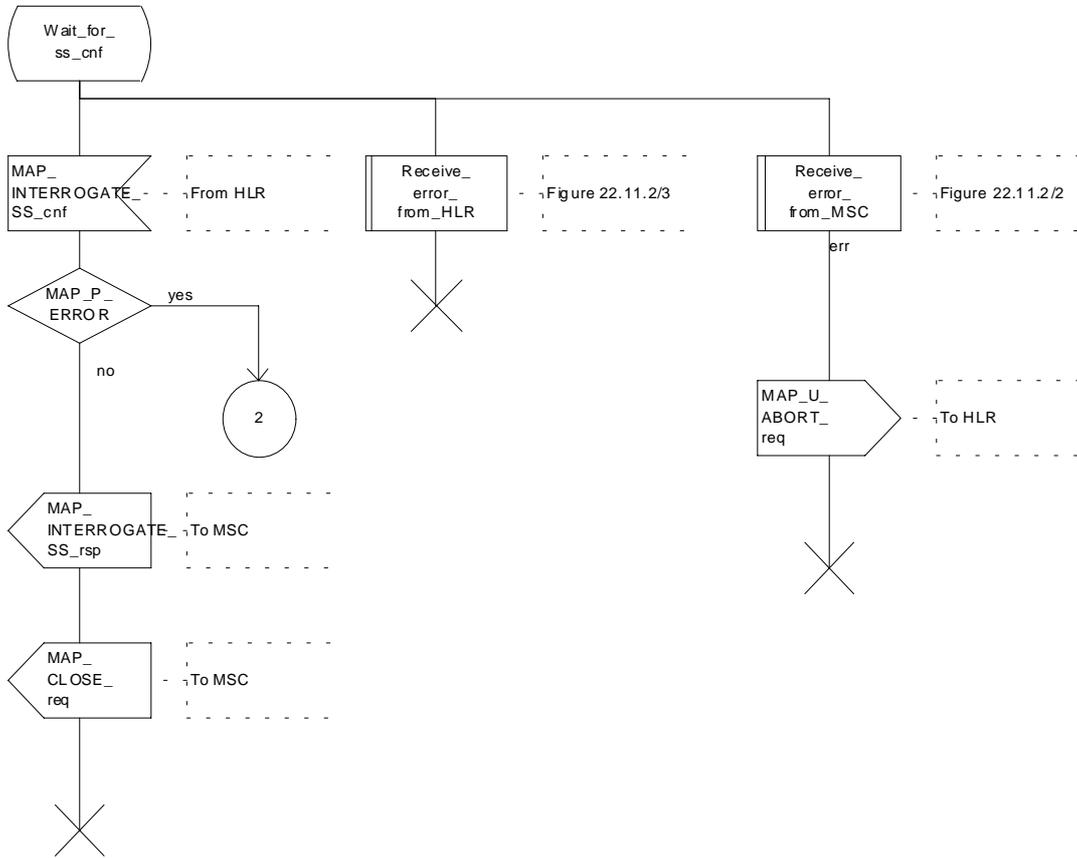


Figure 22.6.3/1 (sheet 3 of 3): Procedure Interrogate_SS_VLR

22.6.4 Procedures in the HLR

When receiving the MAP_INTERROGATE_SS indication, the MAP user acts as follows:

- if the operator has barred the subscriber from access to supplementary services, the error Call Barred is returned to the MSC. The parameter "operatorBarring" shall be included with the error;
- if the supplementary service is not supported in HLR the error Unexpected Data Value is returned to the VLR.

The interrogation is either answered by the VLR or by the HLR, depending on the service interrogated.

a) Interrogation to be handled by the VLR

If the interrogation procedure should have been answered by the VLR, then the HLR assumes that the VLR does not support the interrogated supplementary service, and returns the SS Not Available error to the VLR.

b) Interrogation to be handled by HLR

The supplementary service request shall be processed according to GSM 03.11 and the 03.8x and 03.9x-series of technical specifications. This handling may lead to either a successful result or an error being returned.

For call independent SS operations, each message shall only contain a single component.

Error handling

Handling of MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE and unexpected MAP_CLOSE in this procedure is identical to the handling in the Registration procedure in the VLR, subclause 22.2.3. The Interrogation procedure is described in figure 22.6.4/1.

Figure 22.6.4/1: Interrogation of supplementary services procedure in HLR

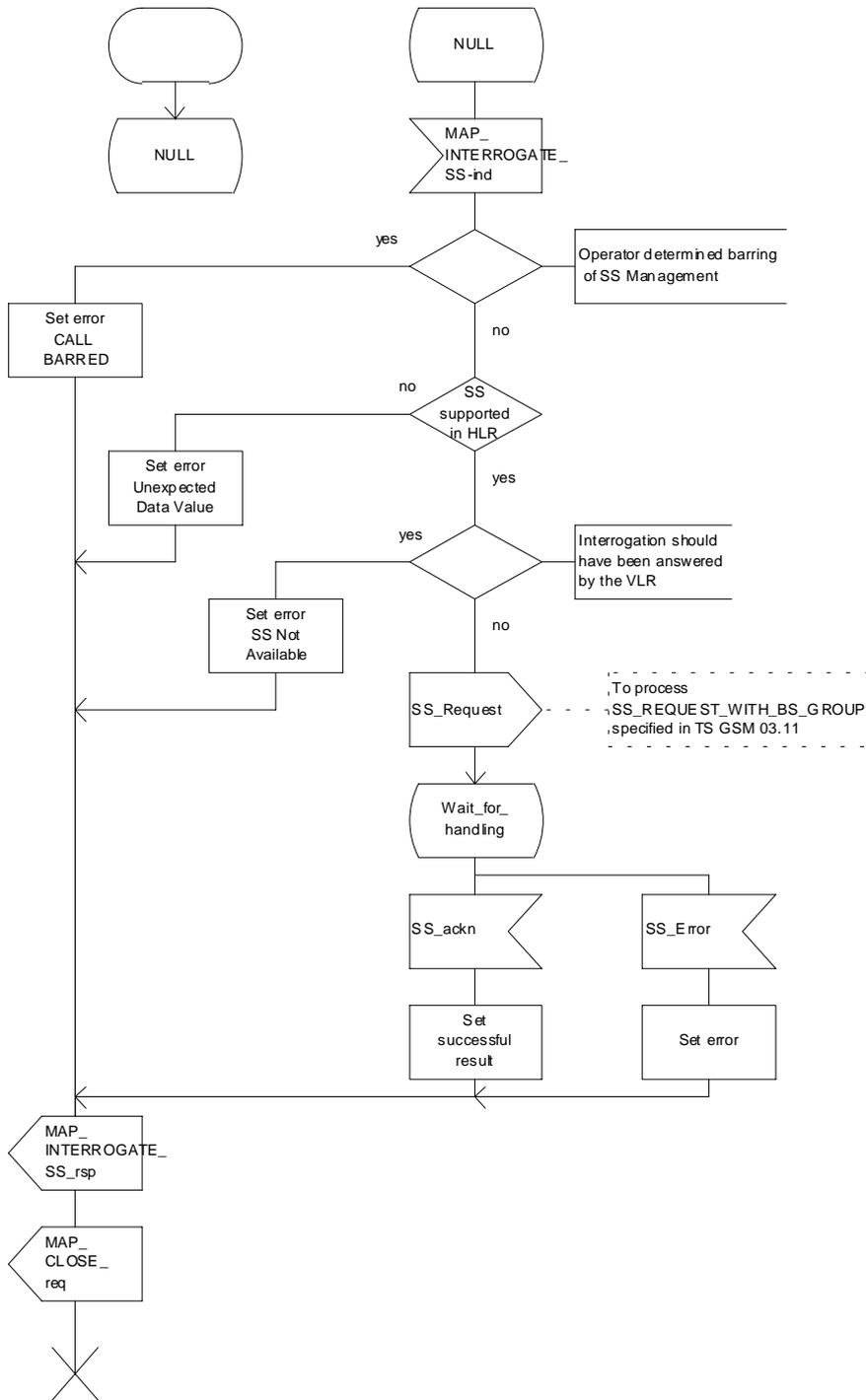


Figure 22.6.4/1: Procedure Interrogate_SS_HLR

22.7 Invocation procedure

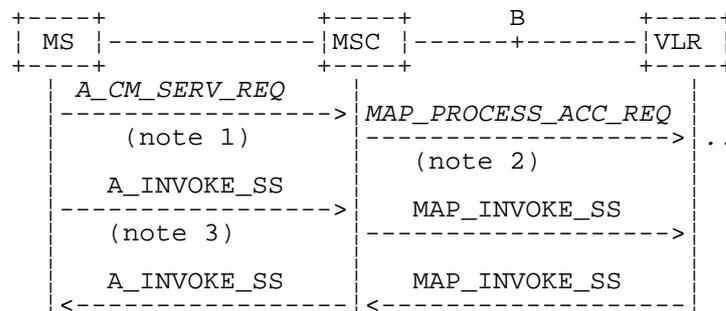
22.7.1 General

The invocation procedure is used to check subscription data in the VLR for certain supplementary services which are invoked after the call set-up phase is finished. For invocation of supplementary services which are invoked during the call set-up phase, please refer to the Call Handling procedure descriptions.

The invocation procedure is shown in figure 22.7.1/1. Note that some optional services may be invoked in connection with this procedure, as described in the subclause below.

The following services are used:

MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(defined in clauses 9 and 25);
MAP_PROVIDE_IMSI	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_CHECK_IMEI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25);
MAP_INVOKE_SS	(defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 in the present document.

NOTE 3: A_INVOKE_SS is a generic message to illustrate any supplementary service invocation request message on the air interface, e.g. BuildMPTY, see GSM 04.80.

Figure 22.7.1/1: Interfaces and services for supplementary service invocation

22.7.2 Procedures in the MSC

Process access request

Before the Call Hold or Multi-Party supplementary services can be invoked, a CC connection must be established between the MS and the MSC as described in GSM 04.08 and the Call Handling procedure descriptions within the present document.

When an A_INVOKE_SS request message arrives at the MSC during a call (as described in GSM 04.10, 04.8x and 04.9x-series of technical specifications), then if control of subscription to the invoked supplementary service is required,

the MSC initiates the process access request procedure towards the VLR as described in clause 25 of the present document.

Supplementary service invocation

If the Process Access Request procedure towards the VLR is successful, the MSC shall forward a MAP_INVOKE_SS service request towards the VLR. This request shall contain the SS-Code of the supplementary service to be invoked, and possibly the Basic service code. Mapping from the A_INVOKE_SS to this service request is described in GSM 09.11.

The MSC will receive a MAP_INVOKE_SS confirm from the VLR. If the outcome of the service is successful (i.e. the service confirm is empty), the MSC will invoke the requested supplementary service as described in GSM 02.8x-series, 03.8x and 03.9x-series of technical specifications. If the outcome of the service is unsuccessful, the MSC shall send an appropriate A_INVOKE_SS response towards the MS. The structure of this message is described in GSM 09.11 and 04.8x and 04.9x-series of technical specifications.

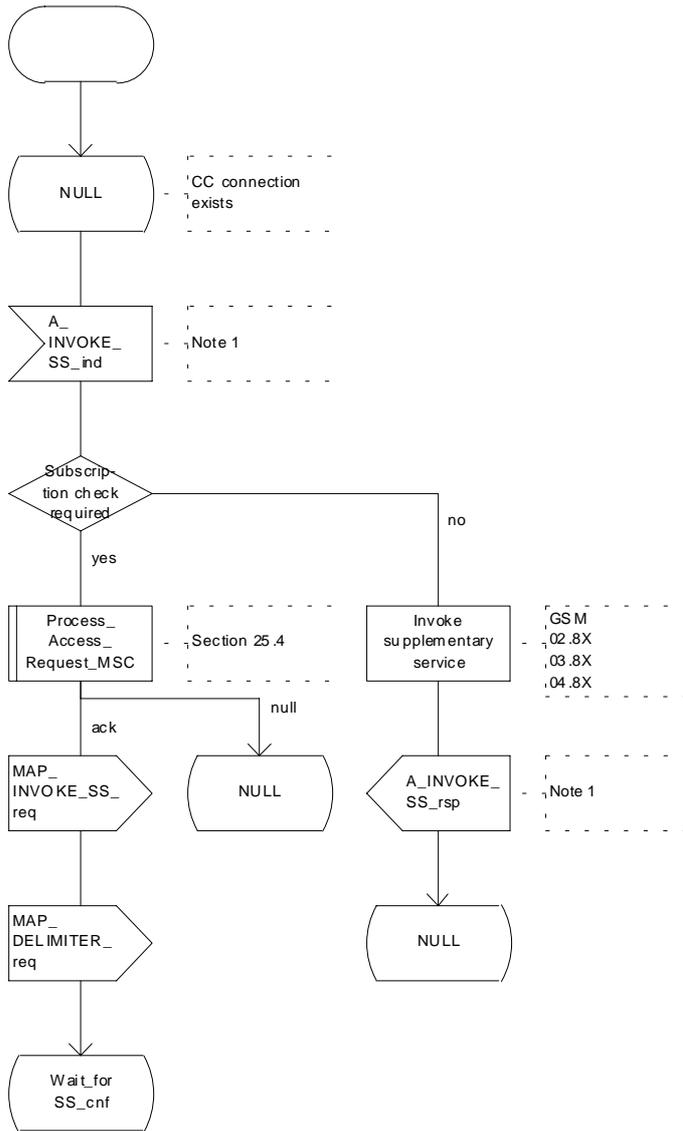
Error handling

If at any time during this procedure a MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE or MAP_CLOSE indication concerning the process is received from the VLR, the process is terminated. If a MAP_NOTICE indication was received from the VLR, the VLR dialogue must also be aborted by sending a MAP_U_ABORT request indicating Procedure error towards the VLR. Possible signalling to the MS is described in GSM 04.10.

If an A_CM_RELEASE indication is received from the MS, all open transactions are released using the MAP_U_ABORT request indicating application procedure cancellation; the process terminates.

The invocation procedure in the MSC is shown in figure 22.7.2/1.

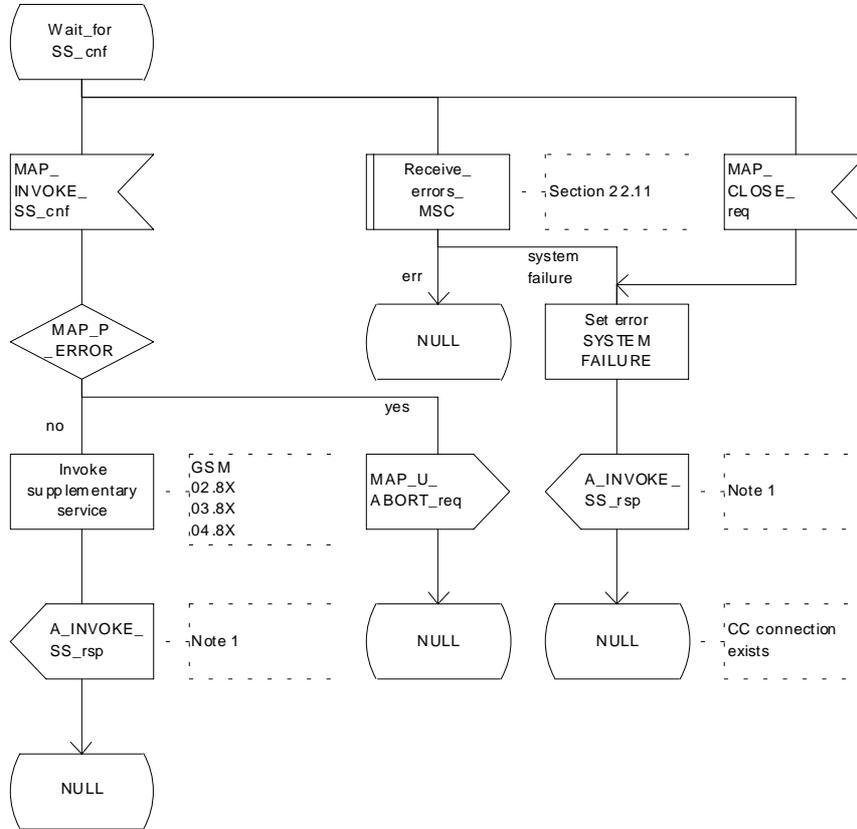
Figure 22.7.2/1: Mobile initiated invocation of supplementary service procedure in the MSC



Note 1: Fictitious signal to indicate receipt/sending of SS invocation in voke component on the air interface (eg. BuildMPTY). Described in GSM 04.8X and 09.11.

Figure 22.7.2/1 (sheet 1 of 2): Procedure Invoke_SS_MSC

Figure 22.7.2/1: Mobile initiated invocation of supplementary service procedure in the MSC



Note 1: Fictitious signal to indicate receipt/sending of SS invocation invoke component on the air interface, (eg. BuildMPTY). Described in GSM 04.08X and 09.11.

Figure 22.7.2/1 (sheet 2 of 2): Procedure Invoke_SS_MSC

22.7.3 Procedures in the VLR

Process Access Request

When receiving the MAP_PROCESS_ACCESS_REQUEST indication, the VLR acts as described in clause 25 of the present document.

Supplementary service invocation

When receiving the MAP_INVOKE_SS indication, the MAP user acts as follows:

- if the operator has barred the subscriber from access to supplementary services, the error "Call Barred" is returned to the MSC. The parameter "operatorBarring" shall be included with the error;
- if any irrelevant information elements (according to the service description) or invalid information element values are present in the service request, then the unexpected data value error is returned to the MSC in the MAP_INVOKE_SS response;
- if the VLR does not support the invoked supplementary service then the VLR shall respond with the SS Not Available error;
- if the requested supplementary service cannot be invoked by subscriber actions, then the VLR shall respond with the Illegal SS Operation error;
- if the subscriber is not provided with (i.e. subscribed to) the requested supplementary service, then the SS error status error (possibly including the SS-Status as parameter) is returned to the MSC in the MAP_INVOKE_SS response.

If all checks are passed the VLR returns an empty MAP_INVOKE_SS response to the MSC, thus indicating that the invocation request was accepted.

If at any time during this procedure a MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE or unexpected MAP_CLOSE indication concerning the process is received from the MSC, the process terminates. If a MAP_NOTICE indication was received from the MSC, that dialogue must be aborted by sending a MAP_U_ABORT request indicating Procedure error towards the MSC. The process terminates.

The invocation procedure in the VLR is shown in figure 22.7.3/1.

Figure 22.7.3/1: Invocation of supplementary service procedure in VLR

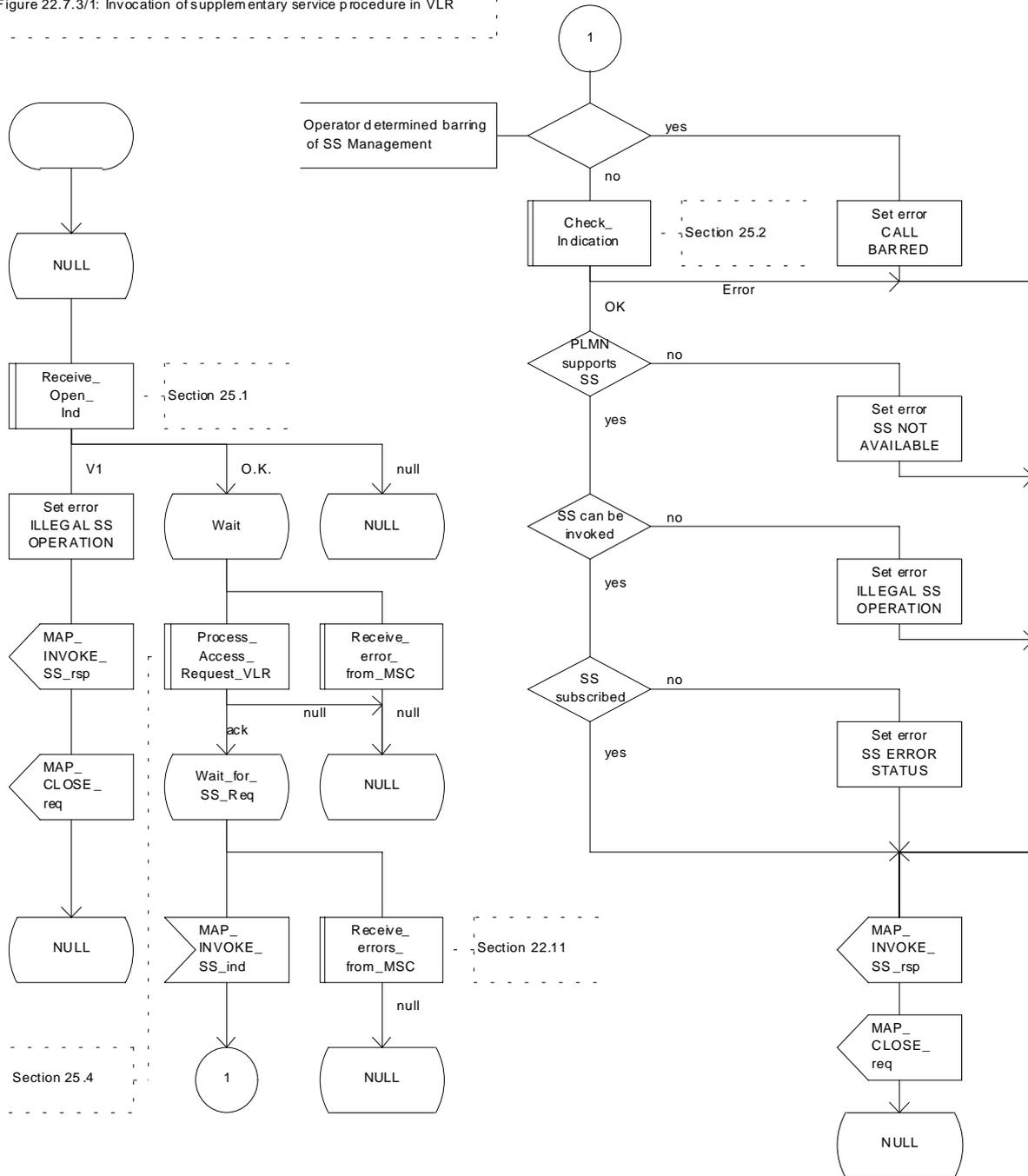


Figure 22.7.3/1: Procedure Invoke_SS_VLR

22.8 Password registration procedure

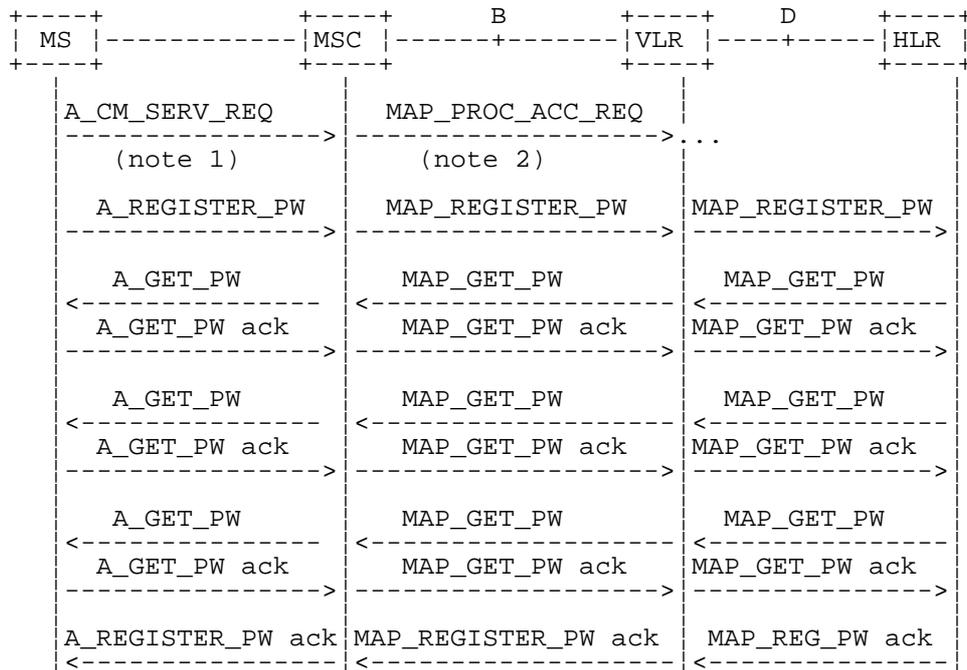
22.8.1 General

The password registration procedure is used to register a password in the HLR. The password registration procedure is a fully transparent communication between the MS and the HLR, except that some services may be invoked as a result of the procedure, as described below.

The password registration procedure is shown in figure 22.8.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(defined in clauses 9 and 25);
MAP_PROVIDE_IMSI	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_CHECK_IMEI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25);
MAP_GET_PASSWORD	(defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines are triggers/ triggered signalling on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 in the present document.

NOTE 3: Use of each of the three MAP_GET_PASSWORD operations is described in subclause 22.8.4.

Figure 22.8.1/1: Interfaces and services for supplementary service password registration

22.8.2 Procedures in the MSC

The password registration procedure in the MSC is identical to that for activation specified in subclause 22.4.2. All the text and diagrams in subclause 22.4.2 apply with all references to activation changed to password registration.

22.8.3 Procedures in the VLR

The password registration procedure in the VLR is identical to that for activation specified in subclause 22.4.3. All the text and diagrams in subclause 22.4.3 apply with all references to activation changed to password registration.

22.8.4 Procedures in the HLR

The procedure in the HLR is initiated when it receives a MAP_REGISTER_PASSWORD indication.

The HLR acts as follows:

- if the operator has barred the subscriber for access to supplementary services, the Call Barred error is returned to the VLR. The parameter "operatorBarring" shall be included with the error;
- if any irrelevant information elements (according to the service description) or invalid information element values are present, then the unexpected data value error is returned to the VLR in the response. This error should thus be returned if the SS-Code provided by the mobile subscriber is not allocated.

The HLR shall then process the MAP_REGISTER_PASSWORD indication as specified in GSM 03.11. During the handling of password registration, the password procedure will be initiated (as specified in GSM 03.11) This will involve the sending of MAP_GET_PASSWORD requests to the VLR.

- Handling of receipt of MAP_P_ABORT, MAP_U_ABORT or MAP_CLOSE indications from the VLR is identical to their handling in the registration procedure, see subclause 22.2.4 above.

The password registration procedure in the HLR is shown in figure 22.8.4/1.

Figure 22.8.4/1: Registration of supplementary service password procedure in HLR

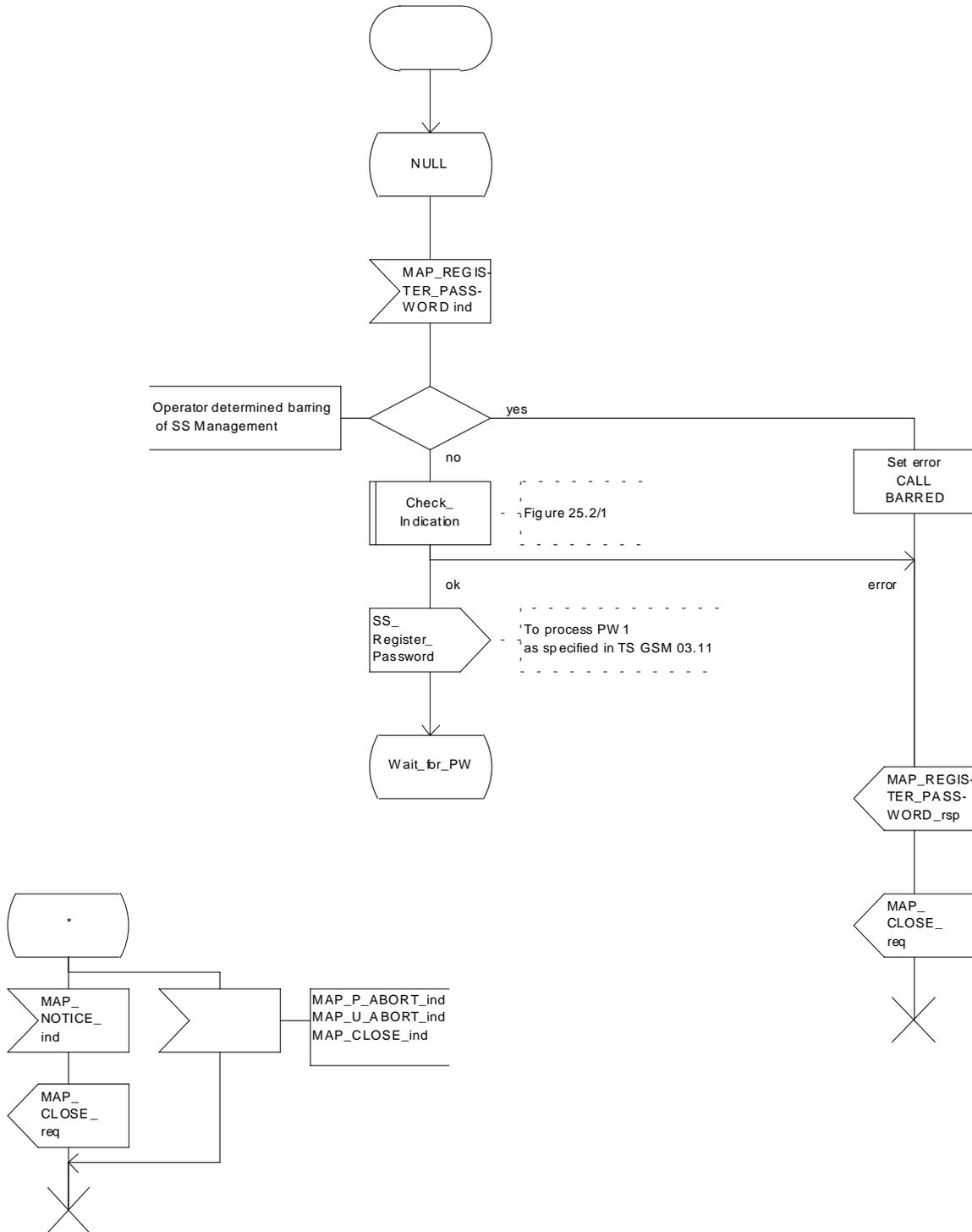


Figure 22.8.4/1 (sheet 1 of 2): Procedure Register_PW_HLR

Figure 22.8.4/1: Registration of supplementary service password procedure in HLR

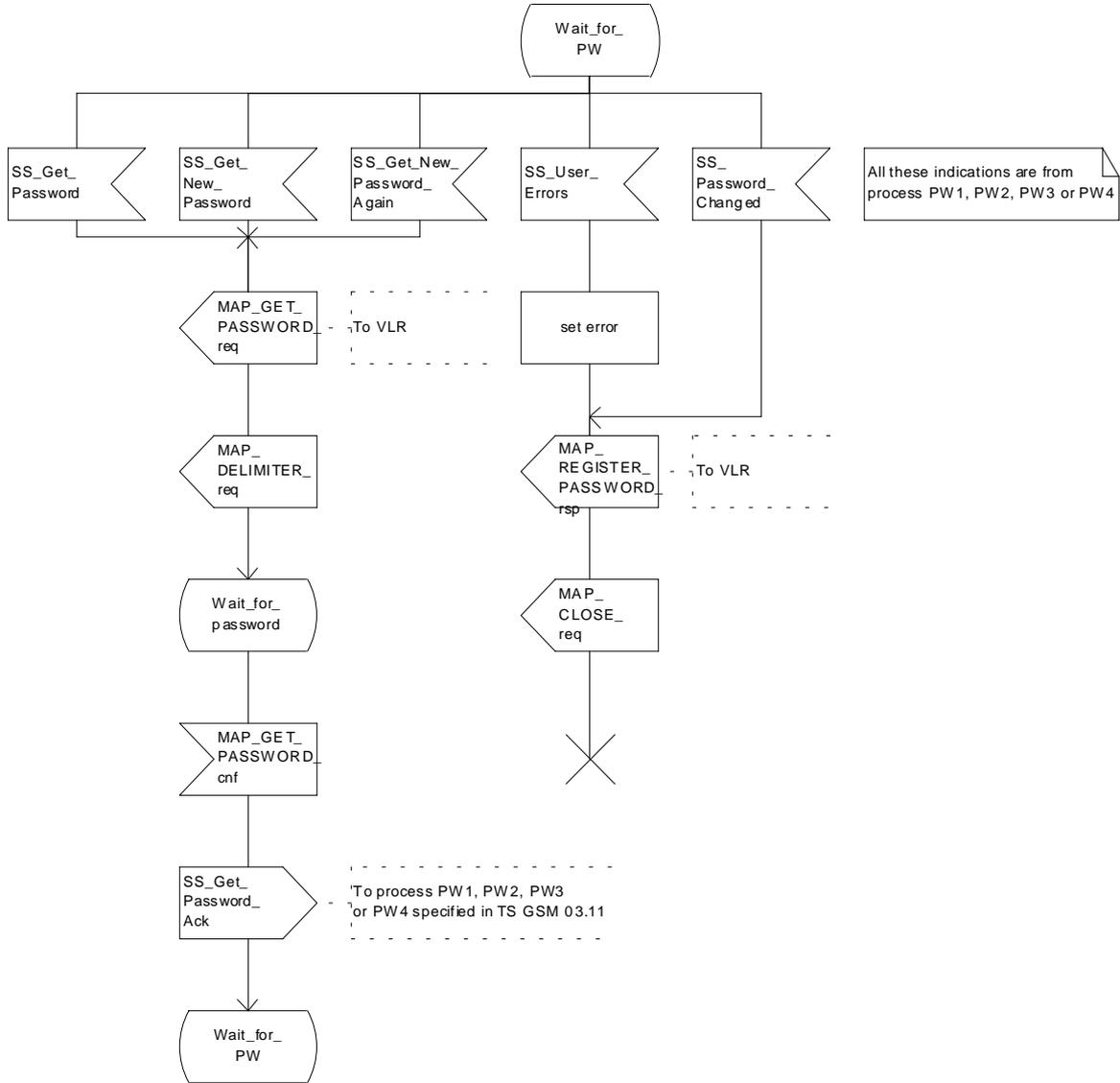


Figure 22.8.4/1 (sheet 2 of 2): Procedure Register_PW_HLR

22.9 Mobile Initiated USSD procedure

22.9.1 General

The procedure supports supplementary service signalling procedures which can allow PLMN specific services to be introduced.

The message flow for the procedure can be found in GSM 03.90.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(defined in clauses 9 and 25);
MAP_PROVIDE_IMSI	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_CHECK_IMEI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25);
MAP_UNSTRUCTURED_SS_REQUEST	(defined in clause 11);
MAP_UNSTRUCTURED_SS_NOTIFY	(defined in clause 11).

The following service is certainly used:

MAP_PROCESS_UNSTRUCTURED_SS_REQUEST (defined in clause 11).

22.9.2 Procedures in the MSC

Before the Process Unstructured SS Request service can be invoked, a call independent CM connection must be created between the MS and the MSC.

Once a CM-connection is established, the MSC may handle the A_PROCESS_UNSTRUCTURED_SS_REQUEST from the MS. This message contains information input by the user, the message may be fed to an application contained locally in the MSC or to the VLR. The rules for determining this are specified in GSM 03.90.

1) Message Destined for VLR

If the message is destined for the VLR then the MSC shall transfer the message to the VLR using the mapping specified in detail in GSM 09.11.

The MSC may subsequently receive one or more MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY indications from the VLR. These shall be sent transparently to the MS. When a confirmation is received from the MS this shall be returned to the VLR.

When the MSC receives a MAP_PROCESS_UNSTRUCTURED_SS_REQUEST confirmation from the VLR then it shall pass this to the MS and initiate release of the CM connection.

2) Message Destined for Local Application

If the message is destined for the local USSD application then the MSC shall transfer the message to the application.

The MSC may subsequently receive one or more requests from the application which correspond to the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY indications. These shall be sent transparently to the MS. When a confirmation is received from the MS this shall be returned to the application.

When the MSC receives the result of the original operation from the application then it shall pass this to the MS and initiate release of the CM connection.

Error Handling

Both the MS and the VLR or USSD Application may initiate release of the CM-connection at any time. This is handled as shown in the diagrams.

The procedure in the MSC is shown in figure 22.9.2/1.

Process MS_INIT_USSD_MSC

22.9.2_1.1(2)

Figure 22.9.2/1: Handling of mobile initiated USSD at MSC

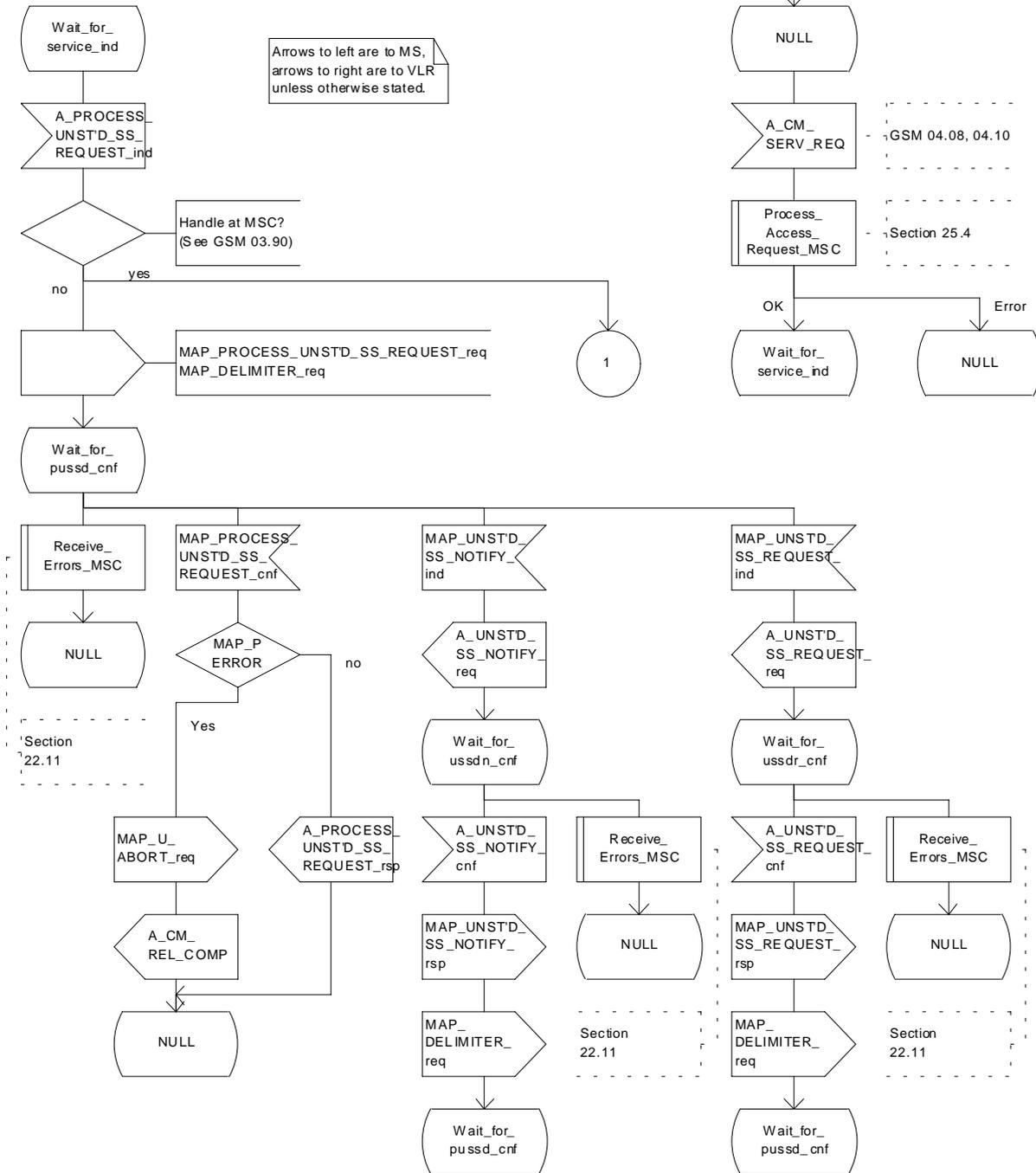


Figure 22.9.2/1 (sheet 1 of 2): Procedure MI_USSD_MSC

Process MS_INIT_USSD_MSC

22.9.2_1.2(2)

Figure 22.9.2/1: Handling of mobile initiated USSD at MSC

Arrows to left are to MS, arrows to right are to USSD application unless otherwise stated.

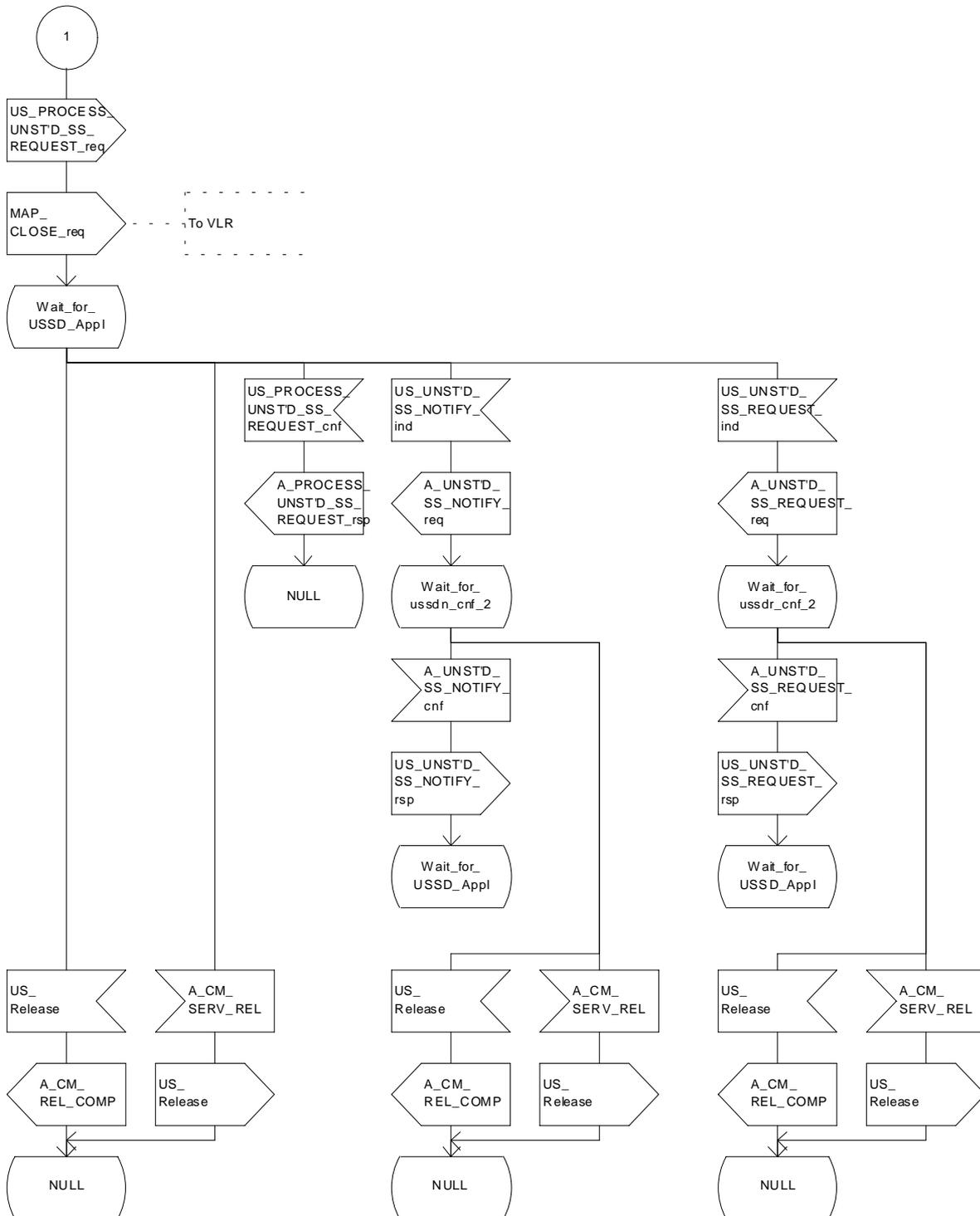


Figure 22.9.2/1 (sheet 2 of 2): Procedure MI_USSD_MSC

22.9.3 Procedures in the VLR

The initiation of the process is shown in subclause 22.1.2.

Once a MAP dialogue is established, the VLR may handle the MAP_PROCESS_UNSTRUCTURED_SS_REQUEST from the MSC. This message contains information input by the user, the message may be fed to an application contained locally in the VLR or to the HLR. The rules for determining this are specified in GSM 03.90.

Message Destined for HLR

If the message is destined for the HLR then the VLR shall transfer the message transparently to the HLR.

The VLR may subsequently receive one or more MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY indications from the HLR. These shall be sent transparently to the MSC. When a confirmation is received from the MSC this shall be returned to the HLR.

When the VLR receives a MAP_PROCESS_UNSTRUCTURED_SS_REQUEST confirmation from the HLR then it shall pass this to the MS and close the MAP provider service.

Message Destined for Local Application

If the message is destined for the local USSD application then the VLR shall transfer the message to the application.

The VLR may subsequently receive one or more requests from the application which correspond to the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY indications. These shall be sent transparently to the MSC. When a confirmation is received from the MSC this shall be returned to the application.

When the VLR receives the result of the original operation from the application then it shall pass this to the MSC and initiate release of the CM connection.

Error Handling

Both the MSC and the HLR or USSD Application may initiate release of the MAP service at any time. This is handled as shown in the diagrams.

The procedure in the VLR is shown in figures 22.9.3/1 and 22.9.3/2.

Process MS_INIT_USSD_VLR

22.9.3_1.1(3)

Figure 22.9.3/1: Handling for mobile initiated USSD at VLR

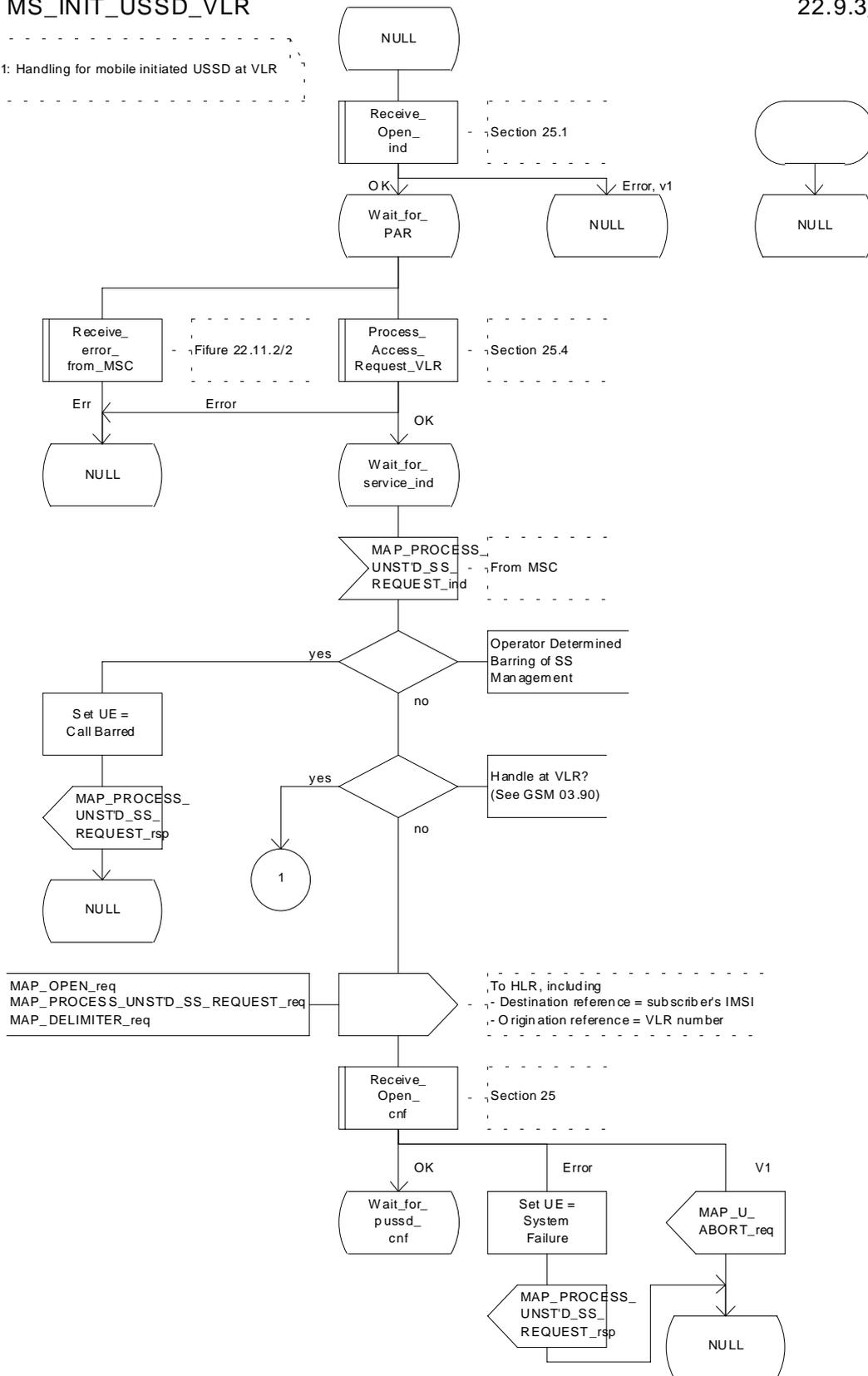


Figure 22.9.3/1 (sheet 1 of 3): Procedure MI_USSD_VLR

Figure 22.9.3/1: Handling for mobile initiated USSD at VLR

Arrows to left are to MSC, arrows to right are to HLR unless otherwise stated.

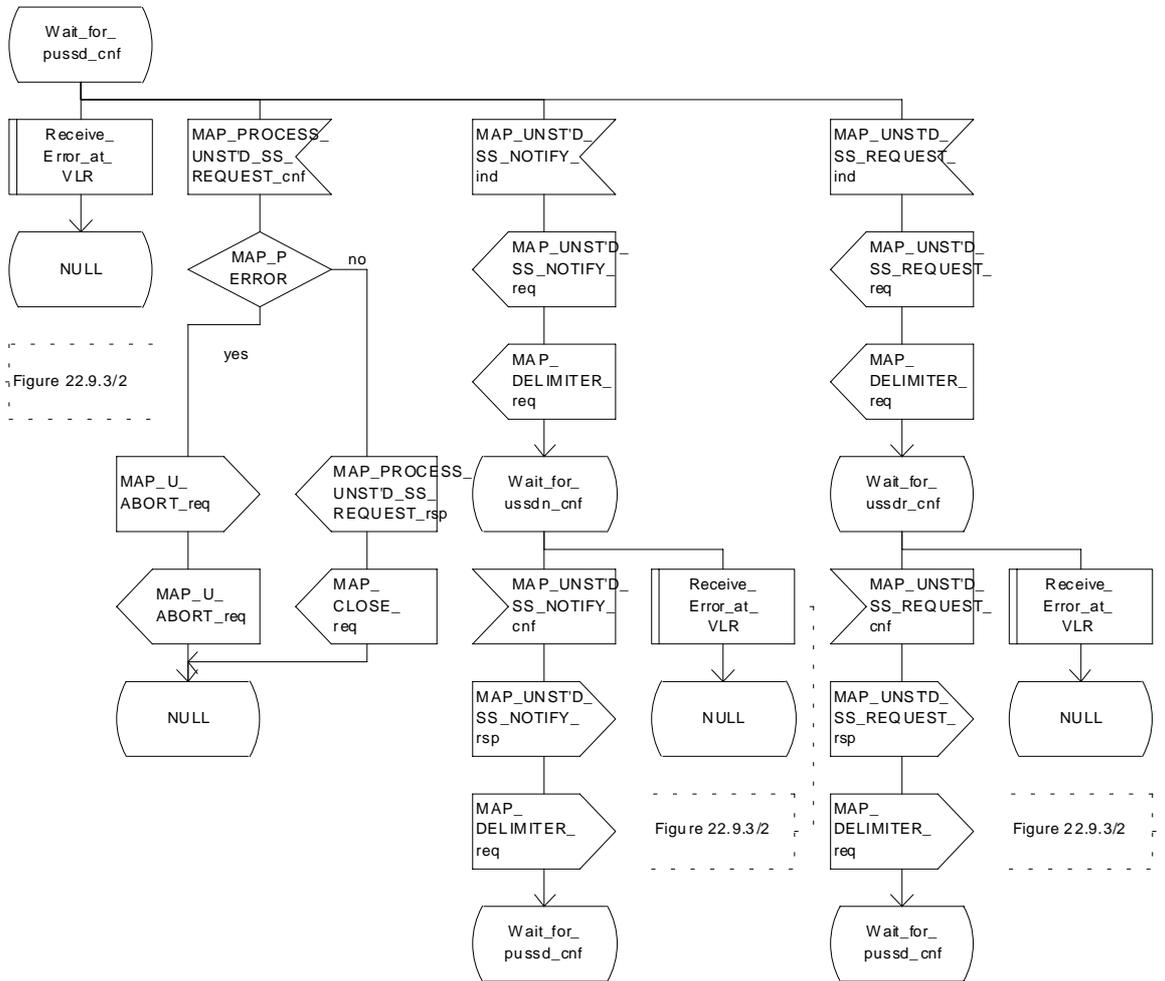


Figure 22.9.3/1 (sheet 2 of 3): Procedure MI_USSD_VLR

Figure 22.9.3/1: Handling for mobile initiated USSD at VLR

Arrows to left are to MSC, arrows to right are to USSD application unless otherwise stated.

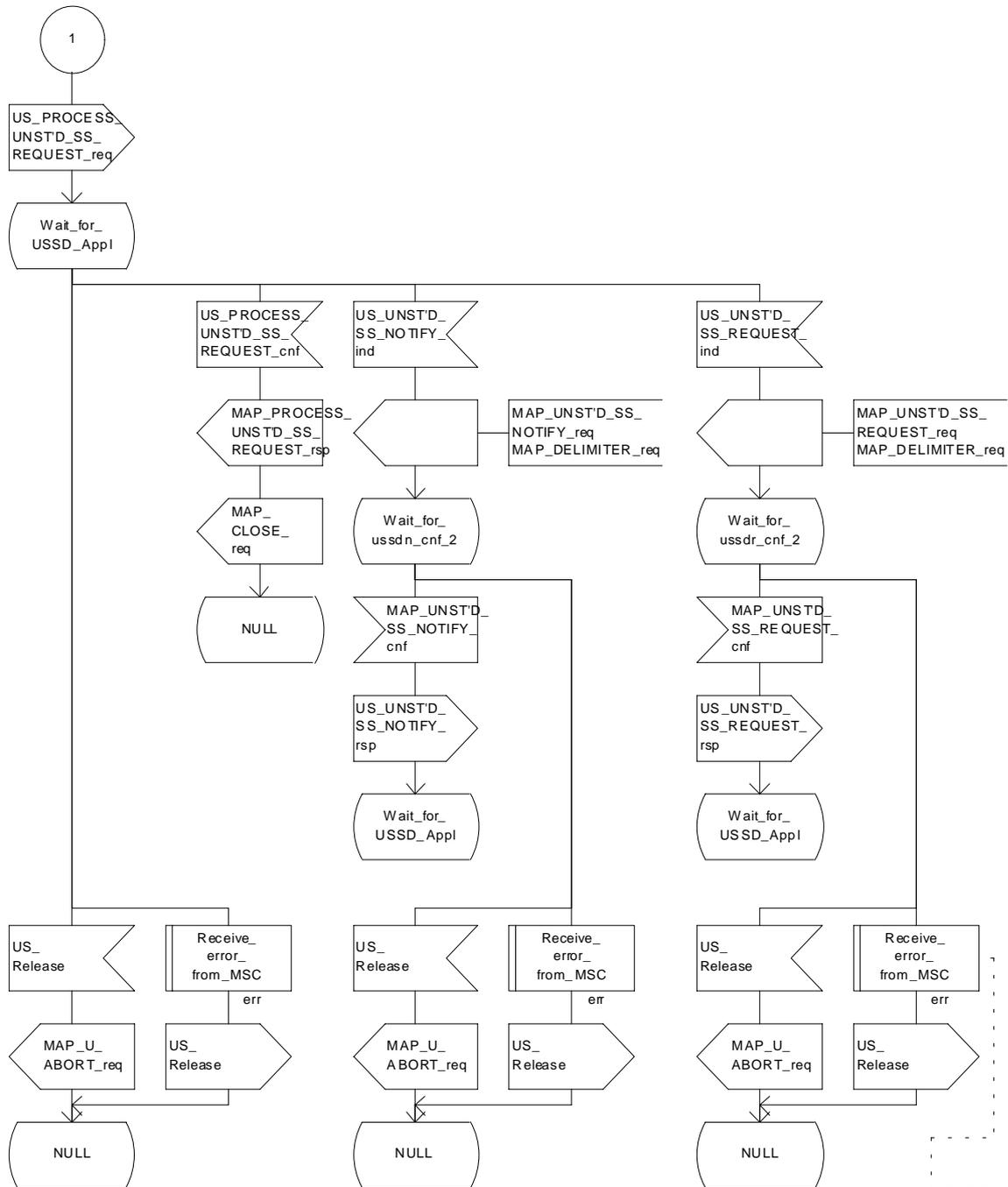


Figure 22.1.1.2/2

Figure 22.9.3/1 (sheet 3 of 3) : Procedure_MI_USSD_VLR

Figure 22.9.3/2: Handling of errors at VLR for USSD

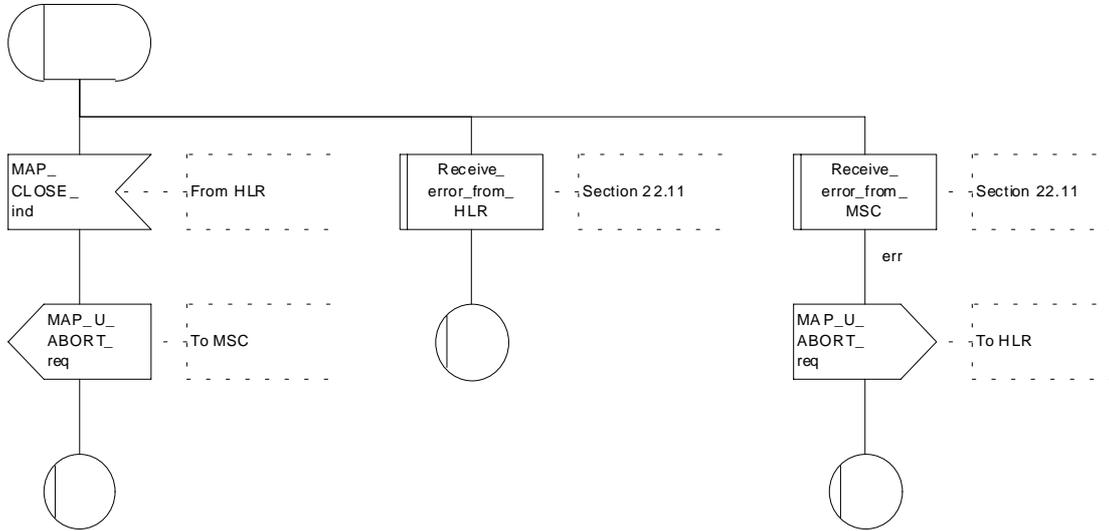


Figure 22.9.3/2: Macro Receive_Error_at_VLR

22.9.4 Procedures in the HLR

The initiation of the process is shown in subclause 22.1.3.

Once a MAP dialogue is established, the HLR may handle the MAP_PROCESS_UNSTRUCTURED_SS_REQUEST from the VLR. This message contains information input by the user. If the alphabet used for the message is understood then the message shall be fed to an application contained locally in the HLR. If the alphabet is not understood then the error "UnknownAlphabet" shall be returned.

The HLR may subsequently receive one or more requests from the application which correspond to the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY indications. These shall be sent transparently to the VLR. When a confirmation is received from the VLR this shall be returned to the application.

When the HLR receives the result of the original operation from the application then it shall pass this to the VLR and initiate release of the CM connection.

Message Destined for gsmSCF

If the message is destined for the gsmSCF then the HLR shall transfer the message transparently to the gsmSCF.

The HLR may subsequently receive one or more MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY indications from the gsmSCF. These shall be sent transparently to the VLR. When a confirmation is received from the VLR this shall be returned to the gsmSCF.

When the HLR receives a MAP_PROCESS_UNSTRUCTURED_SS_REQUEST confirmation from the gsmSCF then it shall pass this to the VLR and closes the MAP provider service.

Error Handling

Both the VLR, the USSD Application and the gsmSCF may initiate release of the MAP service at any time. This is handled as shown in the diagrams.

The procedure in the HLR is shown in figure 22.9.4/1.

Figure 22.9.4/1: Handling of mobile initiated USSD at HLR.

Arrows to left are to VLR unless otherwise stated.

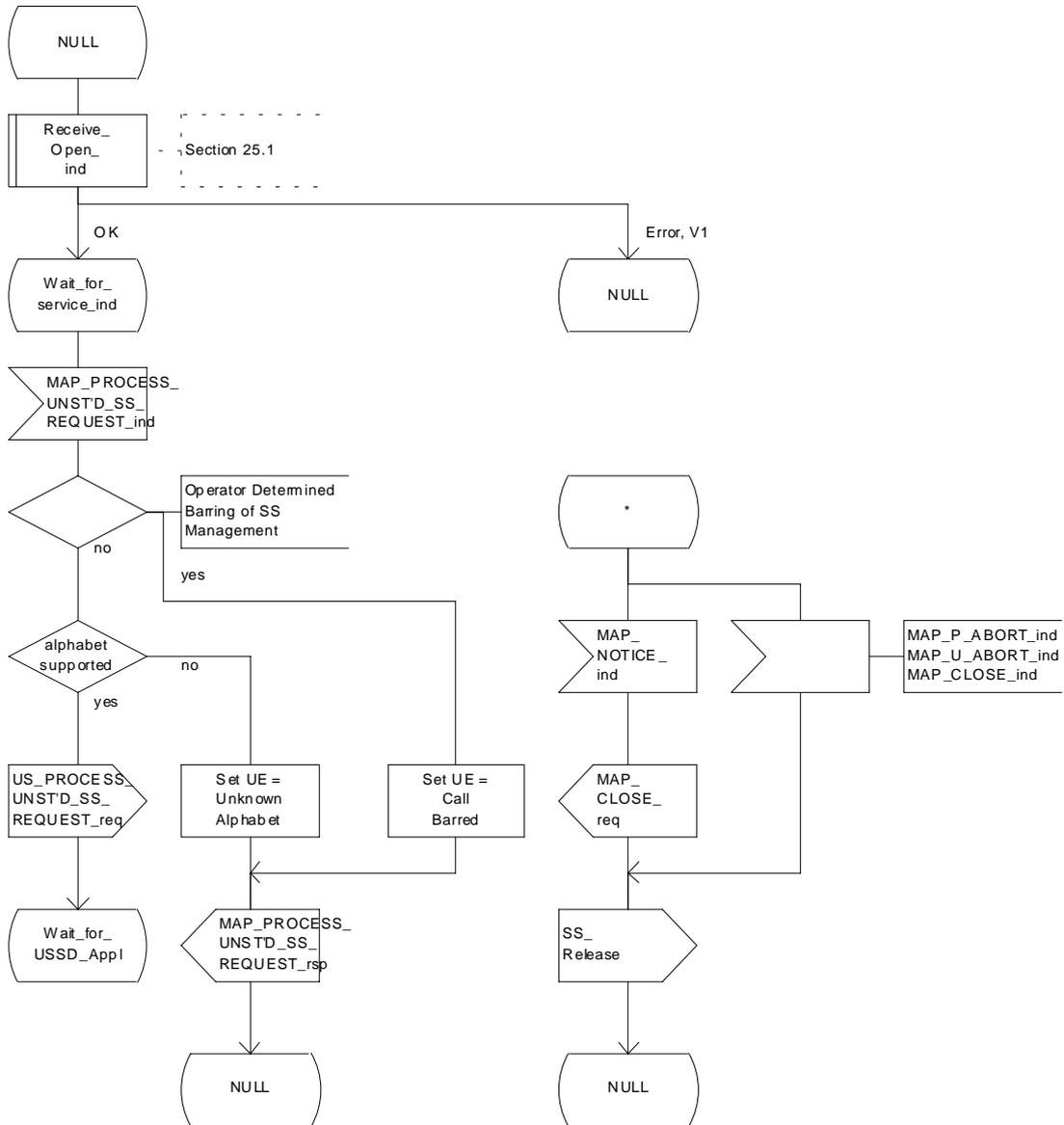


Figure 22.9.4/1 (sheet 1 of 2): Procedure MI_USSD_HLR

Figure 22.9.4/1: Handling of mobile initiated USSD at HLR.

Arrows to left are to VLR, arrows to right are to USSD application unless otherwise stated.

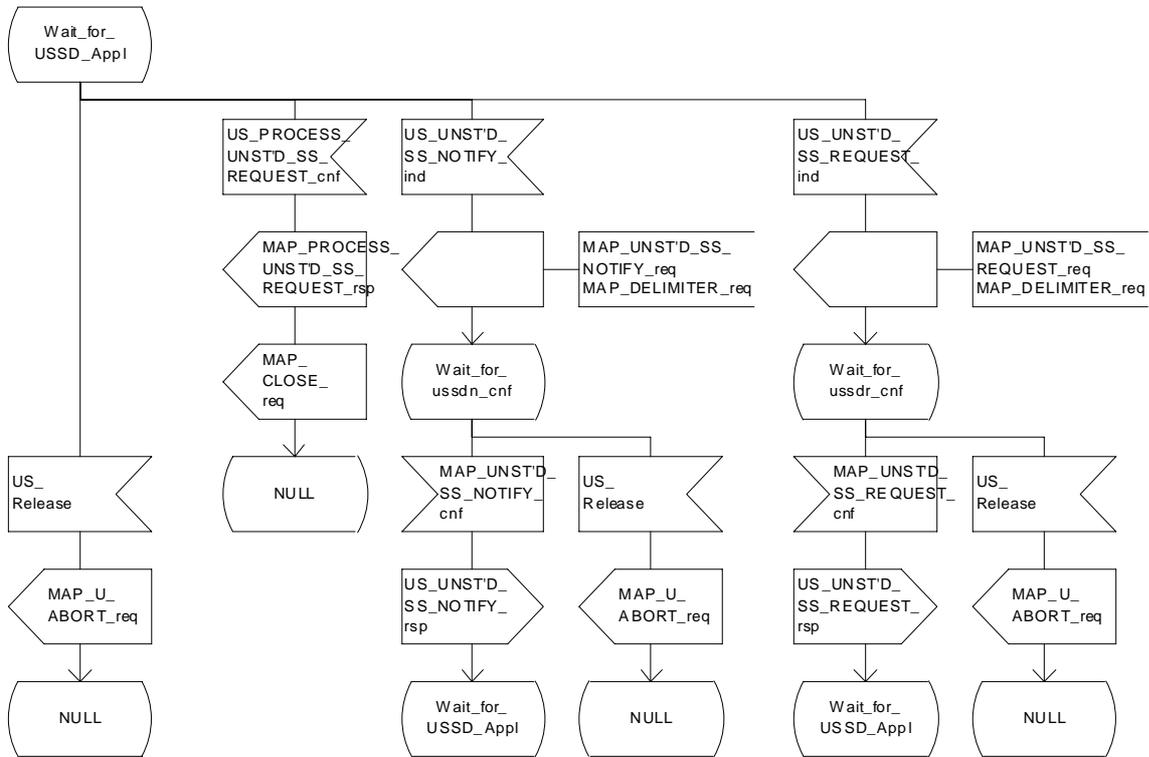


Figure 22.9.4/1 (sheet 2 of 2): Procedure MI_USSD_HLR

22.10 Network initiated USSD procedure

22.10.1 General

The procedure supports supplementary service signalling procedures which can allow PLMN specific services to be introduced.

The message flow for the procedure can be found in GSM 03.90.

The following services may be used:

MAP_PAGE	(defined in clauses 8 and 25);
MAP_SEARCH_FOR_MOBILE_SUBSCRIBER	(defined in clauses 8 and 25);
MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25).

At least one of the following services will certainly be used, and both may be used:

MAP_UNSTRUCTURED_SS_REQUEST	(defined in clause 11);
MAP_UNSTRUCTURED_SS_NOTIFY	(defined in clause 11).

22.10.2 Procedure in the MSC

The procedure may be invoked either by the VLR or by a USSD application local to the MSC. They may start by using either the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY service. If the request is initiated by a local USSD application then the MSC will open a dialogue with the HLR.

In both cases the MSC will initiate a CM connection to the MS (using the page or search macros defined in subclause 25.3). Once the connection is successfully established the message received from the VLR or USSD application will be sent to the MS using the mapping specified in GSM 09.11.

Following transfer of the message the MSC will wait for a confirmation from the MS. This will be sent to the VLR or USSD application as appropriate.

Following this, the MSC may receive further uses of the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY services, or may receive an indication to release the connection to the MS.

In the event of an error, the connection to the MS shall be released, and the MAP process with the VLR shall be aborted as shown in the diagram.

The procedure in the MSC is shown in figure 22.10.2/1.

Process NW_INIT_USSD_MSC

22.10.2_1.1(4)

Figure 22.10.2/1: Handling of network initiated USSD in MSC

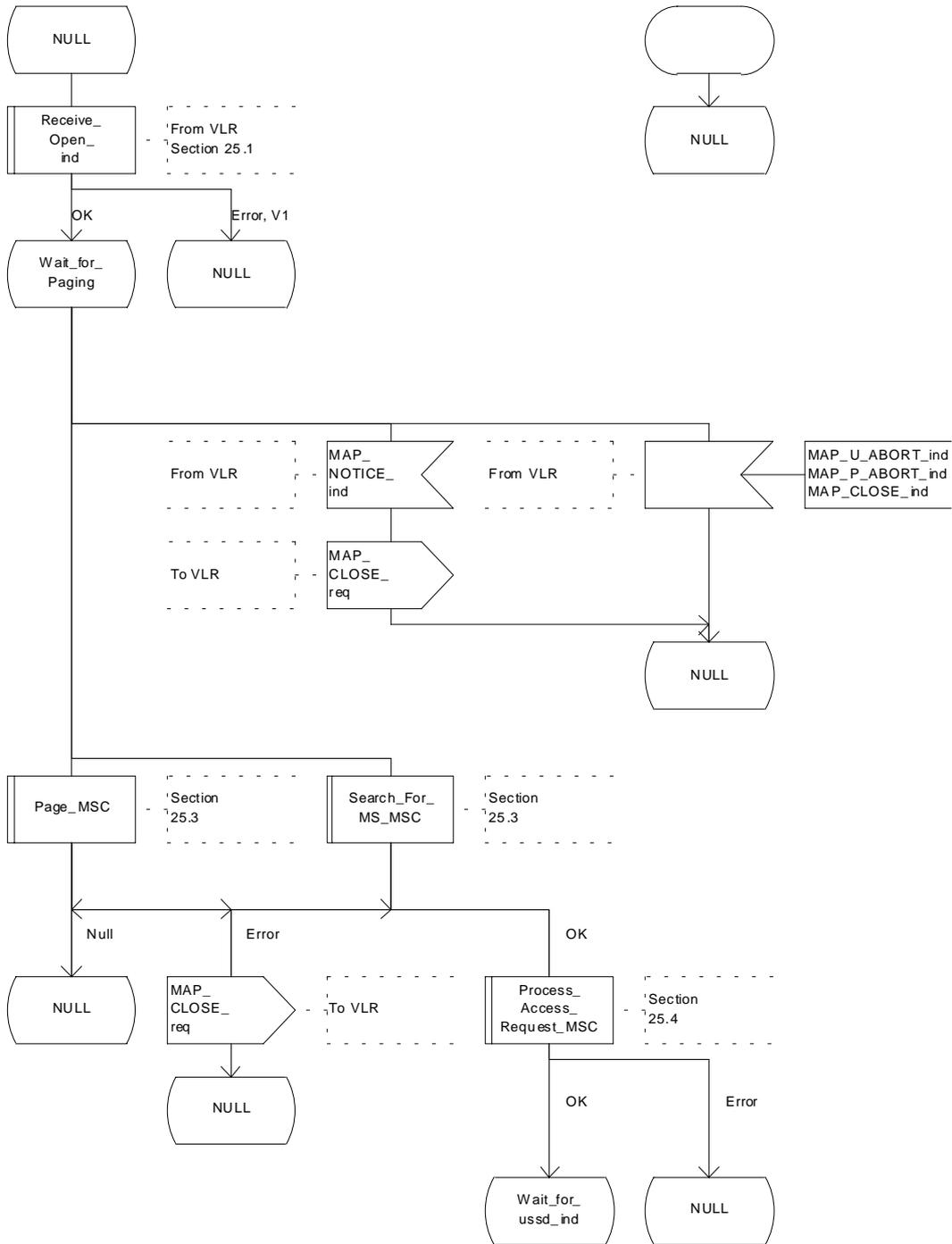


Figure 22.10.2/1 (sheet 1 of 4): Procedure NI_USSD_MSC

Figure 22.10.2/1: Handling of network initiated USSD in MSC

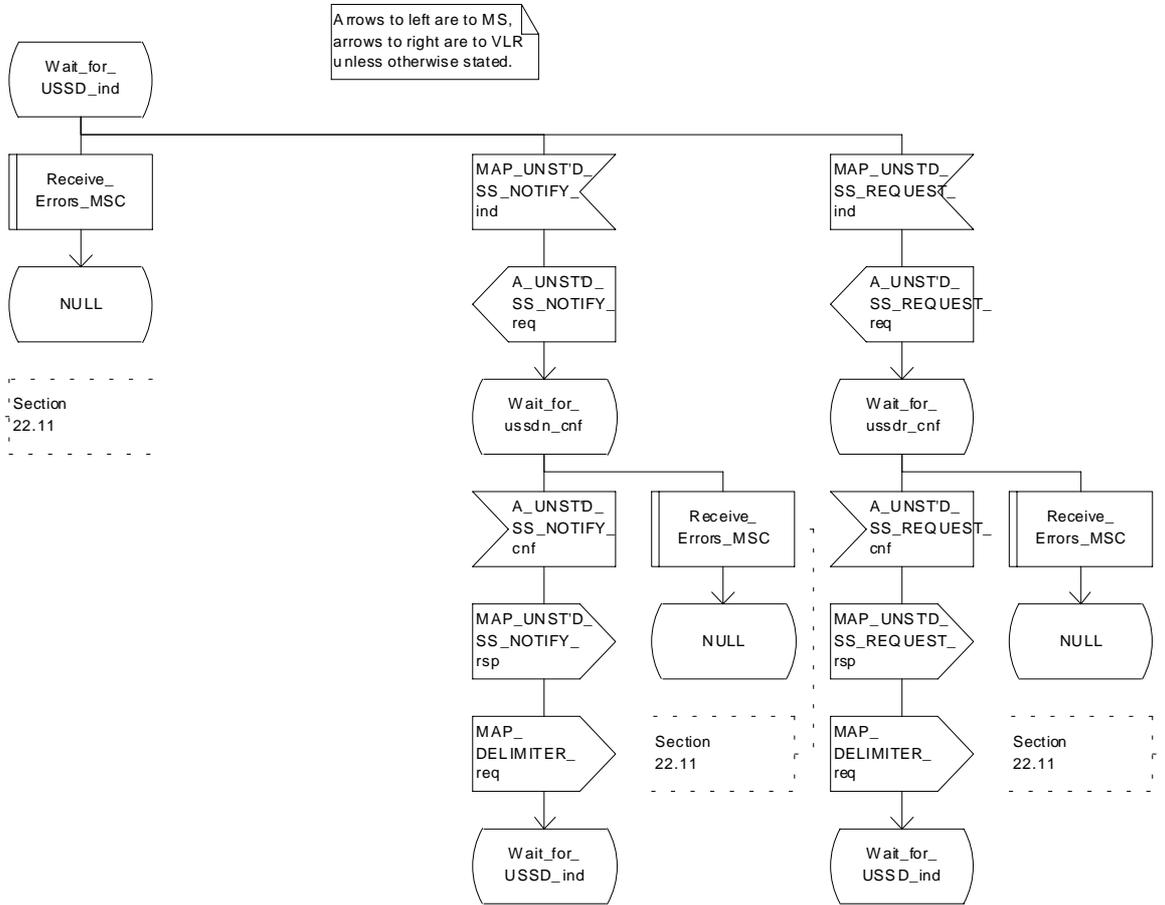


Figure 22.10.2/1 (sheet 2 of 4): Procedure NI_USSD_MSC

Figure 22.10.2/1: Handling of network initiated USSD in MSC

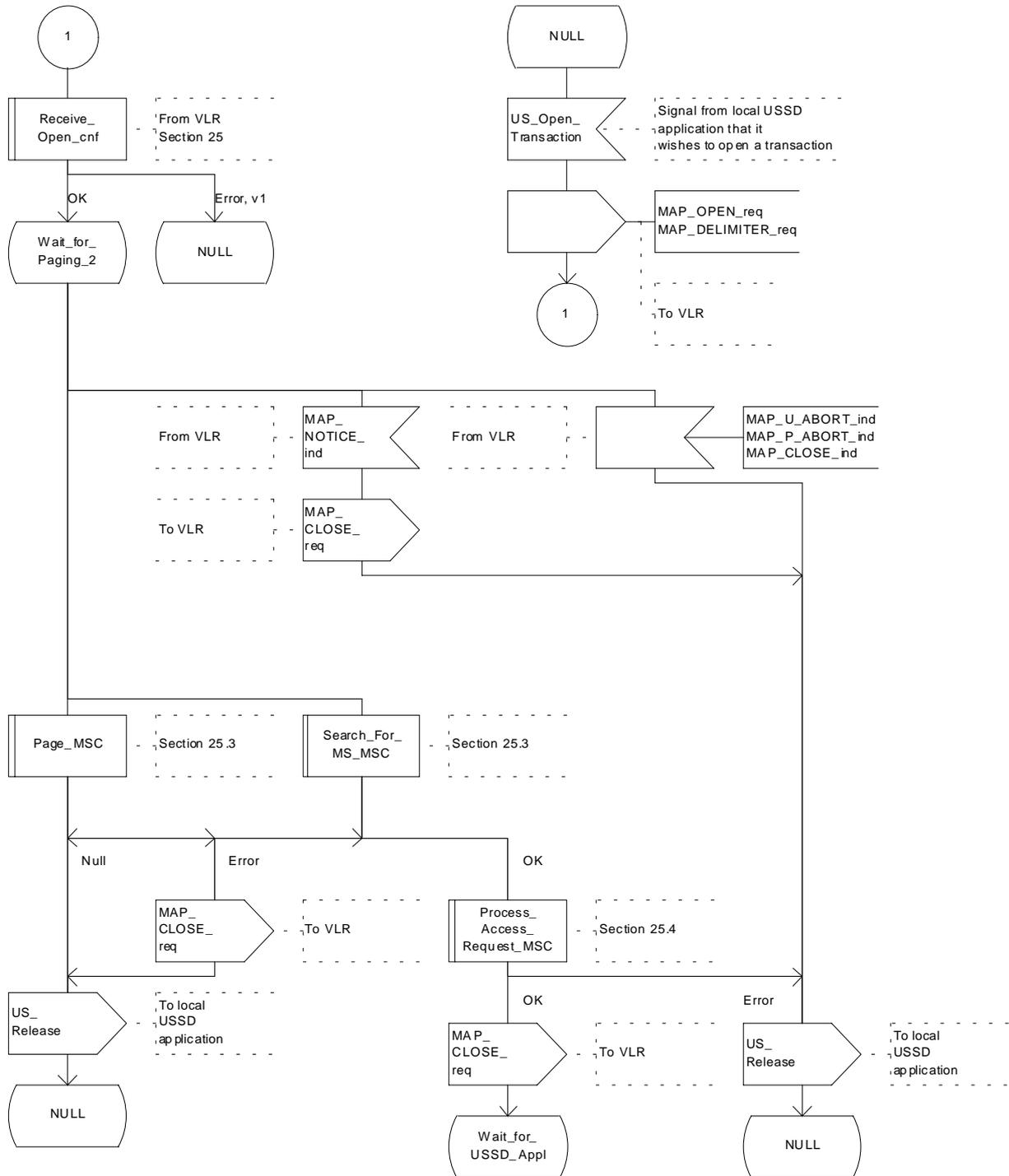


Figure 22.10.2/1 (sheet 3 of 4): Procedure NI_USSD_MSC

Figure 22.10.2/1: Handling of network initiated USSD in MSC



Figure 22.10.2/1 (sheet 4 of 4): Procedure NI_USSD_MSC

22.10.3 Procedure in the VLR

The procedure may be invoked either by the HLR or by a USSD application local to the VLR. They may start by using either the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY service.

In both cases the VLR will first initiate a MAP dialogue with the MSC. When the indication for the unstructured SS request or notify is received then the macro Start_USSD_VLR will be used to page the MS and open a CM connection. Once the CM connection is successfully established the indication received from the HLR or USSD application will be sent to the MSC.

Following transfer of the message the VLR will wait for a confirmation from the MSC. This will be sent to the HLR or USSD application as appropriate.

Following this, the VLR may receive further uses of the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY services, or may receive a MAP_CLOSE_ind.

In the event of an error, the MAP process with the MSC shall be released, and if necessary the MAP process with the HLR shall be aborted as shown in the diagram.

The procedure in the VLR is shown in figure 22.10.3/1.

MSC Initiated USSD

If a USSD application in the MSC wishes to use the network initiated USSD procedure, and a connection to the MS does not exist then it shall open a dialogue to the VLR. This dialogue will automatically lead to the VLR performing page and search using the macro Start_USSD_VLR.

Macro Start_USSD_VLR

This macro is used to initiate a CM connection with the MS for transfer of network initiated unstructured SS data.

It first checks for correct data in the VLR. If a problem is found then "Err" is returned.

A page or search procedure (as appropriate) will then be used to contact the MS. Following successful page or search the macro Process_Access_Request_VLR specified in subclause 25.4 will be used to handle the CM connection establishment.

The macro is shown in figure 22.10.3/2.

Figure 22.10.3/1: Handling of network initiated USSD at VLR

Arrows to left are to MSC, Arrows to right are to HLR unless otherwise stated.

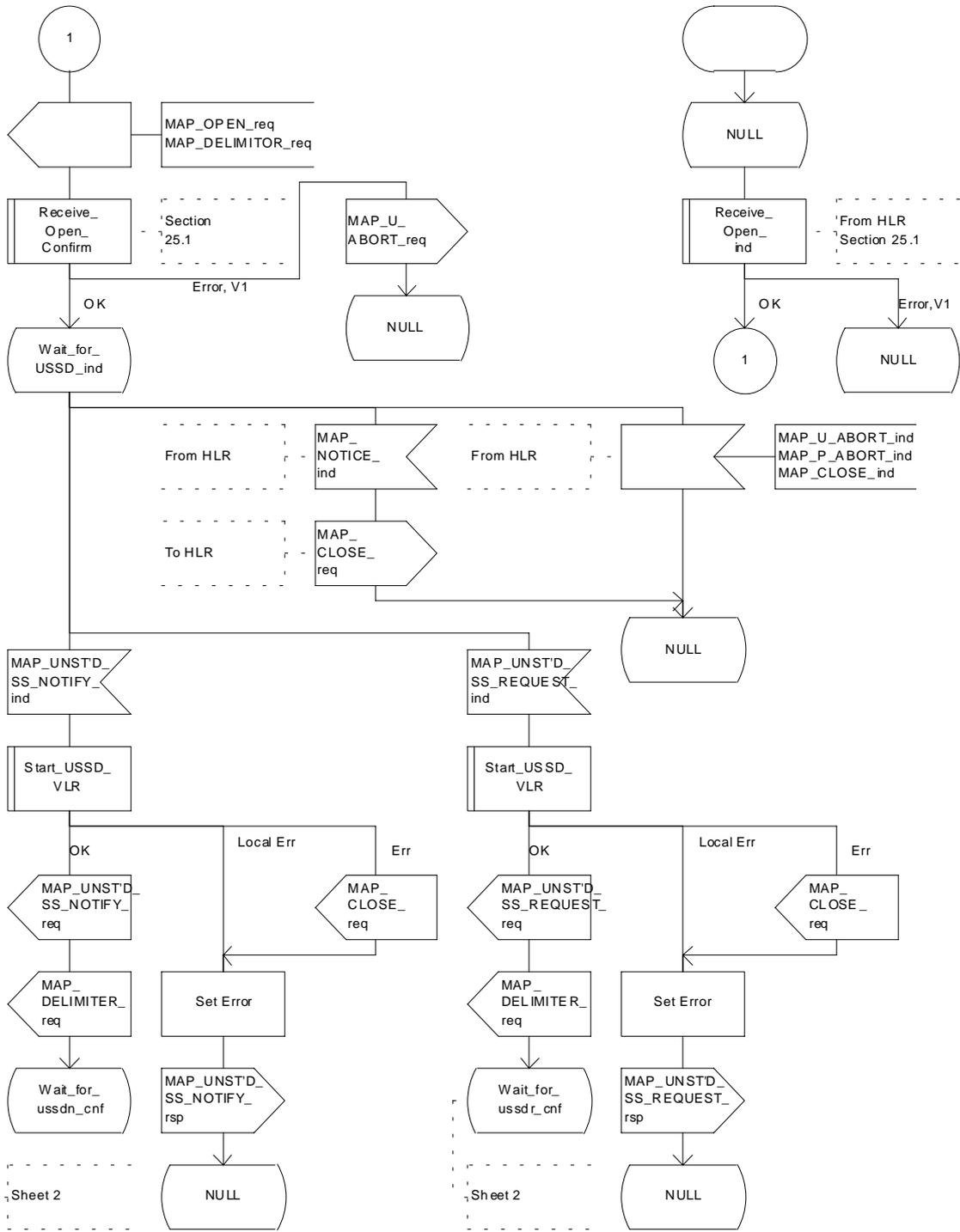


Figure 22.10.3/1 (sheet 1 of 4): Procedure NI_USSD_VLR

Figure 22.10.3/1: Handling of network initiated USSD at VLR

Arrows to left are to MSC, arrows to right are to HLR unless otherwise stated.

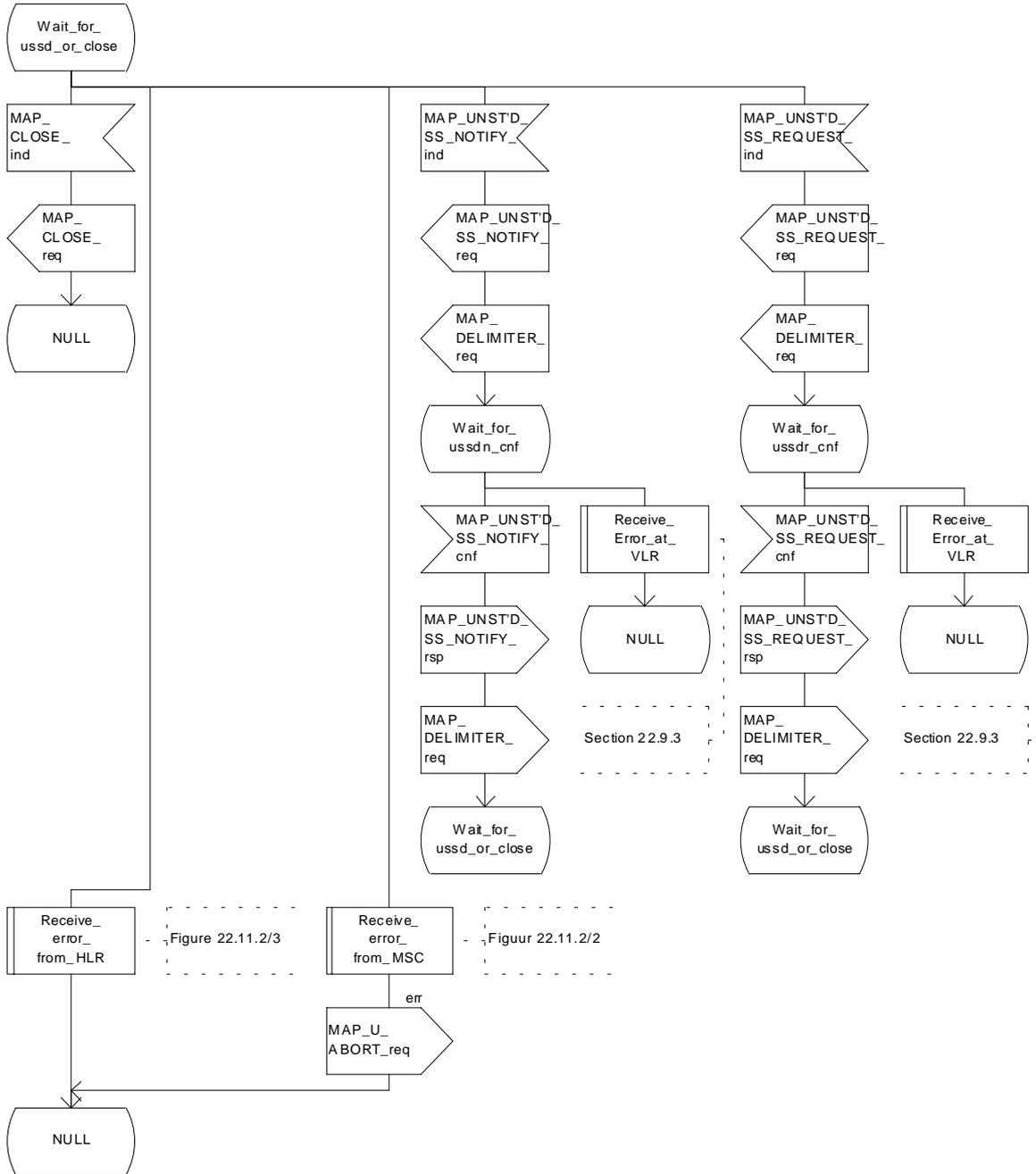


Figure 22.10.3/1 (sheet 2 of 4): Procedure NI_USSD_VLR

Figure 22.10.3/1: Handling of network initiated USSD at VLR

Arrows to left are to MSC, arrows to right are to USSD application unless otherwise stated.

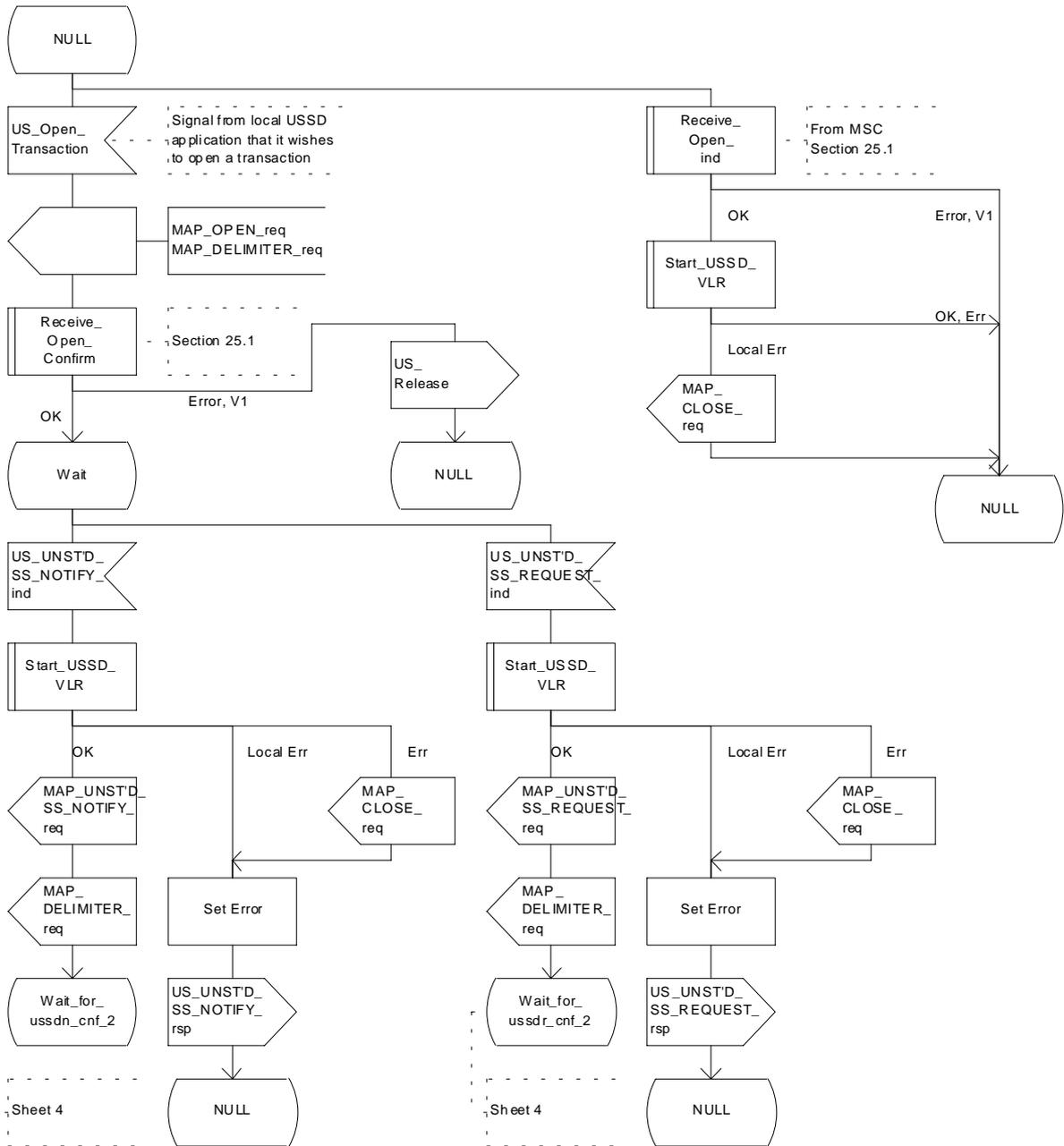


Figure 22.10.3/1 (sheet 3 of 4): Procedure NI_USSD_VLR

Figure 22.10.3/1: Handling of network initiated USSD at VLR

Arrows to left are to MSC, arrows to right are to USSD application unless otherwise stated.

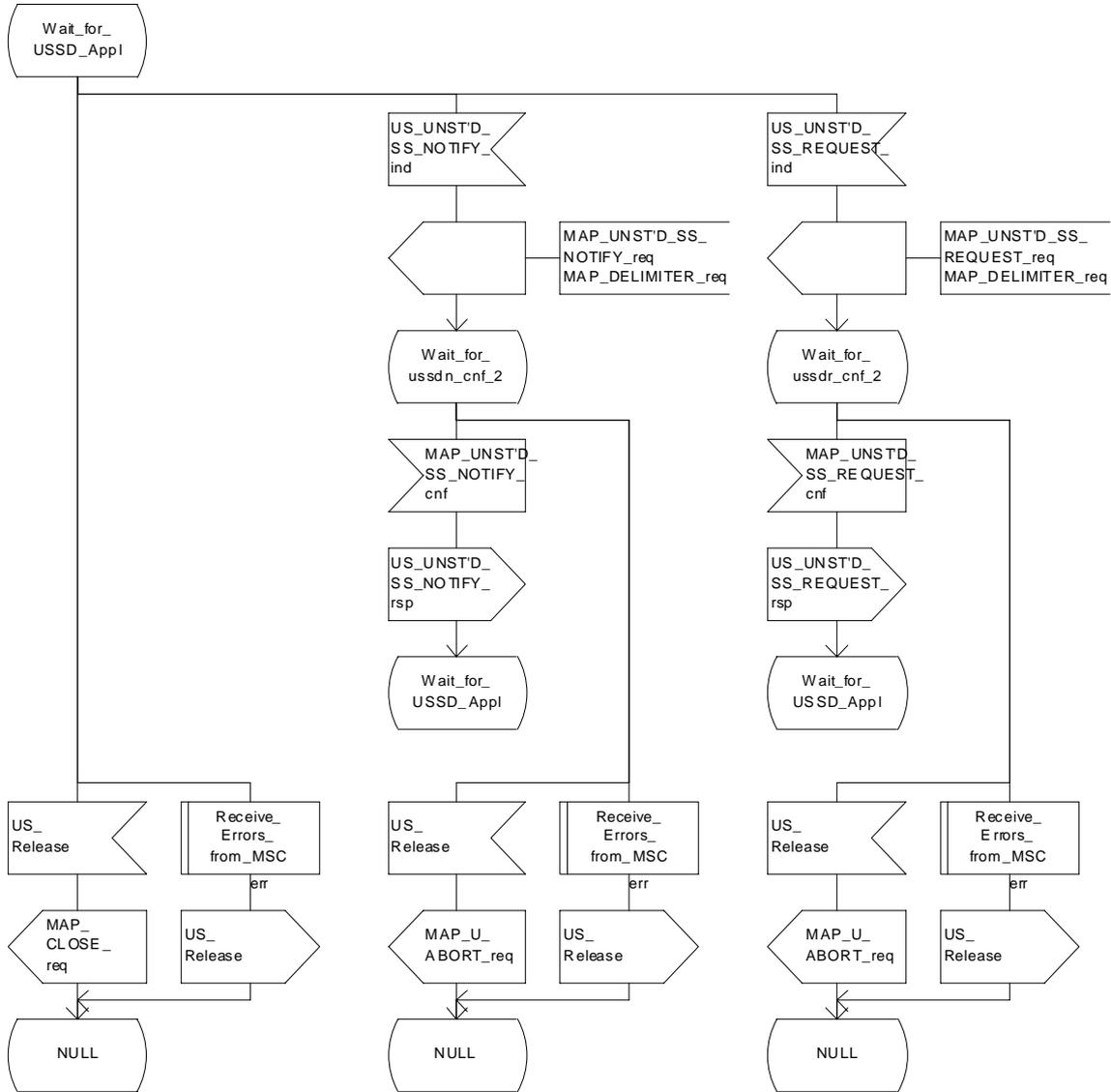


Figure 22.10.3/1 (sheet 4 of 4): Procedure NI_USSD_VLR

Figure 22.10.3/2: Macro to establish a connection to the MS for a network initiated USSD operation.

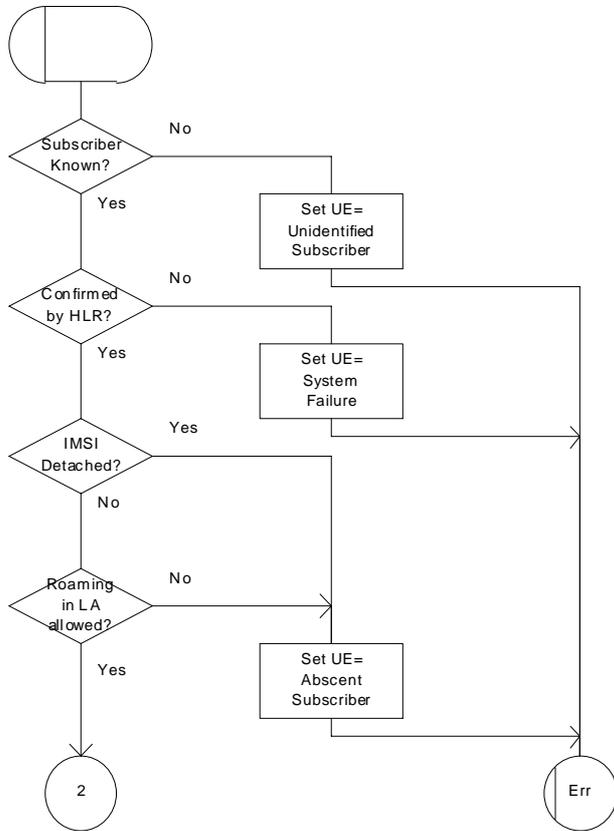


Figure 22.10.3/2 (sheet 1 of 2): Macro Start_USSD_VLR

Figure 22.10.3/2: Macro to establish a connection to the MS for a network initiated USSD operation.

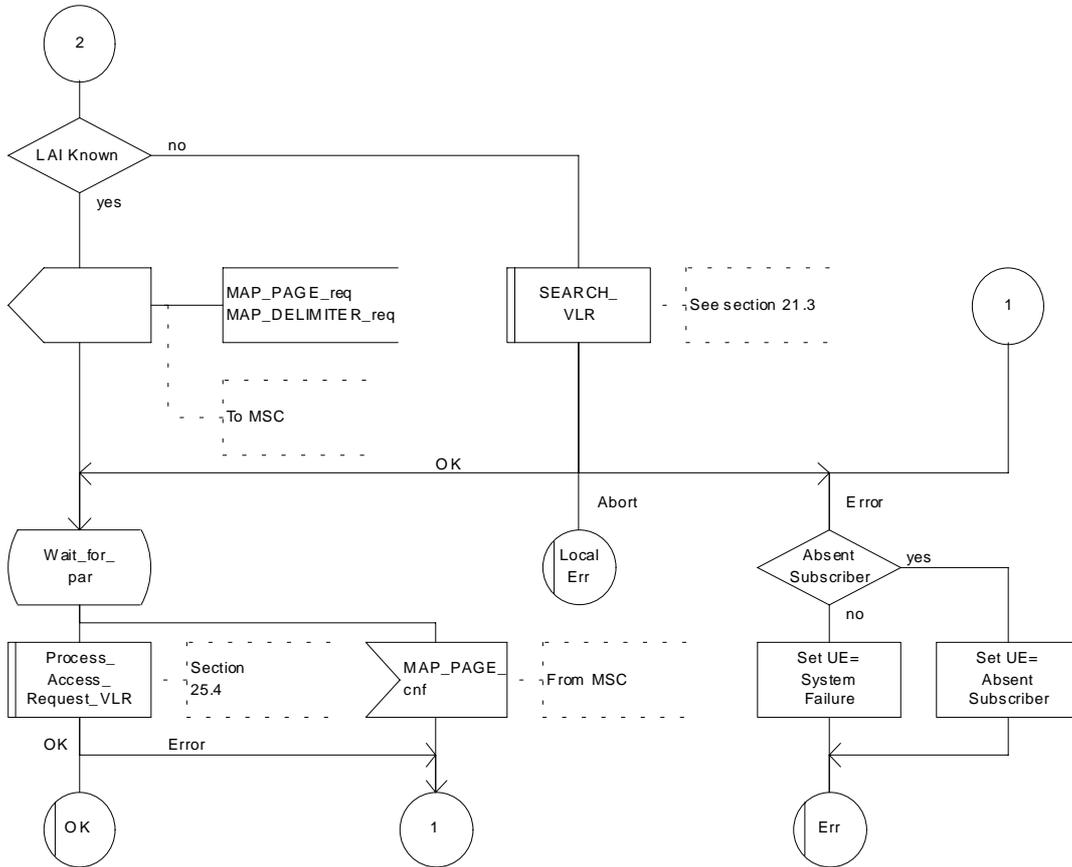


Figure 22.10.3/2 (sheet 2 of 2): Macro Start_USSD_VLR

22.10.4 Procedure in the HLR

The procedure may be invoked by the USSD application local to the HLR. It may start by using either the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY service.

In both cases the HLR will first check whether the MS is reachable (i.e. there is a VLR identity stored in the subscriber record, the MS record is not marked as purged and the MS record is not marked "MSC Area Restricted").

If the MS is reachable, the HLR will initiate a MAP dialogue with the VLR. Once the dialogue is successfully established the message received from the USSD application will be sent to the MSC.

Following transfer of the message the HLR will wait for a confirmation from the MSC. This will be sent to the USSD application.

Following this, the HLR may receive further uses of the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY services, or may receive a MAP_CLOSE_ind.

In the event of an error, the MAP process with the VLR shall be released as shown in the diagram.

Message Originated by gsmSCF

If the message is originated by the gsmSCF then the HLR shall transfer the message transparently to the VLR.

The HLR may subsequently receive one or more MAP_UNSTRUCTURED_SS_REQUEST_ind or MAP_UNSTRUCTURED_SS_NOTIFY_ind indications from the VLR. These shall be sent transparently to the gsmSCF. When a confirmation is received from the gsmSCF this shall be returned to the VLR.

When the HLR receives a MAP_CLOSE_ind from the gsmSCF then it shall pass this to the VLR and close the MAP dialogue.

The procedure in the HLR is shown in figure 22.10.4/1.

Figure 22.10.4/1 Handling of network initiated USSD at HLR

Arrows to left are to VLR, arrows to right are to USSD application unless otherwise stated.

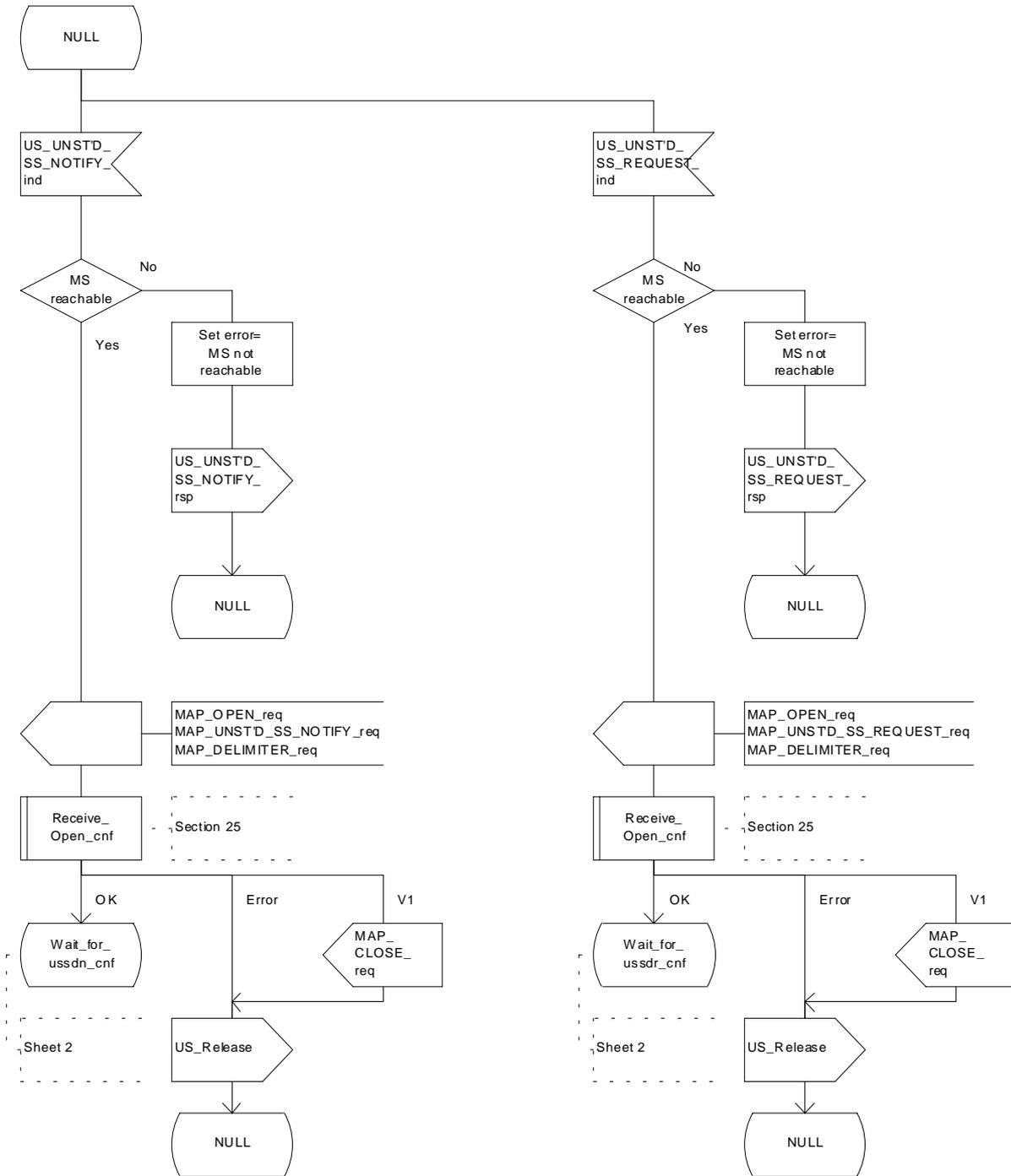


Figure 22.10.4/1 (sheet 1 of 2): Procedure NI_USSD_HLR

Figure 22.10.4/1 Handling of network initiated USSD at HLR

Arrows to left are to VLR, arrows to right are to USSD application unless otherwise stated.

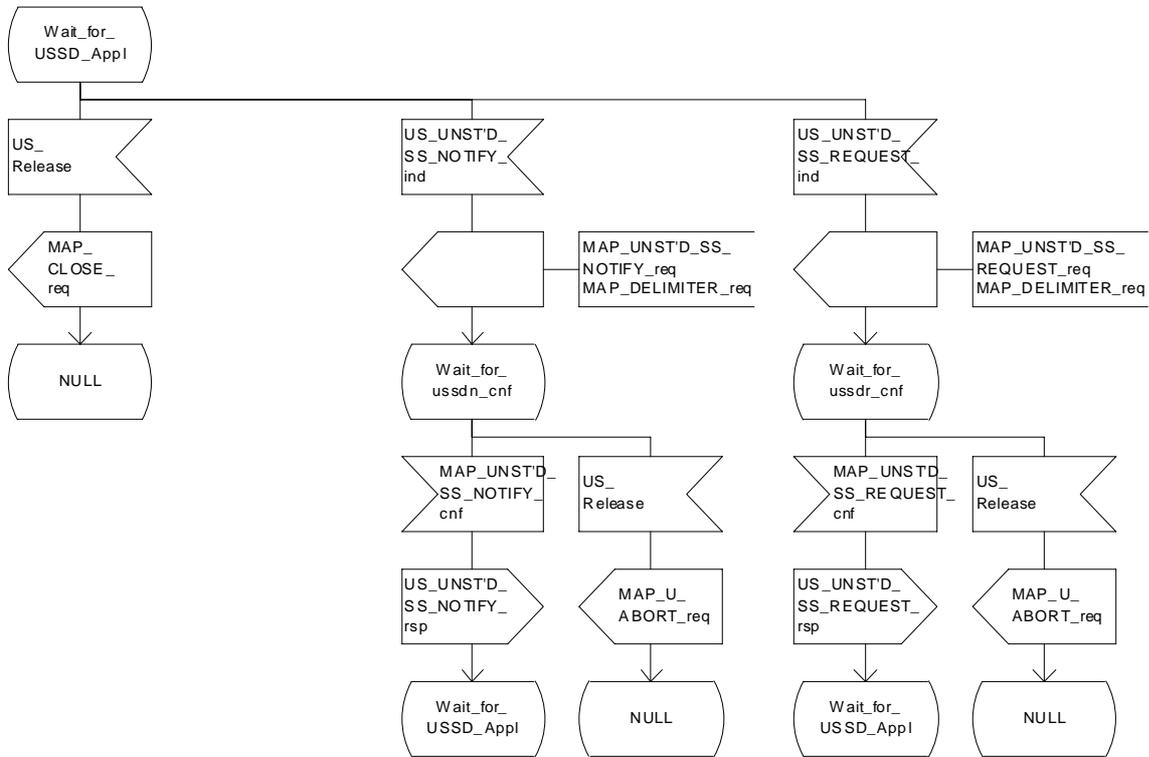


Figure 22.10.4/1 (sheet 2 of 2): Procedure NI_USSD_HLR

22.11 Common macros for clause 22

The following macros are used for the description of more than one of the supplementary service processes described in clause 22:

22.11.1 SS Password handling macros

Macro Get_Password_MSC

This macro is used by the MSC to relay a request for password from the VLR to the MS, and to relay a response from the MS back to the VLR. The macro is described in figure 22.11.1/1.

Macro Get_Password_VLR

This macro is used by the VLR to relay a request for password from the HLR to the MSC, and to relay a response from the MSC back to the HLR. The macro is described in figure 22.11.1/2.

Macrodefinition GET_PASSWORD_MSC

22.11.1_1(1)

Figure 22.11.1/1: Macro which relays a GetPassword request from the VLR to the MS and relays the GetPassword response from the MS to the VLR

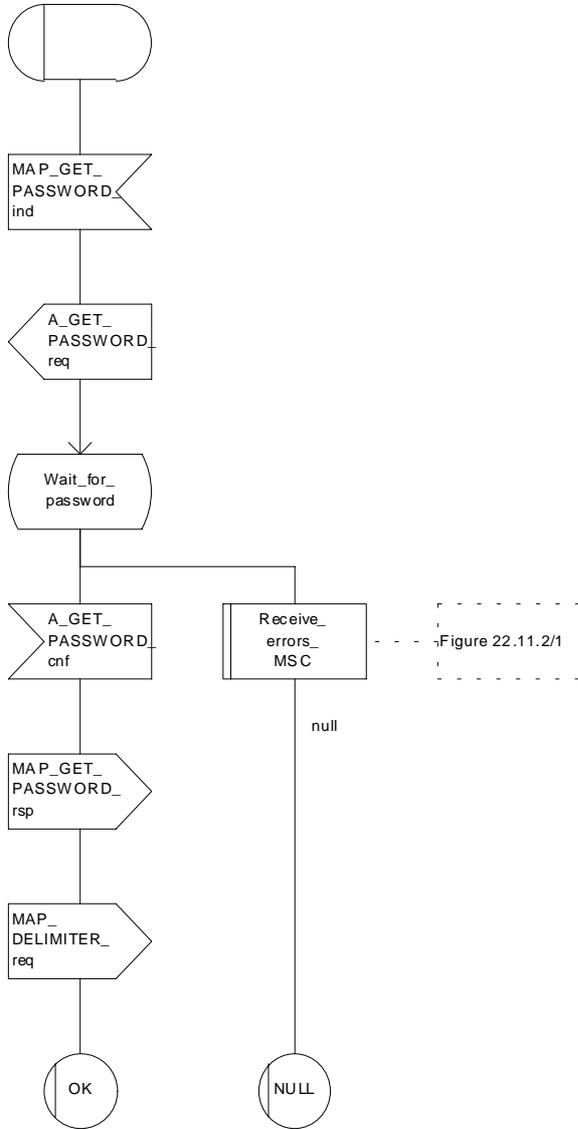


Figure 22.11.1/1: Macro Get_PW_MSC

Macrodefinition GET_PASSWORD_VLR

22.11.1_2(1)

Figure 22.11.1/2: Macro which relay a GetPassword request from the HLR to the VLR and relays the GetPassword response from the VLR to the HLR

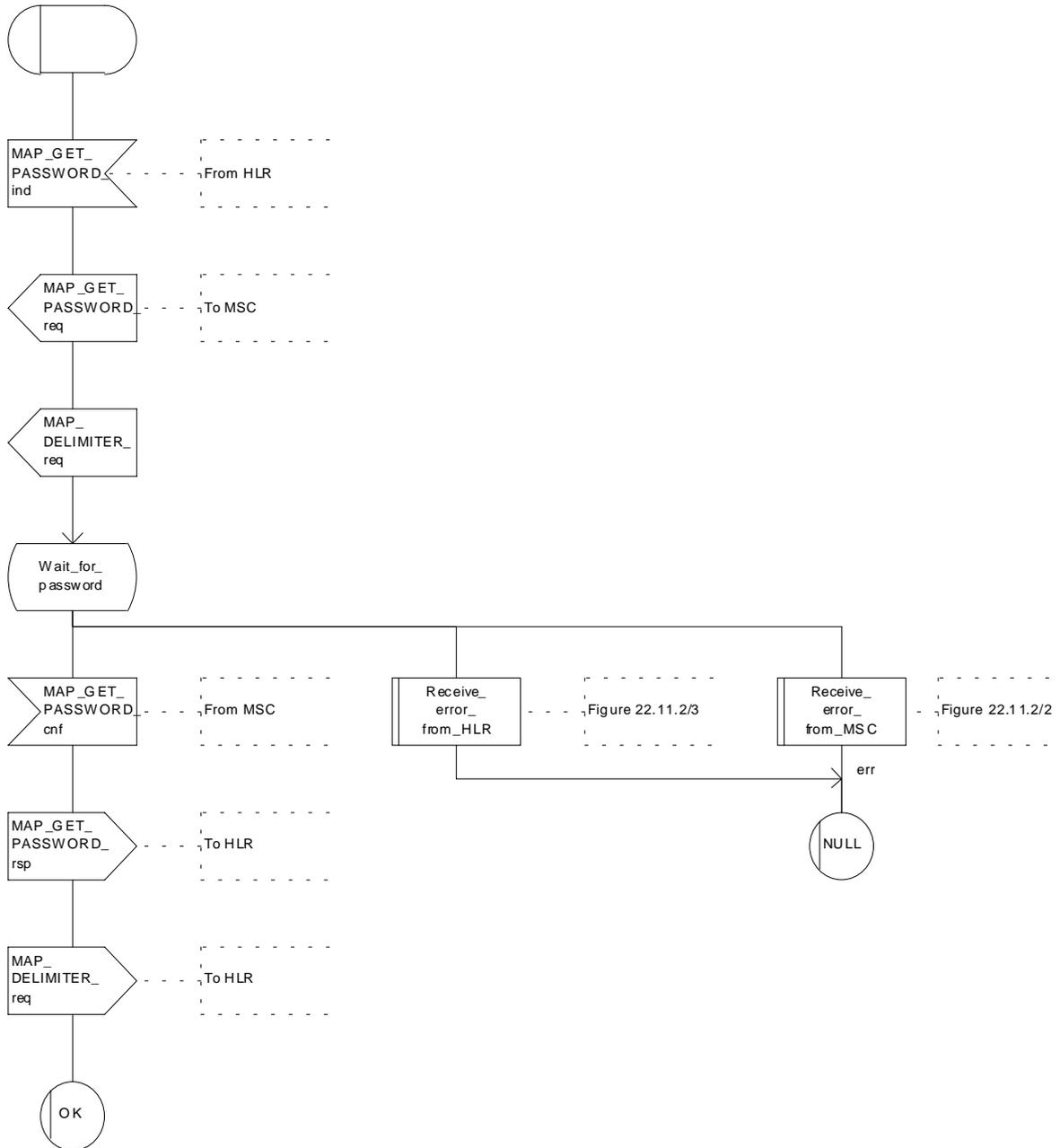


Figure 22.11.1/2: Macro Get_PW_VLR

22.11.2 SS Error handling macros

Macro Receive_errors_MSC

This macro is used by the MSC to receive signals which should lead to failure if received in any state of a supplementary service process. If the air interface connection is released by the MS, the communication towards the VLR is aborted, and the MSC should return to a stable "NULL" state. If a MAP_NOTICE indication is received from the VLR, or the VLR aborts or unexpectedly closes the connection, then the air interface connection shall be released. The macro is described in figure 22.11.2/1.

Macro Receive_error_from_MSC

This macro is used by the VLR to receive signals from the MSC which should lead to failure if received in any state of a supplementary service process. If a MAP_NOTICE indication is received from the MSC, that connection is closed before the only outcome of the macro, "err" is reported back to the calling process. The macro is described in figure 22.11.2/2.

Macro Receive_error_from_HLR

This macro is used by the VLR to receive signals from the HLR which should lead to failure if received in any state of a supplementary service process. If a MAP_NOTICE indication is received from the MSC, that connection is closed. The macro is described in figure 22.11.2/3.

Macrodefinition Receive_errors_MSC

22.11.2_1(1)

Figure 22.11.2/1: Macro which handles possible error situations while the MSC is waiting for a confirmation of a supplementary service request to the VLR

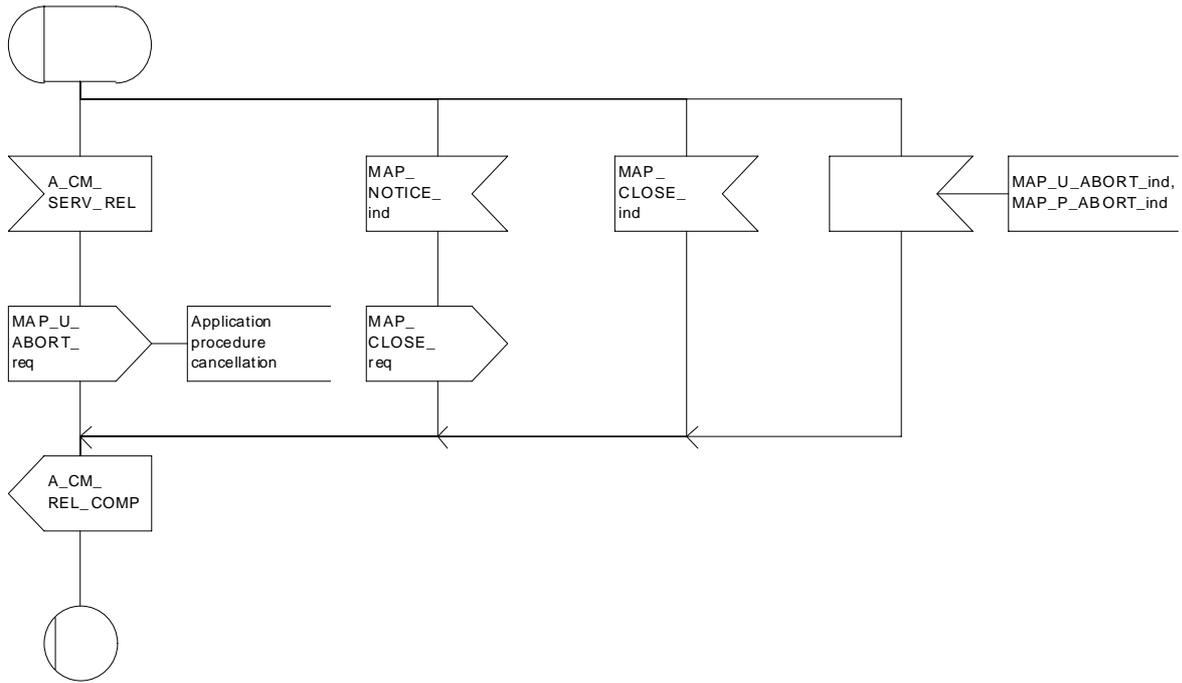


Figure 22.11.2/1: Macro Receive_Errors_MSC

Figure 22.11.2/2: Macro to receive errors from the MSC during supplementary services procedures in the VLR

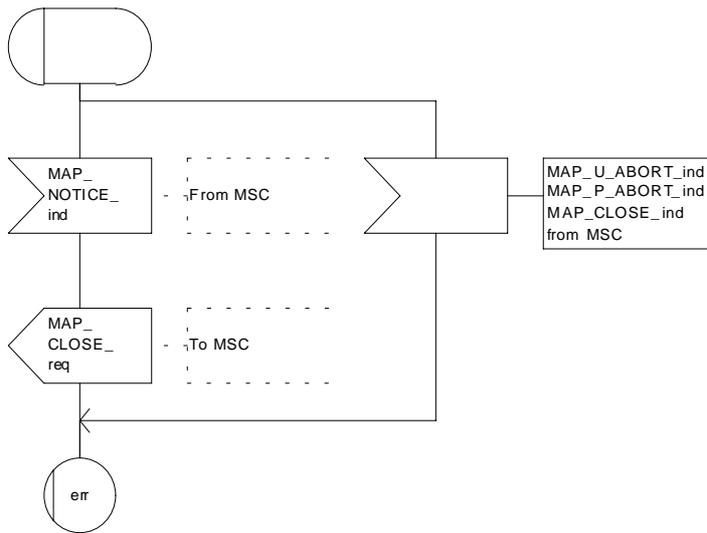


Figure 22.11.2/2: Macro Receive_Error_from_MSC

Macrodefinition Receive_error_from_HLR

22.11.2_3(1)

Figure 22.11.2/3: Macro to receive errors from the HLR while the VLR is waiting for a confirmation of a supplementary service request sent to the HLR

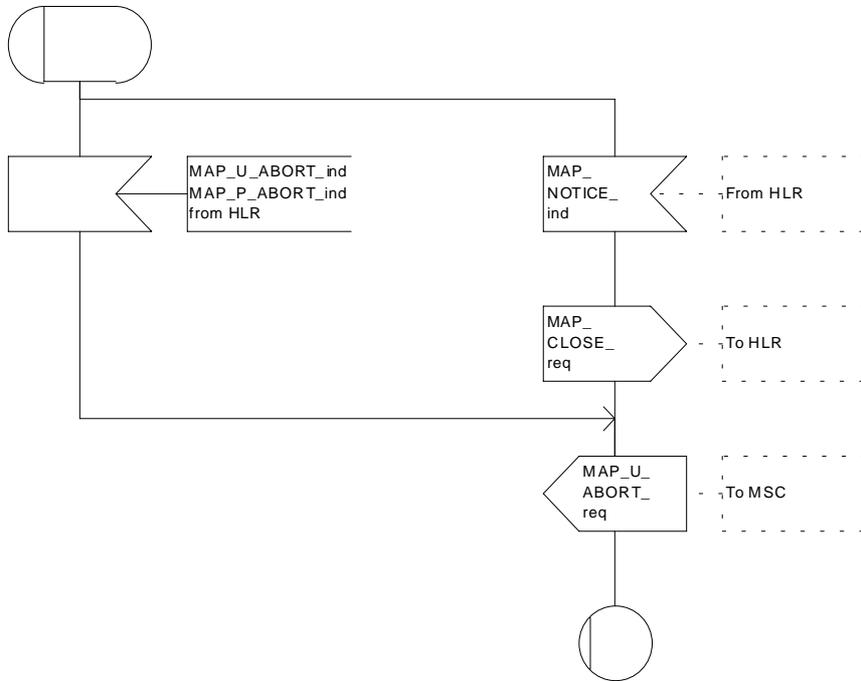


Figure 22.11.2/3: Macro Receive_Errors_HLR

22.12 Supplementary Service Invocation Notification procedure

22.12.1 General

The Supplementary Service Invocation Notification procedure is used to notify a gsmSCF about the invocation of a GSM Supplementary Service.

The password registration procedure is shown in figure 22.12.1/1.

The following services may be used:



(1) MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION (MSC to gsmSCF)

(2) MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION-ACK (gsmSCF to MSC)

MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION (defined in clauses 8 and 25);

Figure 22.12.1/1: Interfaces and services for supplementary service invocation notification

22.12.2 Procedures in the MSC

The supplementary service invocation notification procedure in the MSC is triggered when the requested supplementary service is invoked at the MSC. The MSC notifies the gsmSCF of a supplementary service invocation the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION service. This is sent in a TCAP TC-BEGIN primitive. The MSC then awaits a positive or negative acknowledgement from the gsmSCF to the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION. This is received in a TCAP TC-END primitive, and upon receipt the relationship between the MSC and the gsmSCF is terminated. Similarly, the relationship is terminated at the MSC by the sending from or receipt of a TCAP P-ABORT primitive. This is illustrated in Figure 22.12.2.

Process SS_Invocation_Notify_MSC

SSIN_M1(1)

Process in the MSC to notify the gsmSCF that the user has invoked a supplementary service (CD, ECT or MPTY)

Signals to/from the left are to/from the SS handler in the MSC
signals to/from the right are to/from the gsmSCF

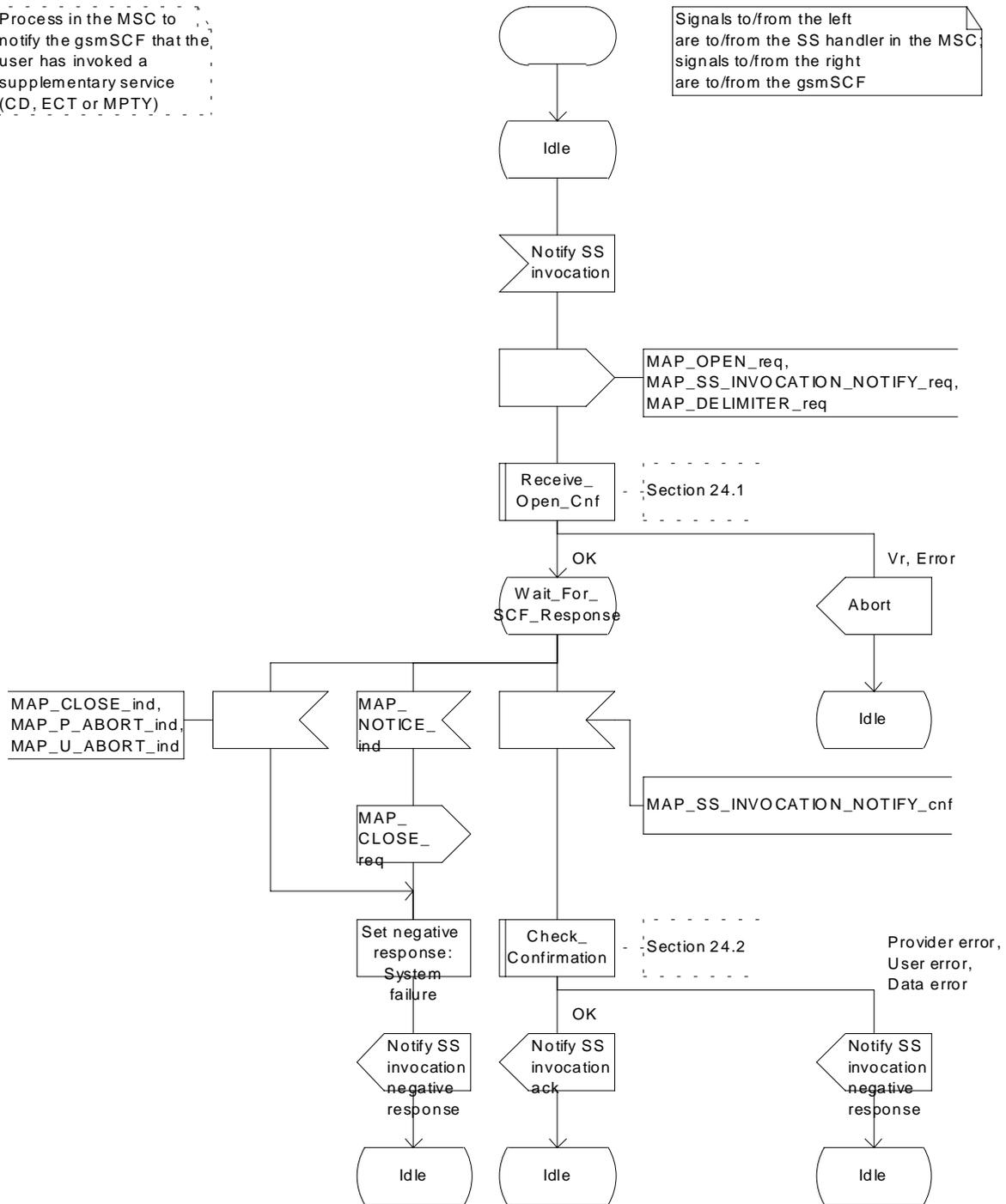


Figure 22.12.2 Process SS_Invocation_Notify_MSC (sheet 1 of 1)

22.12.3 Procedures in the gsmSCF

Upon receiving notification of the supplementary service invocation via the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION service, the gsmSCF analyses the received information. If the gsmSCF understands the information sent via the the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION service then it returns a positive acknowledgement to the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION, indicating the success of the service. This is returned in a TCAP TC-END primitive, using the basic end procedure.

Otherwise, a negative acknowledgement to the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION is returned. This is also returned in a TCAP TC-END primitive, again using the basic end procedure. The gsmSCF TCAP service may also choose to abort the relationship to the MSC by sending a TCAP P-ABORT primitive. It will immediately terminate processing of a MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION should a TCAP P-ABORT primitive be received from the MSC. This is illustrated in Figure 22.12.3.

Process in the gsmSCF to receive a notification that an SS (CD, ECT or MPT) has been invoked

Signals to/from the left are to/from the VMSC; signals to/from the right are to/from the service logic in the gsmSCF

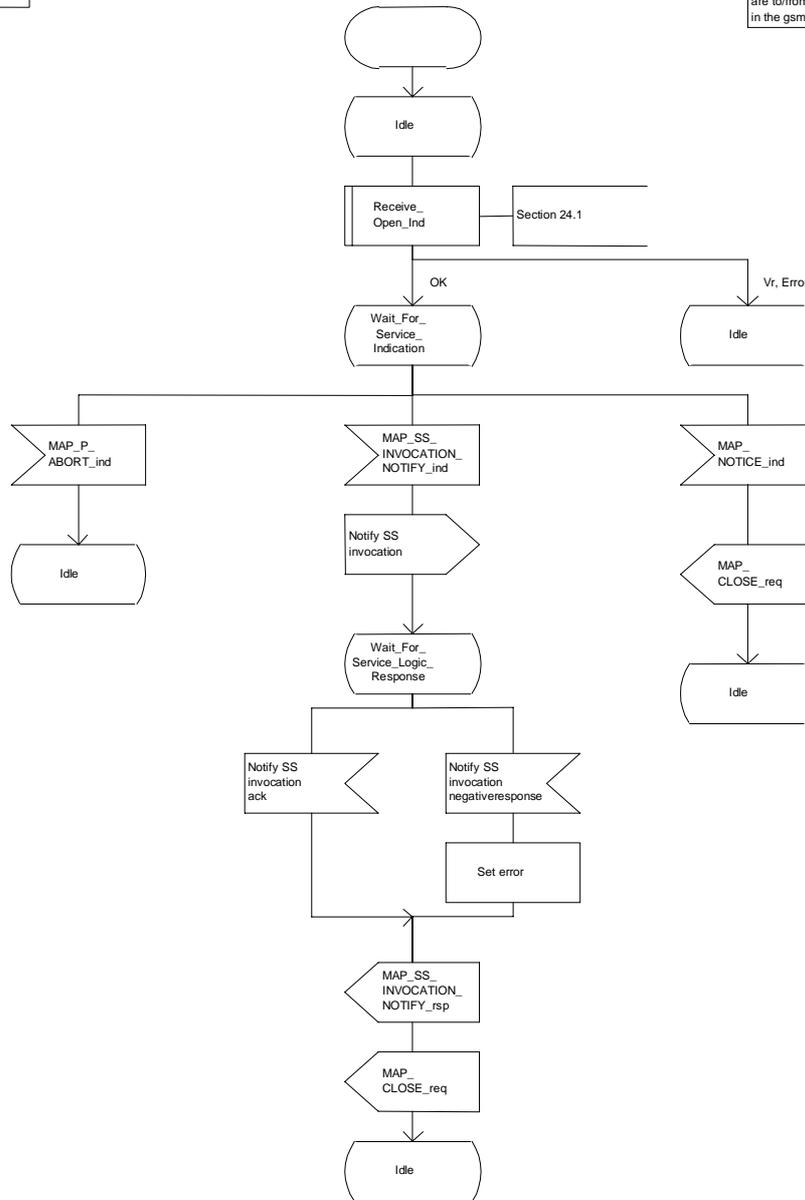


Figure 22.12.3 Process SS_Invocation_Notify_gsmSCF (sheet 1 of 1)

22.13 Activation of a CCBS request

22.13.1 General

The message flow to activate a CCBS request is shown in figure 22.13.1/1.

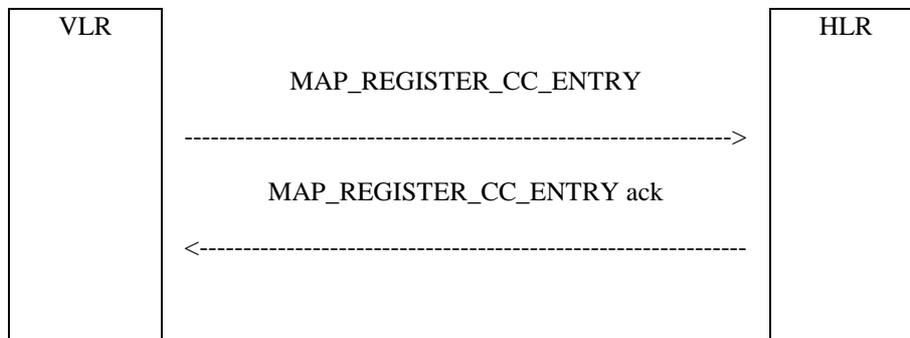


Figure 22.13.1/1: Message flow to activate a CCBS request

22.13.2 Procedure in the VLR

The MAP process in the VLR to activate a CCBS request is shown in figure 22.13.2/1. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

- Receive_Open_Cnf see subclause 25.1.2;
- Check_Confirmation see subclause 25.2.2;

Successful Outcome

When the MAP process receives a CCBS Request message from the CCBS application process in the VLR, it requests a dialogue with the HLR whose identity is contained in the request by sending a MAP_OPEN service request and the necessary information in a MAP_REGISTER_CC_ENTRY service request. The VLR then invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_REGISTER_CC_ENTRY service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a CCBS Request Ack message containing the information received from the HLR to the CCBS application process in the VLR and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a CCBS Request Negative response message to the CCBS application process in the VLR and returns to the idle state.

Error in MAP_REGISTER_CC_ENTRY confirm

If the MAP_REGISTER_CC_ENTRY service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a CCBS Request Negative response message to the CCBS application process in the VLR and returns to the idle state.

Abort of HLR dialogue

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication. In this case, the MAP process sends a CCBS Request negative response to the CCBS application process in the VLR and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR, sends a CCBS Request negative response indicating system failure to the CCBS application process in the VLR and returns to the idle state.

Figure 22.13.2/1: Process in the VLR to register a CC entry in the HLR

Signals to/from the left are to/from the CCBS application process in the VLR; signals to/from the right are to/from the HLR

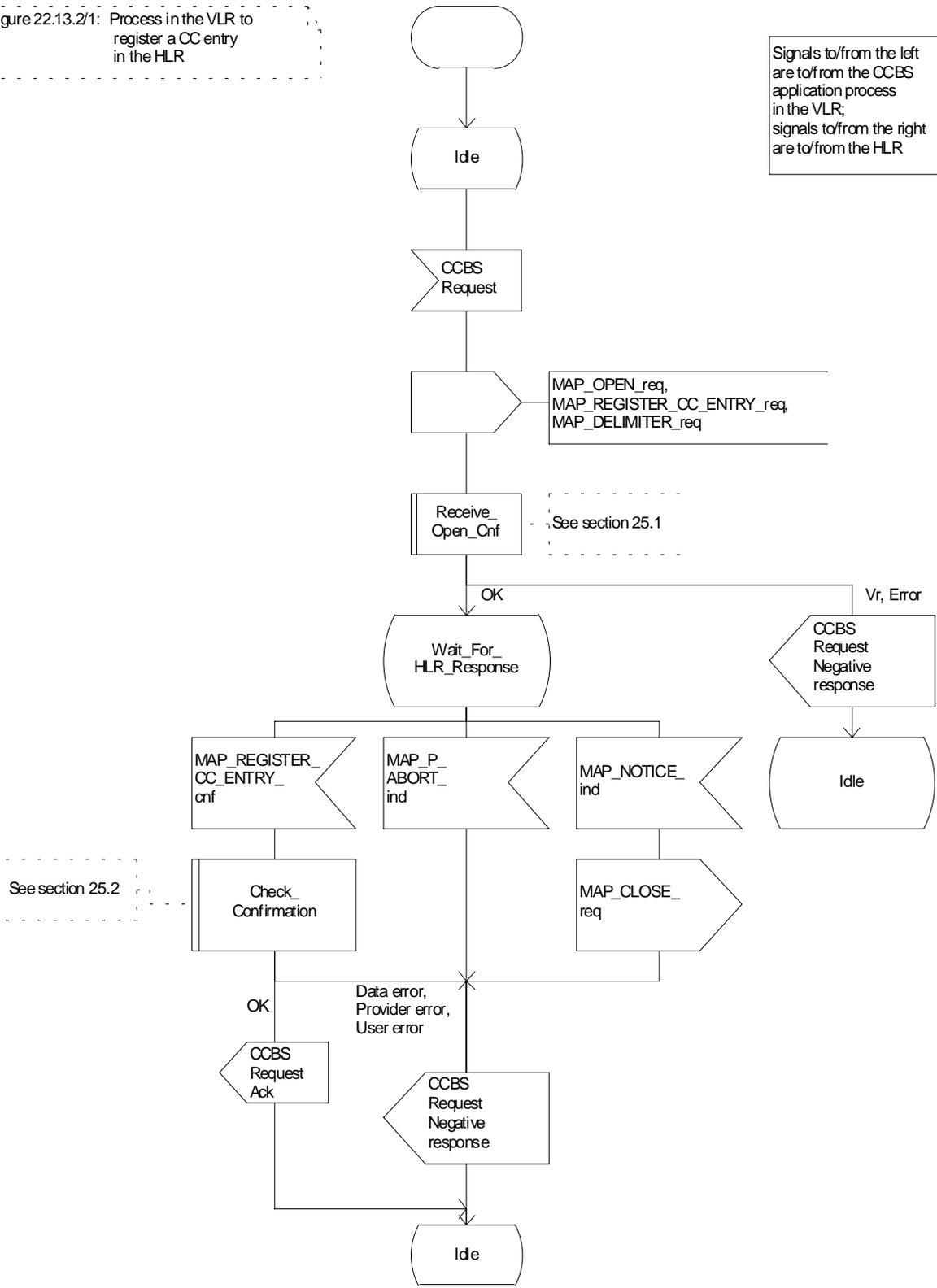


Figure 22.13.2/1: Process Register_CC_Entry_VLR

22.13.3 Procedure in the HLR

Successful outcome

When the MAP process receives a MAP_REGISTER_CC_ENTRY_indication from the co-ordinating process, it sends a CCBS Request message to the CCBS application process in the HLR, and waits for a response. The request contains the parameters received in the MAP_REGISTER_CC_ENTRY service indication.

If the CCBS application process in the HLR returns a positive response, the MAP process constructs a MAP_REGISTER_CC_ENTRY service response, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.

Negative response from HLR CCBS application process

If the CCBS application process in the HLR returns a negative response, the MAP process constructs a MAP_REGISTER_CC_ENTRY service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.

Process Register_CC_Entry_HLR

22.13.3_1(1)

Figure 22.13.3/1: Process in the HLR to handle a request to register a CC entry

Signals to/from the left are to/from the VLR via the coordinating process; signals to/from the right are to/from the CCBS application process in the HLR

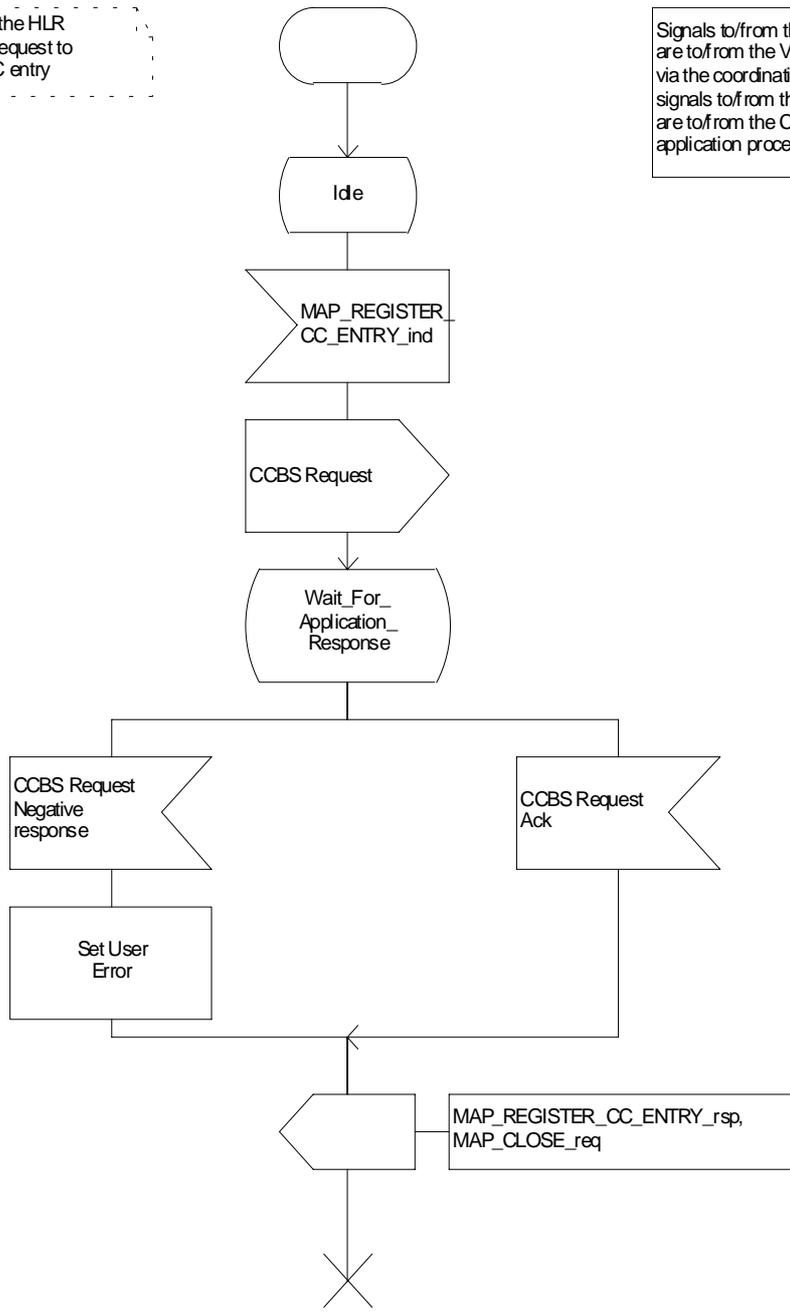


Figure 22.13.3/1: Process Register_CC_Entry_HLR

22.14 Deactivation of a CCBS request

22.14.1 General

The message flow to deactivate a CCBS request is shown in figure 22.14.1/1.

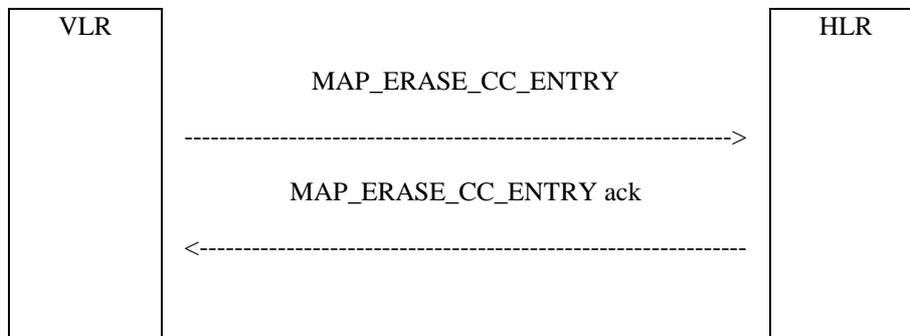


Figure 22.14.1/1: Message flow to deactivate a CCBS request

22.14.2 Procedure in the VLR

The MAP process in the VLR to deactivate a CCBS request is shown in figure 22.14.2/1. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see subclause 25.1.2;
Check_Confirmation	see subclause 25.2.2;

Successful Outcome

When the MAP process receives a Deactivate CCBS message from the CCBS application process in the VLR, it requests a dialogue with the HLR whose identity is contained in the request by sending a MAP_OPEN service request and the necessary information in a MAP_ERASE_CC_ENTRY service request. The VLR then invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_ERASE_CC_ENTRY service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Deactivate CCBS Ack message containing the information received from the HLR to the CCBS application process in the VLR and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a Deactivate CCBS Negative response message to the CCBS application process in the VLR and returns to the idle state.

Error in MAP_ERASE_CC_ENTRY confirm

If the MAP_ERASE_CC_ENTRY service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Deactivate CCBS Negative response message to the CCBS application process in the VLR and returns to the idle state.

Abort of HLR dialogue

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication. In this case, the MAP process sends a Deactivate CCBS negative response to the CCBS application process in the VLR and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR, sends a Deactivate CCBS negative response indicating system failure to the CCBS application process in the VLR and returns to the idle state.

Process Erase_CC_Entry_VLR

22.14.2_1(1)

Figure 22.14.2/1: Process in the VLR to erase a CC entry in the HLR

Signals to/from the left are to/from the CCBS application process in the VLR; signals to/from the right are to/from the HLR

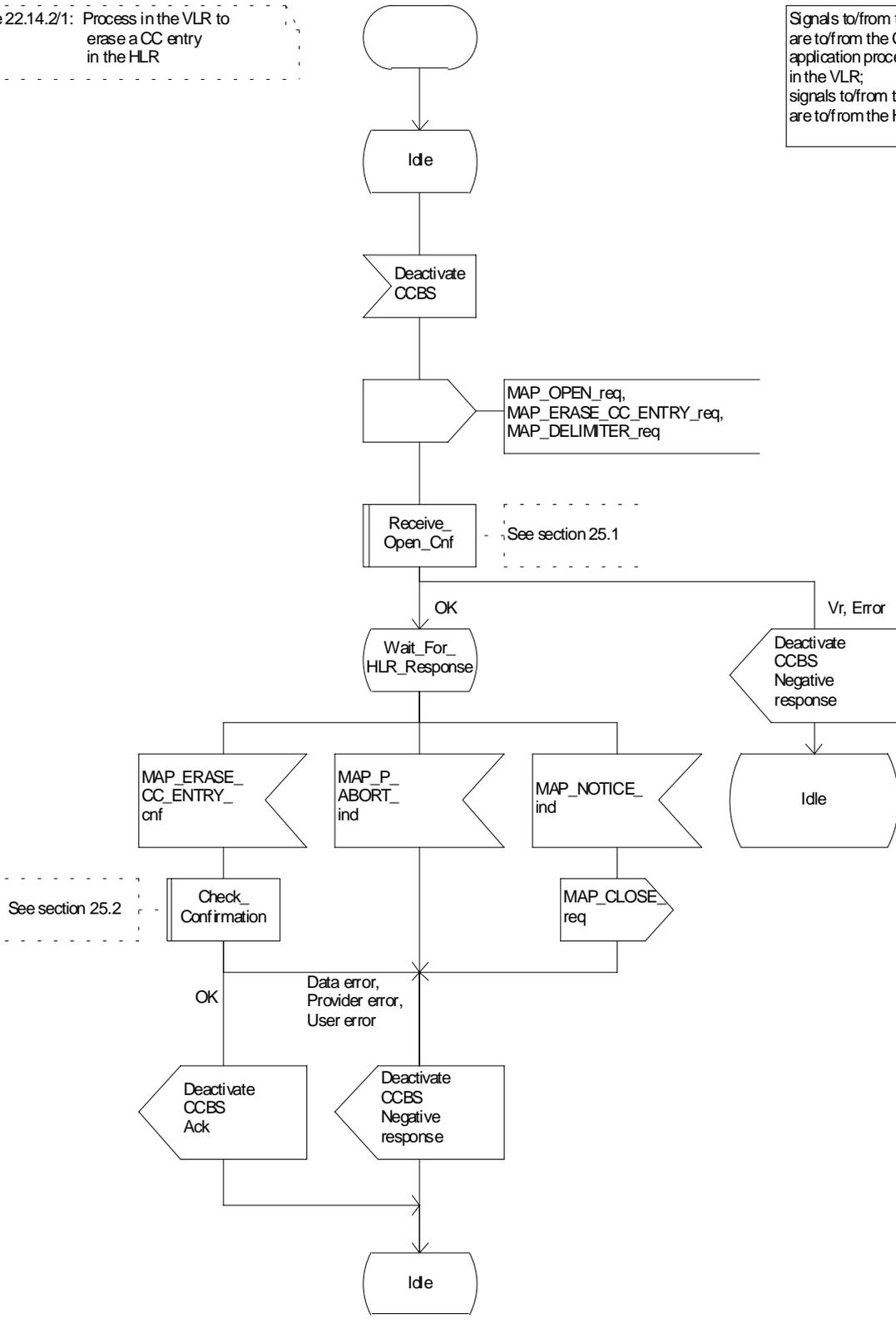


Figure 22.14.2/1: Process Erase_CC_Entry_VLR

22.14.3 Procedure in the HLR

Successful outcome

When the MAP process receives a MAP_ERASE_CC_ENTRY_indication from the co-ordinating process, it sends a Deactivate CCBS message to the CCBS application process in the HLR, and waits for a response. The message contains the parameters received in the MAP_ERASE_CC_ENTRY service indication.

If the CCBS application process in the HLR returns a positive response, the MAP process constructs a MAP_ERASE_CC_ENTRY service response, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.

Negative response from HLR CCBS application process

If the CCBS application process in the HLR returns a negative response, the MAP process constructs a MAP_ERASE_CC_ENTRY service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.

Process Erase_CC_Entry_HLR

22.14.3_1(1)

Figure 22.14.3/1: Process in the HLR to handle a request to erase a CC entry

Signals to/from the left are to/from the VLR via the coordinating process; signals to/from the right are to/from the CCBS application process in the HLR

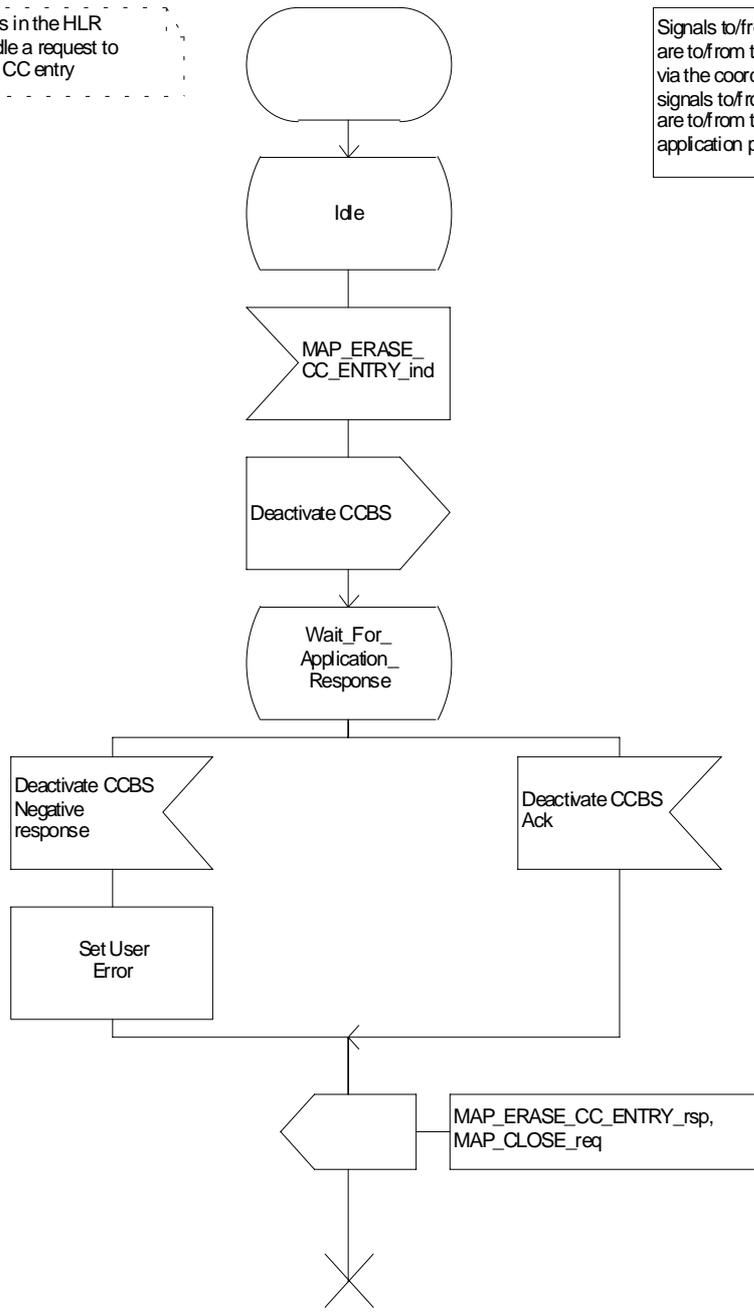


Figure 22.14.3/1: Process Erase_CC_Entry_HLR

23 Short message service procedures

23.1 General

The short message service procedures are used to control both mobile originated and mobile terminated short message transfer.

Four procedures exist for short message services:

- mobile originated short message service transfer;
- mobile terminated short message service transfer;
- short message alert procedure;
- short message waiting data set procedure.

The following application context refers to a complex MAP user consisting of several processes:

- shortMessageGatewayContext.

This application context needs a co-ordinating process in the HLR. Additionally a Co-ordinator has to be defined for the mobile originated situation in the MSC, because the A_CM_SERV_REQ message does not distinguish between mobile originated short message transfer and the short message alert procedures.

NOTE: A_CM_SERV_REQ message is not used for SMS over GPRS.

23.1.1 Mobile originated short message service Co-ordinator for the MSC

The A_CM_SERV_REQ message (GSM 04.08) is received from the A-interface containing the CM service type. This parameter indicates mobile originated short message service. The service MAP_PROCESS_ACCESS_REQUEST is started.

If the MAP_PROCESS_ACCESS_REQUEST service ends successfully, the MS initiates mobile originated short message transfer or alerting indication. Depending on the situation, the appropriate process is initiated as follows:

- if the A_RP_MO_DATA indication is received, the process MOSM_MSC is initiated (see subclause 23.2.1);
- if the A_RP_SM_MEMORY_AVAILABLE indication is received, the process SC_Alert_MSC is initiated (see subclause 23.4.1).

After creation of the user process the Co-ordinator relays the messages between the A-interface and the invoked process until a request or an indication for dialogue termination is received.

The SMS process Co-ordinator is shown in the figure 23.1/1.

Figure 23.1/1: The SMS co-ordinating process in the MSC.

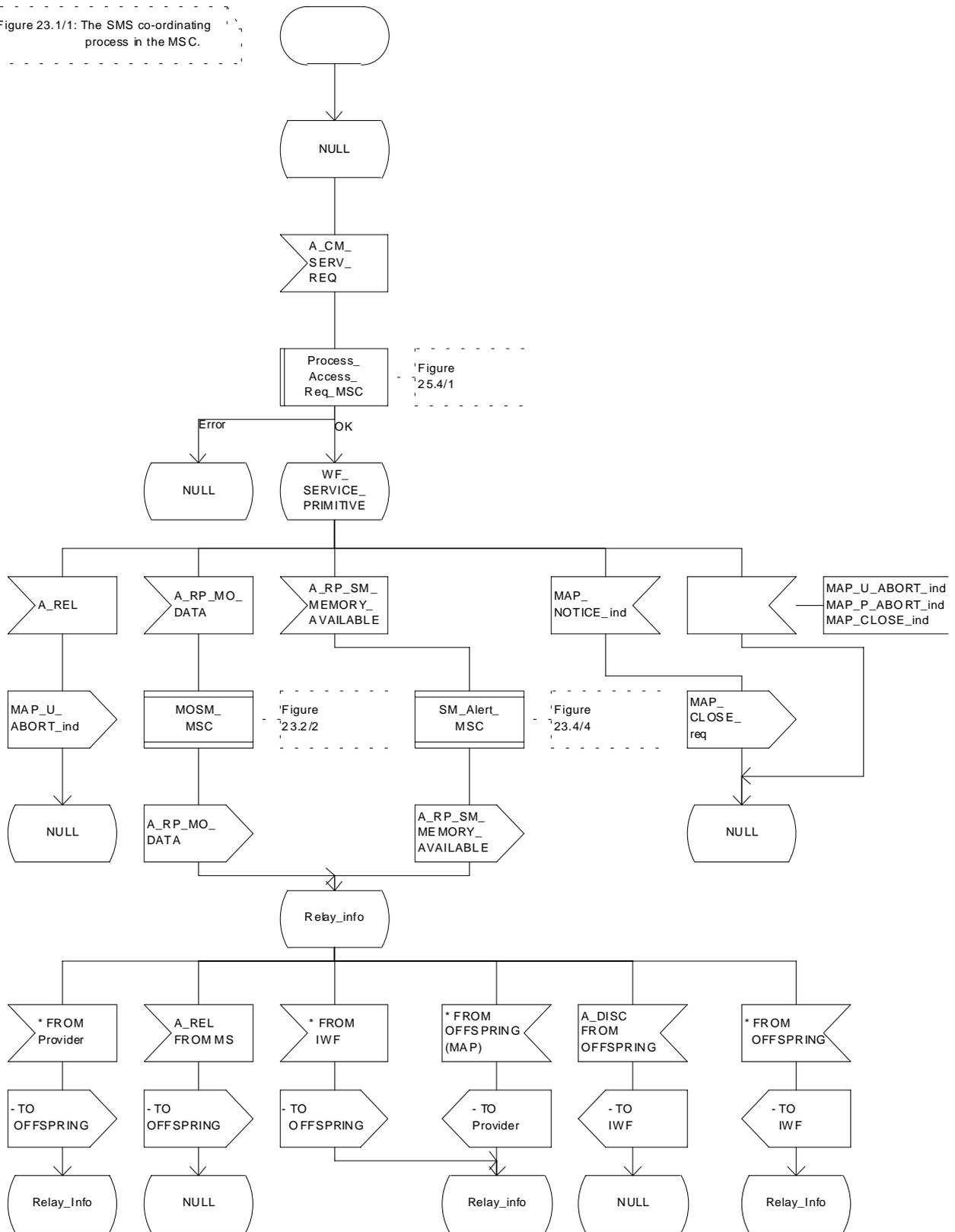


Figure 23.1/1: Process Co_SMS_MSC

23.1.2 Short message Gateway Co-ordinator for the HLR

The MAP_OPEN indication opens a dialogue for the short message procedure between the gateway MSC and the HLR when the application context shortMessageGatewayContext is received. If that service is successful, the Co-ordinator can receive the first service primitive from the MAP_PM. Depending on the received primitive, the user process is created as follows:

- if the MAP_SEND_ROUTING_INFO_FOR_SM indication is received, the process Mobile_Terminated_MS_HLR is created;
- if the MAP_REPORT_SM_DELIVERY_STATUS indication is received, the process Report_SM_delivery_stat_HLR is created.

After creation of the user process the Co-ordinator relays the messages between the MAP_PM and the invoked process until a request or an indication for dialogue termination is received.

The SM Gateway Co-ordinator is shown in the figure 23.1/2.

If the Receive_Open_Ind macro takes the Vr exit then HLR shall perform the MAP Vr dialogue. But based on the subscriber data, handling at the MAP user application level may be performed as described in release 97 :

- If the subscriber is not a GPRS subscriber then the behaviour of the HLR shall be the same as described in the corresponding MAP Vr release.
- If the subscriber is a GPRS subscriber and a non-GPRS subscriber with the option « transfer of SM via the MSC when GPRS is not supported in the GMSC » then the behaviour of the HLR shall be the same as described in the corresponding MAP Vr release.
- If the subscriber is a GPRS subscriber and a non-GPRS subscriber with the option « transfer of SM via the SGSN when GPRS is not supported in the GMSC » or if the subscriber is a GPRS subscriber only then the behaviour of the HLR shall be the same as for the case transfer over GPRS described in MAP release 97, with the following precision : because GMSC does not support MAP release 97, the previous MAP protocol release is used. When the HLR sends the MAP_SEND_ROUTING_INFO_FOR_SM_Resp, the SGSN number is mapped to the MAP parameter « MSC number ». When the HLR sends the MAP_INFORM_SERVICE_CENTRE_resp, the MNRG status shall be mapped to the MAP parameter « mnrf-set ». When the HLR receives the MAP_REPORT_SM_DELIVERY_STATUS_Ind, it shall interpret the delivery outcome as a GPRS delivery outcome.

Figure 23.1/2: The SMS gateway co-ordinating process in the HLR.

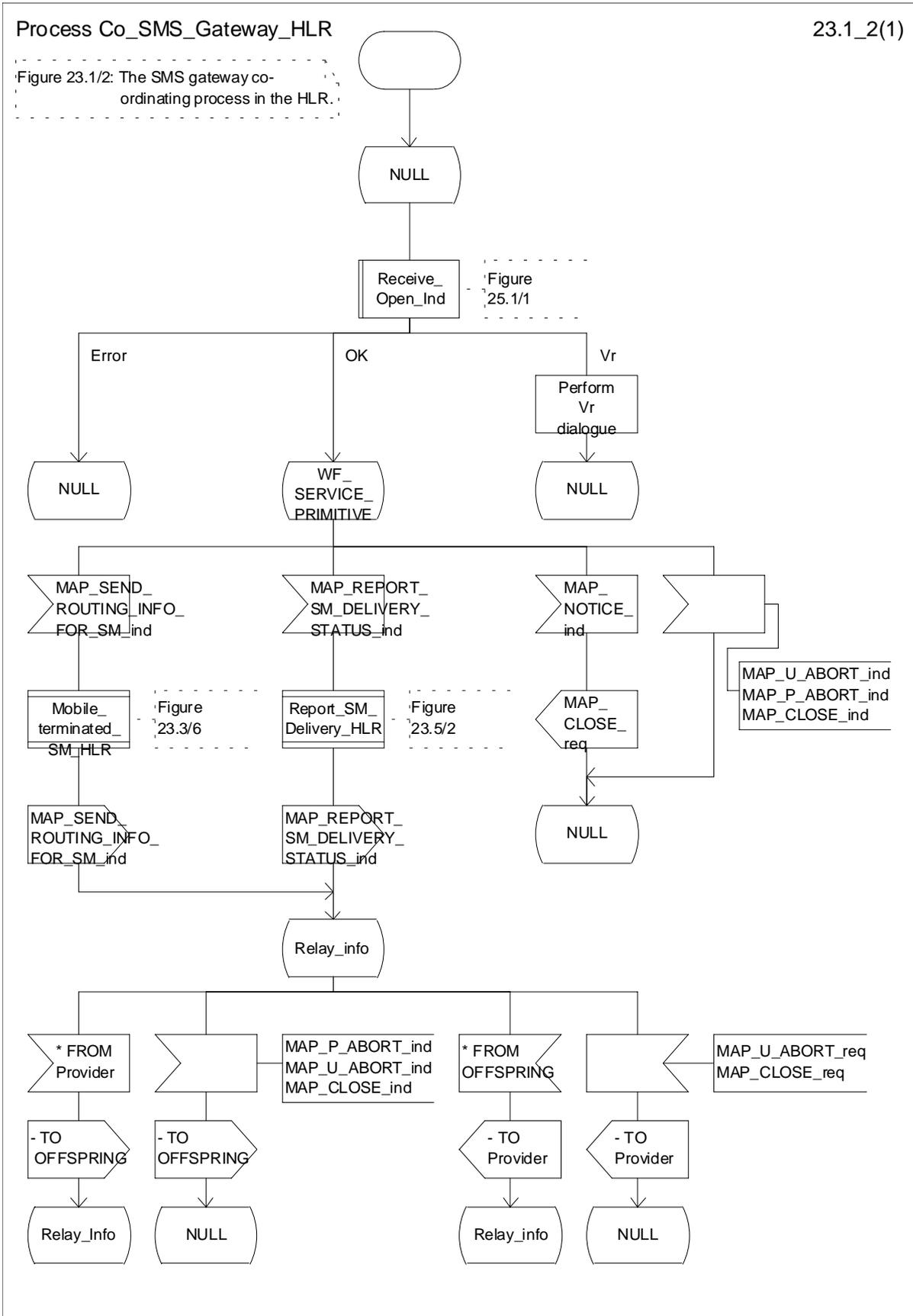


Figure 23.1/2: Process Co_SMS_Gateway_HLR

23.1.3 Mobile originated short message service Co-ordinator for the SGSN

The MS initiates mobile originated short message transfer or alerting indication. Depending on the situation, the appropriate process is initiated as follows:

- if the A_RP_MO_DATA indication is received, the process MOSM_SGSN is initiated (see subclause 23.2.4);
- if the A_RP_SM_MEMORY_AVAILABLE indication is received, the process SC_Alert_SGSN is initiated (see subclause 23.4.5).

After creation of the user process the Co-ordinator relays the messages between the SGSN and the MS, and the invoked process until a request or an indication for dialogue termination is received.

The SMS process Co-ordinator is shown in the figure 23.1/3.

Figure 23.1/3: The SMS co-ordinating process in the SGSN

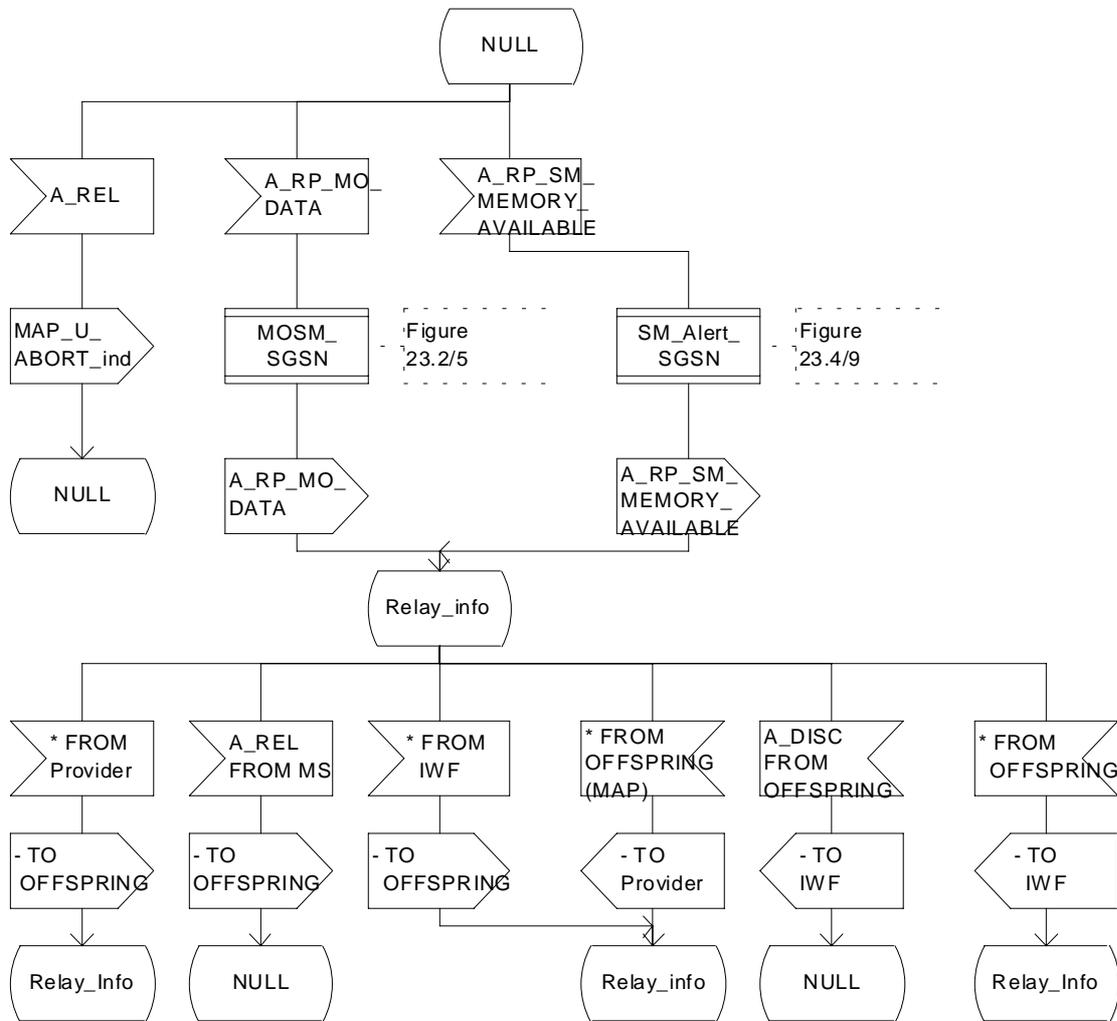
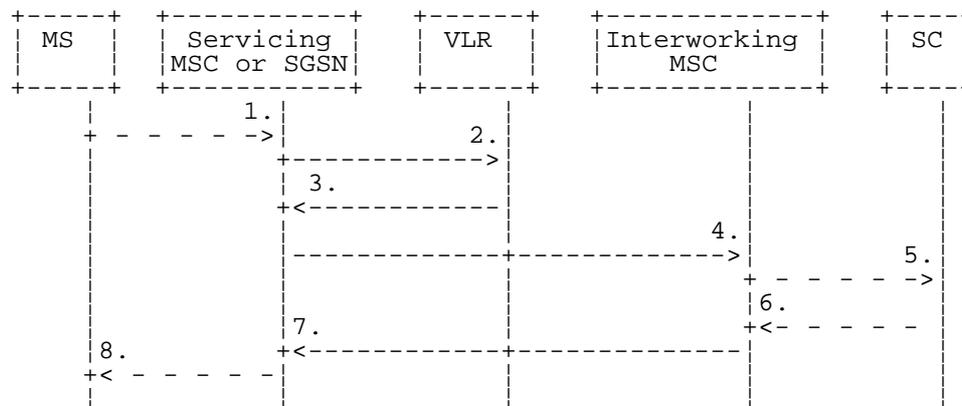


Figure 23.1/3: Process Co_SMS_SGSN

23.2 The mobile originated short message transfer procedure

The mobile originated short message service procedure is used to forward short message from a mobile subscriber to a Service Centre. The mobile originated short message service procedure is shown in figure 23.2/1.



- 1) Short Message (GSM 04.11)
 - 2) MAP_SEND_INFO_FOR_MO_SMS (*)
 - 3) MAP_SEND_INFO_FOR_MO_SMS_ACK (*)
 - 4) MAP_MO_FORWARD_SHORT_MESSAGE
 - 5) Short message (TS GSM 03.40)
 - 6) Short message Acknowledgement (TS GSM 03.40)
 - 7) MAP_MO_FORWARD_SHORT_MESSAGE_ACK
 - 8) Short Message Acknowledgment (GSM 04.11)
- (*) Messages 2) and 3) are not used by SGSN

Figure 23.2/1: Mobile originated short message transfer

In addition the following MAP services are used:

- | | |
|-------------------------------|--------------------------|
| MAP_PROCESS_ACCESS_REQUEST | (see subclause 8.3); (*) |
| MAP_AUTHENTICATE | (see subclause 8.5); (*) |
| MAP_SET_CIPHERING_MODE | (see subclause 8.6); (*) |
| MAP_PROVIDE_IMSI | (see subclause 8.9); (*) |
| MAP_CHECK_IMEI | (see subclause 8.7); |
| MAP_FORWARD_NEW_TMSI | (see subclause 8.9); (*) |
| MAP_TRACE_SUBSCRIBER_ACTIVITY | (see subclause 9.1); (*) |
| MAP_READY_FOR_SM | (see subclause 12.4). |

(*) Those messages are not used by SGSN.

23.2.1 Procedure in the servicing MSC

The activation of the MAP_PROCESS_ACCESS_REQUEST service is described in the subclause 25.4.1.

When receiving the short message from the A-interface, the MSC sends the MAP_SEND_INFO_FOR_MO_SMS request to the VLR. As a response the MSC will receive the MAP_SEND_INFO_FOR_MO_SMS confirmation from VLR indicating that:

- the service ends successfully. If the MSC is not itself the IWMSC, the short message transmission towards the IWMSC is initiated using the MAP_MO_FORWARD_SHORT_MESSAGE request;
- the service ends unsuccessfully. The error cause in the MAP_SEND_INFO_FOR_MO_SMS confirmation indicates the reason for the unsuccessful end. The mapping between MAP error causes and RP_ERROR causes is described in TS GSM 03.40.

If there are data errors in the MAP_SEND_INFO_FOR_MO_SMS confirmation, or there is an operation failure in MAP, the RP_ERROR cause network out of order is forwarded to the mobile station.

The MSC opens a CAMEL dialogue as specified in 3G TS 23.078. If the CAMEL service bars the MO SM then the failure is reported to MS.

The MSC checks the barring as follows;

- if the short message transfer would contravene operator determined barring, the failure is reported to the CAMEL service as specified in 3G TS 23.078 and the call barred error with cause operator barring is returned to MS;
- if the short message transfer would contravene the supplementary service call barring conditions, the failure is reported to the CAMEL service as specified in 3G TS 23.078 and the call barred error with cause barring service active is returned to MS.

If the service MAP_MO_FORWARD_SHORT_MESSAGE is started, the MSC will check whether the grouping of MAP_OPEN request and MAP_MO_FORWARD_SHORT_MESSAGE request needs segmentation. If this is the case then the MAP_OPEN request primitive shall be sent first without any associated MAP service request primitive and the dialogue confirmation must be received before the MAP_MO_FORWARD_SHORT_MESSAGE request is sent. As a response to the procedure, the servicing MSC will receive the MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the IWMSC indicating that:

- the short message has been successfully delivered to the Service Centre. The successful submission of SM is reported to the CAMEL service as specified in 3G TS 23.078 and the acknowledgement is sent to the mobile station;
- one of several error cases has occurred. The mapping between MAP error causes and RP_ERROR causes is described in TS GSM 03.40. The failure in the SM submission is reported to the CAMEL service as specified in 3G TS 23.078 and the appropriate indication is provided to the mobile station.

If the procedure failed, a provider error or an abort indication is received. The RP_ERROR cause network out of order is provided to the mobile station.

If the MSC itself is the interworking MSC, the short message is forwarded to the Service Centre. In that case the service MAP_MO_FORWARD_SHORT_MESSAGE is not initiated. The acknowledge message from the Service Centre is forwarded to the mobile station (TS GSM 03.40, TS GSM 04.11).

The mobile originated short message service procedure is shown in figure 23.2/2.

Process MOSM_MSC

23.2_2.1(3)

Figure 23.2/2: The mobile originated short message service process in the MSC.

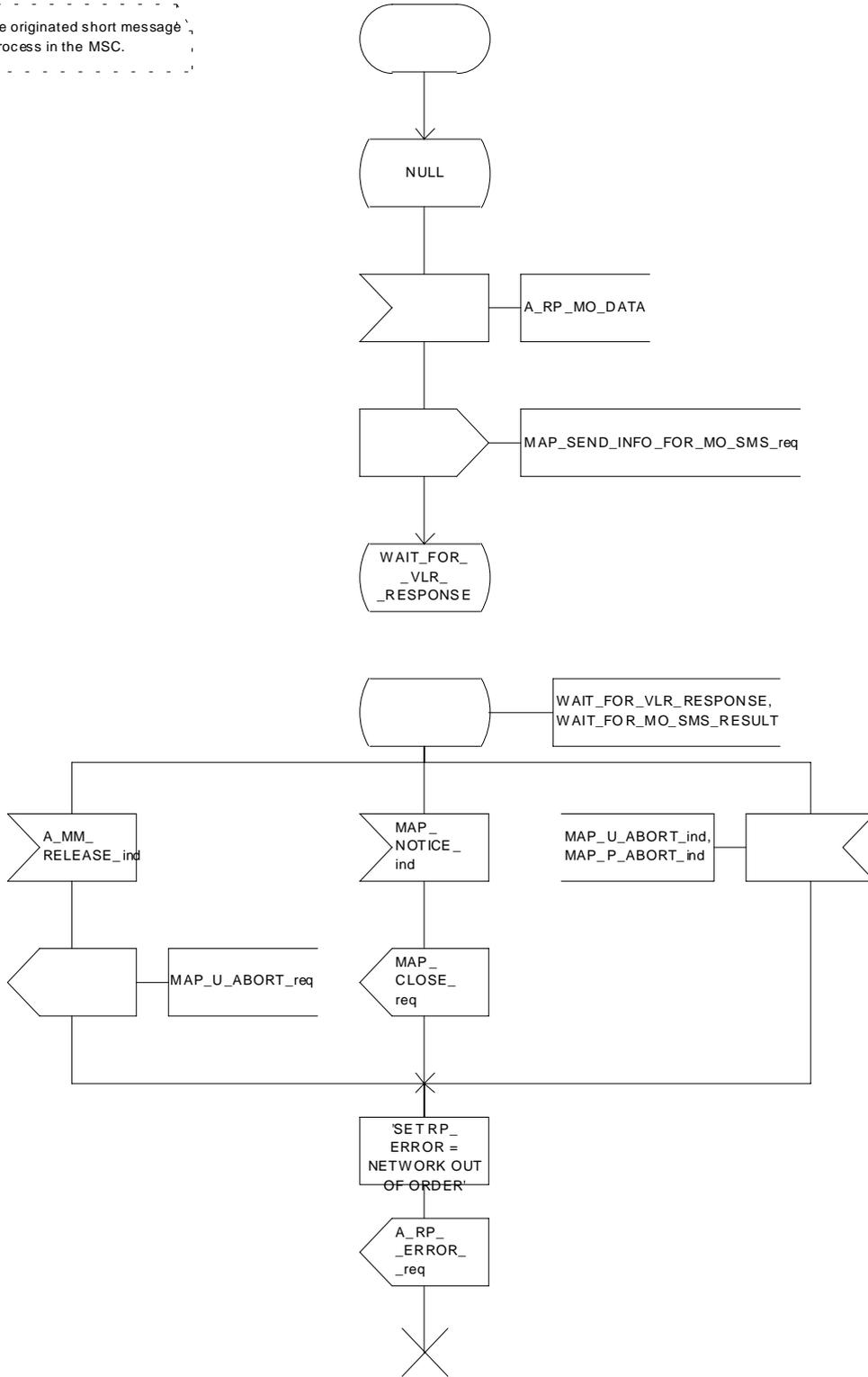


Figure 23.2/2 (sheet 1 of 3): Process MOSM_MSC

Figure 23.2/2: The mobile originated short message service process in the MSC.

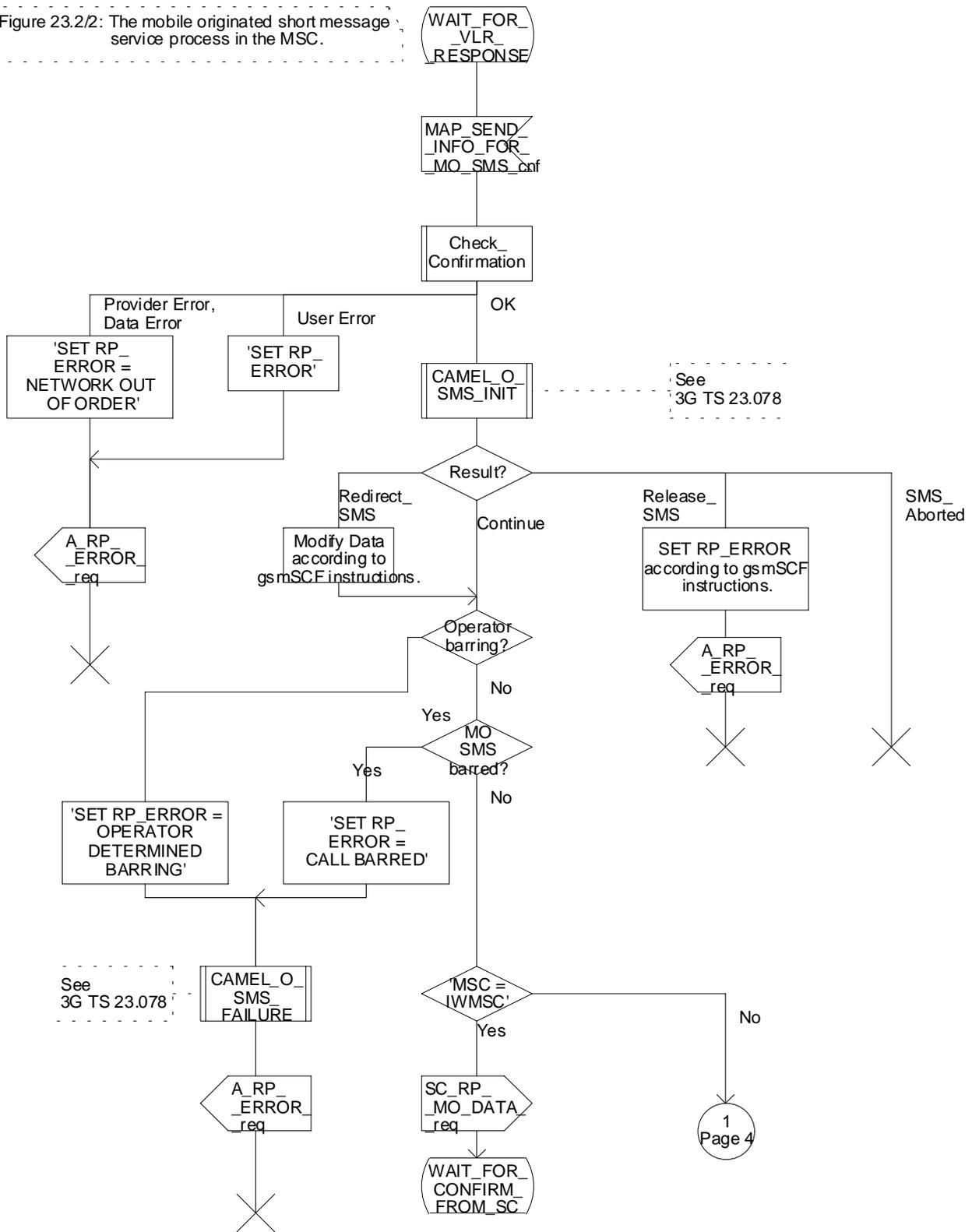


Figure 23.2/2 (sheet 2 of 4): Process MOSM_MSC

Figure 23.2/2: The mobile originated short message service process in the MSC.

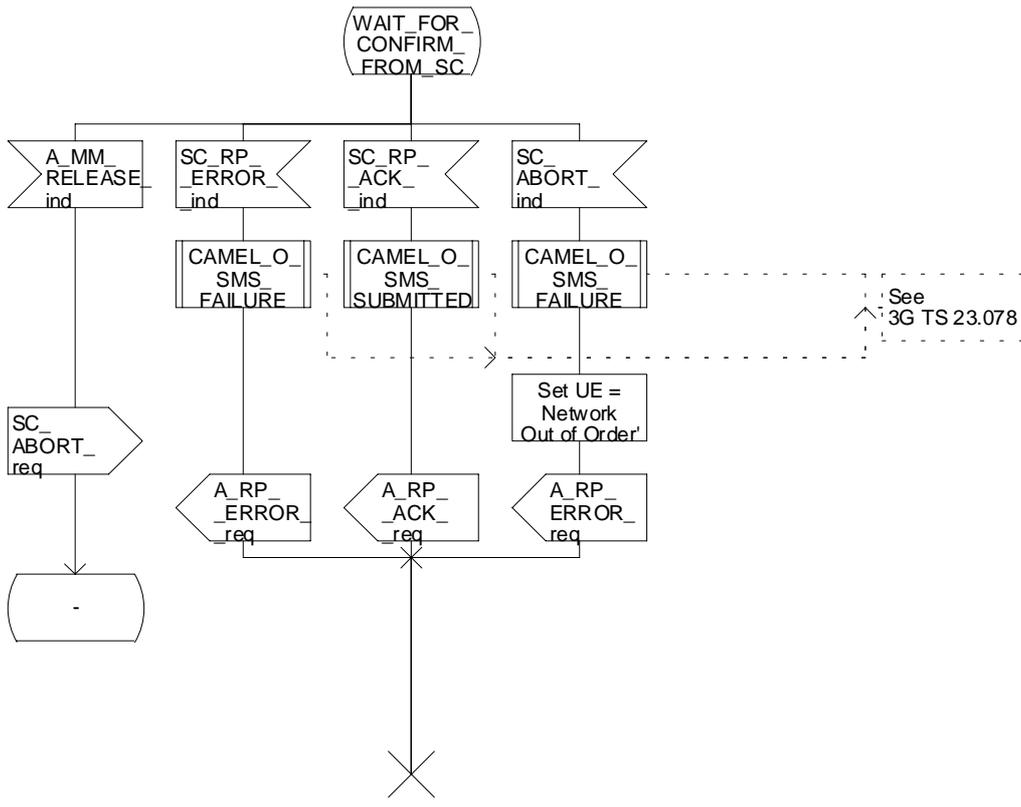


Figure 23.2/2 (sheet 3 of 4): Process MOSM_MSC

Figure 23.2/2: The mobile originated short message service process in the MSC.

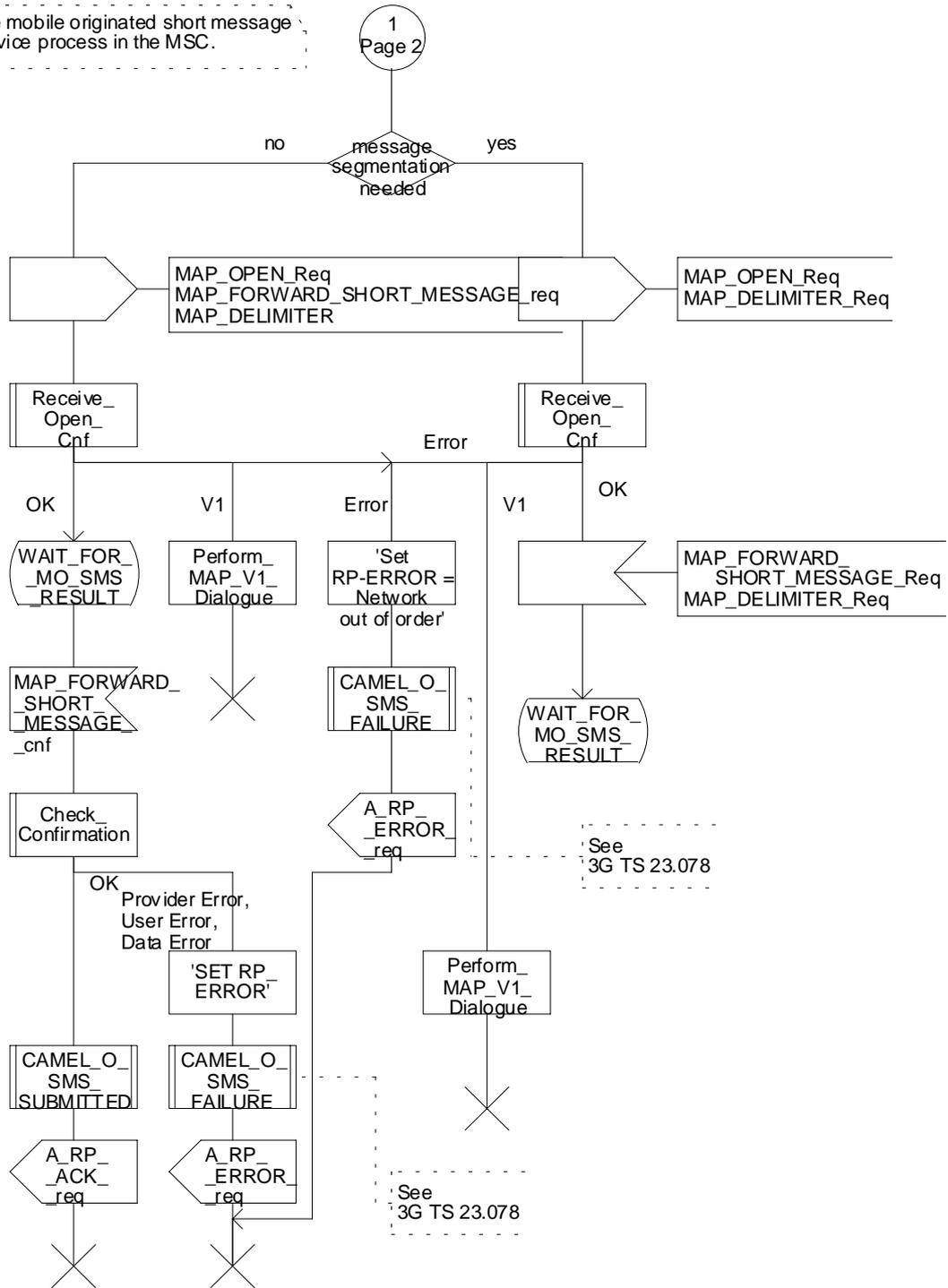


Figure 23.2/2 (sheet 4 of 4): Process MOSM_MSC

23.2.2 Procedure in the VLR

The MAP_PROCESS_ACCESS_REQUEST indication starts the MAP_PROCESS_ACCESS_REQUEST service in the VLR. The application context in the MAP_OPEN indication is mobile originated short message transfer.

If the service MAP_PROCESS_ACCESS_REQUEST is successful, the VLR waits for the next message from the MSC. When receiving the MAP_SEND_INFO_FOR_MO_SMS indication, the VLR acts as follows:

- if there is incompatibility in the subscription check, the error teleservice not provisioned is returned to the MSC;
- if the short message transfer would contravene operator determined barring (BAOC), the call barred error with cause operator barring is returned;
- if the short message transfer would contravene the supplementary service call barring conditions (BAOC) in the VLR, the call barred error with cause barring service active is returned.

When the mobile subscriber has passed all checks, the MAP_SEND_INFO_FOR_MO_SMS response is initiated and the procedure is terminated in the VLR. The mobile originated short message transfer procedure in the VLR is shown in figure 23.2/3.

Process MOSM_VLR

23.2_3(1)

Figure 23.2/3: The mobile originated short message service process in the VLR

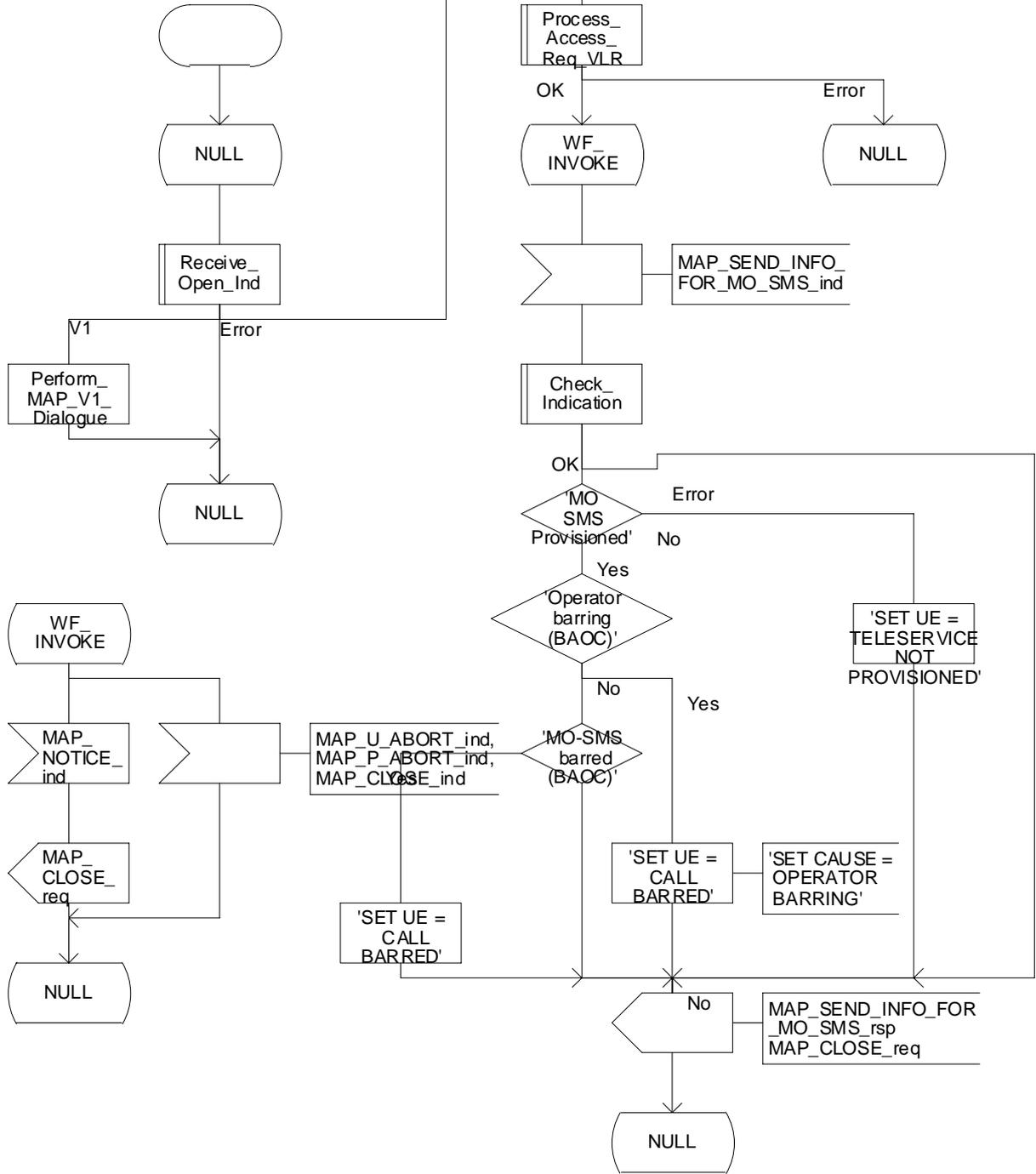


Figure 23.2/3: Process MOSM_VLR

23.2.3 Procedure in the interworking MSC

This procedure applies only when the IWMSC is not the servicing MSC or SGSN.

When receiving a MAP_OPEN indication primitive that is not associated with any MAP service indication primitive and if the dialogue is accepted, the MAP service-user in the interworking MSC issues a MAP_DELIMITER request primitive in order to trigger the local MAP service-provider to confirm the dialogue. Then a MAP_MO_FORWARD_SHORT_MESSAGE indication shall be received.

When a MAP_MO_FORWARD_SHORT_MESSAGE indication is correctly received, the Interworking MSC invokes forwarding of the short message to the Service Centre. If invalid data content is detected, an unexpected data value error or a data missing error is returned to the servicing MSC or SGSN.

The outcome of the procedure with the Service Centre is awaited before a MAP_MO_FORWARD_SHORT_MESSAGE response is given back to the servicing MSC or SGSN:

- if a short message is accepted by the Service Centre, an acknowledgement is sent back to the servicing MSC or SGSN;
- if the Service Centre is not identified, the SM Delivery Failure error is returned to the servicing MSC or SGSN;
- if the Service Centre returns an error indication, the SM Delivery Failure error is returned to the servicing MSC with the error cause and any diagnostic information received from the Service Centre;
- if the short message cannot be forwarded to the Service Centre or the procedure towards the Service Centre fails for some reason, a system failure error is sent to the servicing MSC or SGSN.

The mobile originated short message service transfer in the IWMSC is shown in figure 23.2/4.

Process MOSM_IWMSC

23.2_4(1)

Figure 23.2/4: The mobile originated short message service process in the IWMSC.

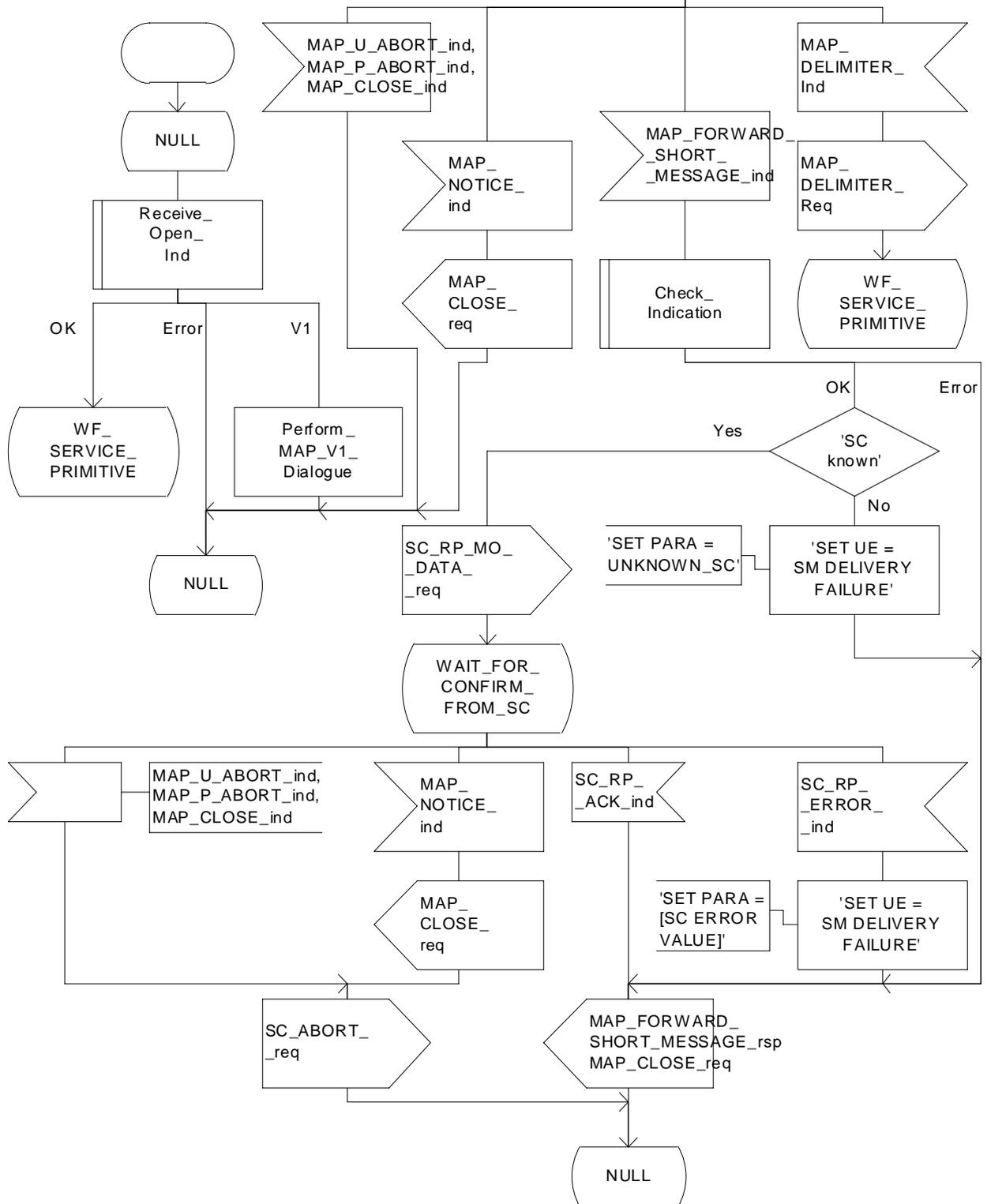


Figure 23.2/4: Process MOSM_IWMSC

23.2.4 Procedure in the servicing SGSN

When receiving the short message from the MS, the SGSN acts as follows:

- if there is incompatibility in the subscription check, the RP_ERROR cause requested facility not subscribed is provided to the mobile station;
- the SGSN opens a CAMEL dialogue as specified in 3G TS 23.078. If the CAMEL service bars the MO SM then the failure is reported to MS;
- if the short message transfer would contravene operator determined barring, the failure is reported to the CAMEL service as specified in 3G TS 23.078 and the RP_ERROR cause operator determined barring is provided to the mobile station;

NOTE: The RP_ERROR causes are described in TS GSM 04.11

- if no error is detected, the short message transmission towards the IWMSC is initiated using the MAP_MO_FORWARD_SHORT_MESSAGE request.

If the service MAP_MO_FORWARD_SHORT_MESSAGE is started, the SGSN will check whether the grouping of MAP_OPEN request and MAP_MO_FORWARD_SHORT_MESSAGE request needs segmentation.

If this is the case then the MAP_OPEN request primitive shall be sent first without any associated MAP service request primitive and the dialogue confirmation must be received before the MAP_MO_FORWARD_SHORT_MESSAGE request is sent. As a response to the procedure, the servicing SGSN will receive the MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the IWMSC indicating that:

- the short message has been successfully delivered to the Service Centre. The successful submission of SM is reported to the CAMEL service as specified in 3G TS 23.078 and the acknowledgement is sent to the mobile station;
- one of several error cases has occurred. The mapping between MAP error causes and RP_ERROR causes is described in TS GSM 03.40. The failure in SM submission is reported to the CAMEL service as specified in 3G TS 23.078 and the appropriate indication is provided to the mobile station.

If the procedure failed, a provider error or an abort indication is received. The RP_ERROR cause network out of order is provided to the mobile station.

The mobile originated short message service procedure is shown in figure 23.2/5

Figure 23.2/5: The mobile originated short message service process in the SGSN.

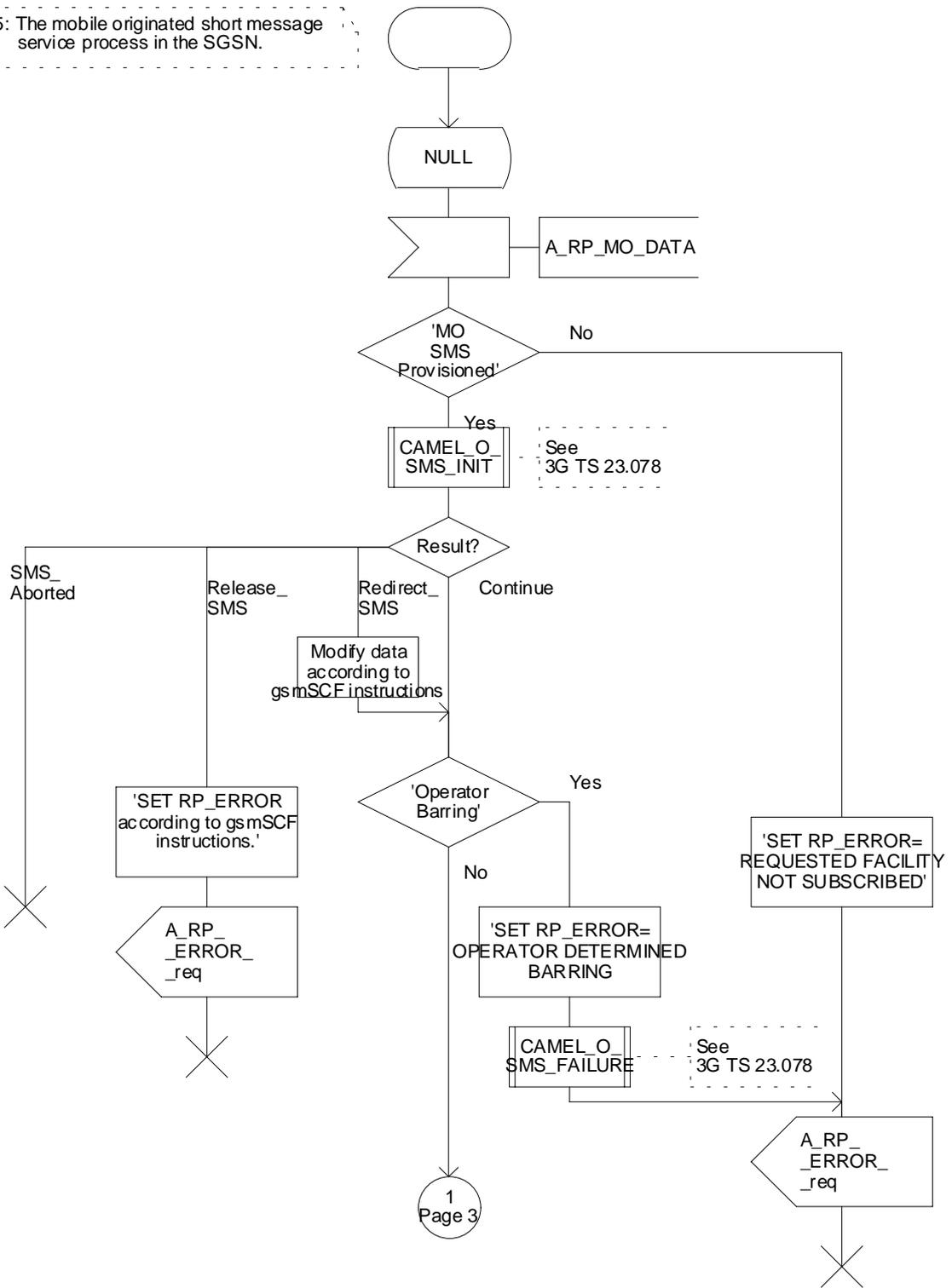


Figure 23.2/5 (sheet 1 of 3): Process MOSM_SGSN

Figure 23.2/5: The mobile originated short message service process in the SGSN.

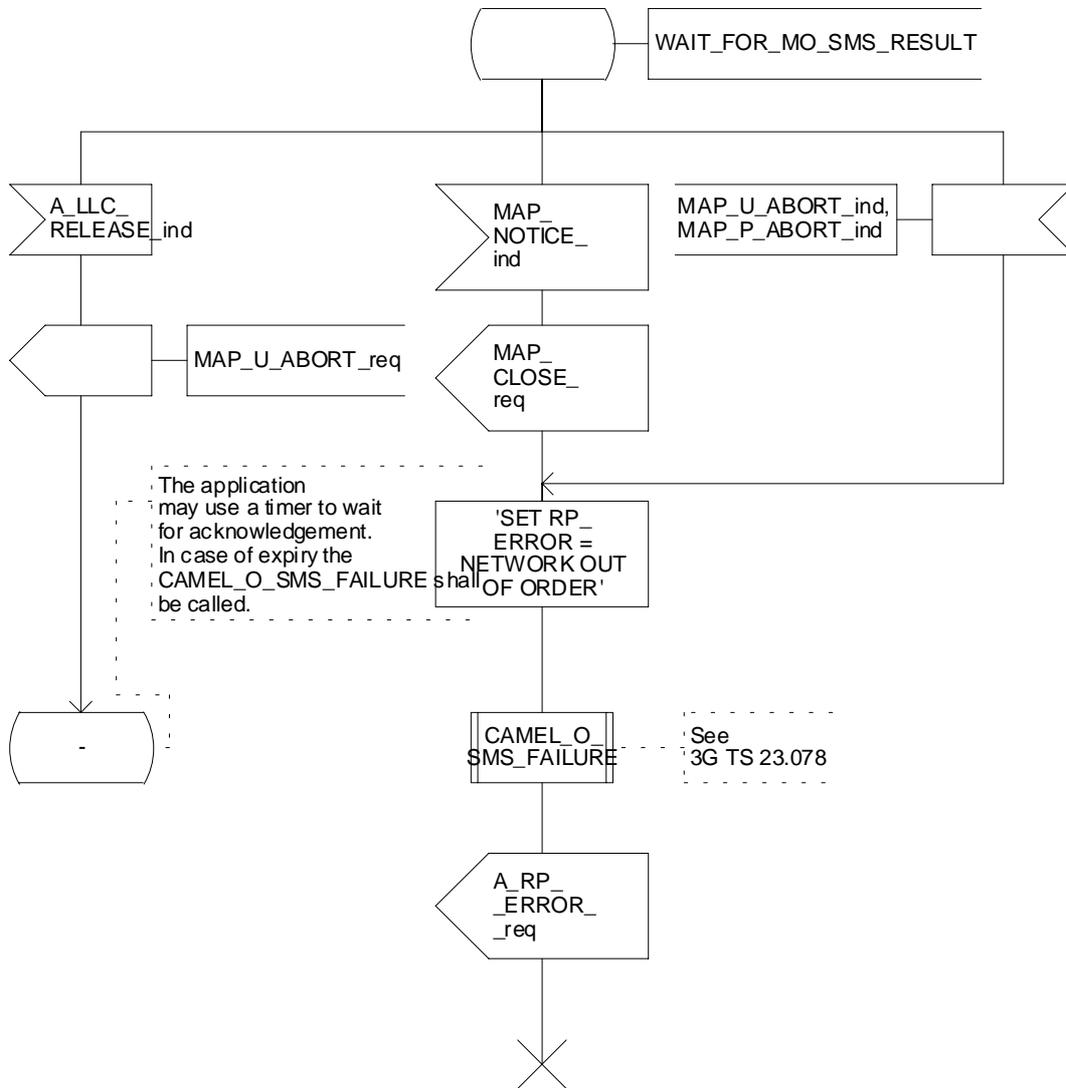


Figure 23.2/5 (sheet 2 of 3): Process MOSM_SGSN

Figure 23.2/5: The mobile originated short message service process in the SGSN.

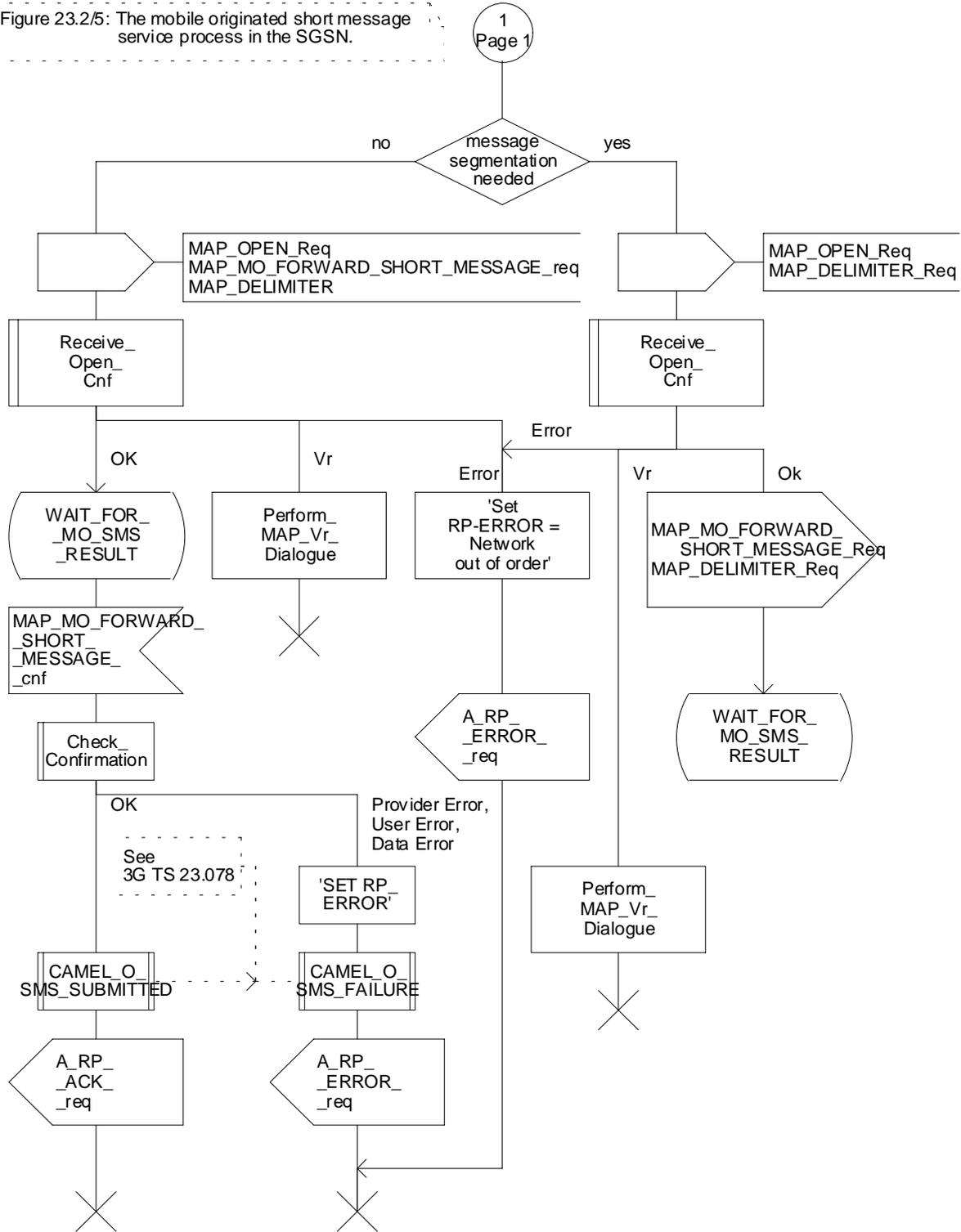
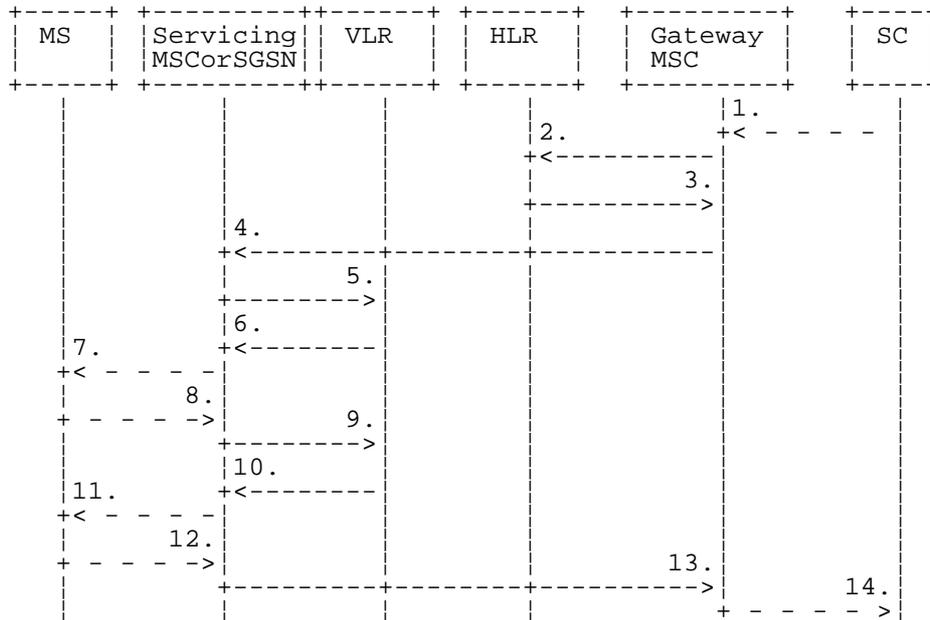


Figure 23.2/5 (sheet 3 of 3): Process MOSM_SGSN

23.3 The mobile terminated short message transfer procedure

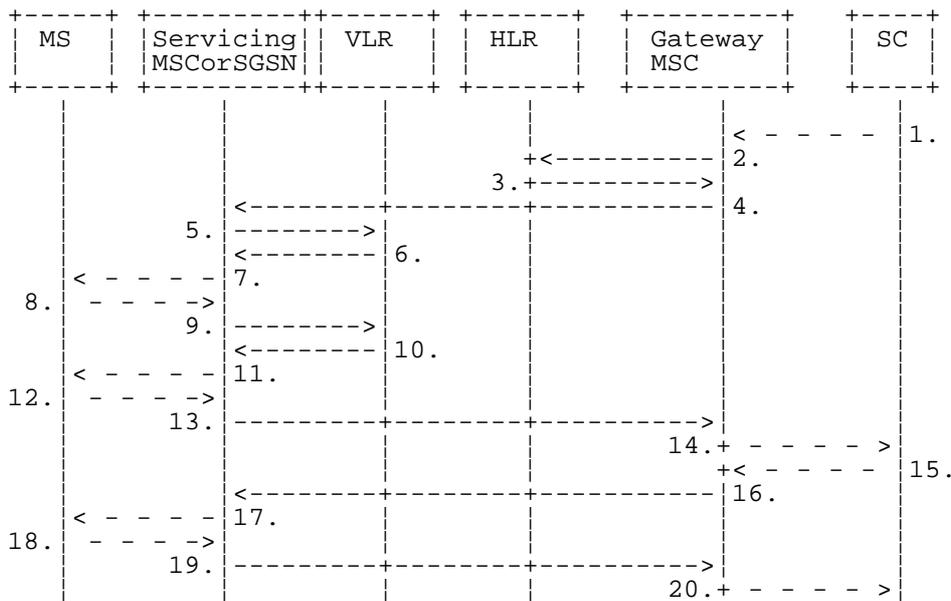
The mobile terminated short message transfer procedure is used for forwarding a short message or several short messages from a Service Centre to a mobile subscriber. The mobile terminated short message procedure for a single short message transfer is shown in figure 23.3/1.



- 1) Short Message (GSM 03.40)
 - 2) MAP_SEND_ROUTING_INFO_FOR_SM
 - 3) MAP_SEND_ROUTING_INFO_FOR_SM_ACK
 - 4) MAP_MT_FORWARD_SHORT_MESSAGE
 - 5) MAP_SEND_INFO_FOR_MT_SMS (*)
 - 6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*)
 - 7) Page (GSM 04.08)
 - 8) Page response (GSM 04.08)
 - 9) MAP_PROCESS_ACCESS_REQUEST_ACK and
MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*)
 - 10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*)
 - 11) Short Message (GSM 04.11)
 - 12) Short Message Acknowledgement (GSM 04.11)
 - 13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK
 - 14) Short Message Acknowledgment (GSM 03.40)
- (*) Messages 5), 6), 9), and 10) are not used by SGSN

Figure 23.3/1: Mobile terminated short message service procedures

The mobile terminated short message procedure for multiple short message transfer is shown in figure 23.3/2.



- 1) Short Message (GSM 03.40)
- 2) MAP_SEND_ROUTING_INFO_FOR_SM
- 3) MAP_SEND_ROUTING_INFO_FOR_SM_ACK
- 4) MAP_MT_FORWARD_SHORT_MESSAGE (note 1)
- 5) MAP_SEND_INFO_FOR_MT_SMS (*)
- 6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*)
- 7) Page (GSM 08.08)
- 8) Page response (GSM 04.08)
- 9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*)
- 10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*)
- 11) Short Message (GSM 04.11)
- 12) Short Message Acknowledgement (GSM 04.11)
- 13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK
- 14) Short Message Acknowledgment (GSM 03.40)
- 15) Short Message (GSM 03.40)
- 16) MAP_MT_FORWARD_SHORT_MESSAGE (note 2)
- 17) Short Message (GSM 04.11)
- 18) Short Message Acknowledgement (GSM 04.11)
- 19) MAP_MT_FORWARD_SHORT_MESSAGE_ACK
- 20) Short Message Acknowledgment (GSM 03.40)

(*) Messages 5), 6), 9), and 10) are not used by SGSN

NOTE 1: The More Messages To Send flag is TRUE.

NOTE 2: The More Messages To Send flag is FALSE

Figure 23.3/2: Mobile terminated short message procedure for multiple short message transfer

In the multiple short message transfer the service MAP_MT_FORWARD_SHORT_MESSAGE can be used several times. However, the short message transfer is always acknowledged to the Service Centre before the next short message is sent.

In addition the following MAP services are used:

MAP_PROCESS_ACCESS_REQUEST (see subclause 8.3); (*)
MAP_PAGE (see subclause 8.2); (*)
MAP_SEARCH_FOR_MS (see subclause 8.2); (*)
MAP_AUTHENTICATE (see subclause 8.5); (*)
MAP_SET_CIPHERING_MODE (see subclause 8.6); (*)
MAP_CHECK_IMEI (see subclause 8.7);
MAP_FORWARD_NEW_TMSI (see subclause 8.9); (*)
MAP_REPORT_SM_DELIVERY_STATUS (see subclause 12.3);
MAP_INFORM_SERVICE_CENTRE see subclause 12.6);
MAP_TRACE_SUBSCRIBER_ACTIVITY (see subclause 9.1); (*)
MAP_READY_FOR_SM (see subclause 12.4).

(*) Those messages are not used by SGSN.

23.3.1 Procedure in the Servicing MSC

When initiating the dialogue with the servicing MSC, the SMS Gateway MSC must provide the IMSI of the subscriber to whom the short message is directed.

The IMSI can be included either in the Destination Reference of the MAP_OPEN indication received from the SMS Gateway MSC or in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication.

When receiving a MAP_OPEN indication primitive that is not associated with any MAP service indication primitive and if the dialogue is accepted, the MAP service-user in the servicing MSC issues a MAP_DELIMITER request primitive in order to trigger the local MAP service-provider to confirm the dialogue.

When receiving the first MAP_MT_FORWARD_SHORT_MESSAGE indication from the gateway MSC, the servicing MSC sends the MAP_SEND_INFO_FOR_MT_SMS request primitive to the VLR, if the MAP service primitive is accepted and if short message service is supported in the servicing MSC.

The MAP_MT_FORWARD_SHORT_MESSAGE indication primitive is checked by the macro "Check_Indication". If the received MAP service primitive contains errors, the service is aborted and an unexpected data value error or data missing error is returned to the GMSC.

If the MSC does not support the short message service, the service is aborted in the servicing MSC and the error "Facility Not Supported" is returned to the GMSC.

The subscriber identity information that may be included in the MAP_OPEN indication primitive and in the MAP service indication primitive is checked by the macro "Check_Subscr_Identity_For_MT_SMS" as follows.

If a Destination Reference has been received in the MAP_OPEN indication, an LMSI must be present in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication. The LMSI shall be included in the sm-RP-DA information field of the MAP_SEND_INFO_FOR_MT_SMS request sent to the VLR; the associated MAP_OPEN request must contain a Destination Reference that carries an IMSI.

Otherwise, if the IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication, it is mapped into the sm-RP-DA information field of the MAP_SEND_INFO_FOR_MT_SMS request that is sent to the VLR. In this case, the IMSI is not accompanied by an LMSI and neither the MAP_OPEN indication received from the gateway MSC nor the MAP_OPEN request sent to the VLR shall include a Destination Reference.

If a Destination Reference has been received in the servicing MSC and the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication does not include an LMSI or if no Destination Reference has been received and the sm-RP-DA information field does not cover an IMSI the service is aborted in the servicing MSC and the error "Unexpected Data Value" is returned to the SMS GMSC.

The following responses to the MAP_SEND_INFO_FOR_MT_SMS request may be received from the VLR:

- unidentified subscriber or system failure error. The error code is forwarded to the GMSC;
- absent subscriber error. The absent subscriber_SM error is forwarded to the GMSC with the absent subscriber diagnostic indication set to 'IMSI Detached';
- unknown subscriber error. The system failure indication is provided to the GMSC;
- data missing or unexpected data value error. The system failure indication is provided to the GMSC;
- a provider error or an abort indication. The system failure indication is provided to the GMSC;
- subscriber busy for MT SMS. The error code is forwarded to the GMSC;
- paging procedure invocation (see subclause 25.3) reporting the successful outcome of the procedure;
- search procedure invocation (see subclause 25.3) reporting the successful outcome of the procedure.

The result of the paging or the search procedure is processed as follows:

- if the procedure is completed successfully, the MSC will send the MAP_PROCESS_ACCESS_REQUEST request to the VLR (see subclause 25.4);
- if the procedure is completed successfully, but the MS has no mobile terminated short message transfer capability, the procedure is terminated and SM delivery failure indication with cause "equipment not SM equipped" is provided to the GMSC;
- if the procedure ends unsuccessfully, the termination of the procedure is awaited from the VLR. The absent subscriber_SM error is forwarded to the GMSC with the absent subscriber diagnostic indication set to 'No Paging Response', but the other error causes are reported as a system failure indication.

If the short message transfer is aborted for any reason, the dialogue with the VLR is aborted. If the procedure with the VLR is aborted by the VLR or by the provider, a system failure indication is provided to the GMSC.

The unsuccessful outcome of the MAP_PROCESS_ACCESS_REQUEST service is reported by using the system failure error to the GMSC.

When the service MAP_PROCESS_ACCESS_REQUEST is carried out, the MSC will receive the MAP_SEND_INFO_FOR_MT_SMS confirmation indicating:

- the unsuccessful outcome of the procedure. The error indication received from the VLR is forwarded to the GMSC;
- the successful outcome of the procedure. The MSC initiates forwarding of the short message to the MS.

If the primitive itself is badly formatted or data is missing, the system failure error is sent to the GMSC.

If forwarding of the short message is initiated, the MSC awaits the result before one of the following responses is sent back to the GMSC:

- an acknowledge if the short message has been successfully delivered to the mobile subscriber;
- an SM delivery failure error containing a parameter indicating either of the following: there is a MS protocol error or the MS memory capacity is exceeded; detailed diagnostic information (see subclause 7.6.1.4) may also be carried;
- a system failure error if the delivery procedure is aborted.

If the More Messages To Send flag was FALSE or the service MAP_MT_FORWARD_SHORT_MESSAGE ends unsuccessfully, the transaction to the gateway MSC is terminated. Otherwise, the servicing MSC waits for the next short message from the Service Centre.

When receiving the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the gateway MSC the servicing MSC will act as follows:

- if the received primitive contains errors, the unexpected data value error or data missing error is provided to the gateway MSC;
- if the More Messages To Send flag is FALSE, the servicing MSC will start the short message transfer procedure to the mobile subscriber. The successful or unsuccessful outcome of this procedure is reported to the gateway MSC and the transaction is terminated.
- if the More Messages To Send flag is TRUE, the servicing MSC will start the short message transfer to the mobile subscriber. If the outcome of this procedure is unsuccessful, the reason is reported to the gateway MSC and the procedure is terminated. If the procedure is successful, it is acknowledged to the gateway MSC and more short messages can be received.

The tracing procedure may be activated. It is described in detail in the clause 20.

The mobile terminated short message transfer procedure in the servicing MSC is shown in figures 23.3/3 and 23.3/4. The page and search procedures are shown in figure 25.3/1 and 25.3/2.

Figure 23.3/3: The mobile terminated short message service process in the MSC

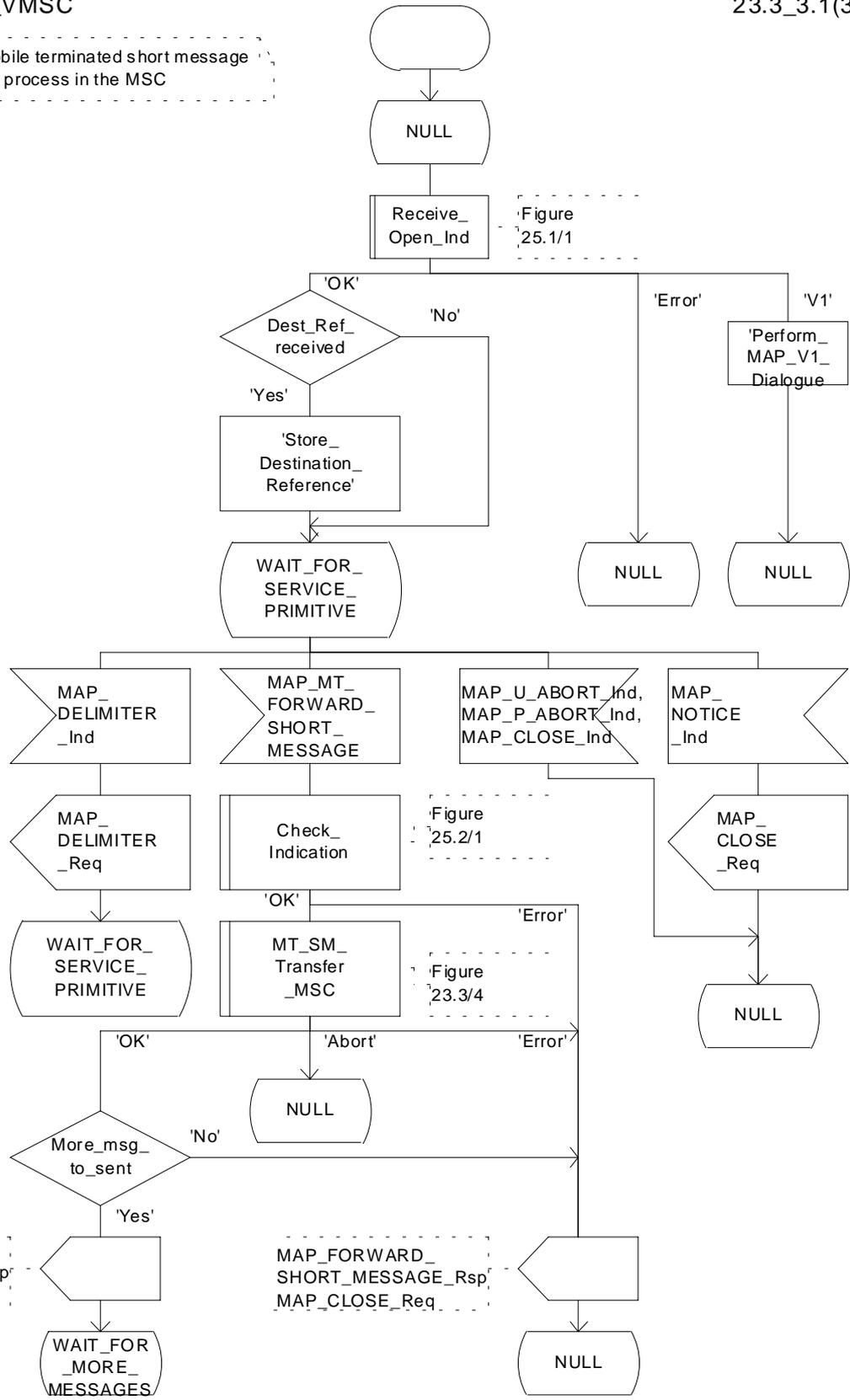


Figure 23.3/3 (sheet 1 of 3): Procedure MTSM_VMSC

Figure 23.3/3: The mobile terminated short message service process in the MSC

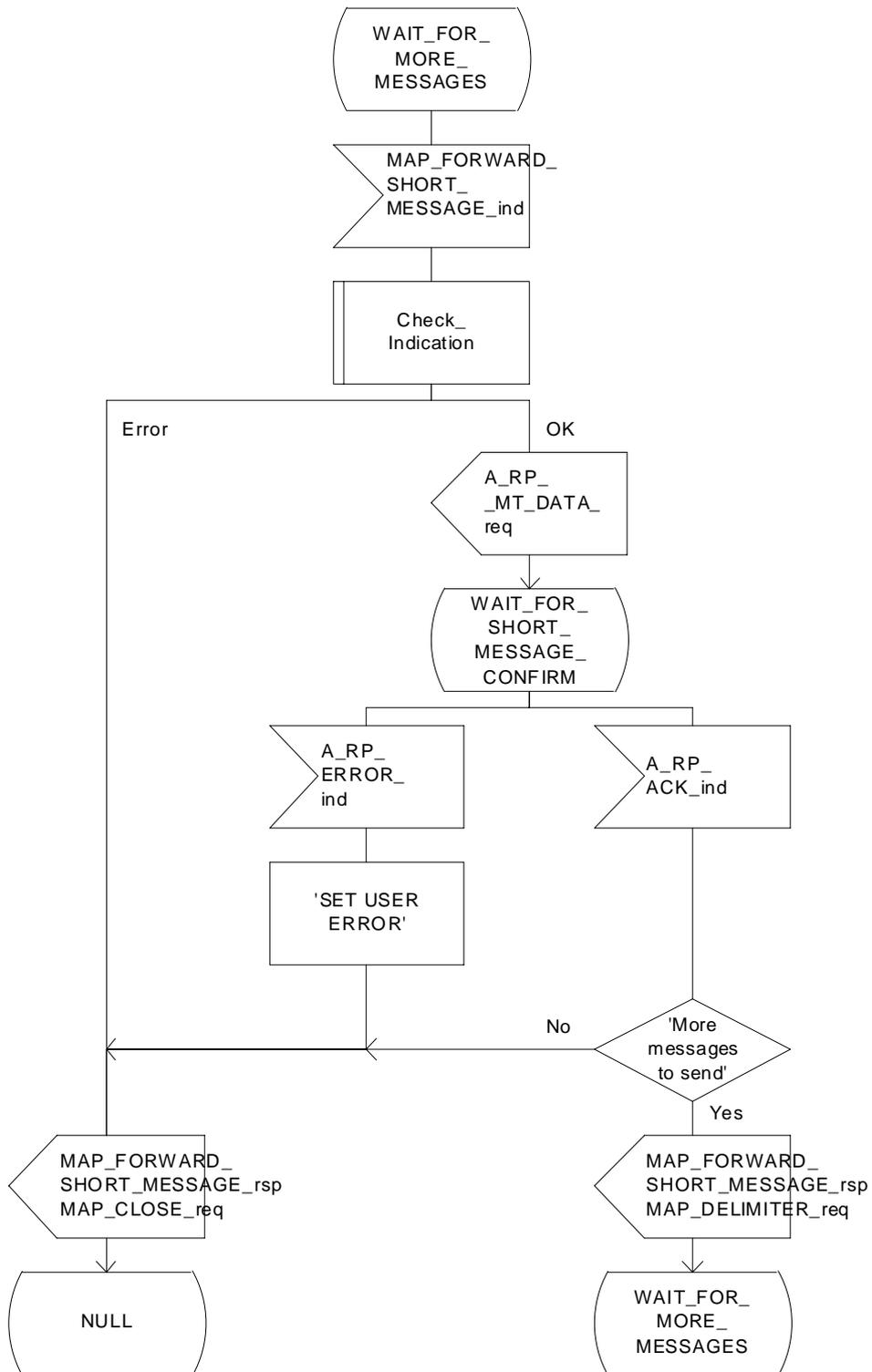


Figure 23.3/3 (sheet 2 of 3): Procedure MTSM_VMSC

Figure 23.3/3: The mobile terminated short message service process in the MSC

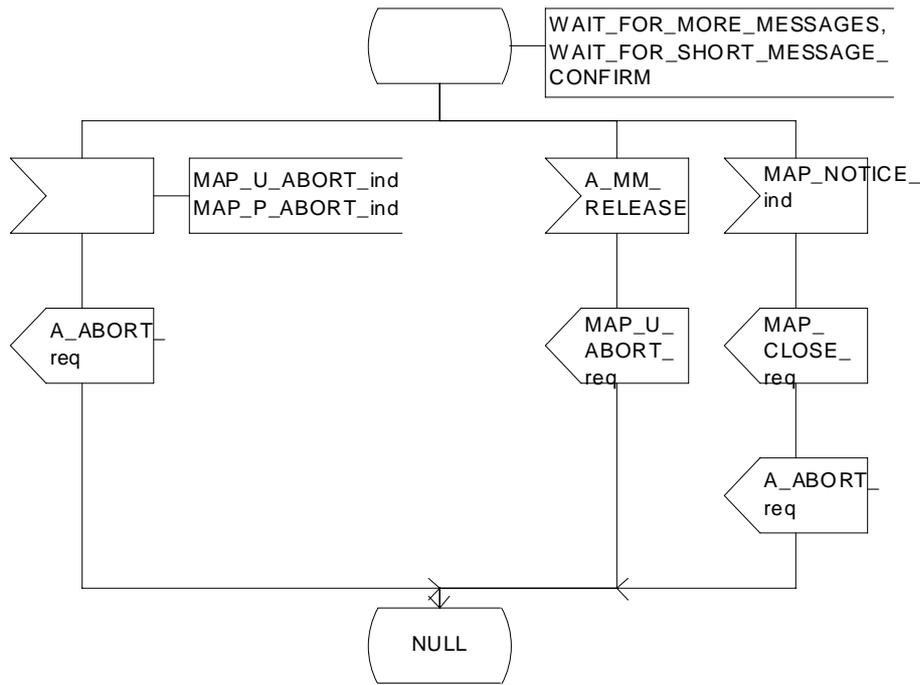


Figure 23.3/3 (sheet 3 of 3): Procedure MTSM_VMSC

Figure 23.3/4: The mobile terminated short message transfer macro in the MSC

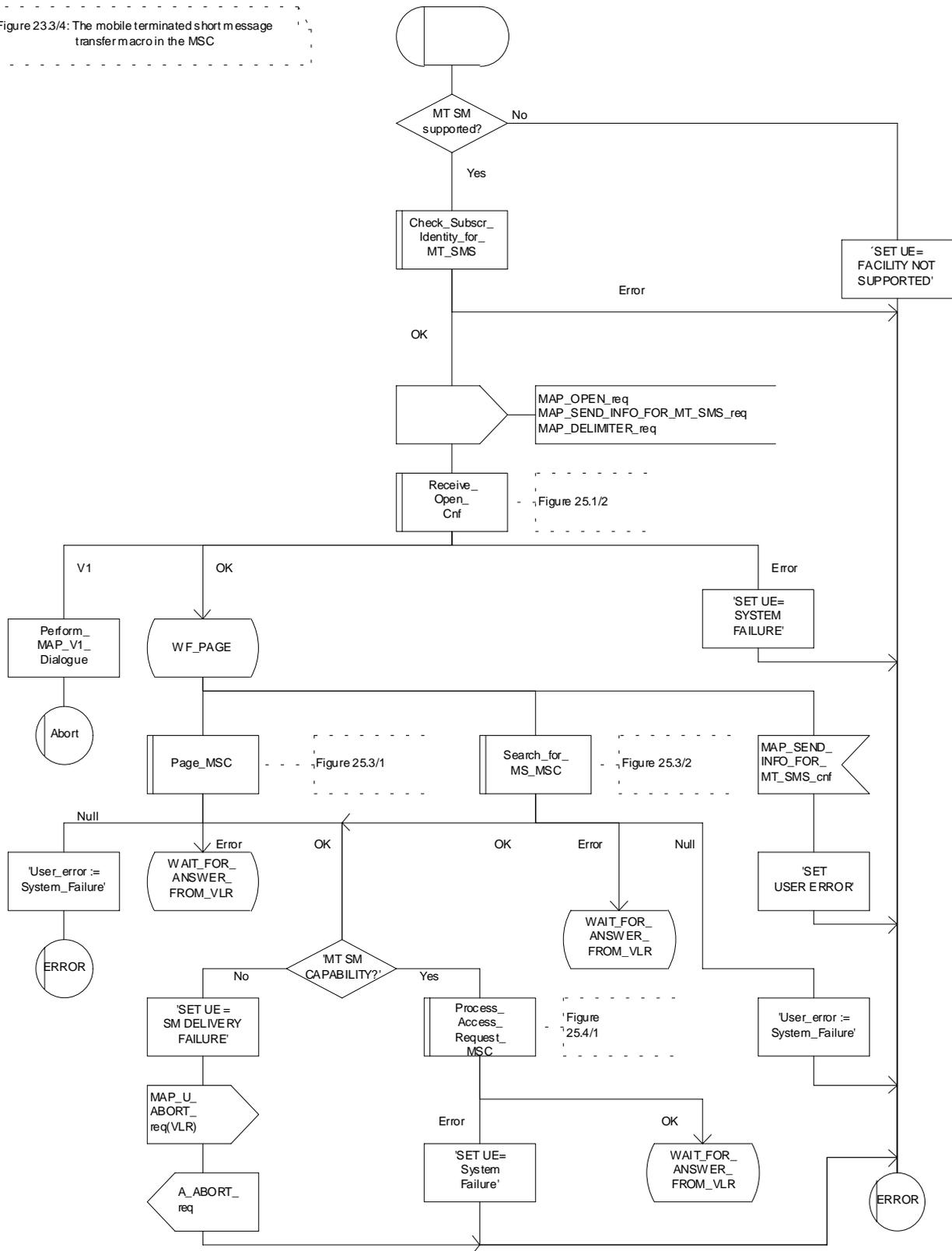


Figure 23.3/4 (sheet 1 of 3): Macro MT_SM_Transfer_MSC

Figure 23.3/4: The mobile terminated short message transfer macro in the MSC

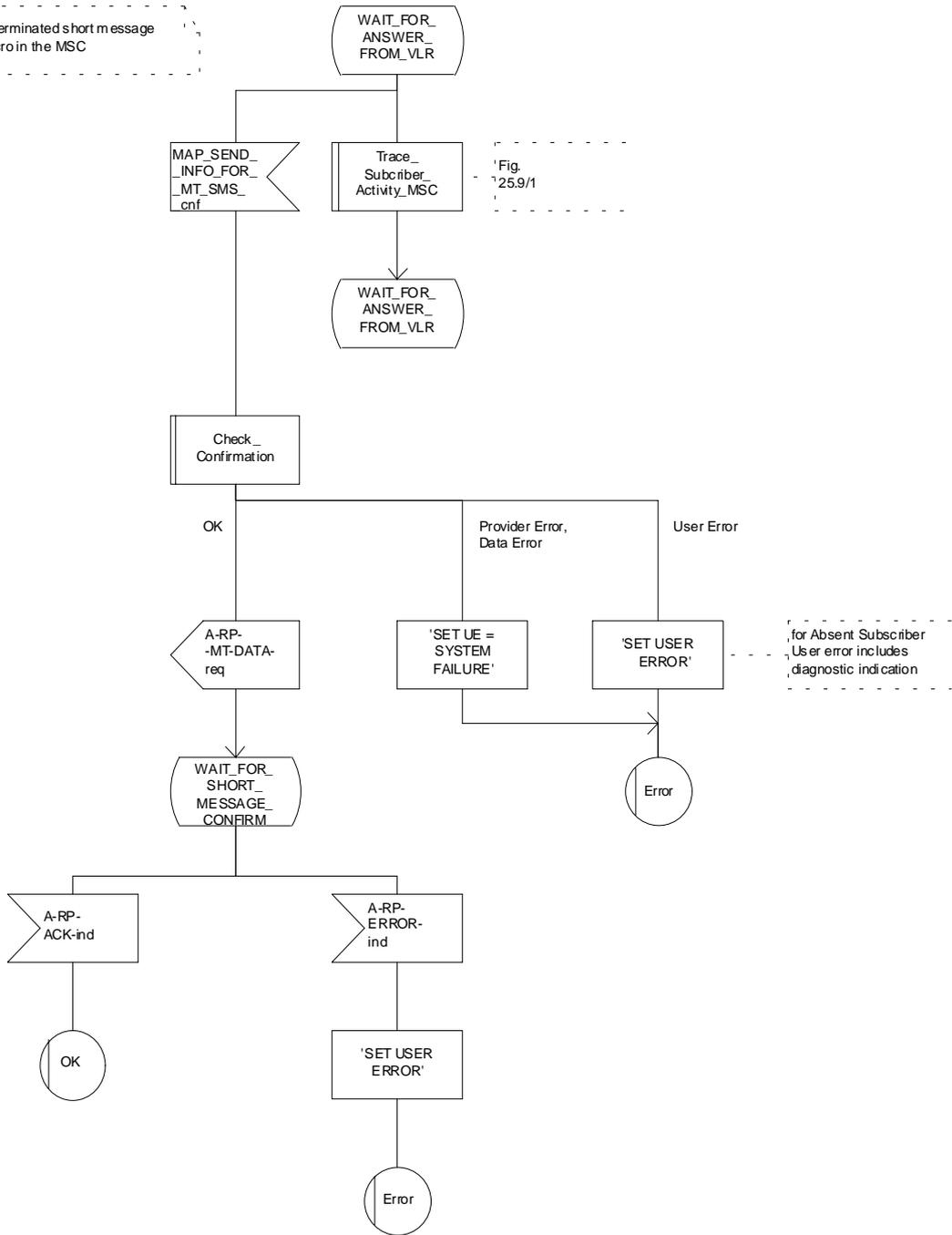


Figure 23.3/4 (sheet 2 of 3): Macro MT_SM_Transfer_MSC

Figure 23.3/4: The mobile terminated short message transfer macro in the MSC

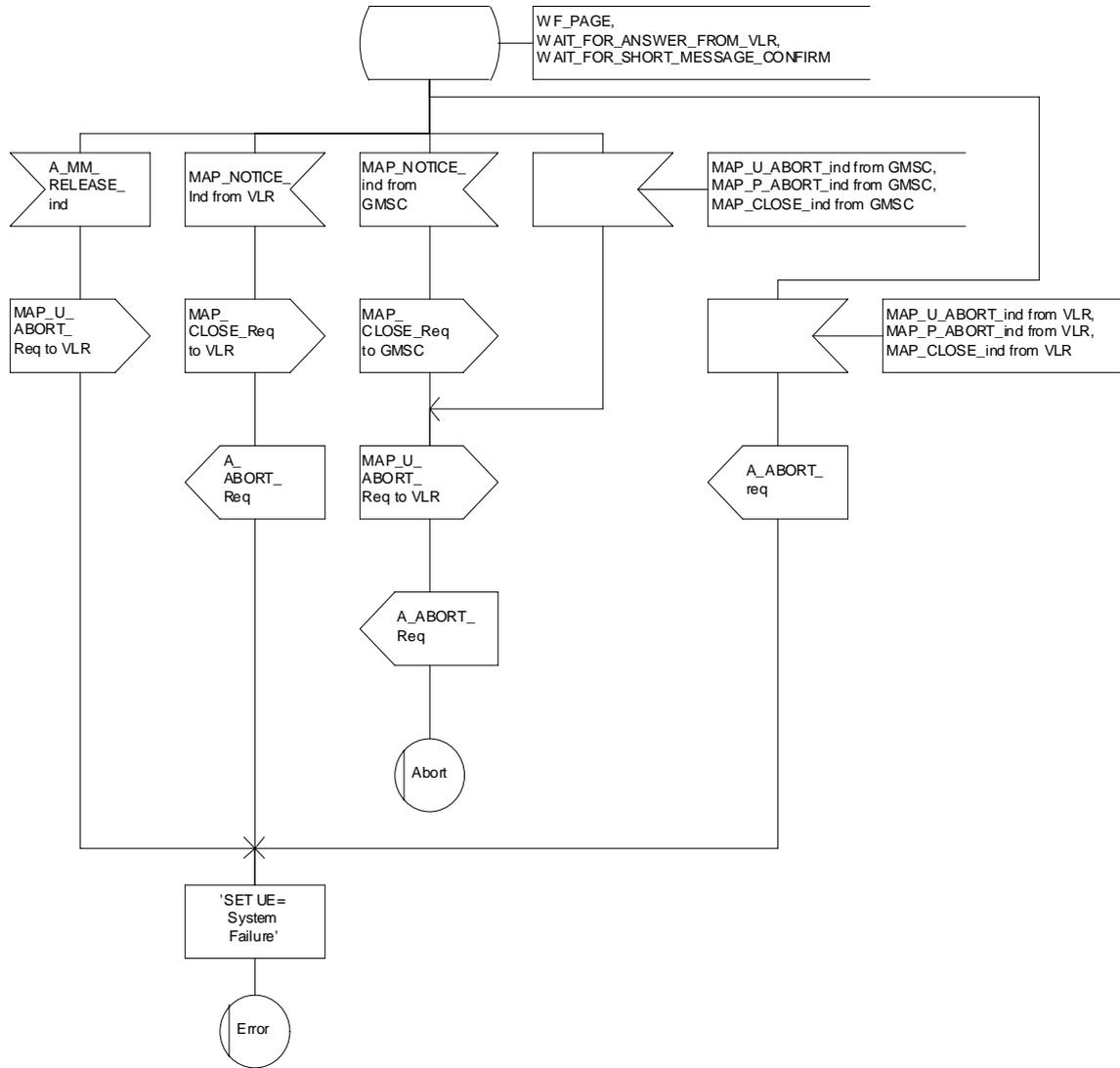


Figure 23.3/4 (sheet 3 of 3): Macro MT_SM_Transfer_MSC

23.3.2 Procedures in the VLR

When receiving the MAP_SEND_INFO_FOR_MT_SMS indication, the VLR will act as follows:

- the parameters and data in the primitive are checked by the macro "Check_Indication". A data failure is reported as an unexpected data value error or a data missing error depending on the nature of the failure;
- for mobile terminated short message the mobile subscriber is identified either by the IMSI only or by the IMSI accompanied by the LMSI. The subscriber identity information that may be included in the MAP_OPEN indication primitive and in the MAP service indication primitive is checked by the macro "Check_Subscr_Identity_For_MT_SMS". In the first case, the IMSI is included in the sm-RP-DA information field and the Destination Reference must not be present in the MAP_OPEN primitive. In the latter case the IMSI must be obtained from the Destination Reference of the MAP_OPEN indication primitive and an LMSI must be present in the sm-RP-DA information field of the MAP_SEND_INFO_FOR_MT_SMS indication. If the mobile subscriber is unknown, the unidentified subscriber error is returned;
- if the "Confirmed by HLR" indicator is set to "Not Confirmed", the unidentified subscriber error is returned;
- if the IMSI Detached Flag is set to detached or the LA Not Allowed Flag is set to not allowed in the VLR, an absent subscriber error with the diagnostic indication set to 'IMSI Detached' is returned and the MS not reachable flag (MNRF) is set;
- if the MAP_SEND_INFO_FOR_MT_SMS indication has passed all the tests, the VLR will initiate the paging procedure. If the location area identification is known and the "Confirmed by Radio Contact" indicator is set to "Confirmed", the MAP_PAGE service is used. Otherwise the MAP_SEARCH_FOR_MOBILE_SUBSCRIBER service is started.

The following responses to the paging procedure may be received from the MSC:

- the MAP_SEARCH_FOR_MOBILE_SUBSCRIBER confirmation indicating a successful outcome, if the search procedure is used. After that the VLR awaits the MAP_PROCESS_ACCESS_REQUEST indication from the MSC;
- the MAP_PAGE confirmation or MAP_SEARCH_FOR_MOBILE_SUBSCRIBER confirmation indicating unsuccessful outcome. If an absent subscriber error is received, the MS not reachable flag (MNRF) is set in the VLR. The errors are forwarded to the MSC in the MAP_SEND_INFO_FOR_MT_SMS response, the absent subscriber error is forwarded with the diagnostic indication set to 'No Paging Response for non GPRS'. If the unexpected data value, or unknown location area error is received, the system failure indication is given to the MSC; if subscriber busy for MT SMS is received, this cause is given to the MSC.
- the MAP_PROCESS_ACCESS_REQUEST indication telling that the outcome of the service MAP_PAGE is successful.

If the paging procedure or process access request procedure or any other procedure invoked fails, the appropriate error is reported to the MSC.

If the process access request procedure is successful, the VLR will send the MAP_SEND_INFO_FOR_MT_SMS response to the MSC and the transaction is terminated in the VLR.

The mobile terminated short message transfer procedure in the VLR is shown in figure 23.3/5.

Figure 23.3/5: The mobile terminated short message service process in the VLR

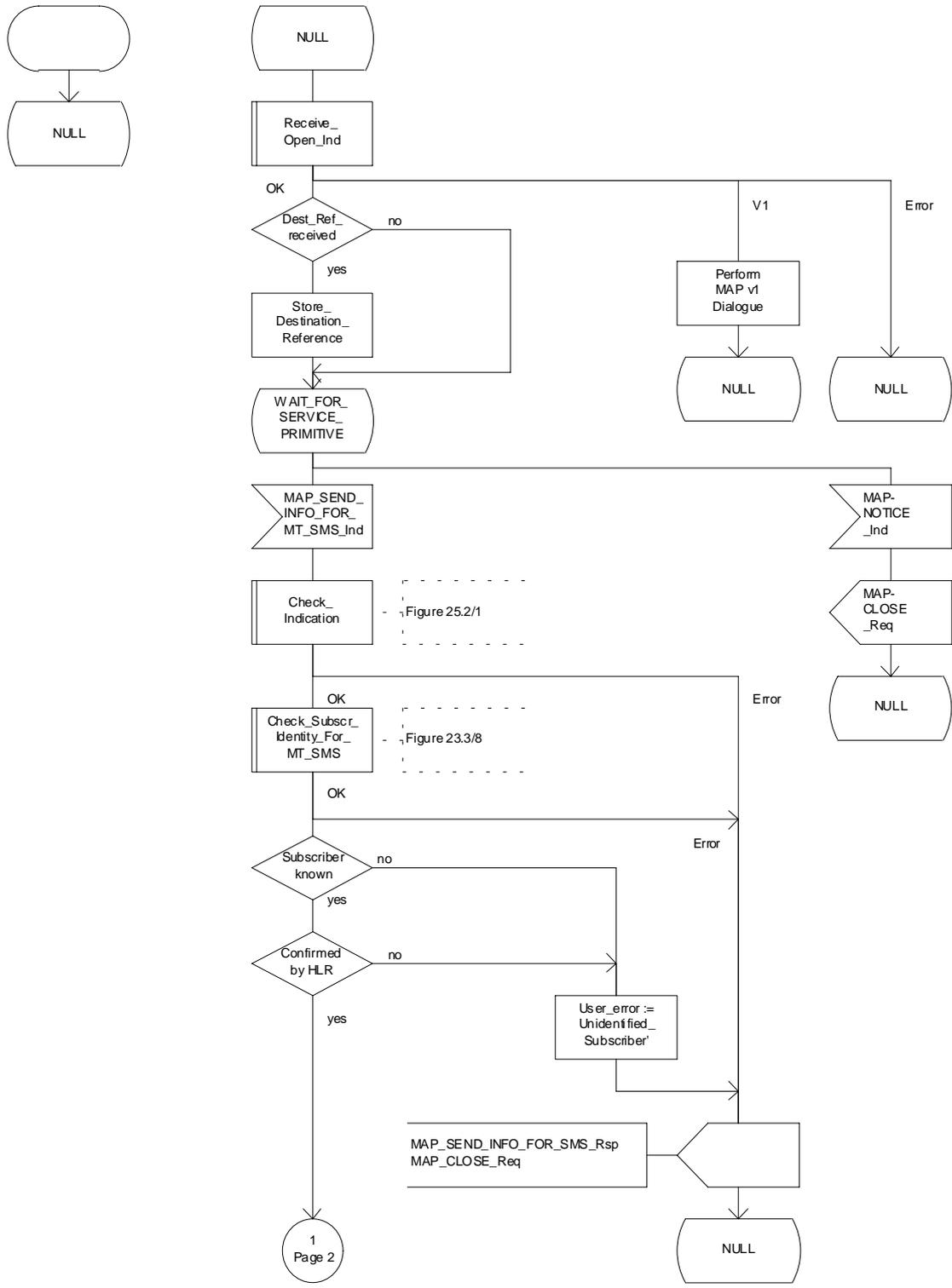


Figure 23.3/5 (sheet 1 of 3): Process MT_SM_VLR

Figure 23.3/5: The mobile terminated short message service process in the VLR

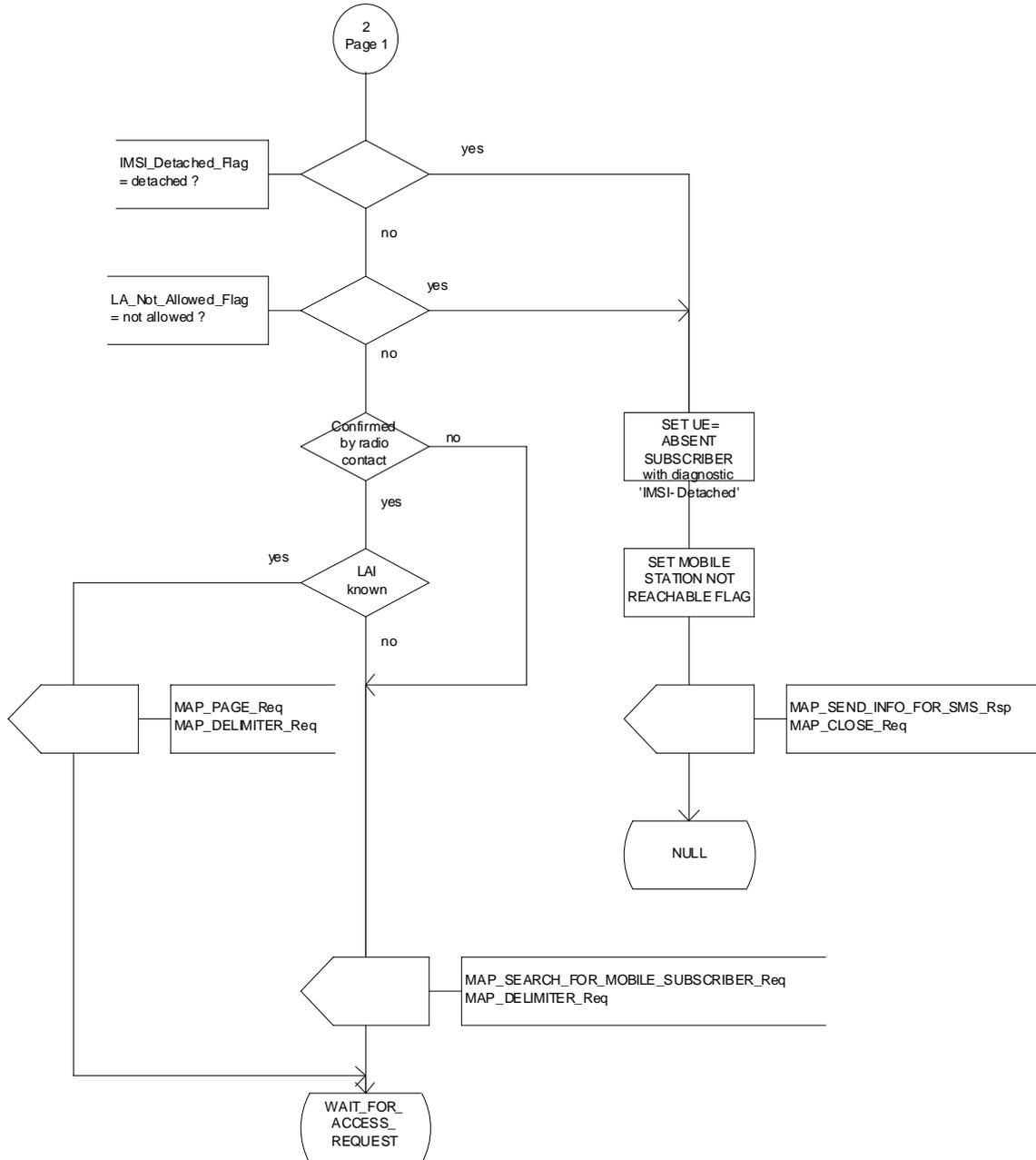


Figure 23.3/5 (sheet 2 of 3): Process MT_SM_VLR

Figure 23.3/5: The mobile terminated short message service process in the VLR

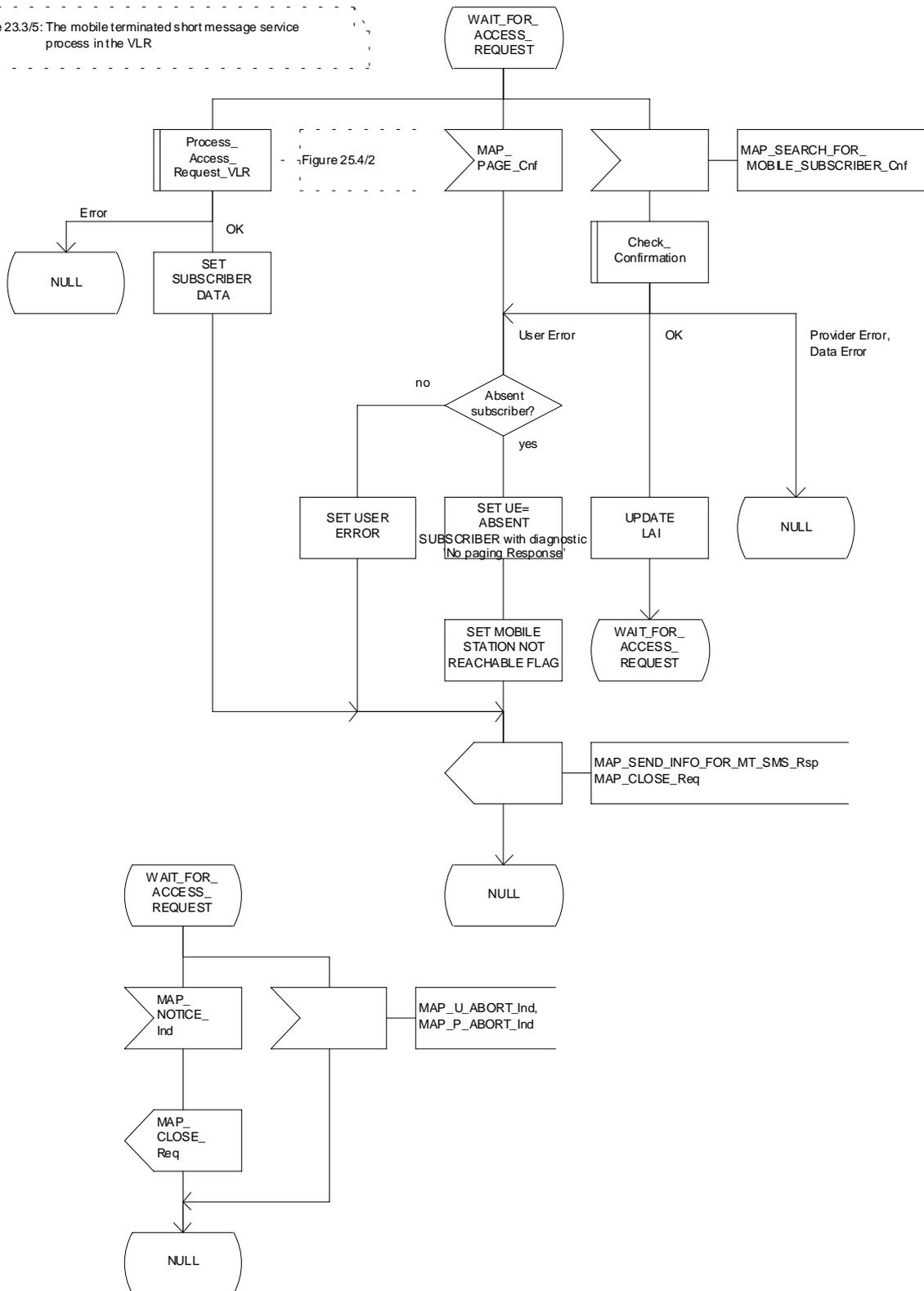


Figure 23.3/5 (sheet 3 to 3): Process MT_SM_VLR

23.3.3 Procedures in the HLR

The MAP_SEND_ROUTING_INFO_FOR_SM indication is received from the GMSC. The following error cases are reported to the GMSC in the MAP_SEND_ROUTING_INFO_FOR_SM response as an unsuccessful outcome of the procedure:

- if the necessary parameters and data are not present in the primitive or they are badly formatted, the data missing or unexpected data value error is returned;
- if the mobile subscriber is unknown, i.e. it cannot be identified from the MSISDN given, an unknown subscriber error is returned;
- if the short message transfer would contravene operator determined barring, the call barred error with cause operator barring is returned;
- if the short message transfer would contravene the « SM filtering by the HPLMN » function criteria, the call barred error with cause unauthorised Message Originator is returned (the definition of the filtering function is out of the scope of GSM specification. Filtering may be based on SM-RP-SMEA information element if received from the GMSC) ;
- if the mobile subscription identified by the given MSISDN number does not include the short message service, the teleservice not provisioned error is returned;
- if the GMSC does not support the GPRS functionality, the behaviour of the HLR depends on the following conditions:
 - If the subscriber is not a GPRS subscriber then the behaviour of the HLR shall be the same as for a subscriber only registered as non GPRS and for SMS delivery.
 - If the subscriber is a GPRS subscriber and a non-GPRS subscriber with the option « transfer of SM via the MSC when GPRS is not supported in the GMSC » then the behaviour of the HLR shall be the same as for a subscriber only registered as non GPRS and for SMS delivery.
 - If the subscriber is a GPRS subscriber and a non-GPRS subscriber with the option « transfer of SM via the SGSN when GPRS is not supported in the GMSC » or if the subscriber is a GPRS subscriber only then the behaviour of the HLR shall be the same as for the case transfer over GPRS described in MAP release 97, with the following precision : because GMSC does not support MAP release 97, the previous MAP protocol release is used. When the HLR sends the MAP_SEND_ROUTING_INFO_FOR_SM_Resp, the SGSN number is mapped to the MAP parameter « MSC number ». When the HLR sends the MAP_INFORM_SERVICE_CENTRE_resp, the MNRG status shall be mapped to the MAP parameter « mnrf-set ».

The HLR may send the MSC, SGSN or both numbers as routing information to SMS-GMSC based on the following:

A) The subscriber may only be registered as non GPRS and for SMS delivery:

- if the short message transfer would contravene the supplementary service barring, the call barred error with cause barring service active is returned;
- if the location registration of the mobile subscriber shows that the VLR in the visited PLMN does not support the MT short message service, the facility not supported error is returned;
- if no MSC identity is stored for the mobile subscriber or the "MSC Area Restricted Flag" is set or the "MS purged for non GPRS" flag is set, i.e. the MS is not reachable, the MSISDN-Alert and the SC address are included in the MWD (if possible), the flag MNRF is set and the "Absent Subscriber_SM" error is returned with the appropriate absent subscriber diagnostic indication, i.e. 'Deregistered in HLR for non GPRS ', 'Roaming Restricted' or 'MS-Purged for non GPRS '.

The priority parameter (SM_RP_PRI) is processed as follows:

- if the priority is low (SM_RP_PRI = False) and the mobile station not reachable flag (MNRF) is set, an absent subscriber_SM error is returned. If a reason for the subscriber's absence for non GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, then this is returned with the absent subscriber_SM error. The SC-address given in the request will be included in the MWD if possible. The service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address has been included in the MWD list.
- if the priority is low (SM_RP_PRI = False), and the MNRF is clear, the routing information with MSC number is retrieved as described below;
- if the priority is high (SM_RP_PRI = True) and the MNRF is set, the HLR will send the acknowledge primitive containing the routing information with MSC number to the gateway MSC. In addition the service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address is already included in the MWD list.

B) The subscriber may only be registered as GPRS and for SMS delivery:

- if the location registration of the mobile subscriber shows that the SGSN in the visited PLMN does not support the MT short message service, the facility not supported error is returned;
- if no SGSN identity is stored for the mobile subscriber or the "SGSN Area Restricted Flag" is set or the "MS purged for GPRS" flag is set, i.e. the MS is not reachable, the MSISDN-Alert and the SC address are included in the MWD (if possible), the flag MNRG is set and the "Absent Subscriber_SM" error is returned with the appropriate absent subscriber diagnostic indication, i.e. 'Deregistered in HLR for GPRS', 'Roaming Restricted' or 'MS-Purged for GPRS'.

The priority parameter (SM_RP_PRI) is processed as follows:

- if the priority is low (SM_RP_PRI = False) and the mobile station not reachable for GPRS (MNRG) flag is set, an absent subscriber_SM error is returned. If a reason for the subscriber's absence for GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, then this is returned with the absent subscriber_SM error. The SC-address given in the request will be included in the MWD if possible. The service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address has been included in the MWD list.
- if the priority is low (SM_RP_PRI = False), and the MNRG is clear, the routing information with SGSN number is retrieved as described below;
- if the priority is high (SM_RP_PRI = True) and the MNRG is set, the HLR will send the acknowledge primitive containing the routing information with SGSN number to the gateway MSC. In addition the service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address is already included in the MWD list.

C) The subscriber may be registered as non GPRS and GPRS and for SMS Delivery:

- if the short message transfer would contravene the supplementary service barring, the behaviour is the same as for a subscriber only registered for GPRS and SMS delivery.
- if the location registration of the mobile subscriber shows that the VLR in the visited PLMN does not support the MT short message service, the behaviour is the same as for a subscriber only registered for GPRS and SMS delivery;
- if the location registration of the mobile subscriber shows that the SGSN in the visited PLMN does not support the MT short message service, the behaviour is the same as for a subscriber only registered for non GPRS and SMS delivery;
- if no MSC and SGSN identities are stored for the mobile subscriber or the "MSC and SGSN Area Restricted Flags" are set or the "MS purged for non GPRS and GPRS" flags are set or a combination of these errors for non GPRS and GPRS are used, i.e. the MS is not reachable, the MSISDN-Alert and the SC address are included in the MWD (if possible), the flags MNRF and MNRG are set and the "Absent Subscriber_SM" error is returned with the appropriate absent subscriber diagnostic indication, i.e. 'Deregistered in HLR for non GPRS or GPRS', 'Roaming Restricted', 'MS-Purged for non GPRS or GPRS' or both.

The priority parameter (SM_RP_PRI) is processed as follows:

- if the priority is low (SM_RP_PRI = False), the MNRF and MNRG are set, an absent subscriber_SM error is returned. If reasons for the subscriber's absence for non GPRS and GPRS are stored in MNRR in the subscriber data, then this is returned with the absent subscriber_SM error. The SC-address given in the request will be included in the MWD if possible. The service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address has been included in the MWD list.
- if the priority is low (SM_RP_PRI = False), and the MNRF is clear and MNRG is set, the routing information with MSC number is retrieved as described below;
- if the priority is low (SM_RP_PRI = False), and the MNRF is set and MNRG is clear, the routing information with SGSN number is retrieved as described below
- if the priority is low (SM_RP_PRI = False), and the MNRF and MNRG are clear, the routing information with MSC and SGSN numbers is retrieved as described below;
- if the priority is high (SM_RP_PRI = True) and the MNRF, the MNRG or both are set, the HLR will send the acknowledge primitive containing the routing information with both MSC and SGSN numbers to the gateway MSC. In addition the service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address is already included in the MWD list.

If the MSISDN-Alert number of the mobile subscriber stored in the MWD is not the same as that received in the MAP_SEND_ROUTING_INFO_FOR_SM indication, the HLR will include in the MAP_INFORM_SERVICE_CENTRE request to the GMSC the MSISDN-Alert number stored.

The MAP_INFORM_SERVICE_CENTRE request is sent also when the MCEF, MNRF, MNRG or both are set but the routing information is still sent to the GMSC. The status of the flags is indicated in the parameter MW Status.

The routing information is included in a MAP_SEND_ROUTING_INFO_FOR_SM response as follows:

- the IMSI will be returned to the GMSC together with the MSC, SGSN or both numbers and may be optionally accompanied by the LMSI.
- an indication specifying which number belongs the MSC and the SGSN will be returned to the GSMC.

LMSI shall not be used in case only the SGSN number is sent by HLR.

The mobile terminated short message transfer procedure in the HLR is shown in figure 23.3/6.

Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS

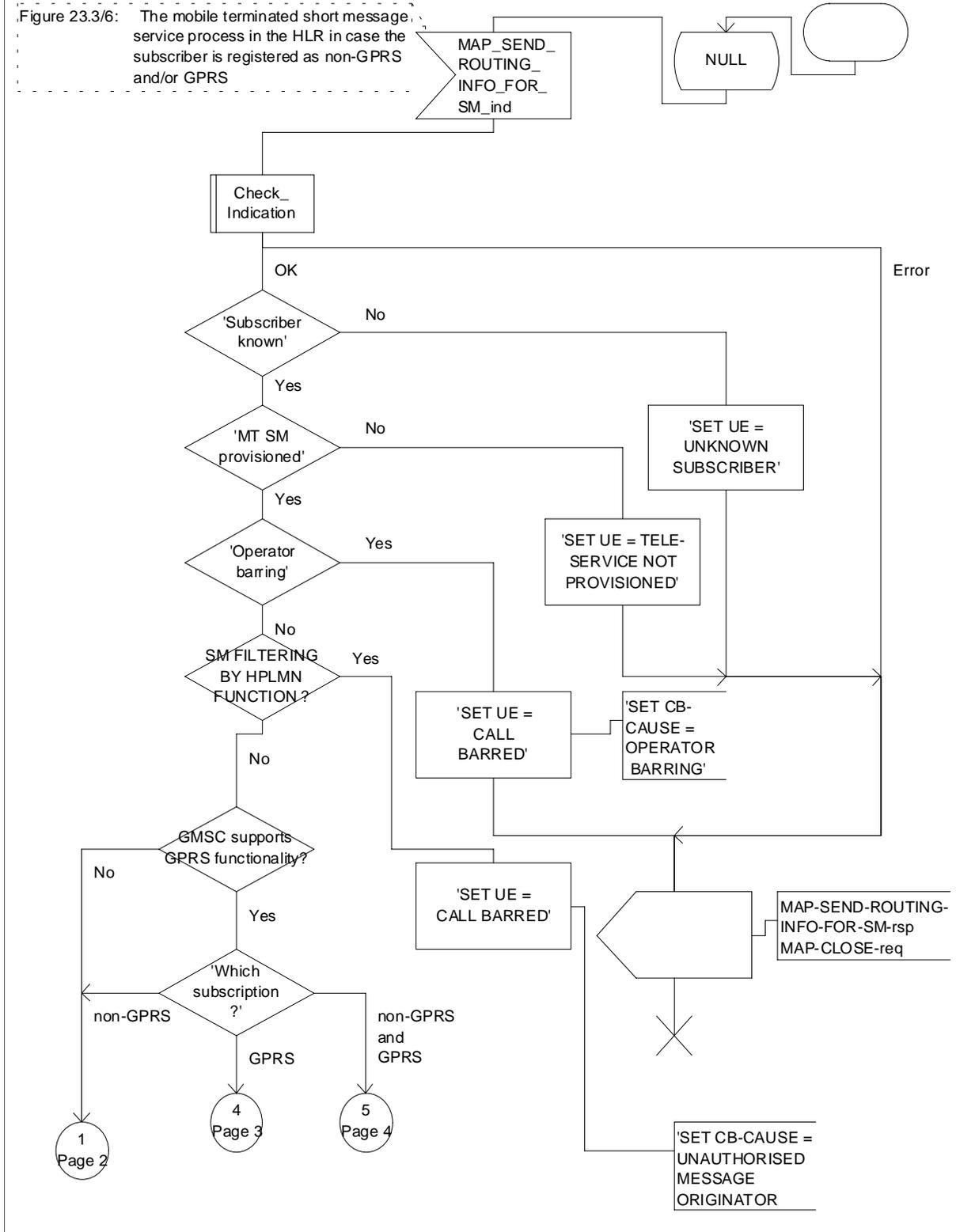


Figure 23.3/6 (sheet 1 of 5): Process Mobile_terminated_SM_HLR

Process Mobile_terminated_SM_HLR

23.3_6.2(5)

Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS

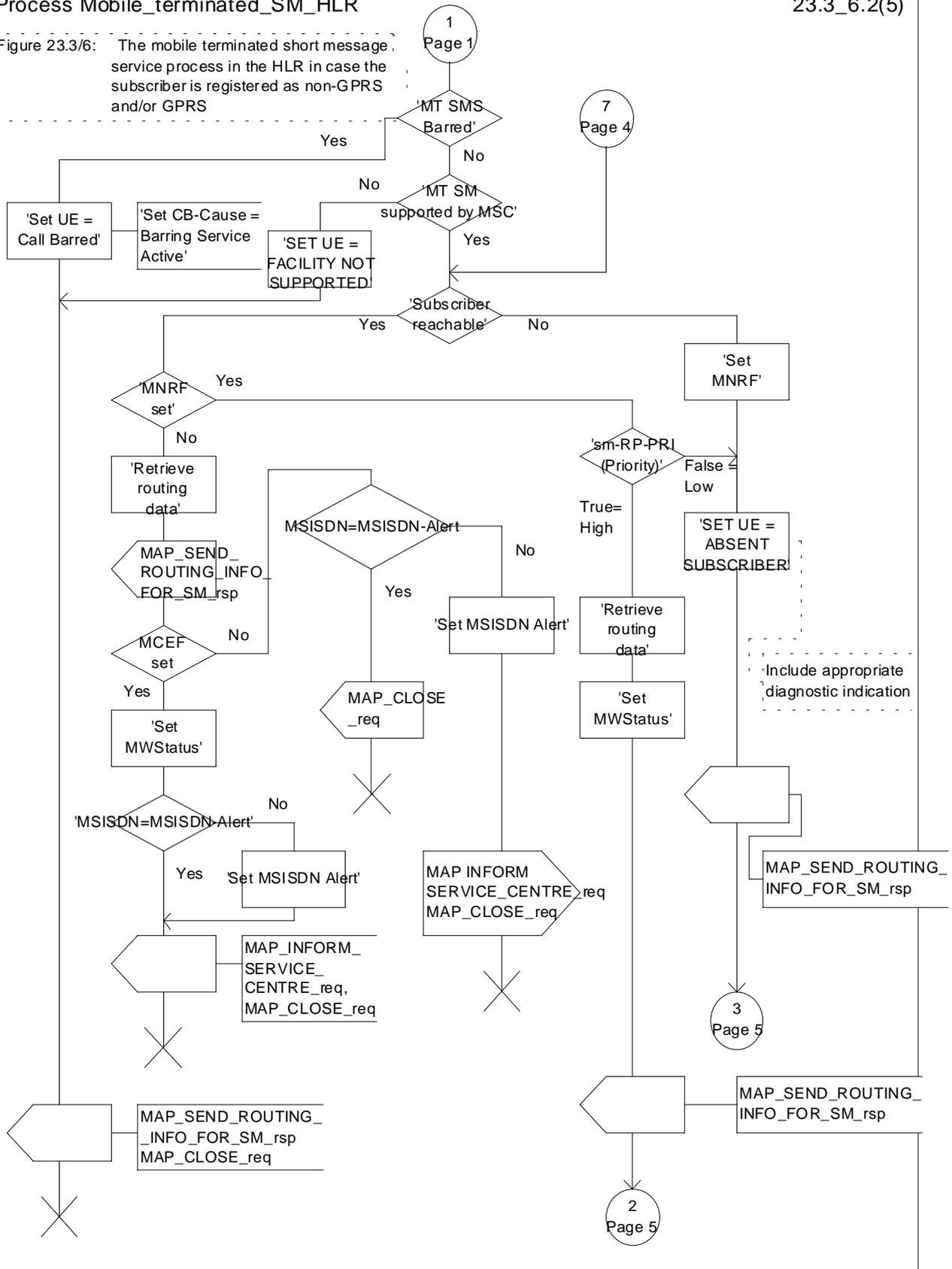


Figure 23.3/6 (sheet 2 of 5): Process Mobile_terminated_SM_HLR

Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS

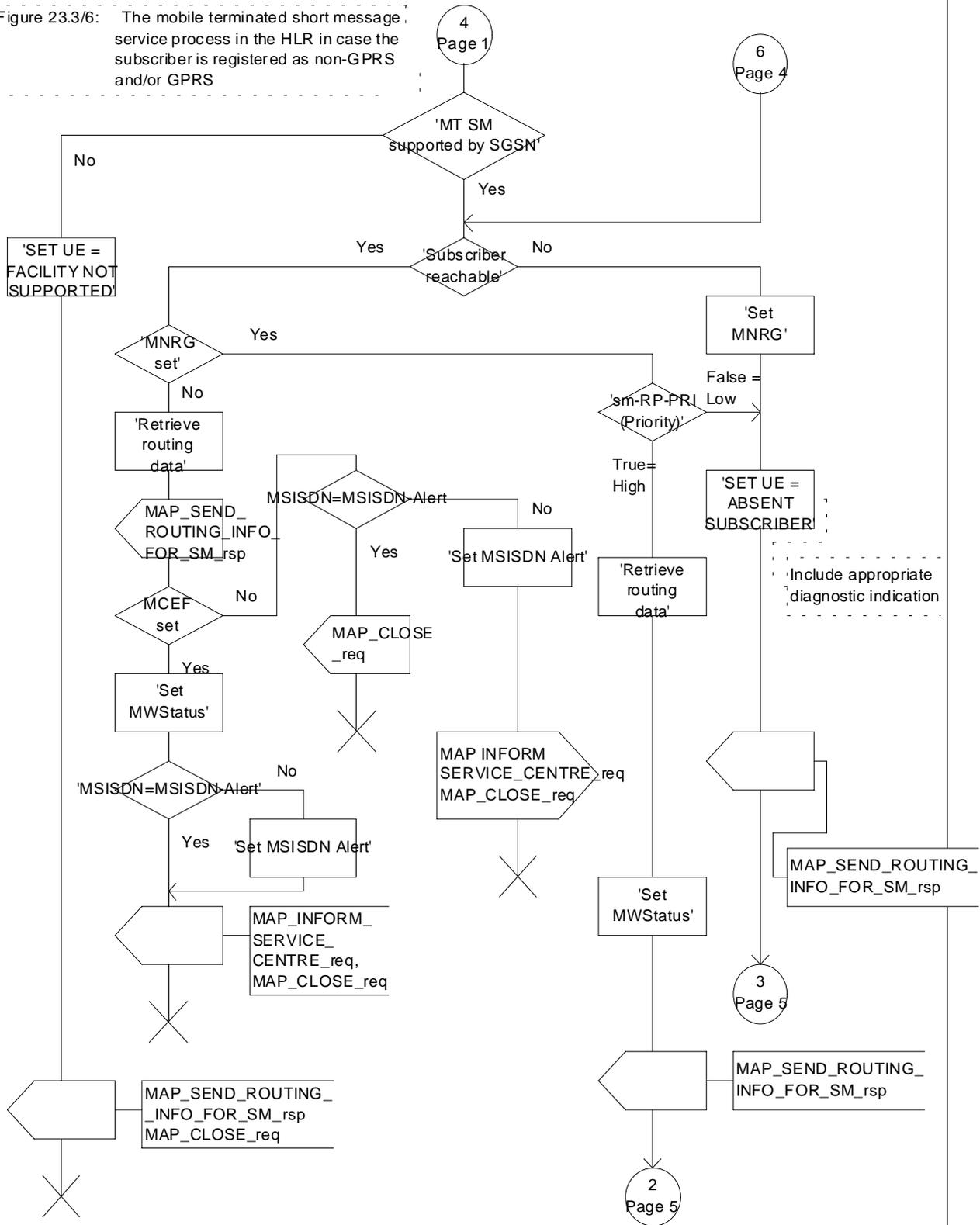


Figure 23.3/6 (sheet 3 of 5): Process Mobile_terminated_SM_HLR

Process Mobile_terminated_SM_HLR

23.3_6.4(5)

Figure 23.3/6: The mobile terminated short me service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS

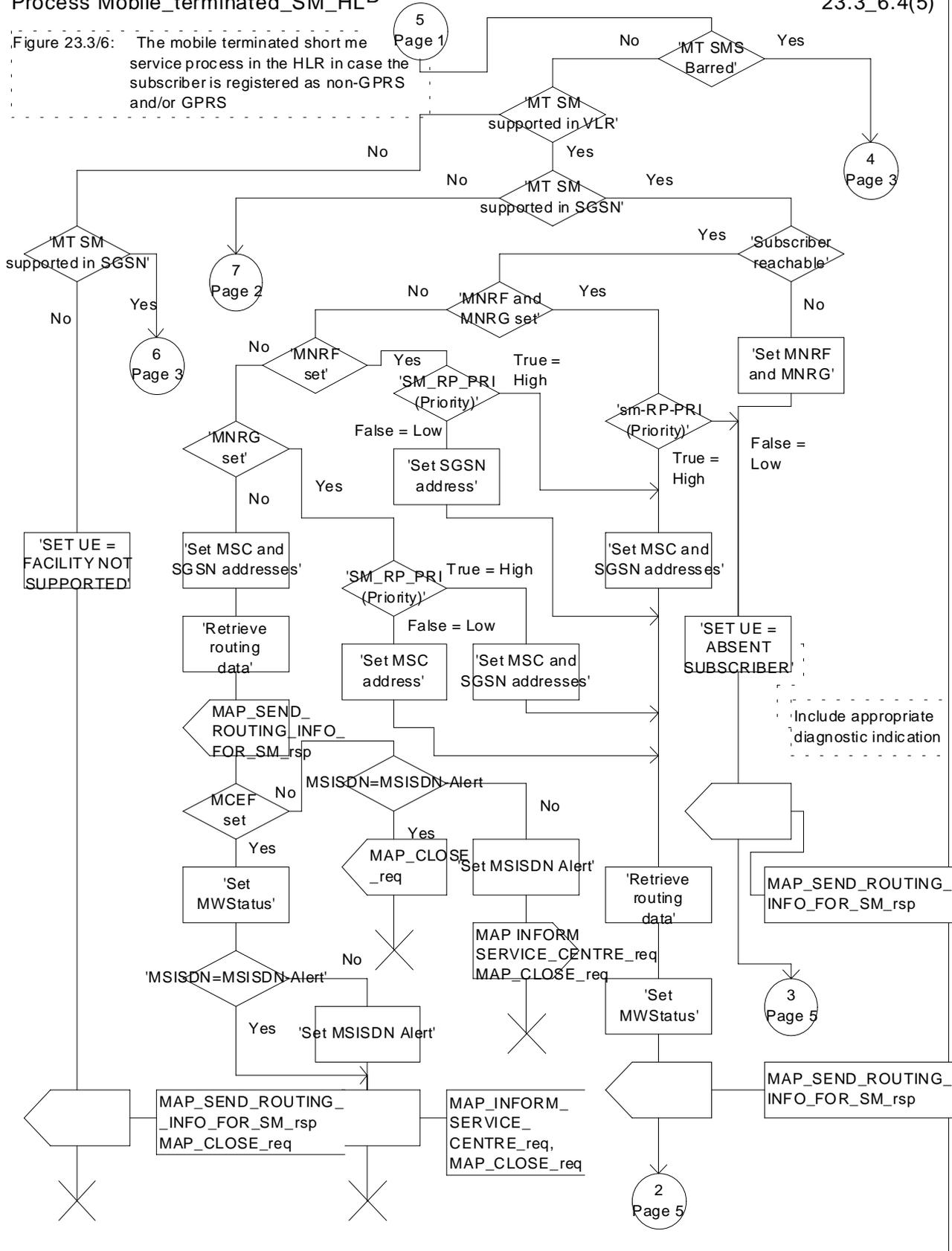


Figure 23.3/6 (sheet 4 of 5): Process Mobile_terminated_SM_HLR

Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS

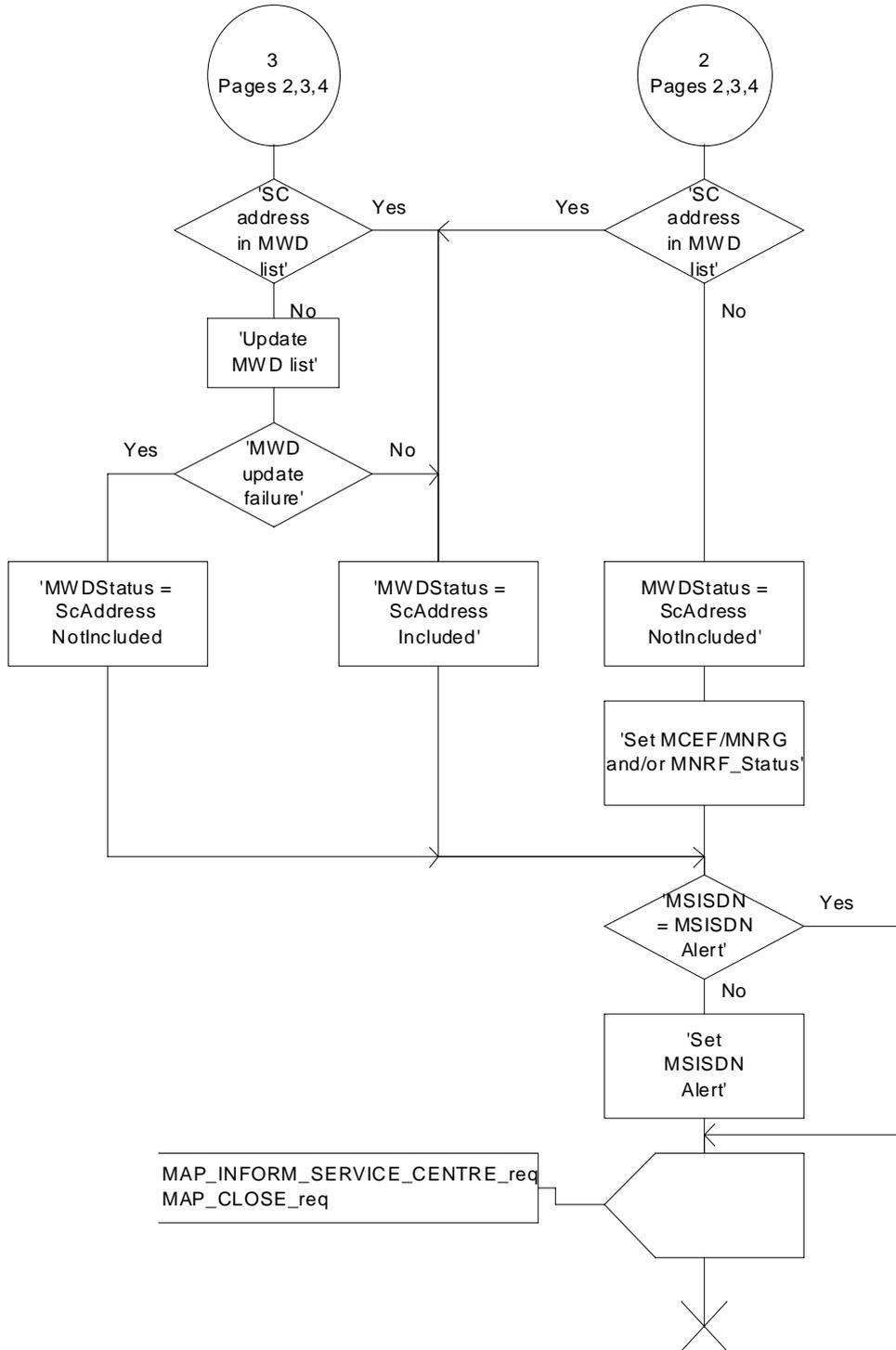


Figure 23.3/6 (sheet 5 of 5): Process Mobile_terminated_SM_HLR

Figure 23.3/11: Procedure in the HLR to select the node (MSC or/and SGSN) to which the SMS-GMSC has to send Short Message

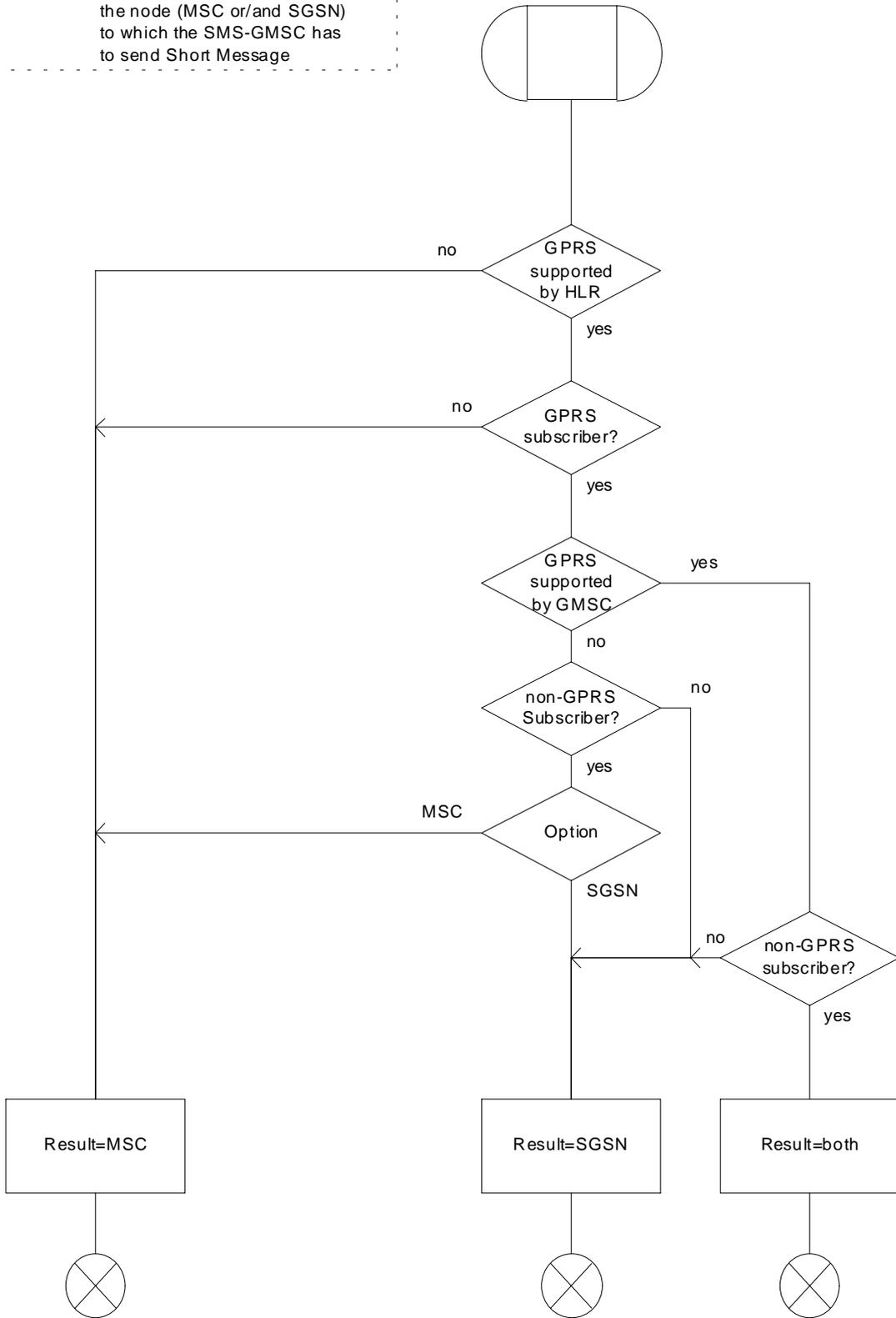


Figure 23.3/11: Procedure Select_Transfer_Nodes

23.3.4 Procedures in the gateway MSC

The short message handling function of the GMSC will request routing information when a mobile terminated short message is received from a Service Centre. The GMSC sends the MAP_SEND_ROUTING_INFO_FOR_SM request to the HLR containing the subscriber data of the mobile subscriber and the indication that the SMS-GMSC supports the GPRS functionality.

As an outcome of the procedure the MAP_SEND_ROUTING_INFO_FOR_SM confirmation is received indicating:

- an unsuccessful event indication containing an error;
The mapping between the MAP error causes and the RP_ERROR causes is explained in TS GSM 03.40.
- a successful event indication containing following parameters:
 - an IMSI optionally accompanied by an LMSI; and
 - routing addresses (servicing MSC, SGSN or both numbers).

The LMSI shall not be used in case the short message is routed towards the SGSN.

The GMSC may also receive a MAP_INFORM_SERVICE_CENTRE indication after the MAP_SEND_ROUTING_INFO_FOR_SM confirmation. The parameter MW Status in the message indicates whether or not the Service Centre address is stored in the Message Waiting Data. It also indicates the status of the MCEF , MNRf and MNRG flags in the HLR.

If the MSISDN-Alert stored in the MWD data is not the same as the one sent to the HLR, the MSISDN-Alert is received in the MAP_INFORM_SERVICE_CENTRE indication. This MSISDN number shall be transferred in a delivery failure report to the SC.

In the abnormal end or in the provider error case the system failure error is provided to the SC.

The forward short message procedure is initiated when the GMSC has obtained the routing information needed to forward a mobile terminated short message to the servicing MSC or SGSN.

If both numbers MSC and SGSN are received from HLR as routing information, the SMS-GMSC may choose which path (SGSN or MSC) first the SMS is to be transferred.

If an LMSI has been provided in the MAP_SEND_ROUTING_INFO_FOR_SM confirmation, it can be included in the sm-RP-DA information field of the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the servicing MSC. In this case, the IMSI must be included in the Destination Reference of the MAP_OPEN request. If the LMSI is not sent by the SMS Gateway MSC, the sm-RP-DA information field in the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the servicing MSC or SGSN shall contain the IMSI and the Destination Reference in the MAP_OPEN request shall not be present. The Service Centre address is sent in the parameter SM_RP_OA. The More Messages To Send flag is set to TRUE or FALSE depending on the information received from the Service Centre.

If the GMSC is the servicing MSC then the MAP service is not initiated. The procedure in the Servicing MSC is described in subclause 23.3.1 and in the figure 23.3/4.

If the grouping of MAP_OPEN request and MAP_MT_FORWARD_SHORT_MESSAGE request together would need segmenting, these primitives must not be grouped together. The MAP_OPEN request primitive is sent first without any associated MAP service request primitive and the dialogue confirmation must be received before the MAP_MT_FORWARD_SHORT_MESSAGE request is sent.

As a response to the procedure, the GMSC will receive the MAP_MT_FORWARD_SHORT_MESSAGE confirmation indicating:

- a successful forwarding of the short message. This indication is passed to the SC;
- unsuccessful forwarding of the short message:

In case only one number (MSC or SGSN) was received from HLR as routing information, the mapping of the MAP error causes and the RP_ERROR causes is explained in TS GSM 03.40. The appropriate error indication is sent to the SC.

In case both numbers (MSC and SGSN) were received from HLR as routing information, the transfer of SMS is re-attempted towards the second path only when one of the following errors is received from the unsuccessful transfer over the first path:

Facility Not Supported

Unidentified Subscriber

Absent Subscriber with indication: GPRS or IMSI Detach

Unexpected Data Value

System failure

Data Missing

Subscriber Busy for MT SMS: GPRS Connection Suspended,

otherwise, the mapping of the MAP error causes and the RP_ERROR causes is performed (see TS GSM 03.40) and the appropriate error indication is sent to the SC.

If second forwarding of short message is unsuccessful, the mapping of the MAP error causes and the RP_ERROR causes is explained in TS GSM 03.40. The appropriate error indications are sent to the SC.

If second forwarding of short message is successful, the successful indication is passed to the SC.

A provider error is indicated as a system failure error to the SC.

The GMSC invokes the procedure MAP_REPORT_SM_DELIVERY_STATUS, if an absent subscriber_SM, an unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded indication is received from the servicing MSC, SGSN or both, and the corresponding flags received in the MAP_INFORM_SC are not already set or the SC address is not yet included in the MWD set.

If absent subscriber diagnostic information (see GSM 03.40) is included with the absent subscriber_SM error indication then this information is relayed to the HLR using the procedure MAP_REPORT_SM_DELIVERY_STATUS.

In case the SMS was attempted to be delivered towards the MSC and the SGSN, and both delivery failed with causes described above, the two unsuccessful SMS delivery outcomes for GPRS and non GPRS are sent to the HLR.

In case the SMS was attempted to be delivered towards the MSC and the SGSN, and the first delivery failed with causes described above and the second delivery succeeded, the unsuccessful and successful SMS delivery outcomes for GPRS and non GPRS are sent to HLR.

The gateway MSC may also invoke the procedure when the first SMS delivery was successful towards MSC, if the MNRF, MCEF flags or both were set in the HLR.

The gateway MSC may also invoke the procedure when the first SMS delivery was successful towards SGSN, if the MNRG, MCEF flags or both were set in the HLR.

This procedure is described in detail in subclause 23.5.

Unexpected data value, system failure errors are indicated as a system failure to the SC. Other errors are indicated using appropriate cause values and diagnostic information between the GMSC and the SC as described in TS GSM 03.40 and GSM 04.11.

The unidentified subscriber error is indicated to the SC as absent subscriber with diagnostic information set to 'Unidentified subscriber' as described in TS GSM 03.40.

Note that the indication, on which number belongs the SGSN and MSC, received from the HLR at routing information result (see subclause 23.3.3) will enable the GMSC to map the causes received from the SGSN, MSC or both into the appropriate causes for non GPRS, GPRS or both, and send them to the SC and HLR.

If there are more short messages to send in the Service Centre and the previous short message transfer succeeded, then the gateway MSC awaits the next short message.

When receiving the next short message from the SC, the gateway MSC sets the More Messages To Send flag according to the information received and starts the service MAP_MT_FORWARD_SHORT_MESSAGE again.

If the gateway MSC is the servicing MSC, then the short message transfer to mobile subscriber is started as described in the subclause 23.3.1.

The mobile terminated short message transfer procedure in the gateway MSC is shown in figure 23.3/7.

Process MT_SM_GMSC

23.3_7.1(6)

'Figure 23.3/7: The mobile terminated short message service process in the GMSC

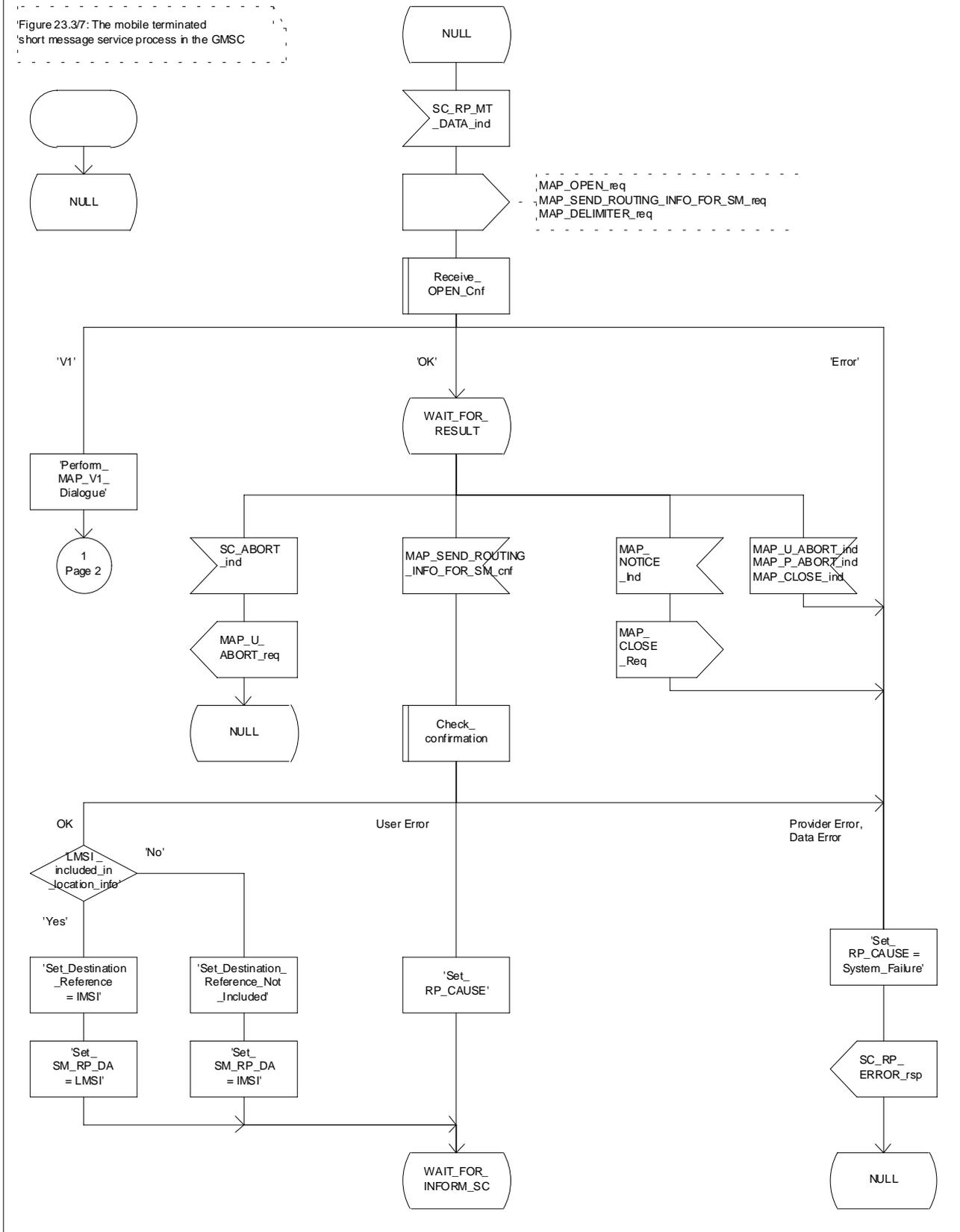


Figure 23.3/7 (sheet 1 of 6): Procedure MT_SM_GMSC

Figure 23.3/7: The mobile terminated short message service process in the GMSC

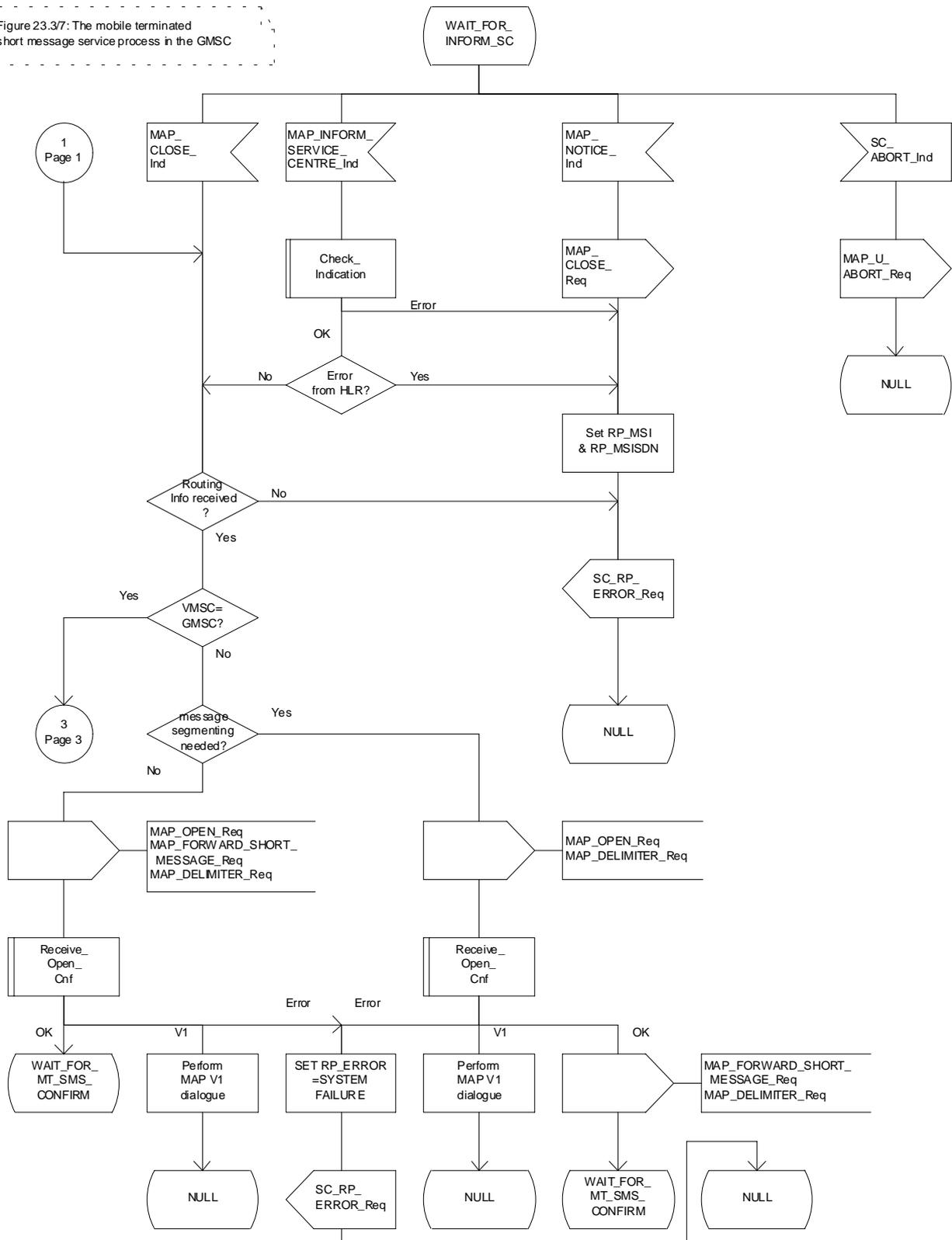


Figure 23.3/7 (sheet 2 to 6): Procedure MT_SM_GMSC

Figure 23.3/7: The mobile terminated short message service process in the GMSC

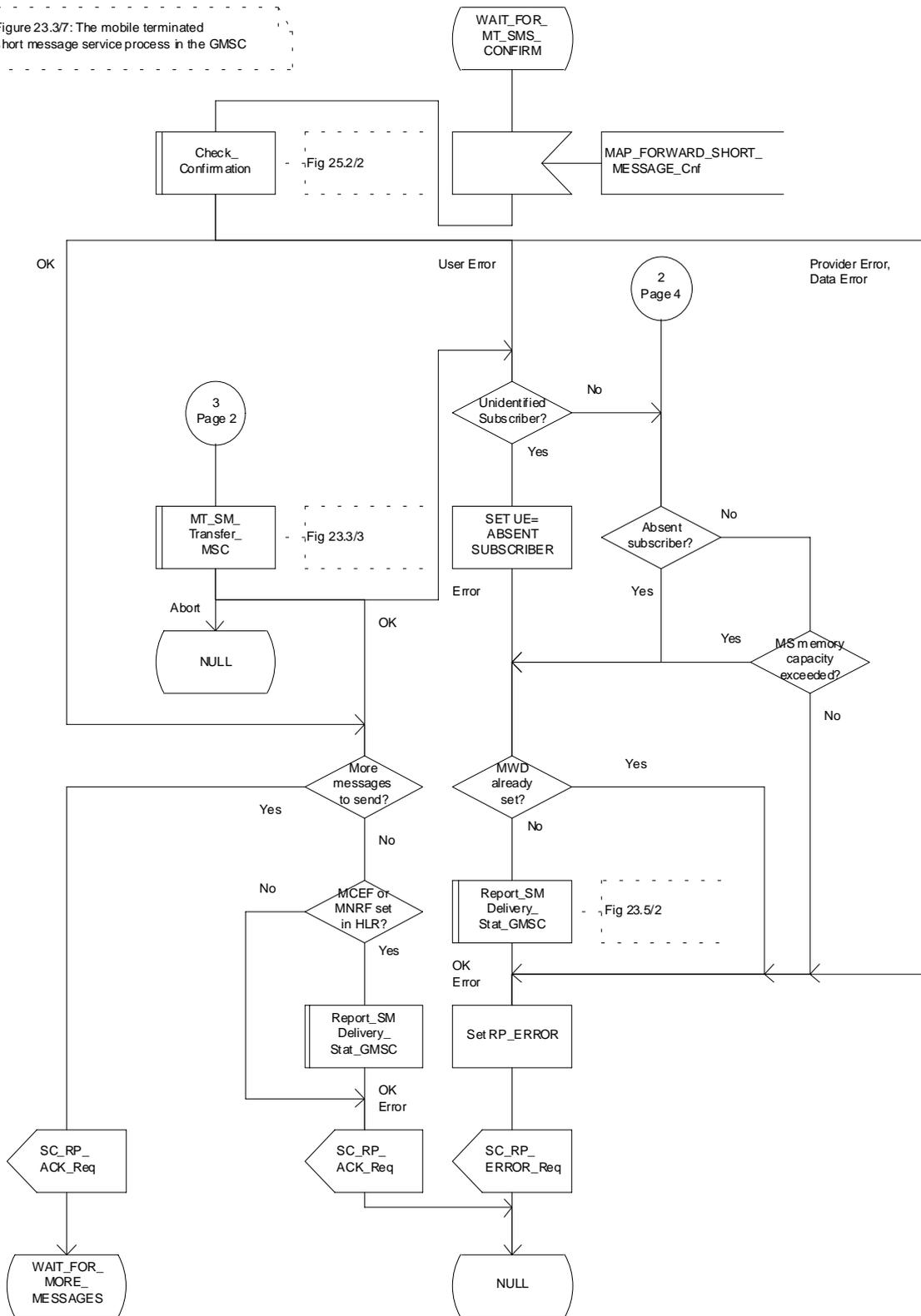


Figure 23.3/7 (sheet 3 of 6): Procedure MT_SM_GMSC

Figure 23.3/7: The mobile terminated short message service process in the GMSC

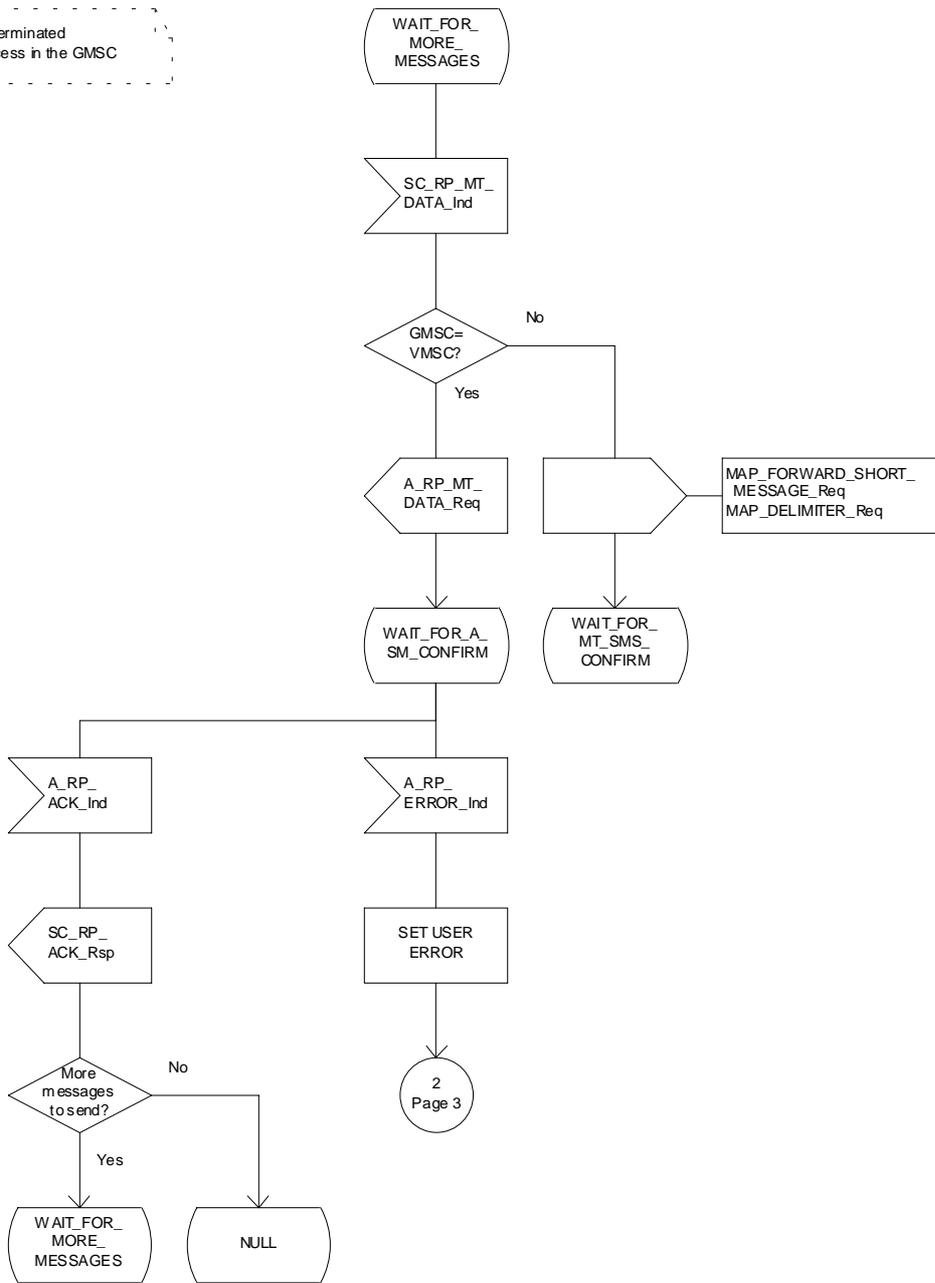


Figure 23.3/7 (sheet 4 of 6): Procedure_MT_SM_GMSC

Process MT_SM_GMSC

23.3_7.5(6)

Figure 23.3/7: The mobile terminated short message service process in the GMSC

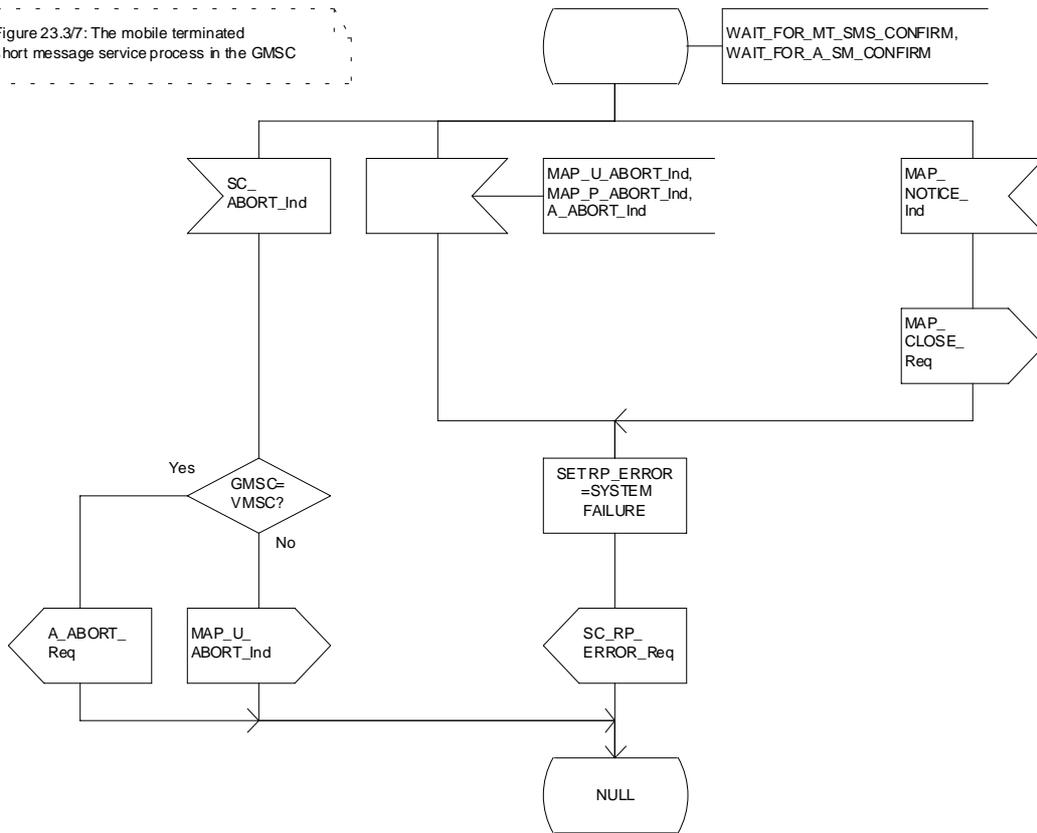


Figure 23.3/7 (sheet 5 to 6): Procedure MT_SM_GMSC

Figure 23.3/7: The mobile terminated short message service process in the GMSC

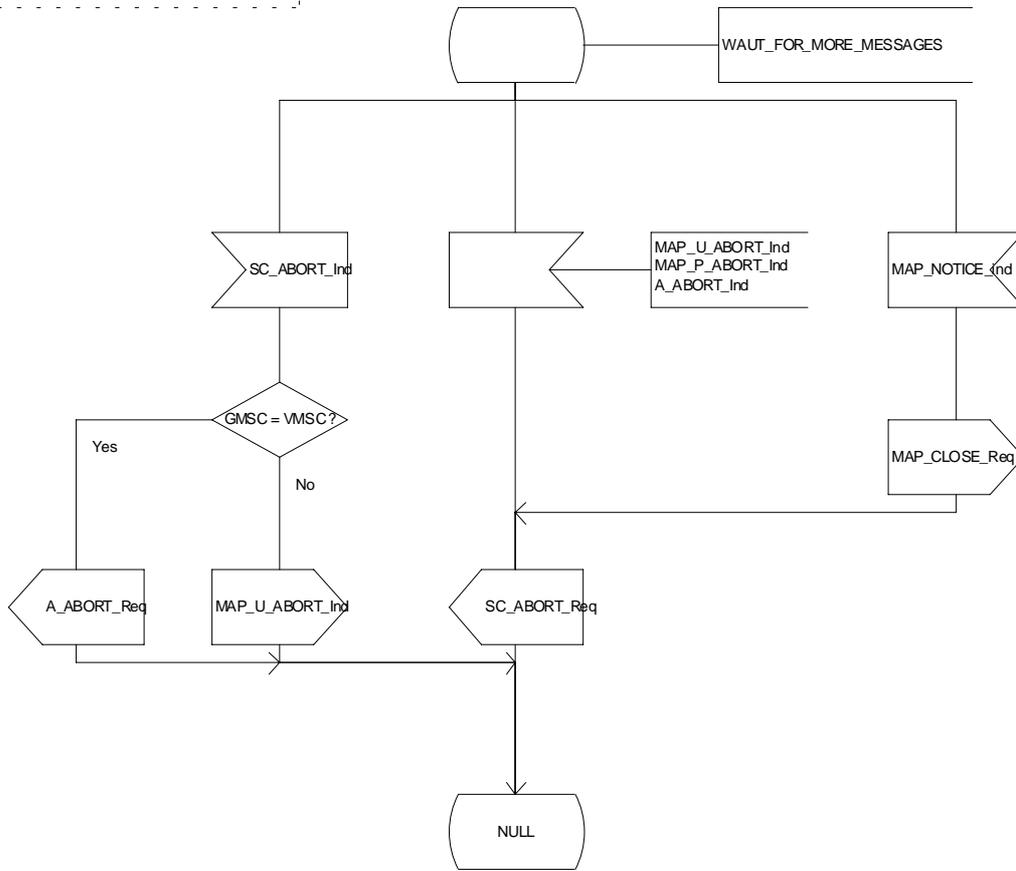


Figure 23.3/7 (sheet 6 of 6): Procedure MT_SM_GMSC

Figure 23.3/8: Check of the subscriber identity for a mobile terminated short message in the servicing MSC and in the VLR

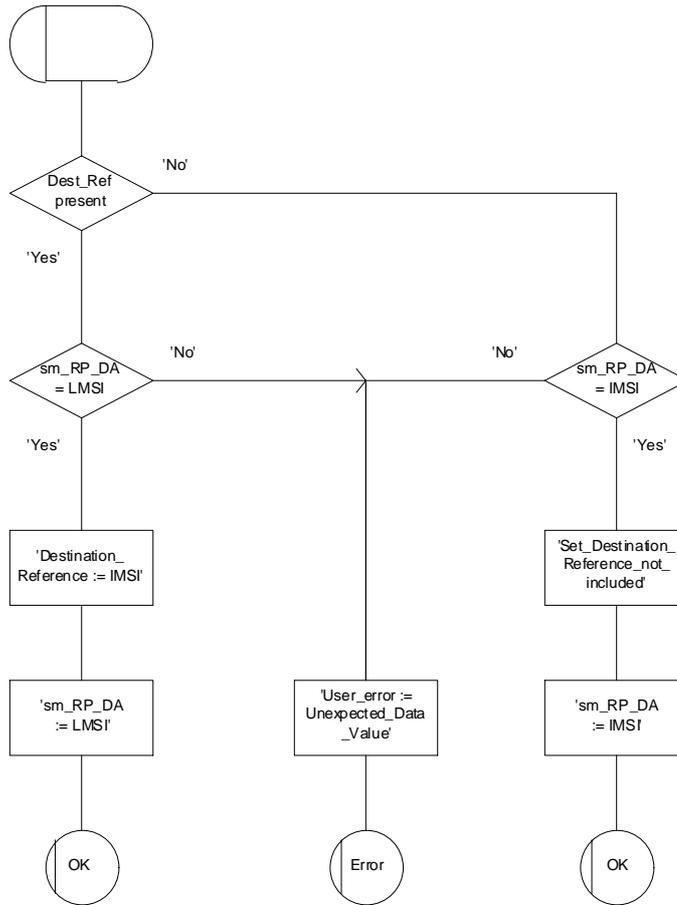


Figure 23.3/8: Macro Check_Subscr_Identity_For_MT_SMS

23.3.5 Procedure in the Servicing SGSN

When initiating the dialogue with the servicing SGSN, the SMS Gateway MSC must provide the IMSI of the subscriber to whom the short message is directed.

The IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication.

When receiving a MAP_OPEN indication primitive that is not associated with any MAP service indication primitive and if the dialogue is accepted, the MAP service-user in the servicing SGSN issues a MAP_DELIMITER request primitive in order to trigger the local MAP service-provider to confirm the dialogue.

When receiving the first MAP_MT_FORWARD_SHORT_MESSAGE indication from the gateway MSC, the servicing SGSN performs some subscriber data checks, if the MAP service primitive is accepted and if short message service is supported in the servicing SGSN.

The MAP_MT_FORWARD_SHORT_MESSAGE indication primitive is checked by the macro "Check_Indication". If the received MAP service primitive contains errors, the service is aborted and an unexpected data value error or data missing error is returned to the GMSC.

If the SGSN does not support the short message service, the service is aborted in the servicing SGSN and the error "Facility Not Supported" is returned to the GMSC.

If the connection is GPRS suspended, the SGSN sends to the GMSC an error specifying that the GPRS connection is suspended.

The subscriber identity information that are included in the MAP service indication primitive is checked by the macro "Check_Subscr_Identity_For_MT_SMS" as follows:

If the IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication, the MAP_OPEN indication received from the gateway MSC shall not include a Destination Reference.

If no Destination Reference has been received and the sm-RP-DA information field does not cover an IMSI the service is aborted in the servicing SGSN and the error "Unexpected Data Value" is returned to the GMSC.

The following outcomes from the subscriber data checks can occur in SGSN:

- if the mobile subscriber is unknown, the unidentified subscriber error is forwarded to the GMSC;
- if the "Confirmed by HLR" indicator is set to "Not Confirmed", the unidentified subscriber error is forwarded to the GMSC.
- if the GPRS Detached Flag is set to detached or the LA Not Allowed Flag is set to not allowed in the SGSN, an absent subscriber error with the diagnostic indication set to 'GPRS Detached' is forwarded to the GMSC and the MS not reachable for GPRS (MNRG) flag is set;
- If the location area identification is known and the "Confirmed by Radio Contact" indicator is set to "Confirmed", the paging procedure is invoked (see subclause 25.3). Otherwise the search procedure is invoked (see subclause 25.3).

The result of the paging or the search procedure is processed as follows:

- if the procedure is completed successfully, the SGSN may trigger the Authentication, Ciphering and IMEI check procedures (see subclauses 25.4 and 25.5). Then, if the procedure are completed successfully, the SGSN will send the short message to the MS;
- if the procedure is completed successfully, but the MS has no mobile terminated short message transfer capability, the SM delivery failure indication with cause "equipment not SM equipped" is provided to the GMSC;
- if the procedure is ended unsuccessfully because of subscriber already busy for SMS, another paging, emergency call, location updating, inter SGSN routing area update or a call set-up, the subscriber busy for MT SMS is provided to the GMSC.

- if the procedure is ended unsuccessfully, the absent subscriber_SM error is forwarded to the GMSC with the absent subscriber diagnostic indication set to 'No Paging Response for GPRS', but if the location area is unknown, the system failure indication is provided to the GMSC.

If forwarding of the short message is initiated, the SGSN awaits the result before one of the following responses is sent back to the GMSC:

- an acknowledge if the short message has been successfully delivered to the mobile subscriber;
- an SM delivery failure error containing a parameter indicating either of the following: there is a MS protocol error or the MS memory capacity is exceeded; detailed diagnostic information (see subclause 7.6.1.4) may also be carried;
- a system failure error if the delivery procedure is aborted.

If the More Messages To Send flag was FALSE or the service MAP_MT_FORWARD_SHORT_MESSAGE ends unsuccessfully, the transaction to the gateway MSC is terminated. Otherwise, the servicing SGSN waits for the next short message from the Service Centre.

When receiving the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the gateway MSC the servicing MSC will act as follows:

- if the received primitive contains errors, the unexpected data value error or data missing error is provided to the gateway MSC;
- if the More Messages To Send flag is FALSE, the servicing SGSN will start the short message transfer procedure to the mobile subscriber. The successful or unsuccessful outcome of this procedure is reported to the gateway MSC and the transaction is terminated.
- if the More Messages To Send flag is TRUE, the servicing SGSN will start the short message transfer to the mobile subscriber. If the outcome of this procedure is unsuccessful, the reason is reported to the gateway MSC and the procedure is terminated. If the procedure is successful, it is acknowledged to the gateway MSC and more short messages can be received.

The mobile terminated short message transfer procedure in the servicing SGSN is shown in figures 23.3/9 and 23.3/10. The page and search procedures are shown in figure 25.3/1 and 25.3/2.

Process MT_SM_Transfer_SGSN

23.3_9.1(3)

Figure 23.3/9: The mobile terminated short message service process in the SGSN

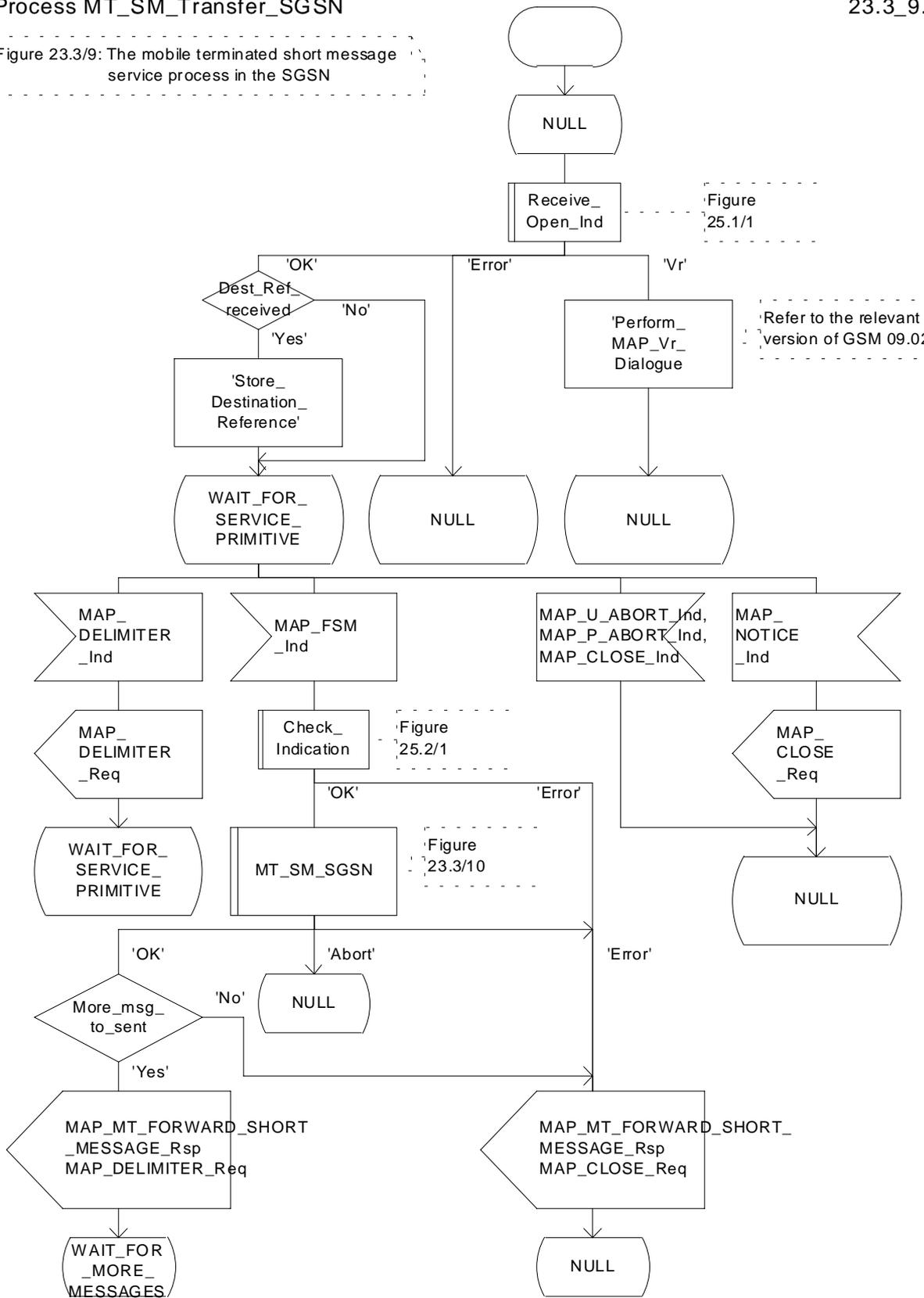


Figure 23.3/9 (sheet 1 of 3): Procedure MT_SM_Transfer_SGSN

Figure 23.3/9: The mobile terminated short message service process in the SGSN

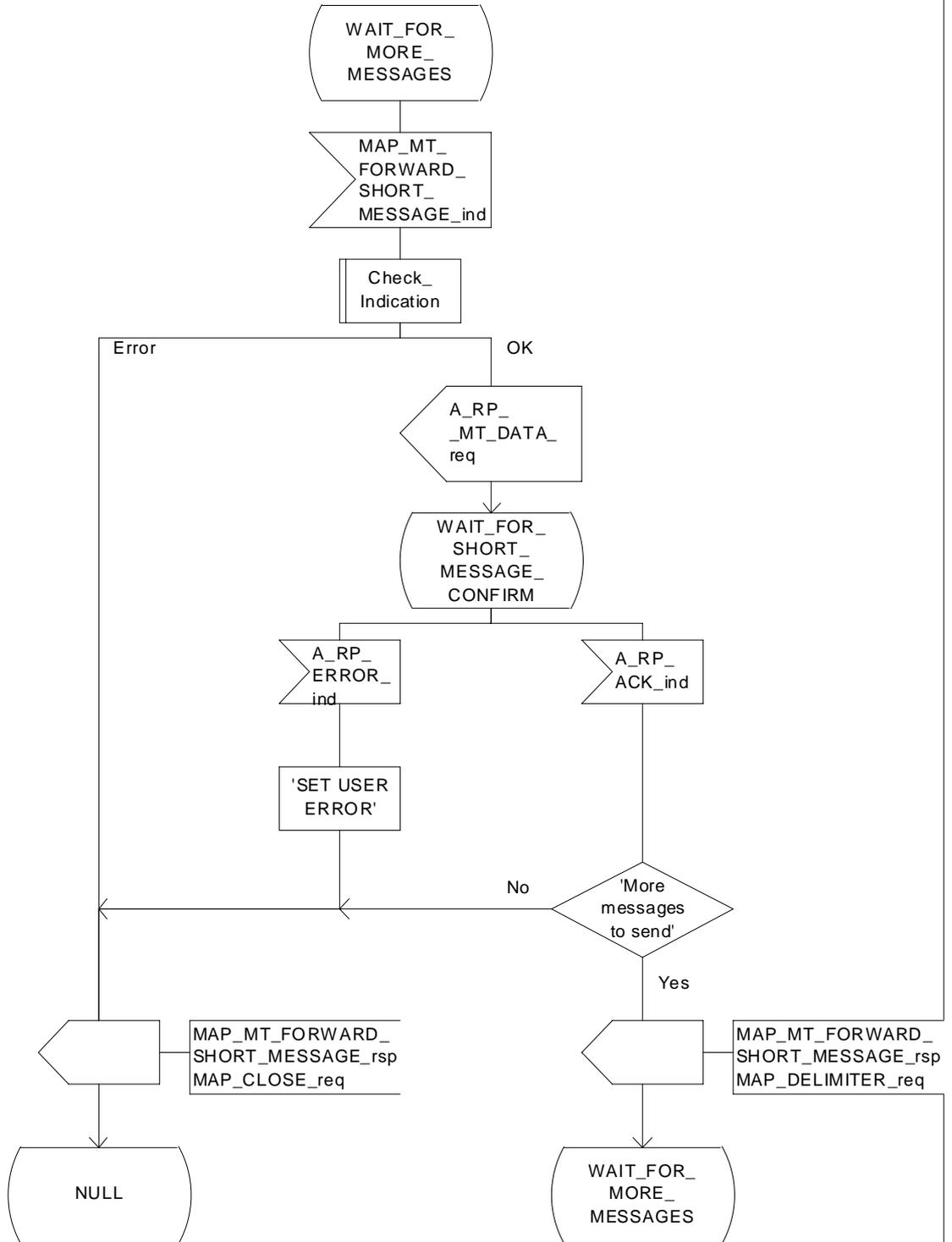


Figure 23.3/9 (sheet 2 of 3): Procedure MT_SM_Transfer_SGSN

Figure 23.3/9: The mobile terminated short message service process in the SGSN

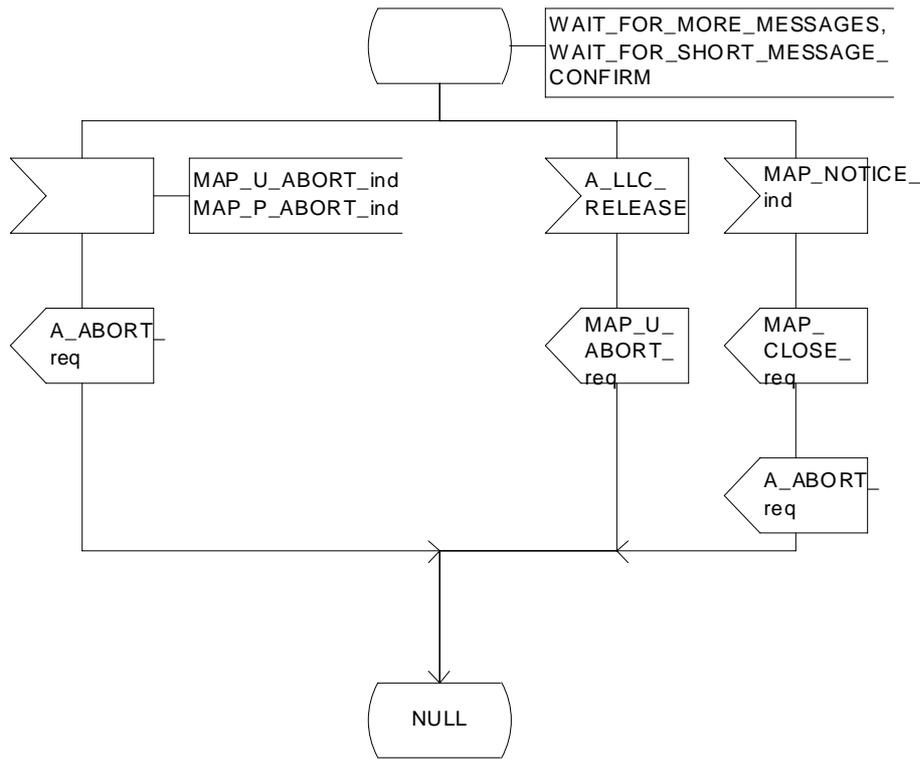


Figure 23.3/9 (sheet 3 of 3): Procedure MT_SM_Transfer_SGSN

Macrodefinition MT_SM_SGSN

23.3_10.1(3)

Figure 23.3/10: The mobile terminated short message transfer macro in the SGSN

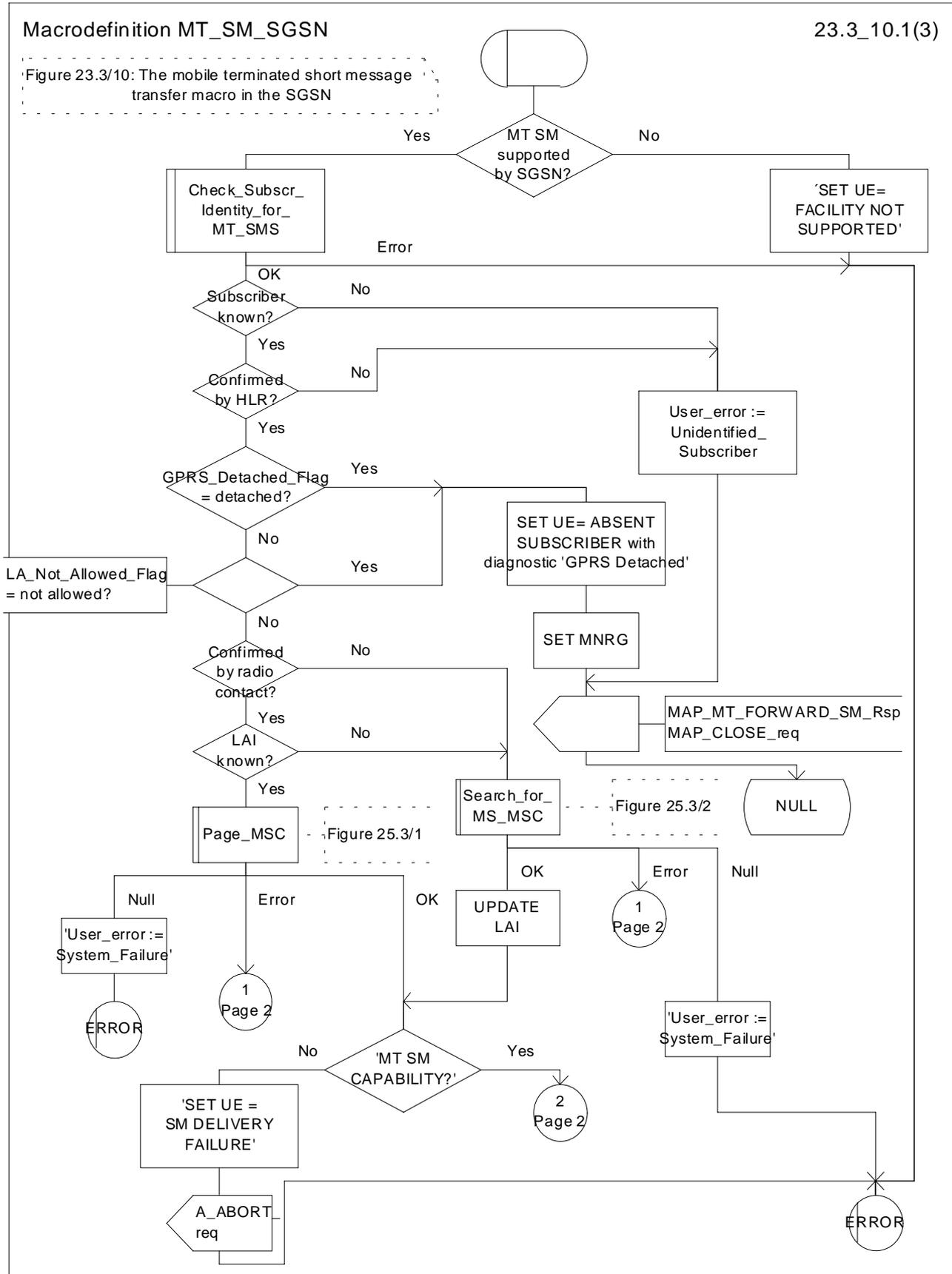


Figure 23.3/10 (sheet 1 of 3): Macro MT_SM_SGSN

Figure 23.3/10: The mobile terminated short message transfer macro in the SGSN

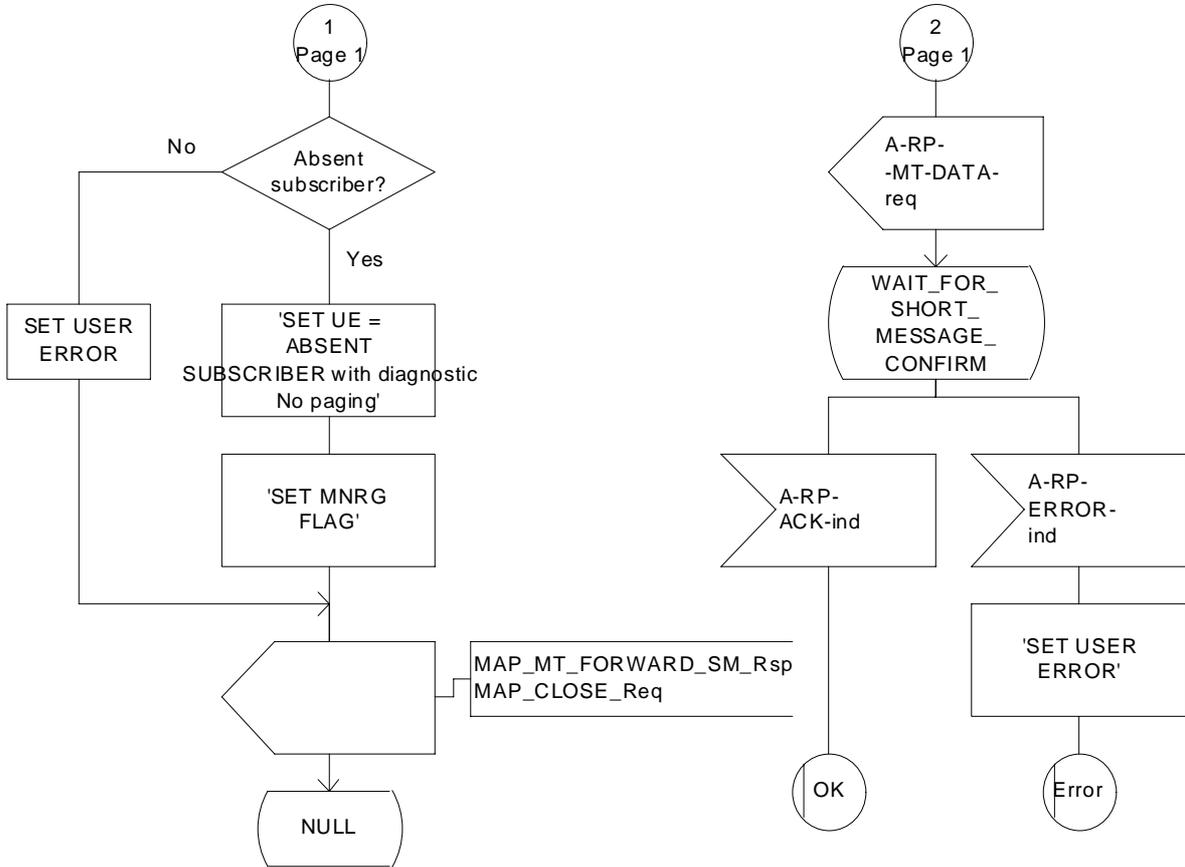


Figure 23.3/10 (sheet 2 of 3): Macro MT_SM_SGSN

Figure 23.3/10: The mobile terminated short message transfer macro in the SGSN

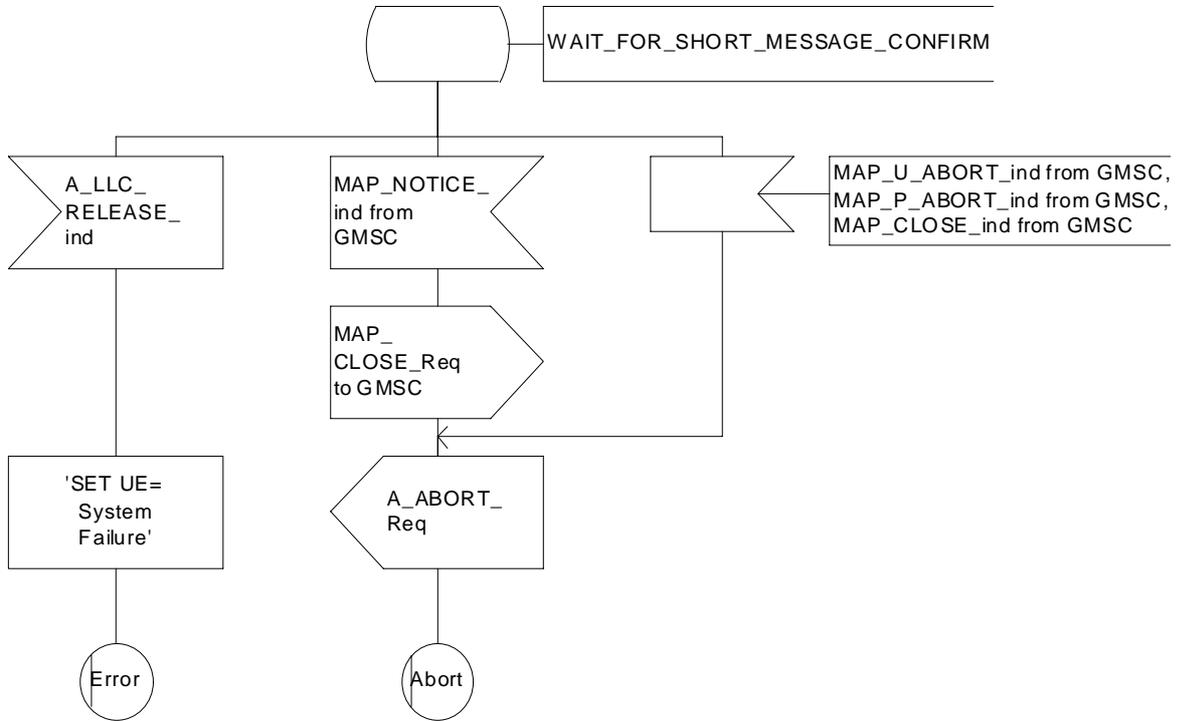
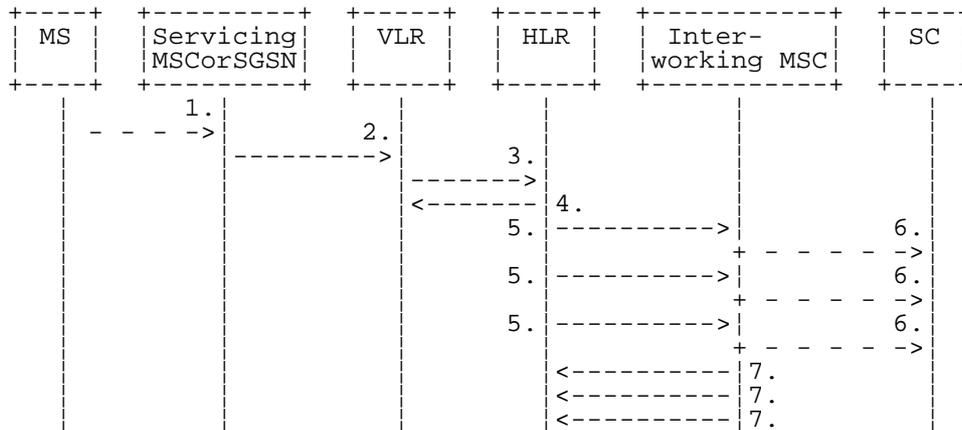


Figure 23.3/10 (sheet 3 of 3): Macro MT_SM_SGSN

23.4 The Short Message Alert procedure

The Short Message Alert procedure is used for alerting the Service Centre when the mobile subscriber is active after a short message transfer has failed because the mobile subscriber is not reachable or when the MS has indicated that it has memory capacity to accept a short message.

The Short Message Alert procedure for the case when the mobile subscriber was not reachable is shown in figure 23.4/1.



- 1) CM Service Request (**), Page response or Location Updating (GSM 04.08)
- 2) MAP_PROCESS_ACCESS_REQUEST / MAP_UPDATE_LOCATION_AREA (**),
- 3) MAP_READY_FOR_SM (Mobile Present) / MAP_UPDATE_LOCATION / Supplementary Service Control Request (*)
- 4) MAP_READY_FOR_SM_ACK (*)
- 5) MAP_ALERT_SERVICE_CENTRE (notes 1 and 2)
- 6) Alert Service Centre (GSM 03.40)
- 7) MAP_ALERT_SERVICE_CENTRE_ACK

NOTE 1: To all Service Centres in the Message Waiting List.

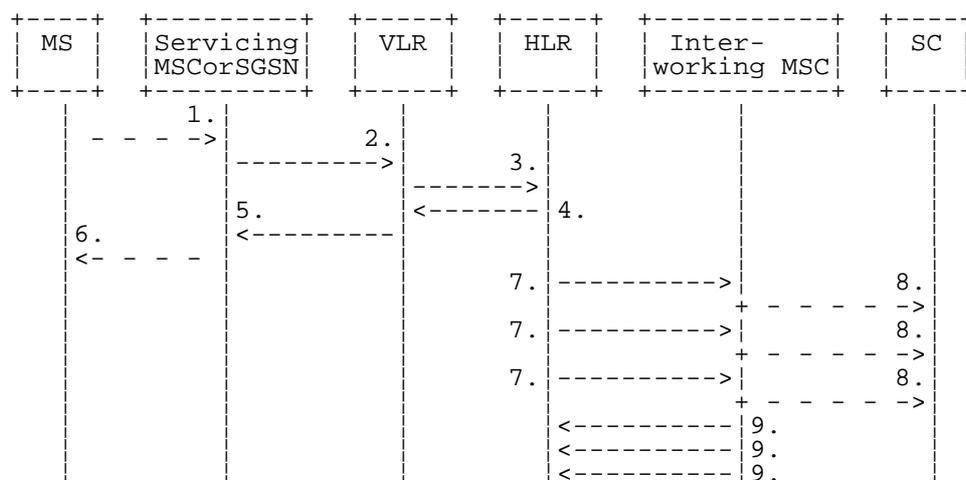
NOTE 2: The HLR initiates the MAP_ALERT_SERVICE_CENTRE service only if the MS Memory Capacity Exceeded flag is clear.

(*) In case of GPRS, messages 3) and 4) are sent/received by SGSN

(**) Those messages are not used by SGSN

Figure 23.4/1: Short message alert procedure (Mobile is present)

The Short Message Alert procedure for the case where the MS indicates that it has memory capacity to accept one or more short messages is shown in figure 23.4/2.



- 1) SM memory capacity available (GSM 04.11)
- 2) MAP_READY_FOR_SM (Memory Available) (*)
- 3) MAP_READY_FOR_SM (Memory Available) (**)
- 4) MAP_READY_FOR_SM_ACK (**)
- 5) MAP_READY_FOR_SM_ACK (*)
- 6) SM memory capacity available (Acknowledge) (GSM 04.11)
- 7) MAP_ALERT_SERVICE_CENTRE (note 1)
- 8) Alert Service Centre (GSM 03.40)
- 9) MAP_ALERT_SERVICE_CENTRE_ACK

NOTE 1: To all Service Centres in the Message Waiting List.

- (*) Message 2) and 5) are not used by SGSN
- (**) In the case of GPRS messages 3) and 4) are sent/received by SGSN

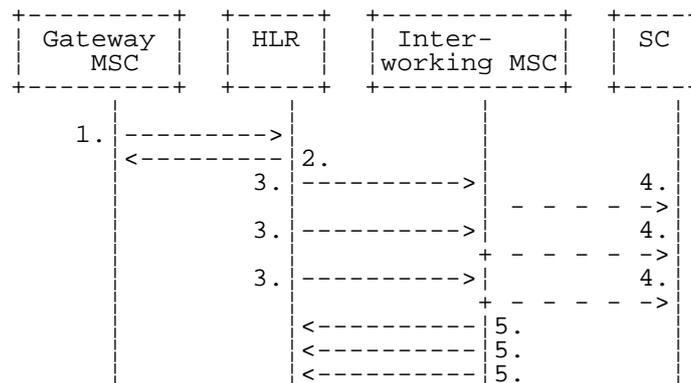
Figure 23.4/2: Short message alert procedure (MS memory capacity available)

In addition the following MAP services are used in the MS memory available case:

- MAP_PROCESS_ACCESS_REQUEST (see subclause 8.3); (*)
- MAP_AUTHENTICATE (see subclause 8.5); (*)
- MAP_SET_CIPHERING_MODE (see subclause 8.6); (*)
- MAP_PROVIDE_IMSI (see subclause 8.9); (*)
- MAP_CHECK_IMEI (see subclause 8.7);
- MAP_FORWARD_NEW_TMSI (see subclause 8.9); (*)
- MAP_TRACE_SUBSCRIBER_ACTIVITY (see subclause 9.1). (*)

(*) Those messages are not used by SGSN.

The Short Message Alert procedure when the MS indicates successful transfer after polling is shown in figure 23.4/3.



- 1) MAP_REPORT_SM_DELIVERY_STATUS (Successful Transfer)
- 2) MAP_REPORT_SM_DELIVERY_STATUS_ACK
- 3) MAP_ALERT_SERVICE_CENTRE (note)
- 4) Alert Service Centre (GSM 03.40)
- 5) MAP_ALERT_SERVICE_CENTRE_ACK

NOTE: To all Service Centres in the Message Waiting List.

Figure 23.4/3: Short message alert procedure (Successful transfer after polling)

23.4.1 Procedures in the Servicing MSC

The activation of the MAP_PROCESS_ACCESS_REQUEST service is described in the subclause 23.6.2.

After receiving the SM memory capacity available indication, the servicing MSC sends the MAP_READY_FOR_SM request to the VLR indicating memory available. The outcome of that procedure is one of the following:

- successful acknowledgment. The MSC sends the corresponding message to the MS;
- negative acknowledgment, where the error causes are treated as follows:
 - unexpected data value, data missing and system failure errors are reported as network out of order error to the MS;
 - facility not supported is reported as requested facility not implemented error to the MS;
 - procedure failure, which is reported as network out of order error to the MS if a connection to the MS still exists.

The short message alert procedure in the MSC for the MS memory capacity available case is shown in figure 23.4/4.

23.4.2 Procedures in the VLR

23.4.2.1 The Mobile Subscriber is present

When receiving the MAP_PROCESS_ACCESS_REQUEST indication, MAP_UPDATE_LOCATION_AREA indication while the MS not reachable flag (MNRF) is set, the VLR will send the MAP_READY_FOR_SM request towards the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for non GPRS. If the authentication procedure is initiated and it fails, the VLR will not initiate the service. The process in VLR is described in detail in the subclause 25.10.

23.4.2.2 The Mobile Equipment has memory available

The MAP_PROCESS_ACCESS_REQUEST indication starts the MAP_PROCESS_ACCESS_REQUEST service in the VLR. The application context in the MAP_OPEN indication refers to the short message alerting procedure.

If the service MAP_PROCESS_ACCESS_REQUEST is successful, the VLR waits for the next message from the MSC. When receiving the MAP_READY_FOR_SM indication from the MSC, the VLR will check the contents. Data errors are reported to the MSC as an unexpected data value or data missing error, depending on the error. If the primitive passes the data check, the VLR forwards it to the HLR and awaits an acknowledgment.

When receiving the MAP_READY_FOR_SM confirmation from the HLR and the Alert Reason is MS memory available, the VLR will act as follows:

- the MAP_READY_FOR_SM response is sent to the MSC as follows:
 - an acknowledge in the positive case;
 - system failure error, if unexpected data value, data missing, or unknown subscriber errors are received, otherwise the error cause received from the HLR;
 - a facility not supported error, if the HLR supports MAP Vr only;
 - procedure failure is reported as a system failure error.

The short message alert procedure in the VLR is shown in figures 23.4/5.

Process SM_Alert_VLR

23.4_5(1)

Figure 23.4/5: The short messages alert process in the VLR for MS memory capacity available

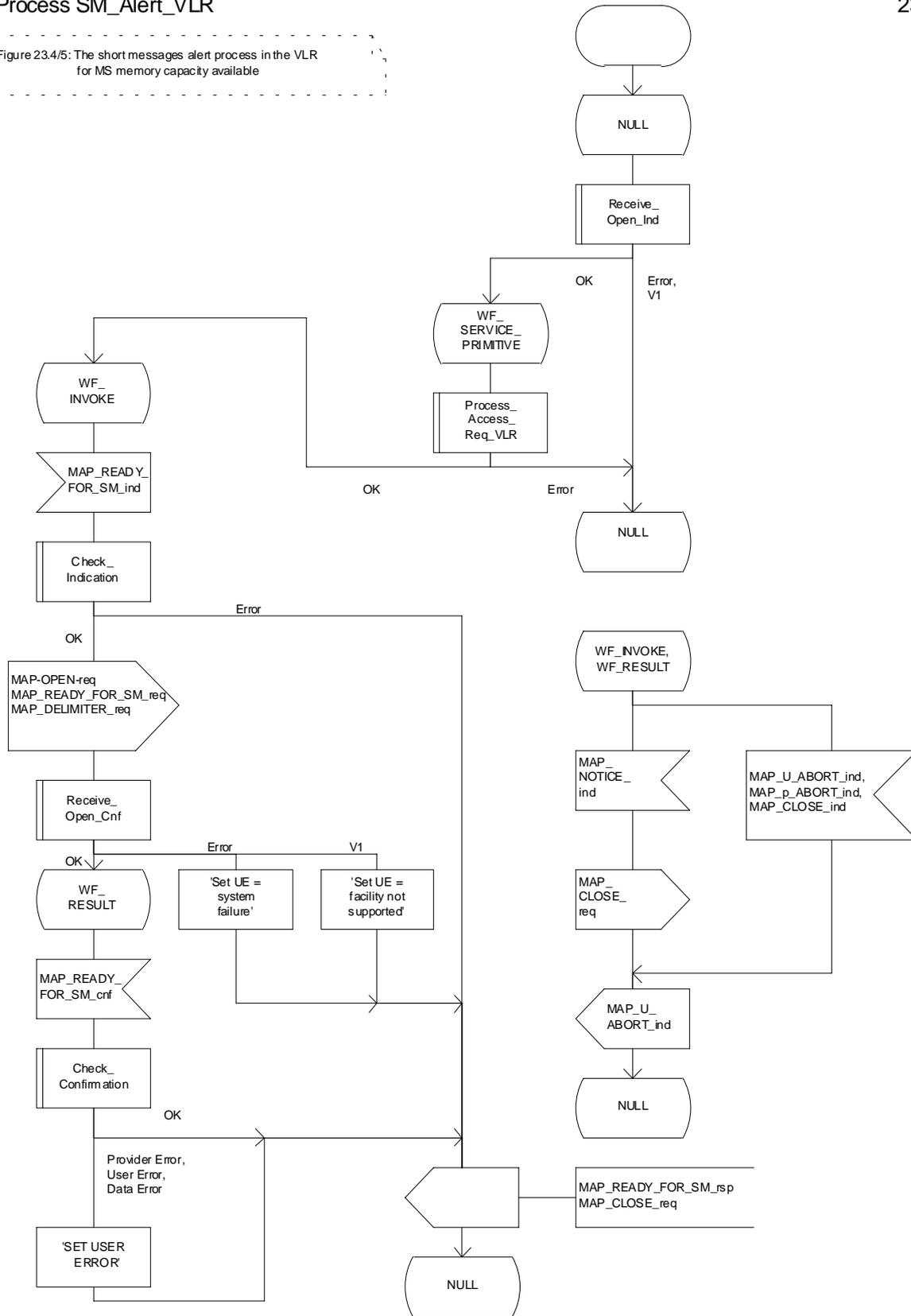


Figure 23.4/5: Procedure SM_Alert_VLR

23.4.3 Procedures in the HLR

When receiving the MAP_READY_FOR_SM indication, the HLR will check the contents. Data errors are reported to the VLR as an unexpected data value or a data missing error depending on the error. If the HLR does not support the MNRF or MNRG, MCEF, and MWD a facility not supported error is reported to the VLR or SGSN. If the IMSI is unknown an unknown subscriber error is reported to the VLR or SGSN. Otherwise an acknowledgement is returned to the VLR or SGSN.

If neither the MS not reachable flag (MNRF) or the MS not reachable for GPRS (MNRG) flag, nor the memory capacity exceeded flag (MCEF) are set, and MAP_READY_FOR_SM is received from the VLR or SGSN, the HLR sets a timer and waits for it to expire. This ensures that in the race situation the MAP_REPORT_SM_DELIVERY_STATUS service (as described in the subclause 23.6) for the same subscriber can be carried out when delayed in the GMSC.

If the Alert Reason indicates the mobile present for non GPRS situation, or when the update location procedure has been successfully completed or Supplementary Service Control request is received, the MS not reachable flag (MNRF) is cleared and the service centre alert procedure is initiated. If the memory capacity exceeded flag is set, the MS not reachable flag is cleared and stored reason for absence for non GPRS are cleared but the alert procedure is not started.

If the Alert Reason indicates the mobile present for GPRS situation, or when the Update GPRSlocation procedure has been successfully completed, the MS not reachable for GPRS (MNRG) flag is cleared and the service centre alert procedure is initiated. If the memory capacity exceeded flag is set, the MS detach for GPRS flag is cleared and stored reason for absence for GPRS are cleared but the alert procedure is not started.

If the Alert Reason indicates the memory available for non GPRS situation, the HLR initiates the alert procedure. The MS not reachable and memory capacity available flags are cleared.

If the Alert Reason indicates the memory available for GPRS situation, the HLR initiates the alert procedure. The MS detach for GPRS and memory capacity available flags are cleared.

If the MAP_REPORT_SM_DELIVERY_STATUS indication is received and it indicates the successful transfer of the mobile terminated short message for non GPRS, the HLR initiates the alert procedure described in the subclause 25.10 and clears MCEF and MNRF flags and stored reason for absence for non GPRS are cleared.

If the MAP_REPORT_SM_DELIVERY_STATUS indication is received and it indicates the successful transfer of the mobile terminated short message for GPRS, the HLR initiates the alert procedure described in the subclause 25.10 and clears MCEF and MNRG flags and stored reason for absence for GPRS are cleared.

The short message alert procedure in the HLR is shown in figures 23.4/6 and 25.10/2.

Process SM_Alert_HLR

23.4_6.1(2)

Figure 23.4/6:
The short message alert process in the HLR

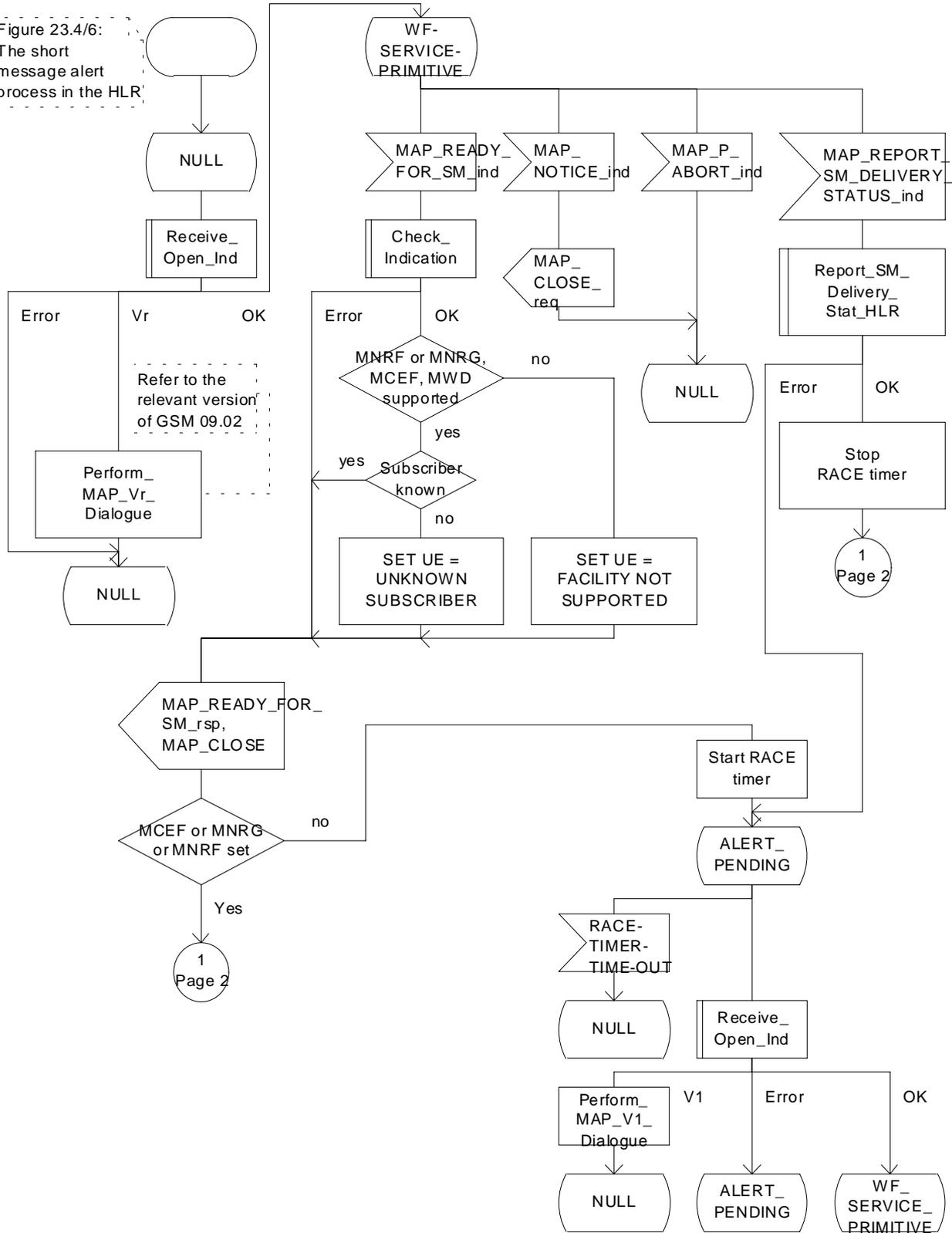


Figure 23.4/6 (sheet 1 of 2): Process SM_Alert_HLR

Figure 23.4/6:
The short
message alert
process in the HLR

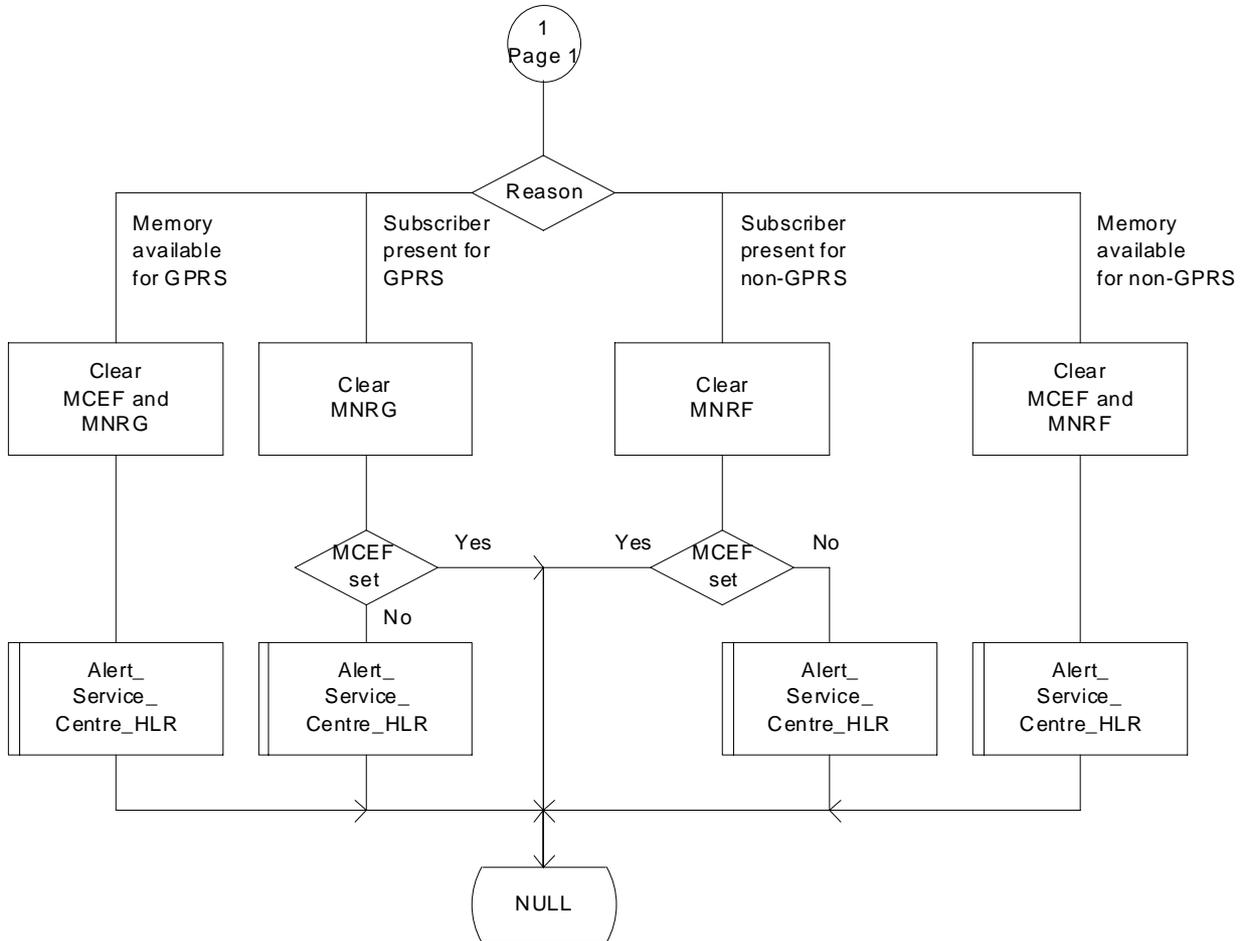


Figure 23.4/6 (sheet 2 of 2): Process SM_Alert_HLR

23.4.4 Procedures in the Interworking MSC

When a MAP_ALERT_SERVICE_CENTRE indication is correctly received by the IWMSC, the IWMSC will forward the alerting to the given Service Centre if possible.

Data errors are reported to the HLR as an unexpected data value or a data missing error depending on the error.

The short message alert procedure is shown in figure 23.4/7.

Figure 23.4/7: The short message alert message in the IWMSC

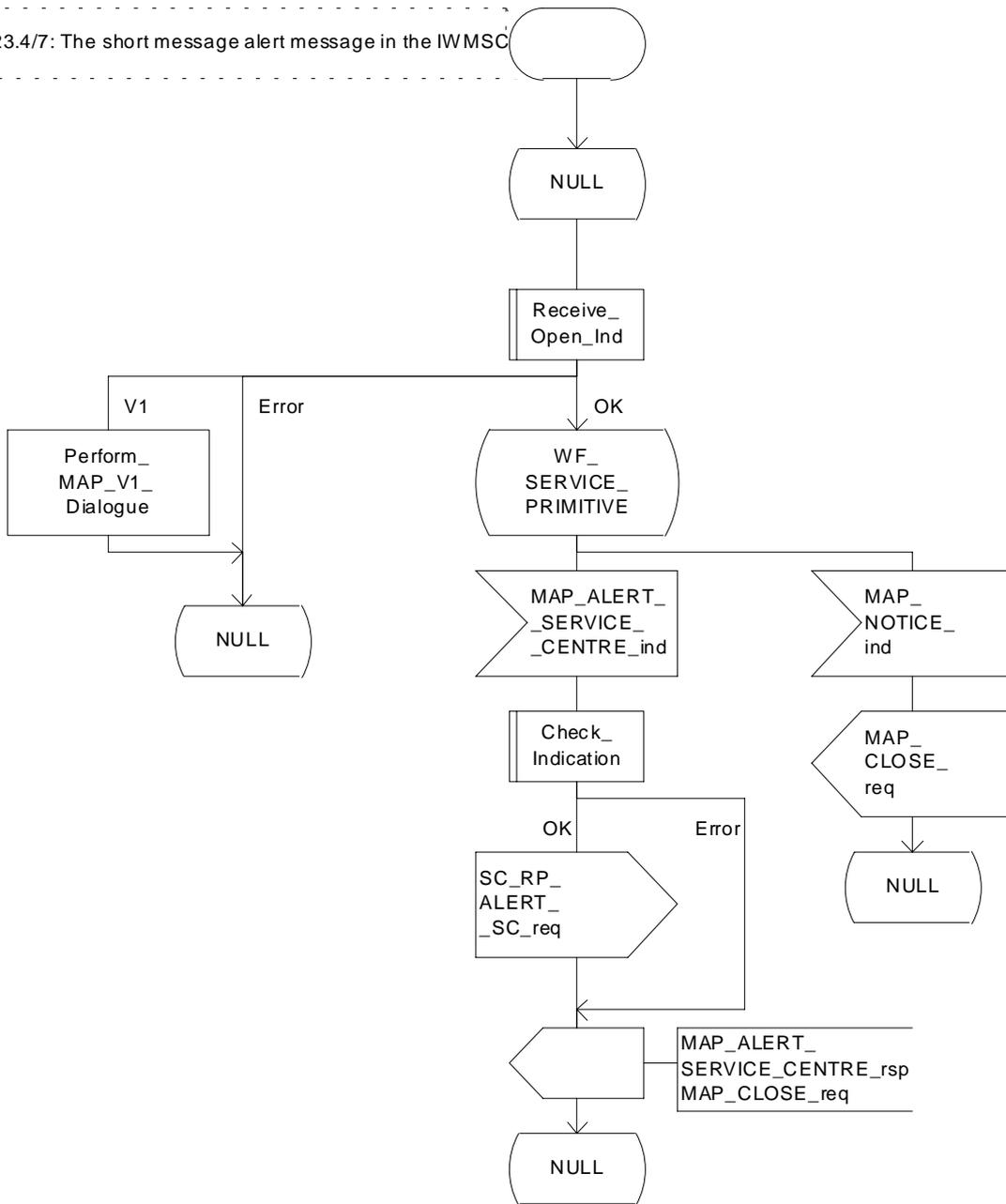


Figure 23.4/7: Process Alert_SC_IWMSC

23.4.5 Procedures in the Servicing SGSN

23.4.5.1 The Mobile Subscriber is present

When receiving Page response, Attach request or Routing area update request messages (TS GSM 04.08), while the MS not reachable for GPRS (MNRG) flag is set, the SGSN will send the MAP_READY_FOR_SM request towards the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for GPRS.

When receiving the answer, the SGSN will act as follows:

- MNRG is cleared if the procedure is successful
- MNRG is not cleared if the procedure is not successful

The process in SGSN is described in detail in the subclause 25.10/3.

23.4.5.2 The Mobile Equipment has memory available

After receiving the SM memory capacity available indication, the servicing SGSN sends the MAP_READY_FOR_SM request to the HLR indicating memory available for GPRS. The outcome of that procedure is one of the following:

- successful acknowledgment. The SGSN sends the corresponding message to the MS;
- negative acknowledgment, where the error causes are treated as follows:
 - unexpected data value, data missing and system failure errors are reported as network out of order error to the MS;
 - facility not supported is reported as requested facility not implemented error to the MS;
 - procedure failure, which is reported as network out of order error to the MS if a connection to the MS still exists.

The short message alert procedure in the SGSN for the MS memory capacity available case is shown in figure 23.4/8.

Process Subscriber_Present_SGSN

23.4_8(1)

Figure 23.4/8: The short message alert process in the SGSN for mobile present situation

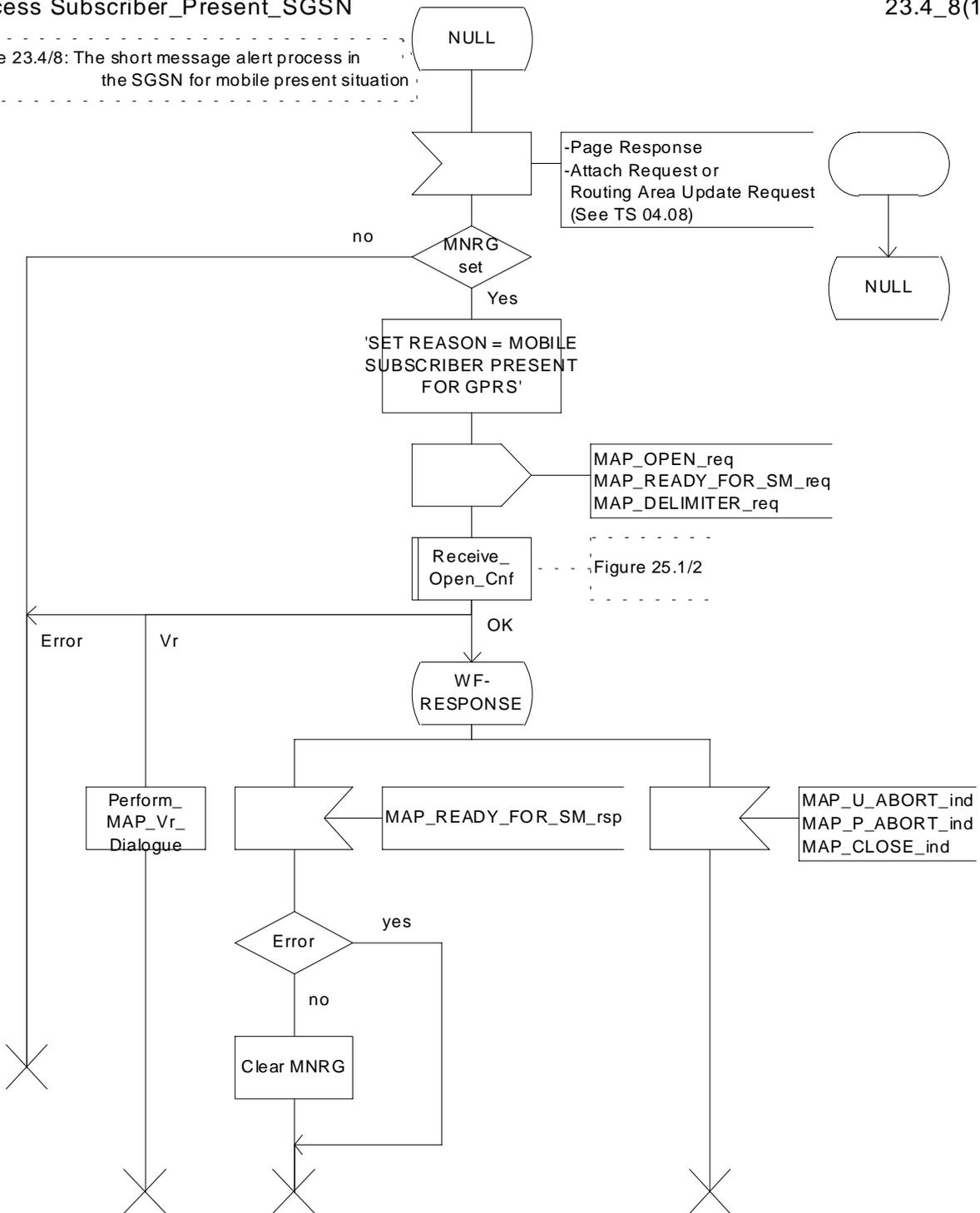


Figure 23.4/8: Process Subscriber_Present_SGSN

23.5 The SM delivery status report procedure

The SM delivery status report procedure is used to set the Service Centre address into the message waiting list in the HLR because the subscriber is absent or unidentified or the memory capacity is exceeded. The procedure sets

- the memory capacity exceeded flag in the HLR if the MS memory does not have room for more messages
- and/or the MS not reachable flag for non GPRS in the case of unidentified or absent subscriber
- and/or the MS not reachable for GPRS flag in the case of unidentified or absent subscriber for GPRS

Additionally the procedure is used to report the HLR about the successful transfer for GPRS or non GPRS after the Service Centre has polled the subscriber. This procedure is described also in the subclause 23.4.

The SM delivery status report procedure is shown in figure 23.5/1.

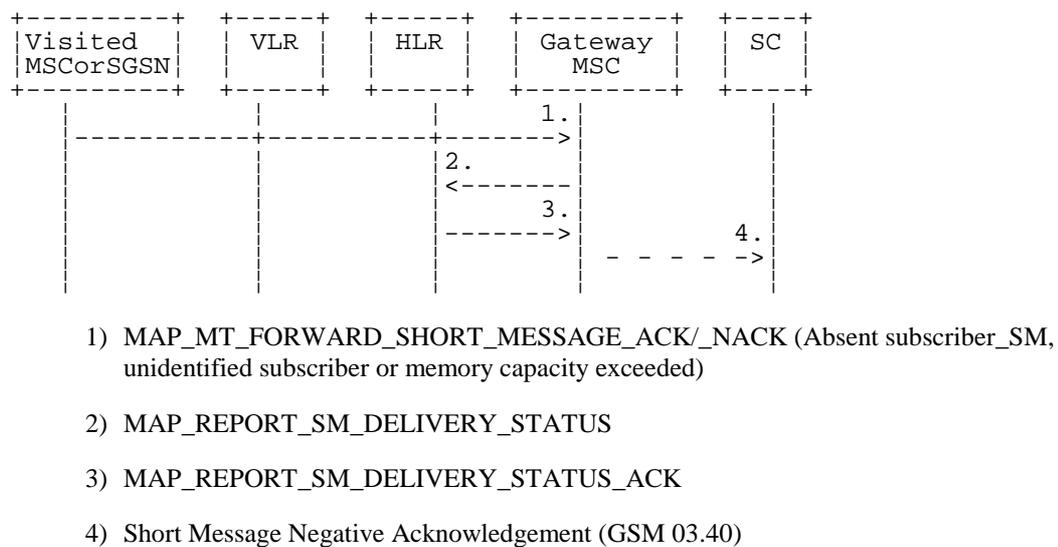


Figure 23.5/1: Short message delivery status report procedure

23.5.1 Procedures in the HLR

When the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication, it acts as described in the subclause 23.6, macro Report_SM_Delivery_Stat_HLR.

The short message delivery status report process in the HLR is shown in figure 23.5/2.

Figure 23.5/2: The report SM delivery process in the HLR

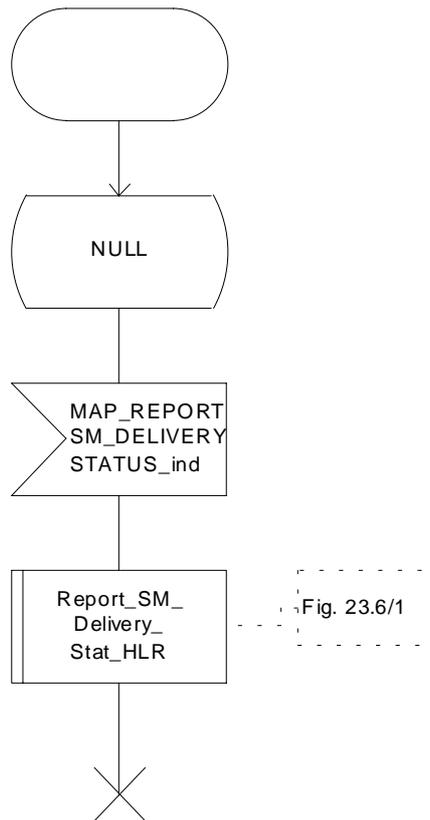


Figure 23.5/2: Process SM_Delivery_Status_Report_HLR

23.5.2 Procedures in the gateway MSC

The GMSC invokes the short message delivery status report procedure if an absent subscriber_SM indication, unidentified subscriber indication, SM delivery failure error indicating MS memory capacity exceeded or both are received from the servicing MSC, SGSN or both during a mobile terminated short message transfer, and the HLR has not indicated that the SC address is included in the MWD. The unidentified subscriber indication is however processed as the absent subscriber_SM indication

In case of successful SMS delivery on the second path, the successful SMS Delivery outcome is sent in combination with the unsuccessful SMS Delivery outcome to the HLR.

The service is invoked also when the HLR has indicated that either of the flags MCEF, MNRF or both are set and the first SM delivery was successful from the servicing MSC or, in case of subsequent SM, the last SM delivery was successful from the servicing MSC.

The service is invoked also when the HLR has indicated that either of the flags MCEF, MNRF or both are set and the SM delivery was successful from the servicing SGSN or, in case of subsequent SM, the last SM delivery was successful from the servicing SGSN.

The reason for unsuccessful, successful for GPRS, non GPRS or both deliveries of the short message are included in the SM Delivery Outcome in the MAP_REPORT_SM_DELIVERY_STATUS request. In the case of an unsuccessful delivery due to the subscriber being absent the absent subscriber diagnostic indication (if available) is also included in the MAP_REPORT_SM_DELIVERY_STATUS request.

If the reason for unsuccessful delivery is absent subscriber with diagnostic 'Paging failure' for GPRS or non GPRS, the two SM Delivery Outcomes absent subscriber with both diagnostics 'Paging failure' for GPRS and non GPRS is included in the MAP_REPORT_SM_DELIVERY_STATUS request.

The GMSC sends the MAP_REPORT_SM_DELIVERY_STATUS request to the HLR. As a response the GMSC will receive the MAP_REPORT_SM_DELIVERY_STATUS confirmation reporting:

- successful outcome of the procedure. The acknowledge primitive may contain the MSISDN-Alert number which is stored in the MWD List in the HLR;
- unsuccessful outcome of the procedure. The system failure indication is forwarded to the SC. In that case, if the SM Delivery Outcome was successful SMS delivery for GPRS or non GPRS (combined or not with another unsuccessful reason), a successful report is forwarded to the SC.

A provider error is indicated as a system failure to the SC.

Note that the indication, on which number belongs the SGSN and MSC, received from the HLR at routing information result (see subclause 23.3.3) will enable the GMSC to map the causes received from the SGSN, MSC or both into the appropriate causes for GPRS, non GPRS or both, and send them to the SC and HLR.

The procedure towards the Service Centre may also be aborted. If so the operation towards the HLR is also aborted.

The short message delivery status report procedure in the GMSC is shown in figure 23.5/3.

Figure 23.5/3: The report SM delivery status macro in the GMSC

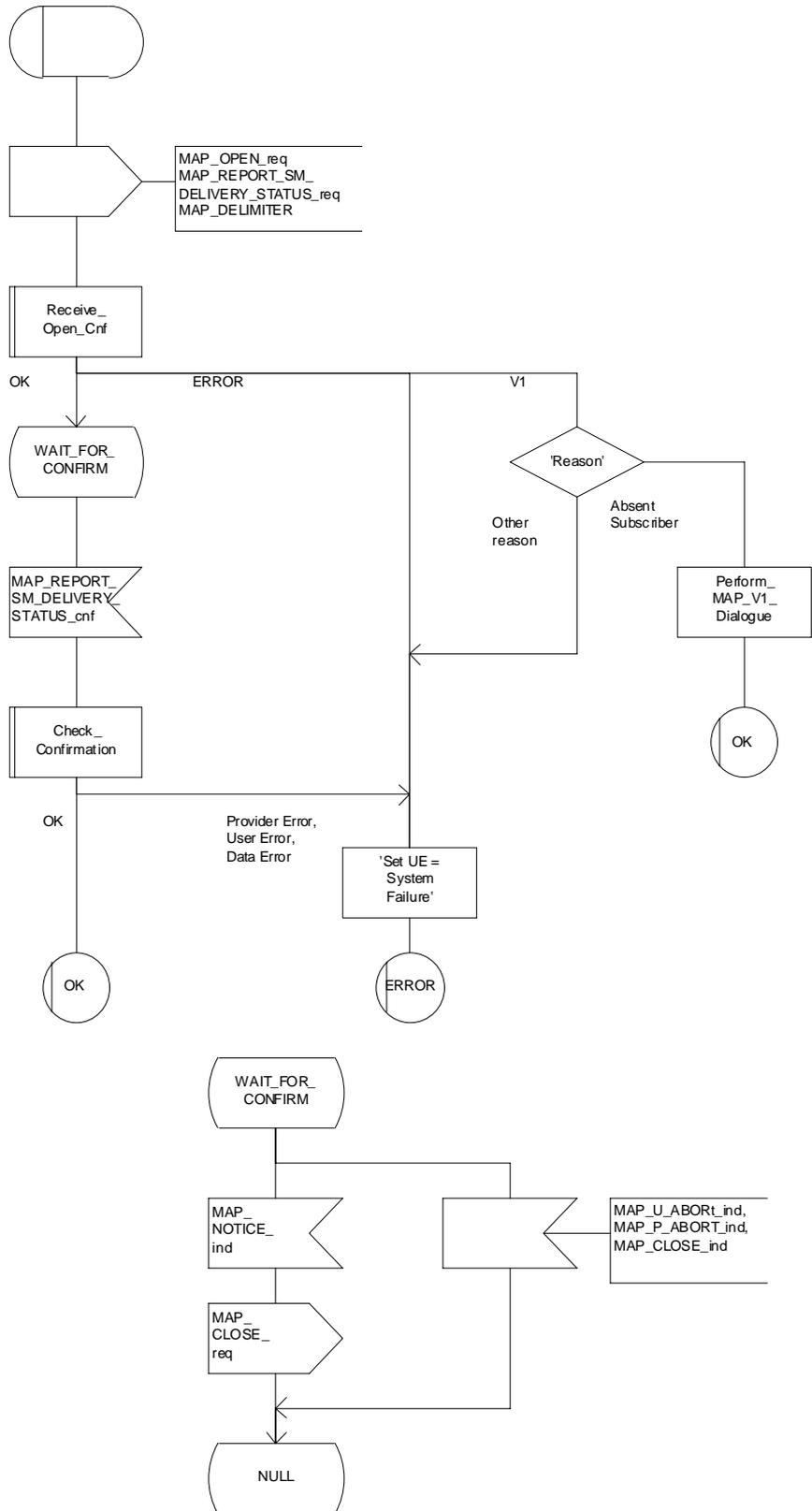


Figure 23.5/3: Macro Report_SM_Delivery_Stat_GMSC

23.6 Common procedures for the short message clause

23.6.1 The macro Report_SM_Delivery_Stat_HLR

This macro is used when the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication from the GMSC. The HLR responds to the indication as follows:

- if the flag « GPRS Support Indicator » is absent then if the subscriber is a GPRS subscriber and a non-GPRS subscriber with the option « transfer of SM via the SGSN when GPRS is not supported in the GMSC » or if the subscriber is a GPRS subscriber only, the HLR shall interpret the delivery outcome as a GPRS delivery outcome.
- if invalid data content is detected, an unexpected data value error or a data missing error is returned to the GMSC;
- if the MSISDN number provided is not recognized by the HLR, an unknown subscriber error is returned to the GMSC;
- if the MAP_REPORT_SM_DELIVERY_STATUS indication reports a successful SM delivery, the Service Centres in the Message Waiting list are alerted as described in the subclause 25.10;
- if the SM Delivery Outcome reports unsuccessful delivery and the inclusion of the SC address in the MWD is not possible, a message waiting list full error is returned to the GMSC;
- if the SM Delivery Outcome reports unsuccessful delivery and the message waiting list is not full, the given Service Centre address is inserted and an acknowledgement is sent to the GMSC. If the MSISDN-Alert stored in the subscriber data is not the same as that received in the MAP_REPORT_SM_DELIVERY_STATUS indication, the MSISDN-Alert is sent in a response primitive to the GMSC;

The SC address is only stored in the MWD if the unsuccessful SM Delivery Outcome is not received in combination with another successful SM Delivery Outcome

- if the SM Delivery Outcome is MS memory capacity exceeded for non GPRS, the HLR sets the memory capacity exceeded flag in the subscriber data and resets the MNRF;
- if the SM Delivery Outcome is MS memory capacity exceeded for GPRS the HLR sets the memory capacity exceeded flag in the subscriber data and resets the MNRG;
- if the SM Delivery Outcome is absent subscriber for non GPRS, the HLR sets the mobile station not reachable flag in the subscriber data. If a reason for absence is provided by the GMSC then this is stored in the mobile station not reachable reason (MNRR) in the subscriber data.
- if the SM Delivery Outcome is absent subscriber for GPRS, the HLR sets the mobile station not reachable for GPRS flag in the subscriber data. If a reason for absence is provided by the GMSC then this is stored in the mobile station not reachable reason (MNRR) in the subscriber data.

Note that a combination of all the SM Delivery Outcome specified above may be provided to the HLR from the SMS-GMSC.

The short message delivery status report macro in the HLR is shown in figure 23.6/1.

Figure 23.6/1: The report SM delivery status macro in the HLR

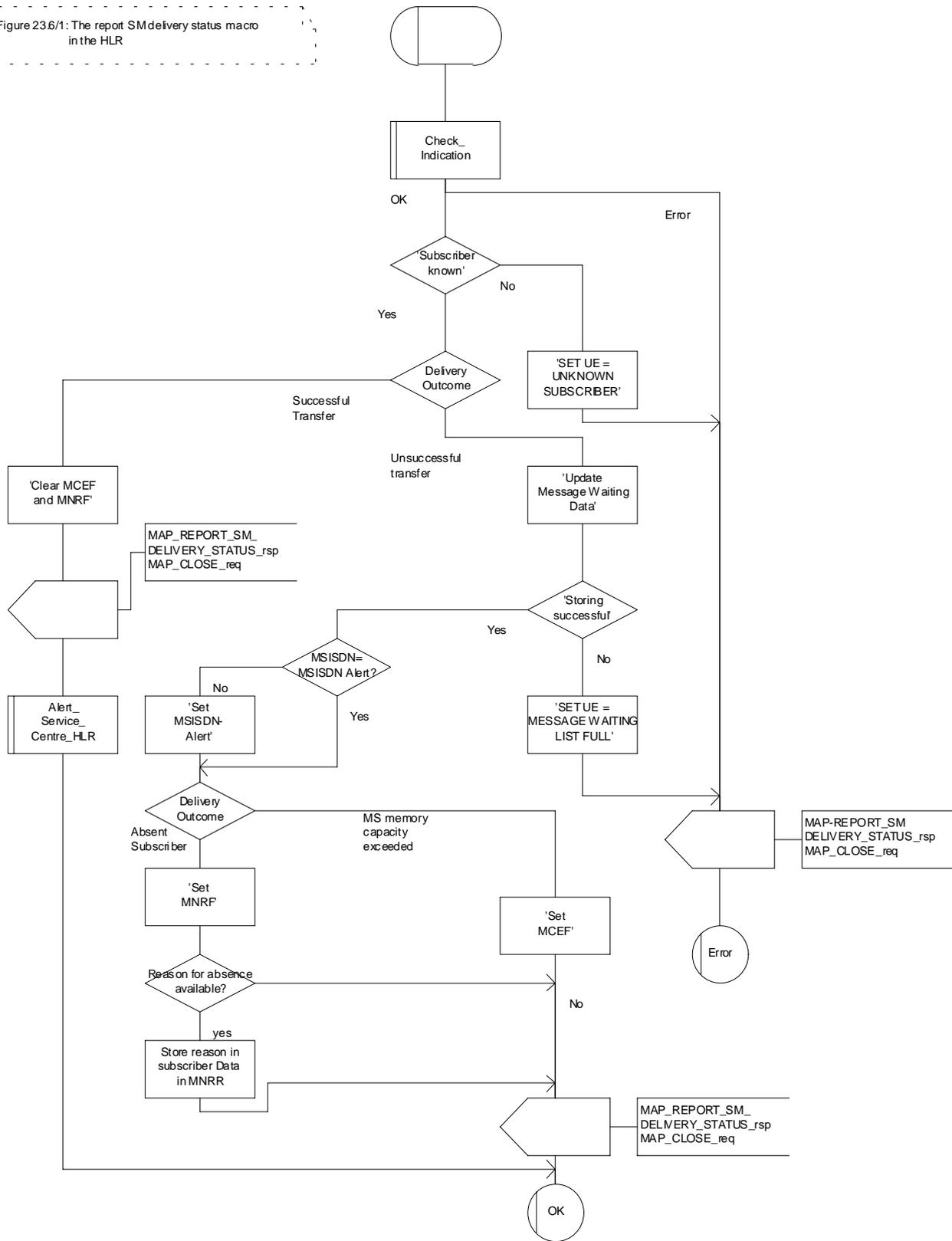


Figure 23.6/1: Macro Report_SM_Delivery_Stat_HLR

24 GPRS process description

24.1 General

The MAP GPRS procedures are used for the Network Requested PDP-Context Activation procedures.

The stage 2 specification for General Packet Radio Service (GPRS) is in GSM 03.60 [100].

24.1.1 Process in the HLR for Send Routing Information for GPRS

The MAP process in the HLR to provide routing information for a network-requested PDP context activation is shown in figure 24.1/1. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Check_Indication	see subclause 25.2.1.

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context gprsLocationInfoRetrieval, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_SEND_ROUTING_INFO_FOR_GPRS service indication is received, the HLR sends a Send Routing Info For Gprs request to the GPRS application process in the HLR, and wait for a response. The Send Routing Info For Gprs request contains the parameter received in the MAP_SEND_ROUTING_INFO_FOR_GPRS service indication

If the GPRS application process in the HLR returns a positive response containing the routing information, the MAP process constructs a MAP_SEND_ROUTING_INFO_FOR_GPRS service response containing the routing info, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.

Negative response from HLR GPRS application process

If the GPRS application process in the HLR returns a negative response, the MAP process constructs a MAP_SEND_ROUTING_INFO_FOR_GPRS service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.

Failure of dialogue opening with the GGSN

If the macro Receive_Open_Ind takes the Vr exit or the Error exit, the MAP process returns to the idle state.

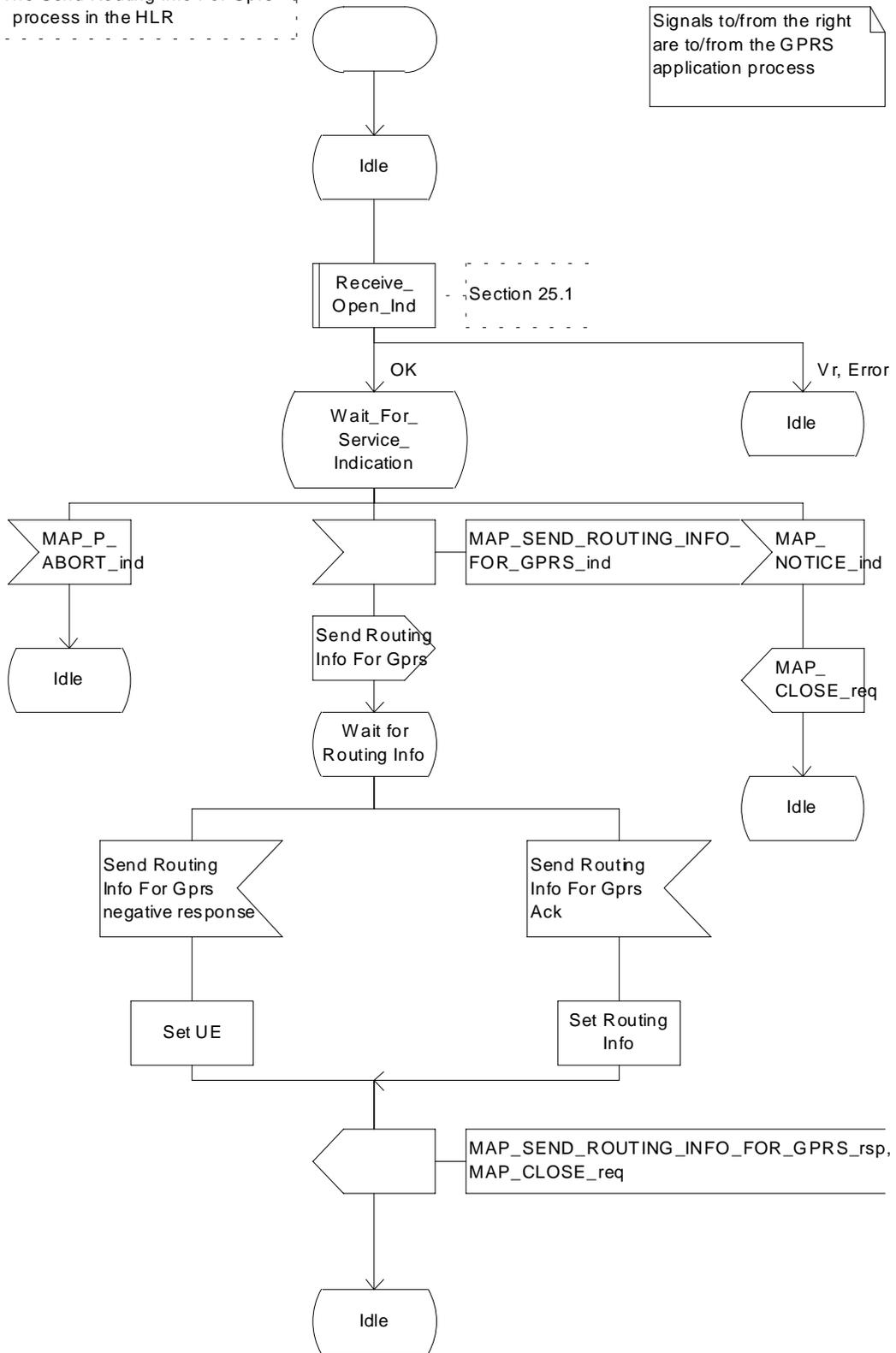
If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Process Send_Routing_Info_For_Gprs_HLR

24.1_1(1)

Figure 24.1/1: The Send Routing Info For Gprs process in the HLR



Process Send_Routing_Info_For_Gprs_HLR

24.1_1(1)

Figure 24.1/1: The Send Routing Info For GPRS process in the HLR

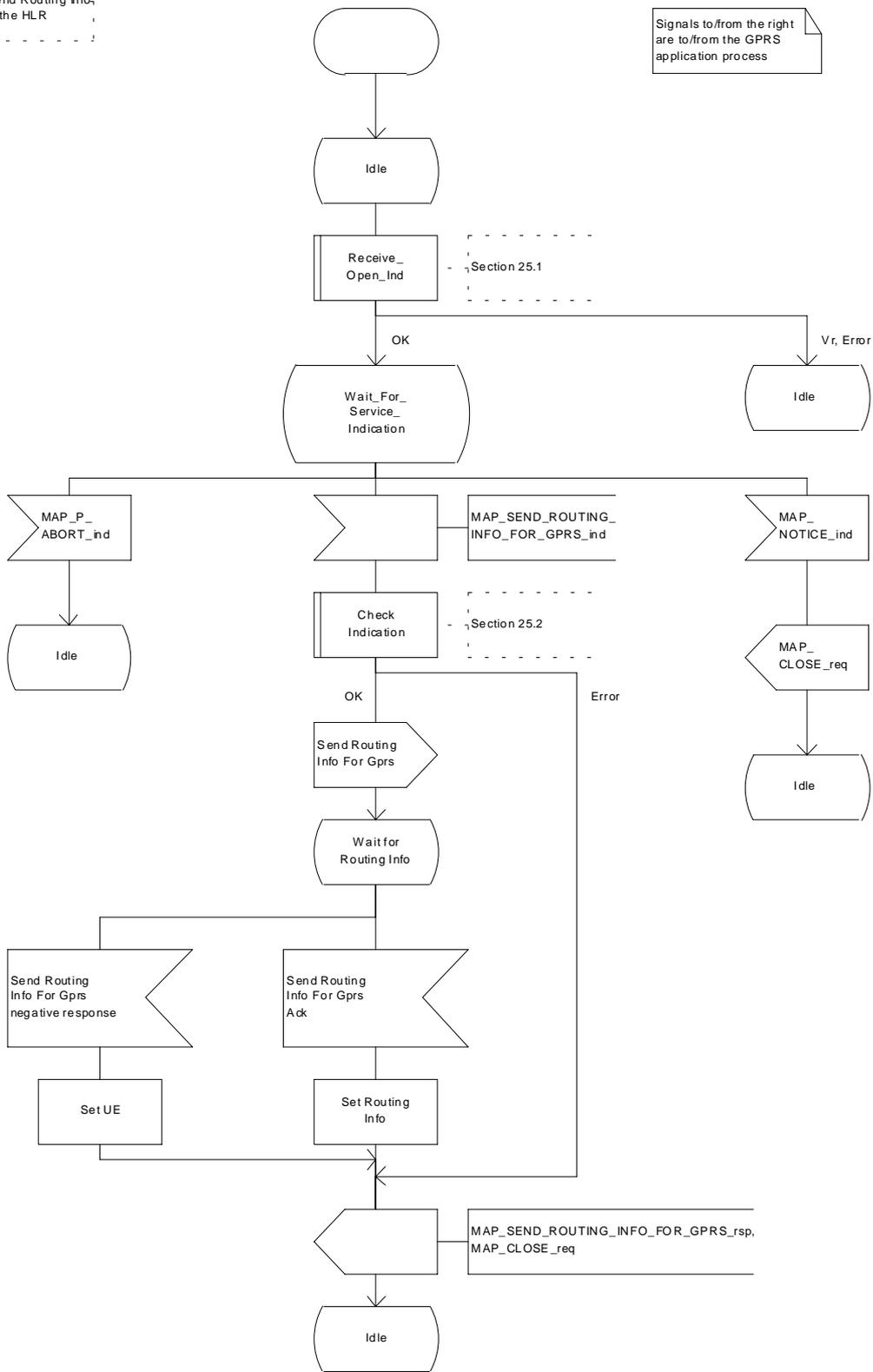


Figure 24.1/1: Process Send Routing Info For Gprs_HLR

24.1.2 Process in the GGSN for Send Routing Information for GPRS

Successful Outcome

When the MAP process receives a Send Routing Info For Gprs request from the GPRS application process in the GGSN, it requests a dialogue with the HLR whose identity is contained in the Send Routing Info For Gprs request by sending a MAP_OPEN service request, requests routing information using a MAP_SEND_ROUTING_INFO_FOR_GPRS service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_SEND_ROUTING_INFO_FOR_GPRS service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Send Routing Info For Gprs ack containing the routing information received from the HLR to the GPRS application process in the GGSN and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a negative response to the GPRS application process in the GGSN and returns to the idle state.

Error in MAP_SEND_ROUTING_INFO_FOR_GPRS confirm

If the MAP_SEND_ROUTING_INFO_FOR_GPRS service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Send Routing Info For Gprs negative response to the GPRS application process in the GGSN and returns to the idle state.

Abort of HLR dialogue

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process sends a Send Routing Info For Gprs negative response to the GPRS application process in the GGSN and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR, sends a Send Routing Info For Gprs negative response indicating system failure to the GPRS application process in the GGSN and returns to the idle state.

Process Send_Routing_Info_For_Gprs_GGSN

24.1_2(1)

Figure 24.1/2: Send Routing Info For Gprs process in the GGSN

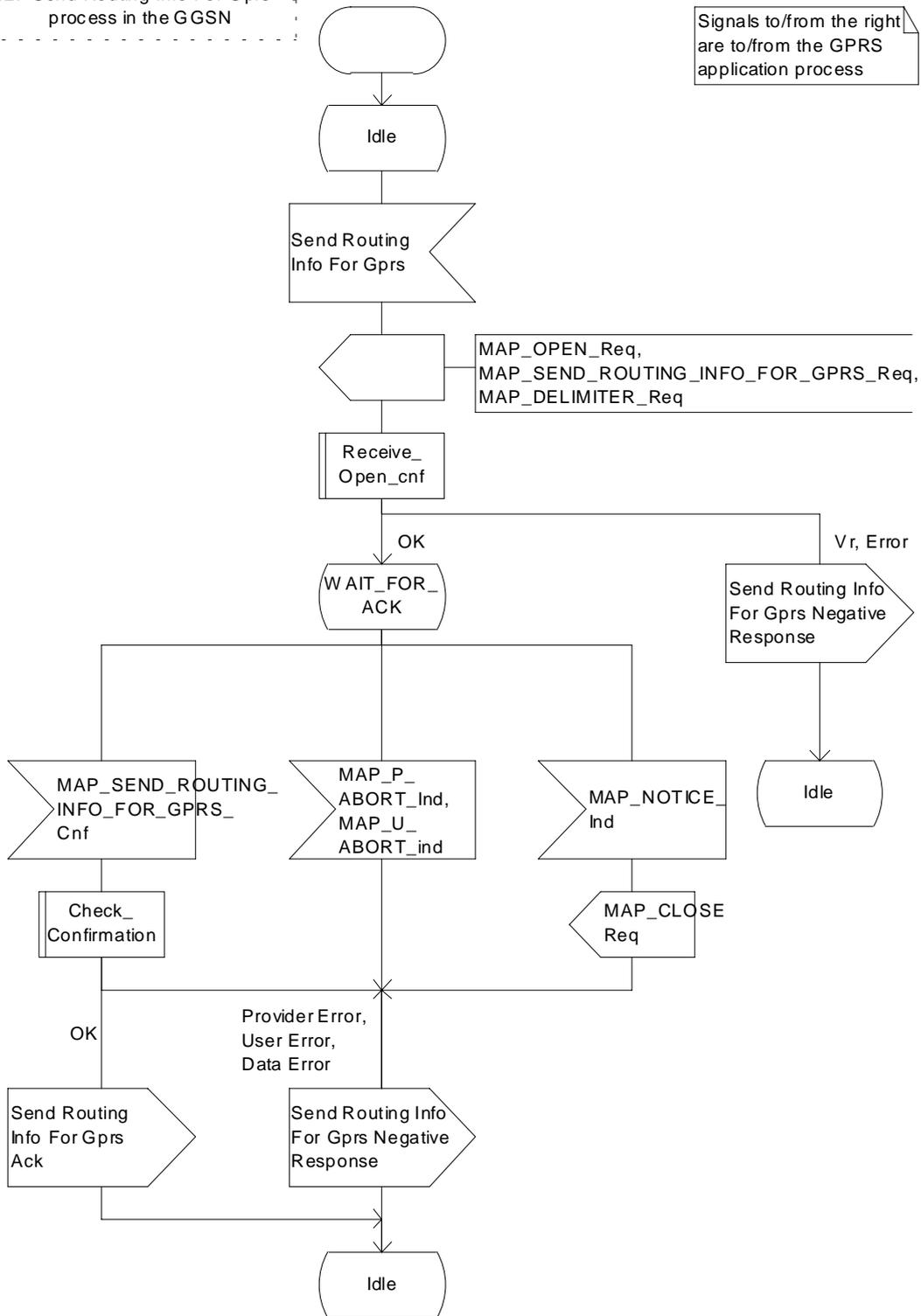


Figure 24.1/2: Process Send_Routing_Info_For_Gprs_GGSN

24.2.1 Process in the HLR for Failure Report

The MAP process in the HLR to set the MNRG (Mobile station Not Reachable for GPRS) flag for the subscriber is shown in figure 24.2/1. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Check Indication	see subclause 25.2.1.

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context failureReport, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_FAILURE_REPORT service indication is received, the HLR sends a Failure Report request to the GPRS application process in the HLR, and wait for a response. The Failure Report request contains the parameter received in the MAP_FAILURE_REPORT service indication.

If a positive response is received, the MAP process constructs a MAP_FAILURE_REPORT service response, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.

Negative response from HLR GPRS application process

If the GPRS application process in the HLR returns a negative response, the MAP process constructs a MAP_FAILURE_REPORT service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.

Failure of dialogue opening with the GGSN

If the macro Receive_Open_Ind takes the Vr exit or the Error exit, the MAP process returns to the idle state.

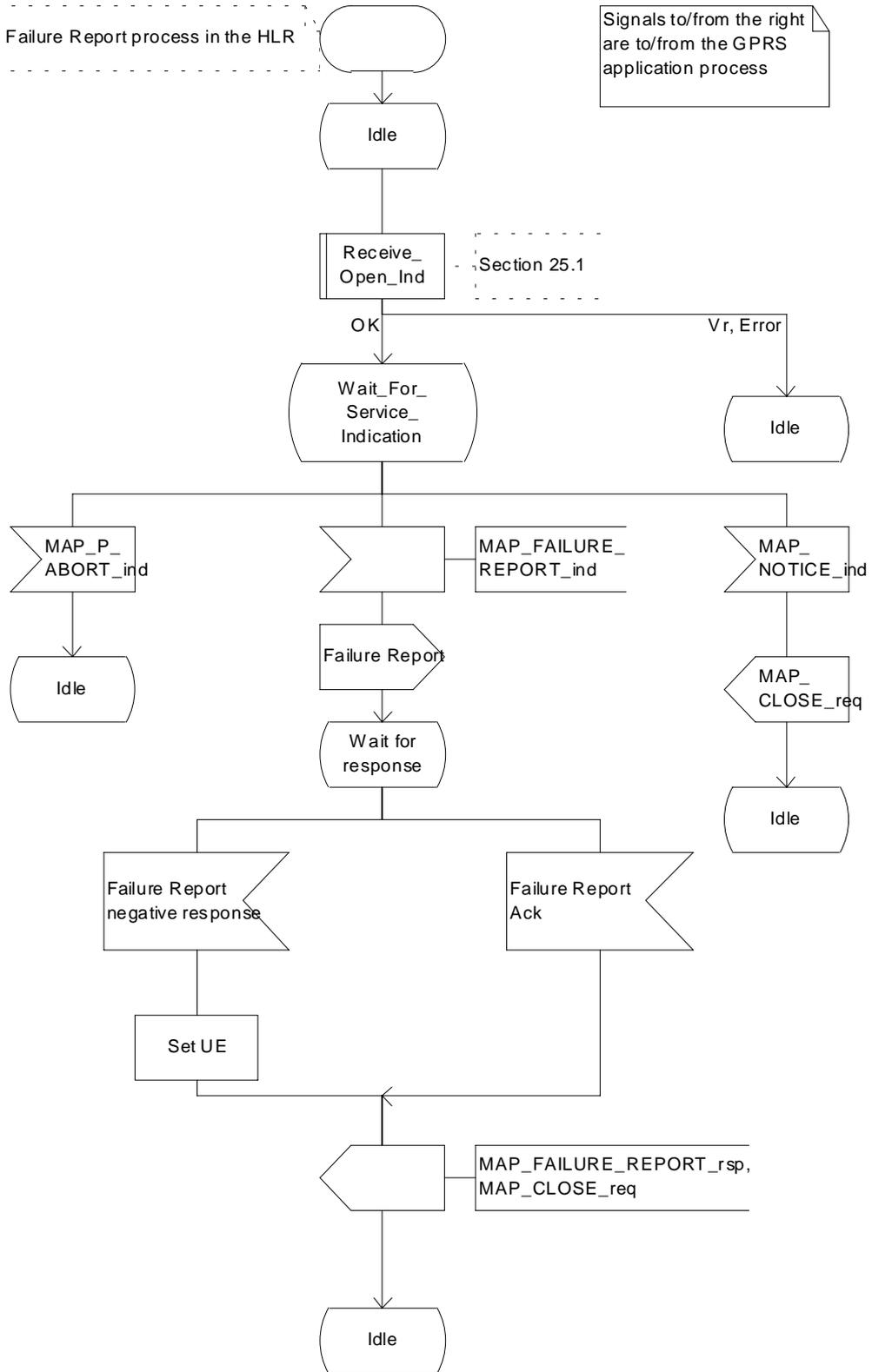
If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Process Failure_Report_HLR

24.2_1(1)

Figure 24.2/1: The Failure Report process in the HLR



Process Failure_Report_HLR

24.2_1(1)

Figure 24.2/1: The Failure Report process in the HLR

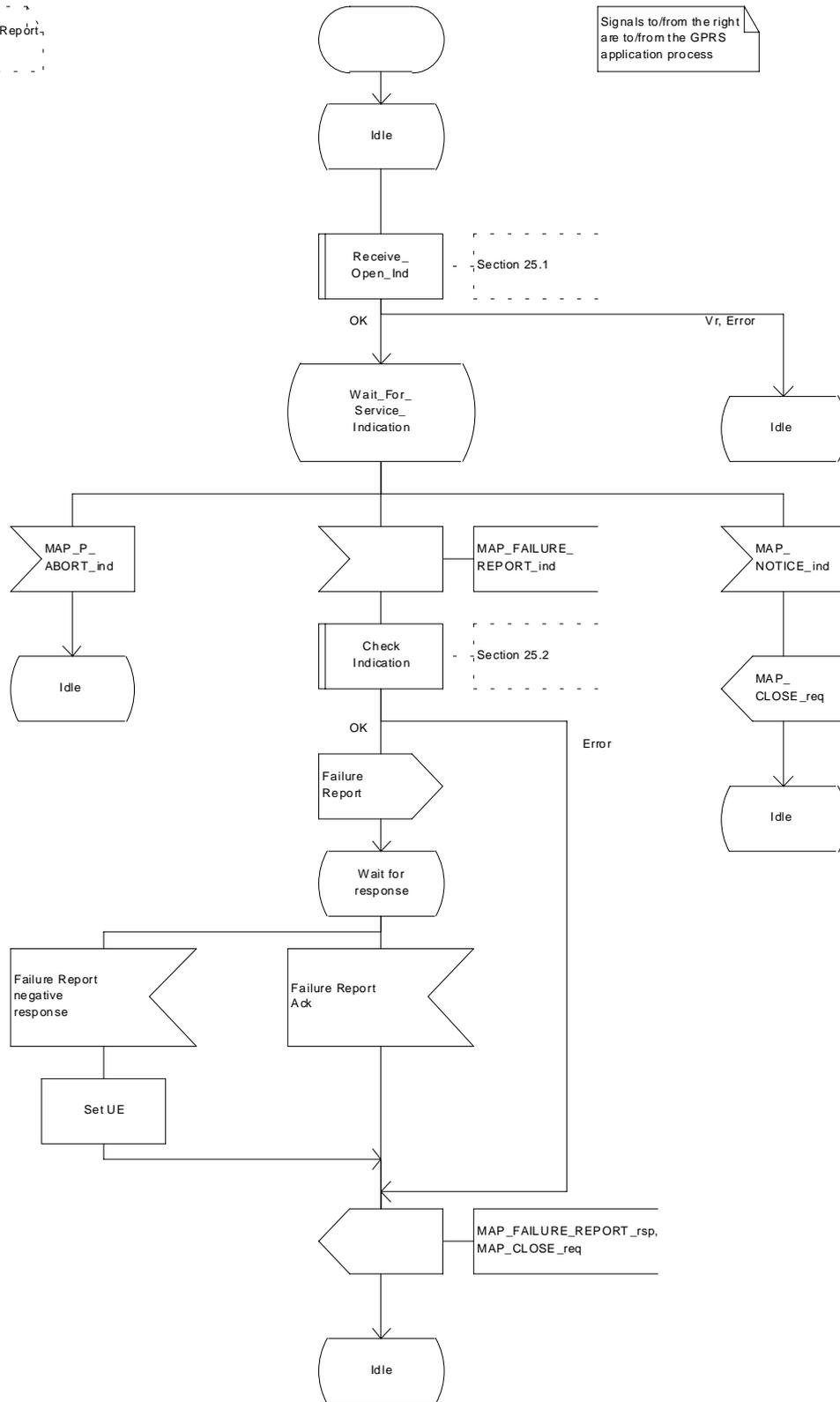


Figure 24.2/1: Process Failure_Report_HLR

24.2.2 Process in the GGSN for Failure Report

Successful Outcome

When the MAP process receives a Failure Report request from the GPRS application process in the GGSN, it requests a dialogue with the HLR whose identity is contained in the Failure Report request by sending a MAP_OPEN service request, sending failure information using a MAP_FAILURE_REPORT service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_FAILURE_REPORT service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Failure Report ack containing the information received from the HLR to the GPRS application process in the GGSN and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a negative response to the GPRS application process in the GGSN and returns to the idle state.

Error in MAP_FAILURE_REPORT confirm

If the MAP_FAILURE_REPORT service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Failure Report negative response to the GPRS application process in the GGSN and returns to the idle state.

Abort of HLR dialogue

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process sends a Failure Report negative response to the GPRS application process in the GGSN and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR, sends a Failure Report negative response indicating system failure to the GPRS application process in the GGSN and returns to the idle state.

Figure 24.2/2: Failure Report process in the GGSN

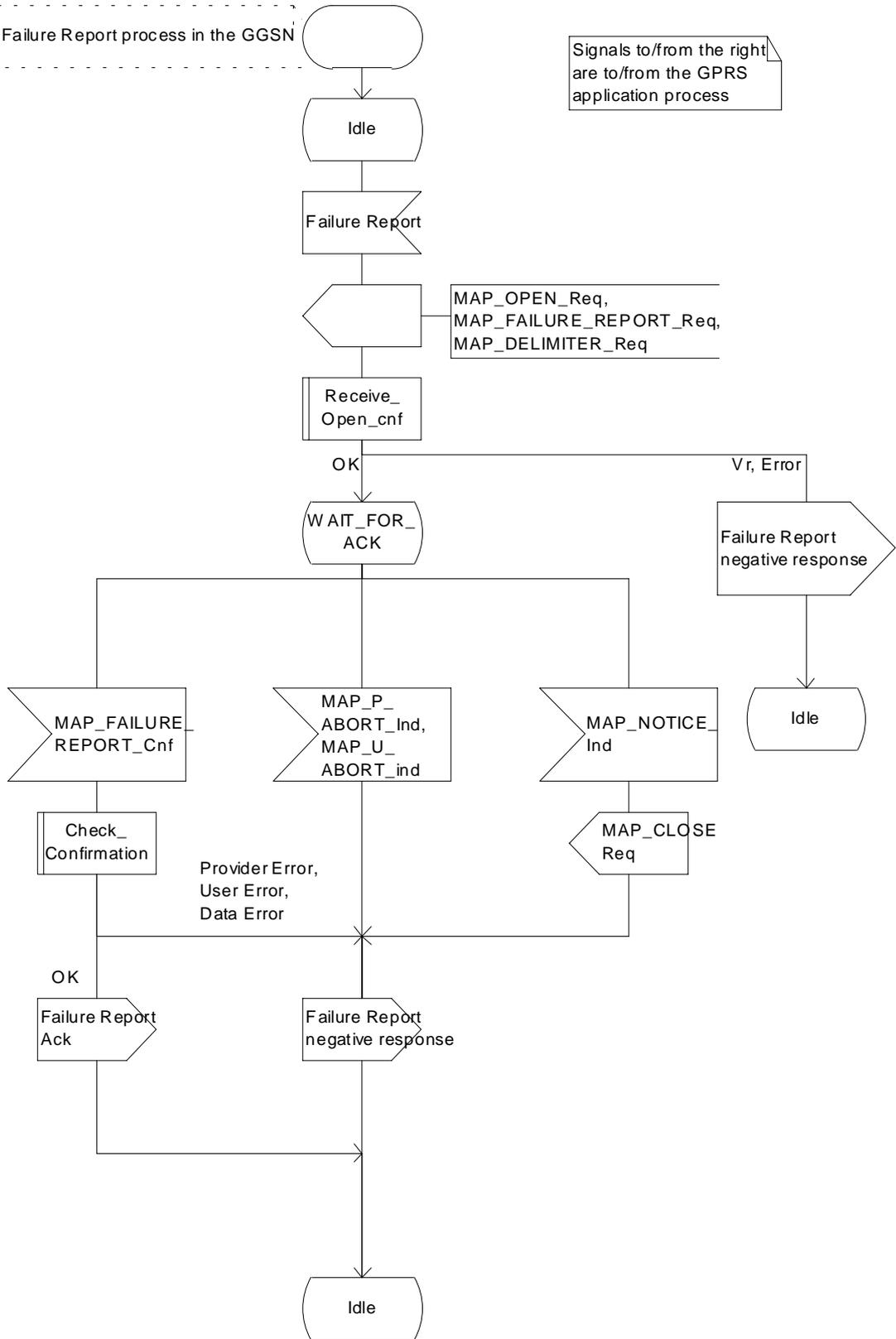


Figure 24.2/2: Process Failure_Report_GGSN

24.3.1 Process in the GGSN for Note Ms Present For Gprs

The MAP process in the GGSN to inform that the subscriber is present for GPRS again is shown in figure 24.3/1. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Check_Indication	see subclause 25.2.1.

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context gprsNotify, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_NOTE_MS_PRESENT_FOR_GPRS service indication is received, the GGSN sends a Note Ms Present For Gprs request to the GPRS application process in the GGSN, and wait for a response. The Note Ms Present For Gprs request contains the parameter received in the MAP_NOTE_MS_PRESENT_FOR_GPRS service indication.

If the GPRS application process in the GGSN returns a positive response, the MAP process constructs a MAP_NOTE_MS_PRESENT_FOR_GPRS service response, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Negative response from GGSN GPRS application process

If the GPRS application process in the GGSN returns a negative response, the MAP process constructs a MAP_NOTE_MS_PRESENT_FOR_GPRS service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Ind takes the Vr exit or the Error exit, the MAP process returns to the idle state.

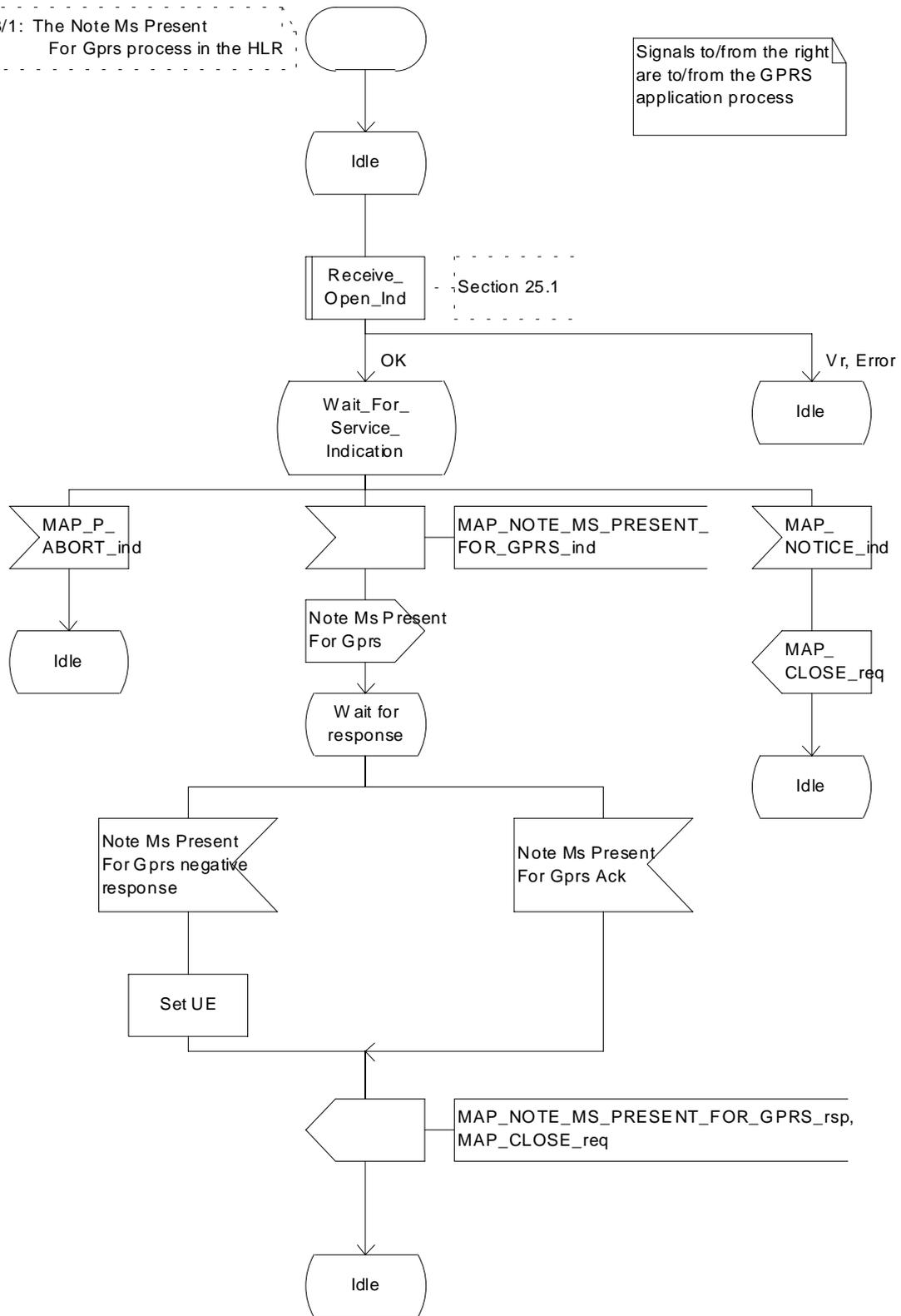
If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Process Note_Ms_Present_For_Gprs_GGSN

24.3_1(1)

Figure 24.3/1: The Note Ms Present For Gprs process in the HLR



Process Note_Ms_Present_For_Gprs_GGSN

24.3_1(1)

Figure 24.3/1: The Note Ms Present For Gprs process in the HLR

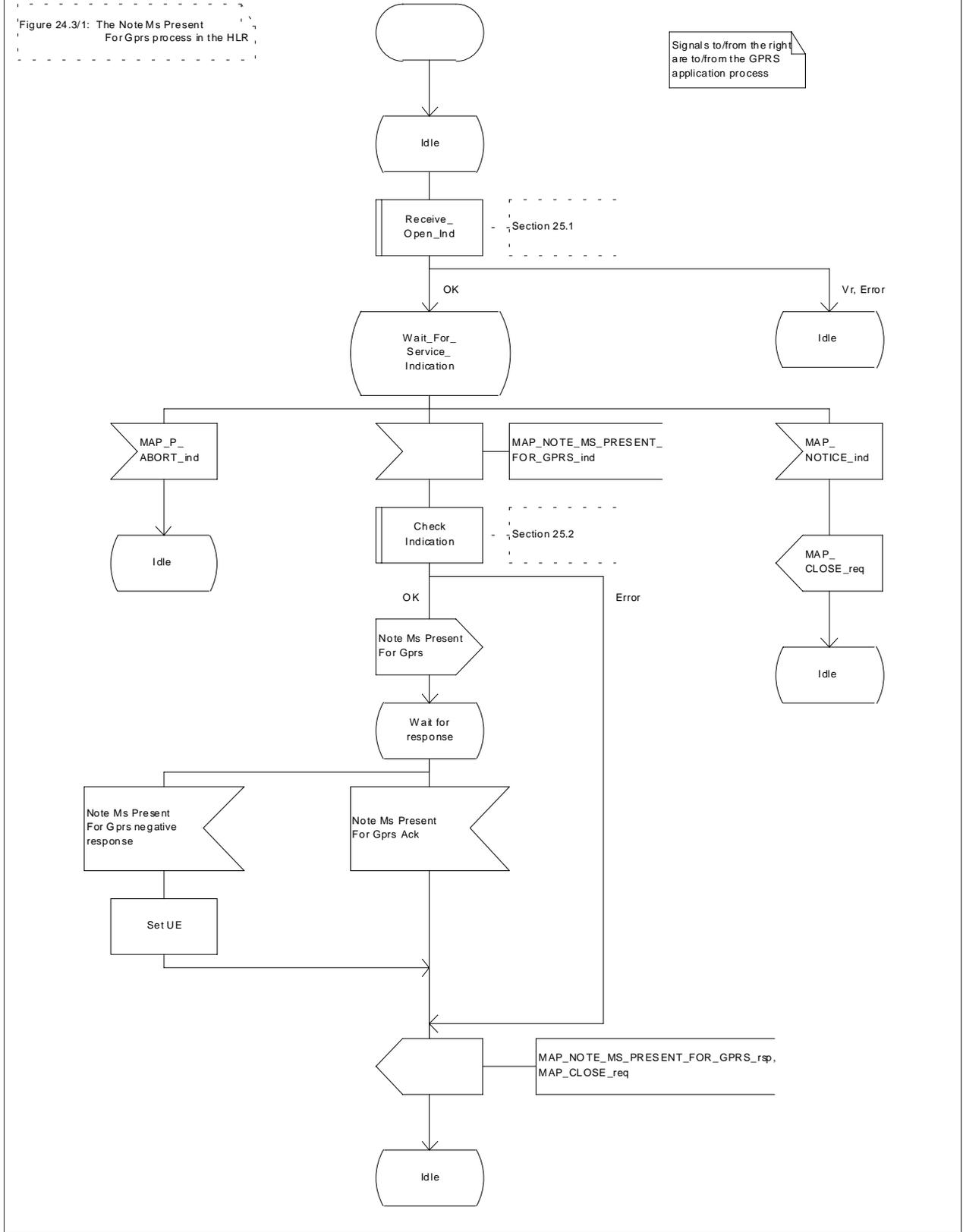


Figure 24.3/1: Process Note_Ms_Present_For_Gprs_GGSN

24.3.2 Process in the HLR for Note Ms Present For Gprs

Successful Outcome

When the MAP process receives a Note Ms Present For Gprs request from the GPRS application process in the HLR, it requests a dialogue with the GGSN whose identity is contained in the Note Ms Present For Gprs request by sending a MAP_OPEN service request, sending necessary information using a MAP_NOTE_MS_PRESENT_FOR_GPRS service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the GGSN.

If the MAP process receives a MAP_NOTE_MS_PRESENT_FOR_GPRS service confirm from the GGSN, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Note Ms Present For Gprs ack containing the information received from the GGSN to the GPRS application process in the HLR and returns to the idle state.

Failure of dialogue opening with the GGSN

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a negative response to the GPRS application process in the HLR and returns to the idle state.

Error in MAP_NOTE_MS_PRESENT_FOR_GPRS confirm

If the MAP_NOTE_MS_PRESENT_FOR_GPRS service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Note Ms Present For Gprs negative response to the GPRS application process in the HLR and returns to the idle state.

Abort of GGSN dialogue

After the dialogue with the GGSN has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process sends a Note Ms Present For Gprs negative response to the GPRS application process in the HLR and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the GGSN, sends a Failure Report negative response indicating system failure to the GPRS application process in the HLR and returns to the idle state.

Process Note_MS_Present_For_Gprs_HLR

24.3_2(1)

Figure 24.3/2: Note Ms Present For Gprs process in the HLR

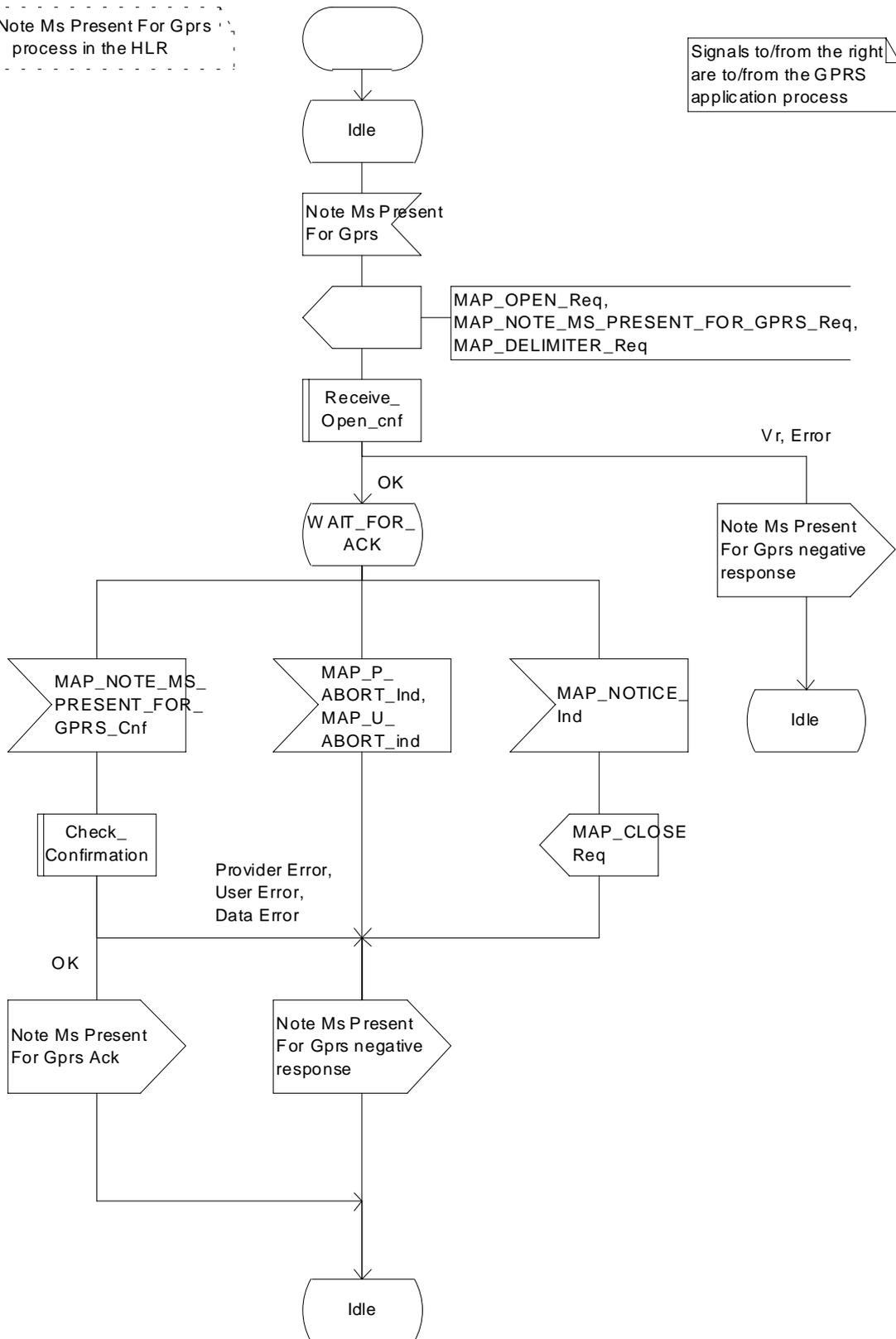


Figure 24.3/2: Process Note_Ms_Present_For_Gprs_HLR

24A CSE control of subscriber data

24A.1 Any Time Subscription Interrogation procedure

24A.1.1 General

The message flows for successful retrieval of subscription information related to an any time interrogation from the CAMEL server are shown in figure 24A.1/1.

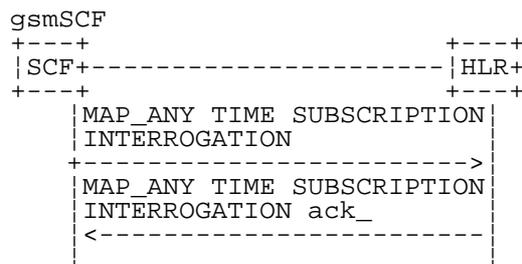


Figure 24A.1/1: Message flow for any time subscription interrogation

The following MAP services are used to retrieve requested information:

MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION see subclause 8.11.x;

24A.1.2 Process in the gsmSCF

Out of the scope of the MAP specification.

24A.1.3 Process in the HLR

The MAP process in the HLR to provide subscription information in response to an interrogation from the CAMEL server is shown in figure 24A.1/2. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context anyTimeInformationHandling, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service indication is received, the MAP process sends an Any Time Subscription Interrogation request to the call handling process in the HLR (described in 3G TS 23.078), and waits for a response. The Any Time Subscription Interrogation request contains the parameters received in the MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service indication.

If the call handling process in the HLR returns an Any Time Subscription Interrogation response, the MAP process constructs a MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service response containing the subscription information contained in the Any Time Subscription Interrogation response, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state. If the MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service response cannot be carried in a single TC-Result component, it is carried in one or more TC-Result-NL components (each sent in a TC-CONTINUE), followed by a TC-Result-L component in a TC-END message.

Negative response from HLR call handling process

If the call handling process in the HLR returns a negative response to obtain subscription information, the MAP process constructs a MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state.

Failure of dialogue opening with the CAMEL server

If the macro Receive_Open_Ind takes the Vr or Error exit, the MAP process returns to the idle state.

If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Process ATSI_HLR

24A.1_2.1(1)

Figure 24A.1/2: Process in the HLR to respond to the request any time subscription interrogation

Signals to/from the left are to /from the gsmSCF

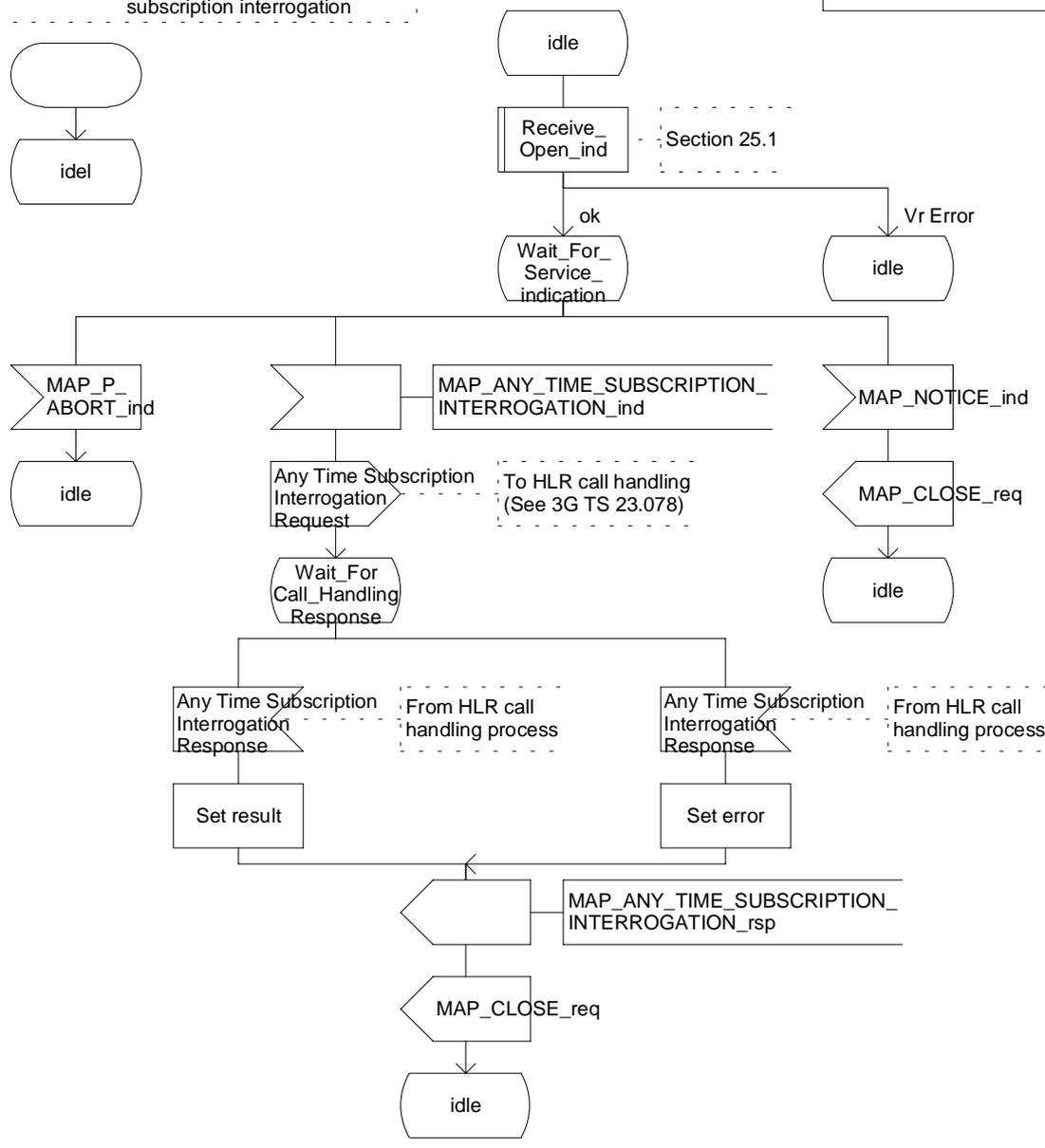


Figure 24A.1/2: Process ATSI_HLR

24A.2 Any Time Modification procedure

24A.2.1 General

The message flows for successful modification of subscriber information related to an any time modification from the CAMEL server are shown in figure 24A.2/1

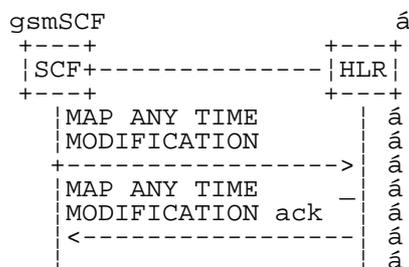


Figure 24A.2/1 Message flow for any time modification

The following MAP services are used to modify subscription information:

MAP_ANY_TIME_MODIFICATION see subclause 8.11.x;

24A.2.2 Process in the gsmSCF

Out of the scope of the MAP specification.

24A.2.3 Process in the HLR

The MAP process in the HLR to modify subscriber information in response to a modification request from the CAMEL server is shown in figure 24A.2/2. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Insert_Sub_Data_Stand_Alone_HLR see subclause 25.7.2;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context anyTimeInformationHandling, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_ANY_TIME_MODIFICATION service indication is received, the MAP process sends an Any Time modification request to the call handling process in the HLR (described in 3G TS 23.078), and waits for a response. The Any Time modification request contains the parameters received in the MAP_ANY_TIME_MODIFICATION service indication.

If the call handling process in the HLR returns an Any Time modification response, the MAP process constructs a MAP_ANY_TIME_MODIFICATION service response containing the modified subscription information contained in the Any Time modification response, constructs a MAP_CLOSE service request, sends them to the CAMEL server. If the MAP_ANY_TIME_MODIFICATION service response cannot be carried in a single TC-Result component, it is carried in one or more TC-Result-NL components (each sent in a TC-CONTINUE), followed by a TC-Result-L component in a TC-END message. If the VLR/SGSN is to be updated after the modification, the MAP_INSERT_SUBS_DATA_HLR process shall be initiated and then returns to the idle state.

Negative response from HLR call handling process

If the call handling process in the HLR returns a negative response to modify subscription information, the MAP process constructs a MAP_ANY_TIME_MODIFICATION service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state.

Failure of dialogue opening with the CAMEL server

If the macro Receive_Open_Ind takes the Vr or Error exit, the MAP process returns to the idle state.

If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Process ATM_HLR

24A.2_2.1(1)

Figure 24A.2/2: Process in the HLR to respond to the request any time modification

Signals to/from the left are to/from the gsmSCF; signals to/from the right are to/from the HLR call handling unless specified otherwise

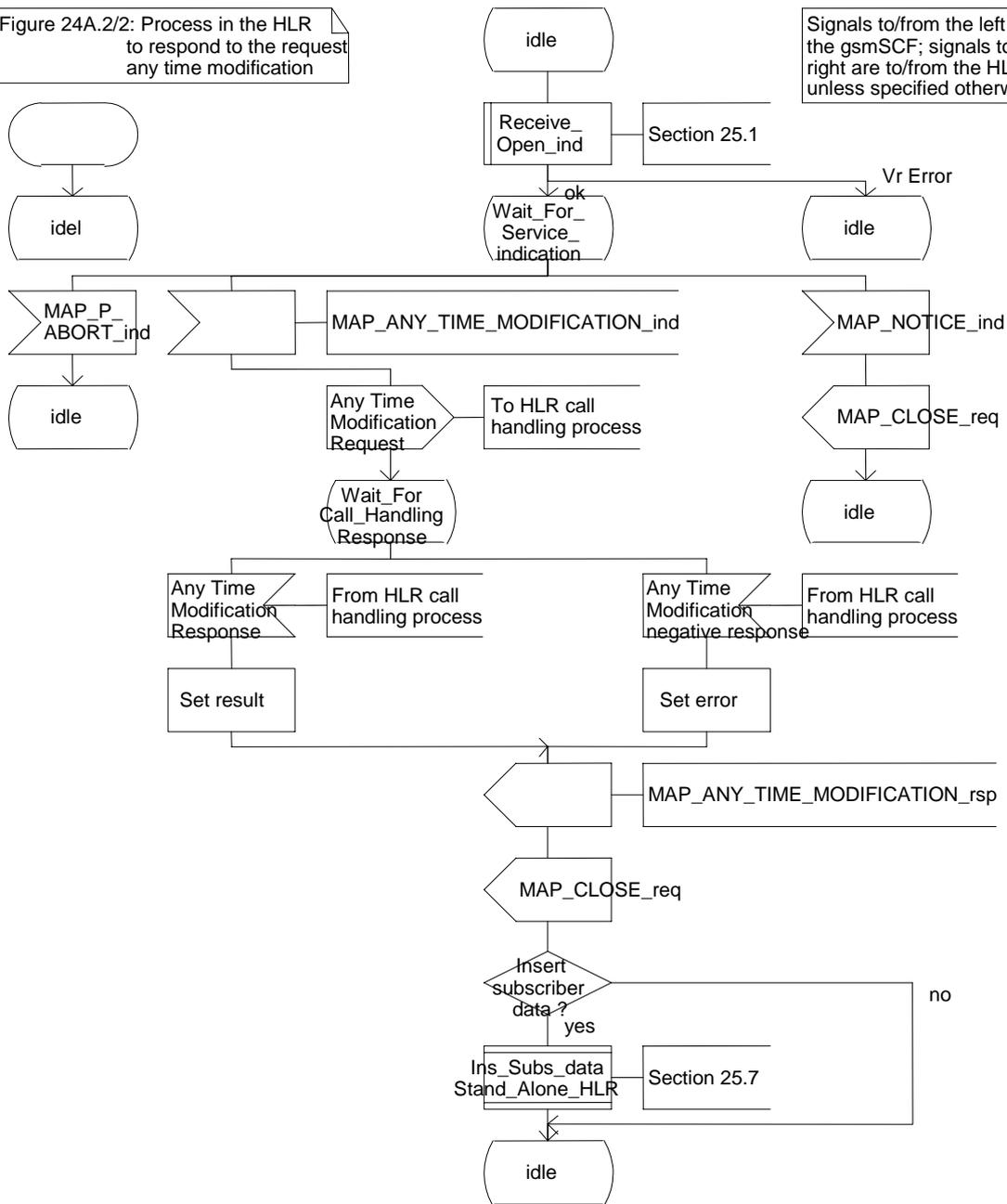


Figure 24A.2/2: Process ATM_HLR

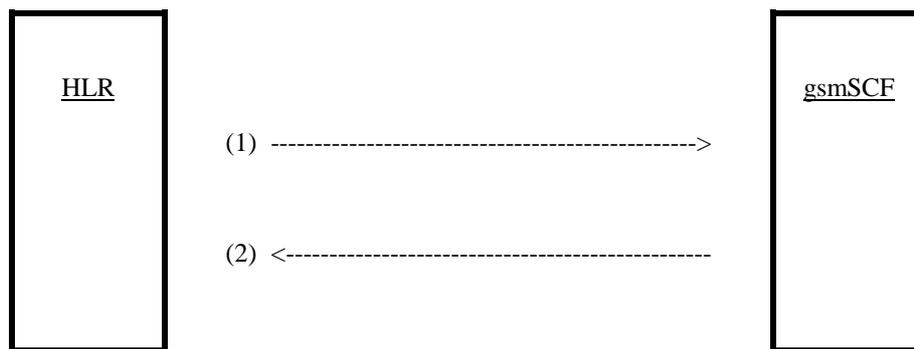
24A.3 Subscriber Data Modification Notification procedure

24A.3.1 General

The Subscriber Data Modification Notification procedure is used to notify a gsmSCF about the modification of subscriber data.

The stage 2 specification for Subscriber Data Modification Notification is in TS 23.078. The interworking between the MAP signalling procedures and the Subscriber Data Modification Notification procedures for each entity (HLR, gsmSCF) is shown by the transfer of signals between these procedures.

The following services are used:



(1) MAP-NOTE_SUBSCRIBER_DATA_MODIFIED (HLR to gsmSCF)

(2) MAP-NOTE_SUBSCRIBER_DATA_MODIFIED-ACK (gsmSCF to HLR)

Figure 24A.3/1: Interfaces and services for subscriber data modification notification

24A.3.2 Processes in the MAP Entities

The text in this clause is a supplement to the definition in the SDL diagrams; it does not duplicate the information in the SDL diagrams.

24A.3.2.1 Process in the HLR

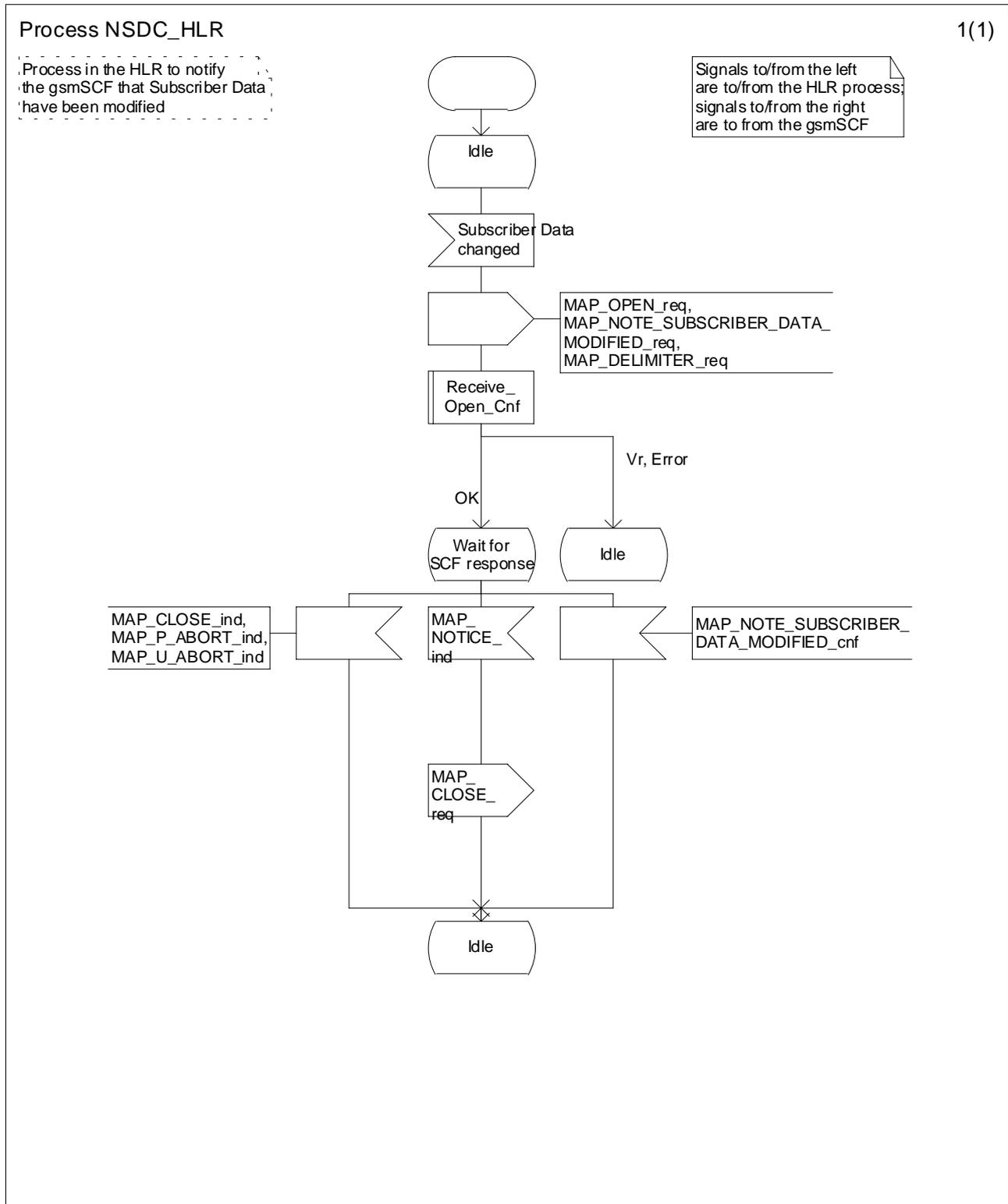


Figure 24A.3/2 Process Subscriber_Data_Modification_Notification_HLR (sheet 1 of 1)

24A.3.2.2 Process in the gsmSCF

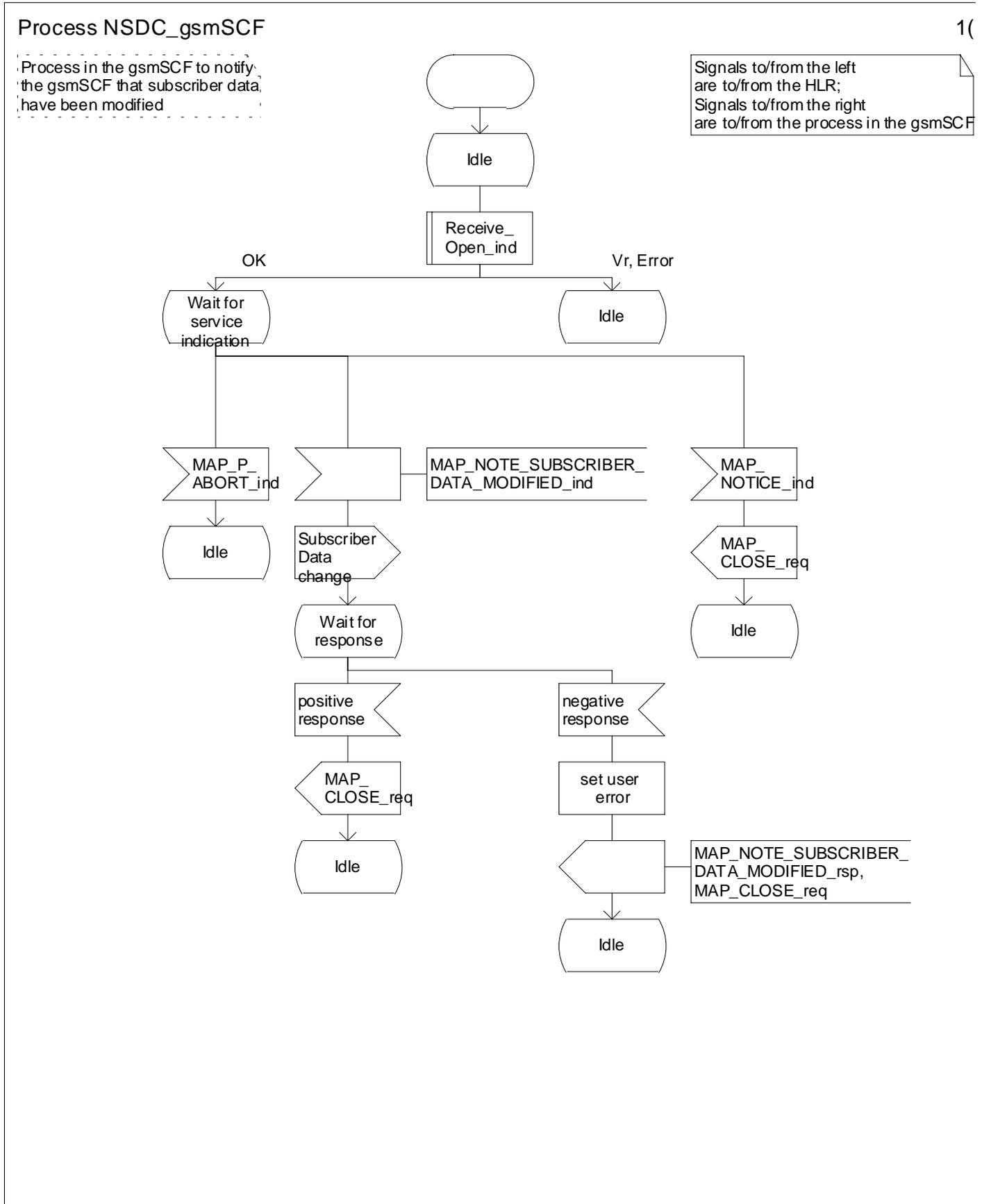


Figure 24A.3/3 Process Subscriber_Data_Modification_Notification_gsmSCF (sheet 1 of 1)

25 General macro description

25.1 MAP open macros

25.1.1 Macro Receive_Open_Ind

This macro is used by a MAP service-user procedure when a peer entity requests opening of a dialogue.

If the application context received in the MAP-OPEN indication primitive indicates a context name of the MAP version one context set, the macro takes the Vr exit..

If an application-context different from version 1 is received, the presence of MAP_OPEN information is checked. If no MAP_OPEN information has been received, the MAP_OPEN response with:

- Result set to Dialogue Accepted; and
- Application Context Name set to the received value,

is returned

If the received version (Vr) is the one described in this version of MAP, the macro takes the OK exit, otherwise it takes the Vr exit..

If MAP_OPEN information is received, the macro "CHECK_REFERENCE" is called in order to check whether the received values for Destination Reference and Originating Reference correspond with the requirements of the received application-context-name. The outcome of this check is an error, the MAP_OPEN response with:

- Result set to Dialogue Refused;
- Refuse Reason set to Invalid Destination Reference or Invalid Originating Reference;
- Application Context Name set to the highest version supported,

is returned and the macro takes the error exit.

If the data values received for Destination Reference and Originating Reference are accepted for the associated application-context-name it is checked whether the Destination Reference is known if this check is required by the process that calls the macro.

If the Destination Reference (e.g. a subscribers IMSI) is unknown, the MAP_OPEN response with

- Result set to Dialogue Refused;
- Refuse Reason set to Invalid Destination Reference;
- Application Context Name set to the highest version supported,

is returned and the macro takes the error exit.

Else, if the Destination Reference is accepted or if no check is required, the MAP_OPEN response with

- Result set to Dialogue Accepted; and
- Application Context Name set to the received value,

is returned and

If the received version (Vr) is the one described in this version of MAP, the macro takes the OK exit, otherwise it takes the Vr exit.

25.1.2 Macro Receive_Open_Cnf

This macro is used by a user procedure after it requested opening of a dialogue towards a peer entity.

On receipt of a MAP_OPEN Confirmation with a "Result" parameter indicating "Dialogue Accepted", the macro takes the OK exit.

If the "Result" parameter indicates "Dialogue Refused", the "Refuse-reason" parameter is examined. If the "Refuse-reason" parameter indicates "Potential Version Incompatibility", the macro terminates in a way that causes restart of the dialogue by using the version 1 protocol.

If the "Refuse-reason" parameter indicates "Application Context Not Supported" and if the received Application Context Name indicates "Version V_r " ($V_r < V_n$), the macro terminates in a way that causes restart of the dialogue by using the version V_r protocol. Otherwise, the macro takes the Error exit.

If the "Refuse-reason" parameter indicates neither "Potential Version Incompatibility" nor "Application Context Not Supported", the macro takes the Error exit.

If a MAP_U_ABORT, a MAP_P_ABORT or a MAP_NOTICE Indication is received, the macro takes the Error exit.

Figure 25.1/1: Macro Receive_Open_Ind

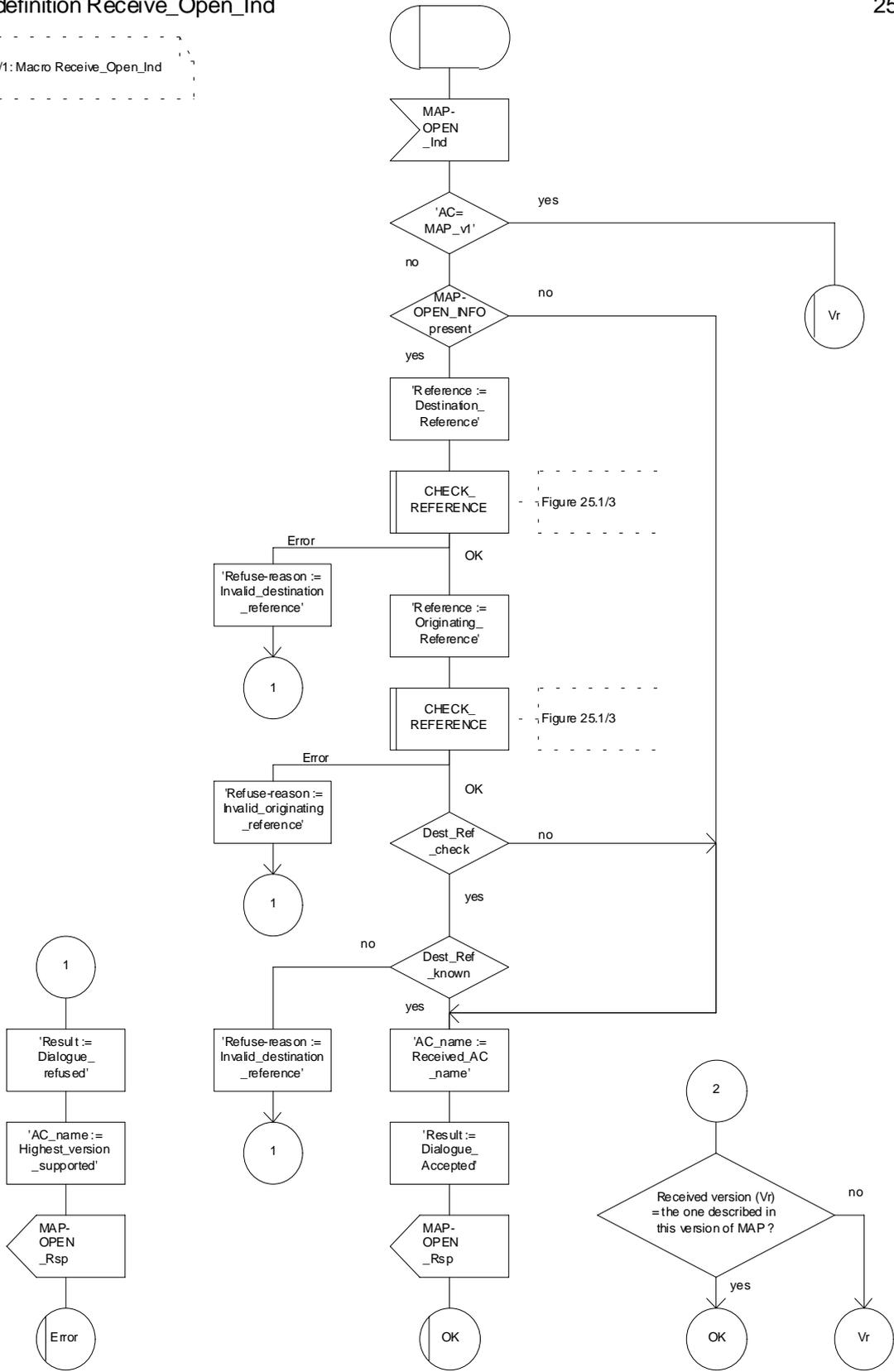


Figure 25.1/1: Macro Receive_Open_Ind

Figure 25.1/2: Macro to receive a MAP_OPEN_Cnf

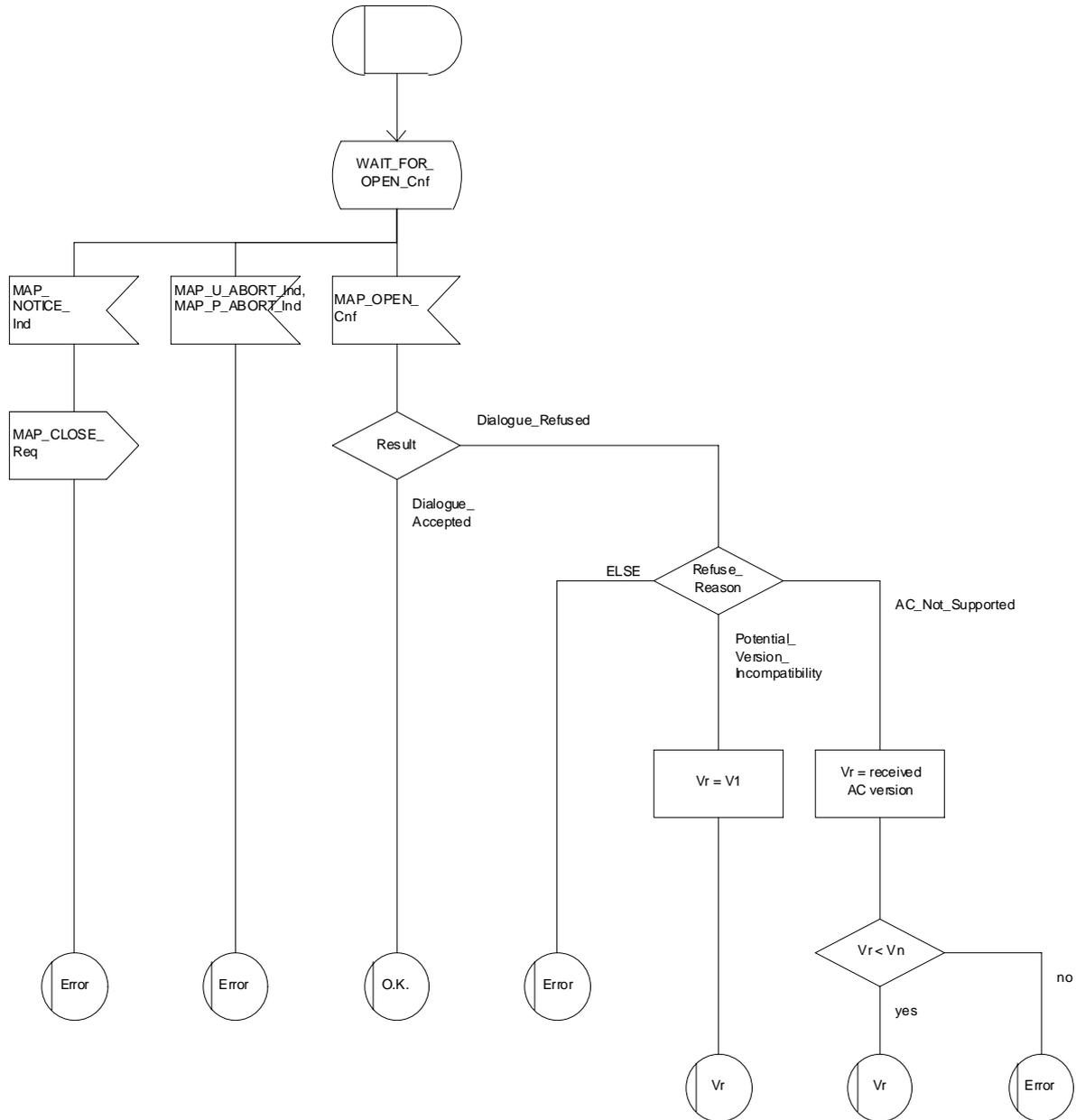


Figure 25.1/2: Macro Receive_Open_Cnf

Figure 25.1/3: Check of Destination Reference and Originating Reference received in a MAP-OPEN indication primitive

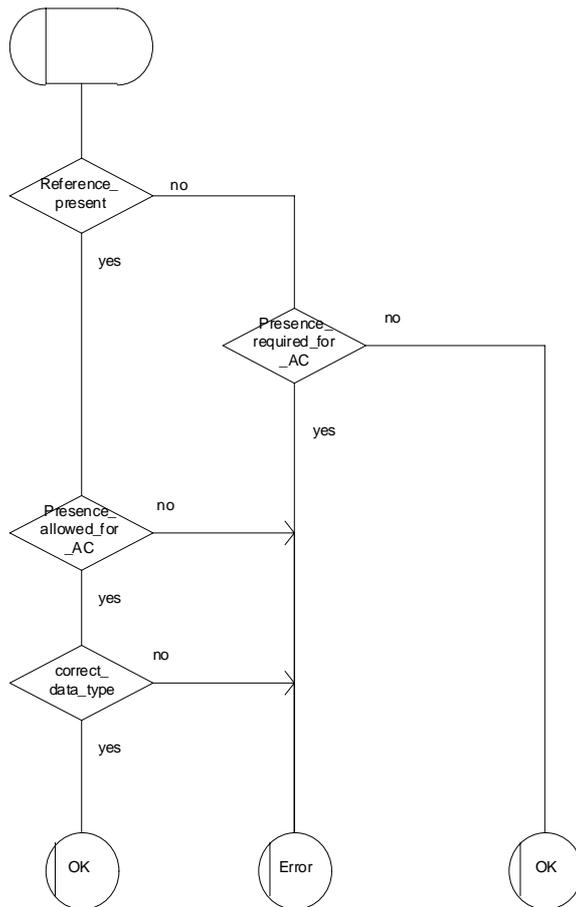


Figure 25.1/3: Macro CHECK_REFERENCE

25.2 Macros to check the content of indication and confirmation primitives

25.2.1 Macro Check_Indication

If a parameter required by the application is missing from the indication, the macro takes the error exit, with a user error of "Data Missing".

If a parameter not expected by the application is present in the indication, or an expected parameter has a value not in the set of values permitted by the application, the macro takes the error exit, with a user error of "Unexpected Data Value".

Otherwise the macro takes the "OK" exit.

The macro is shown in figure 25.2/1.

25.2.2 Macro Check_Confirmation

If the confirmation contains a provider error the macro issues a MAP CLOSE request and takes the provider error exit.

Otherwise, if the confirmation contains a user error the macro takes the user error exit.

Otherwise, if a parameter required by the application is missing from the confirmation, or a parameter not expected by the application is present in the confirmation, or an expected parameter has a value not in the set of values permitted by the application, the macro takes the data error exit.

Otherwise the macro takes the "OK" exit.

The macro is shown in figure 25.2/2.

Figure 25.2/1: Macro to check the parameters of an indication primitive

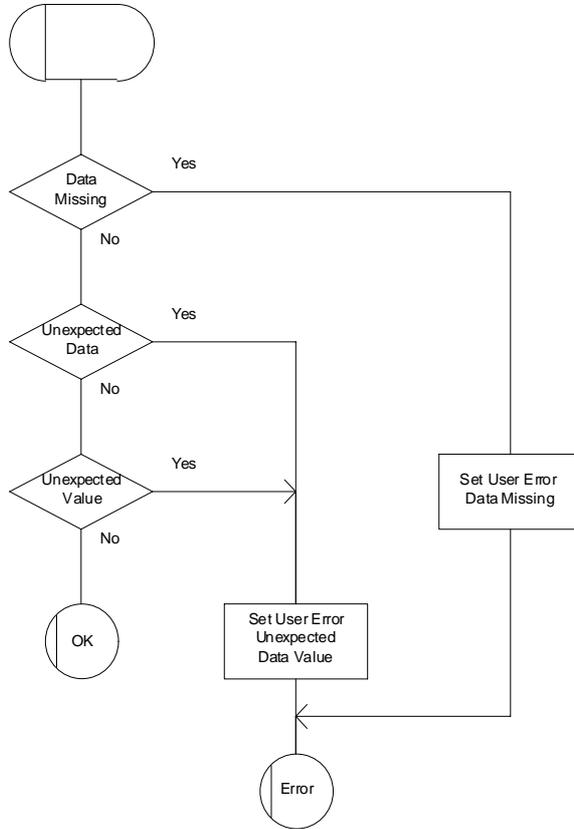


Figure 25.2/1: Macro Check_Indication

Figure 25.2/2: Macro to check the parameters of a confirmation primitive

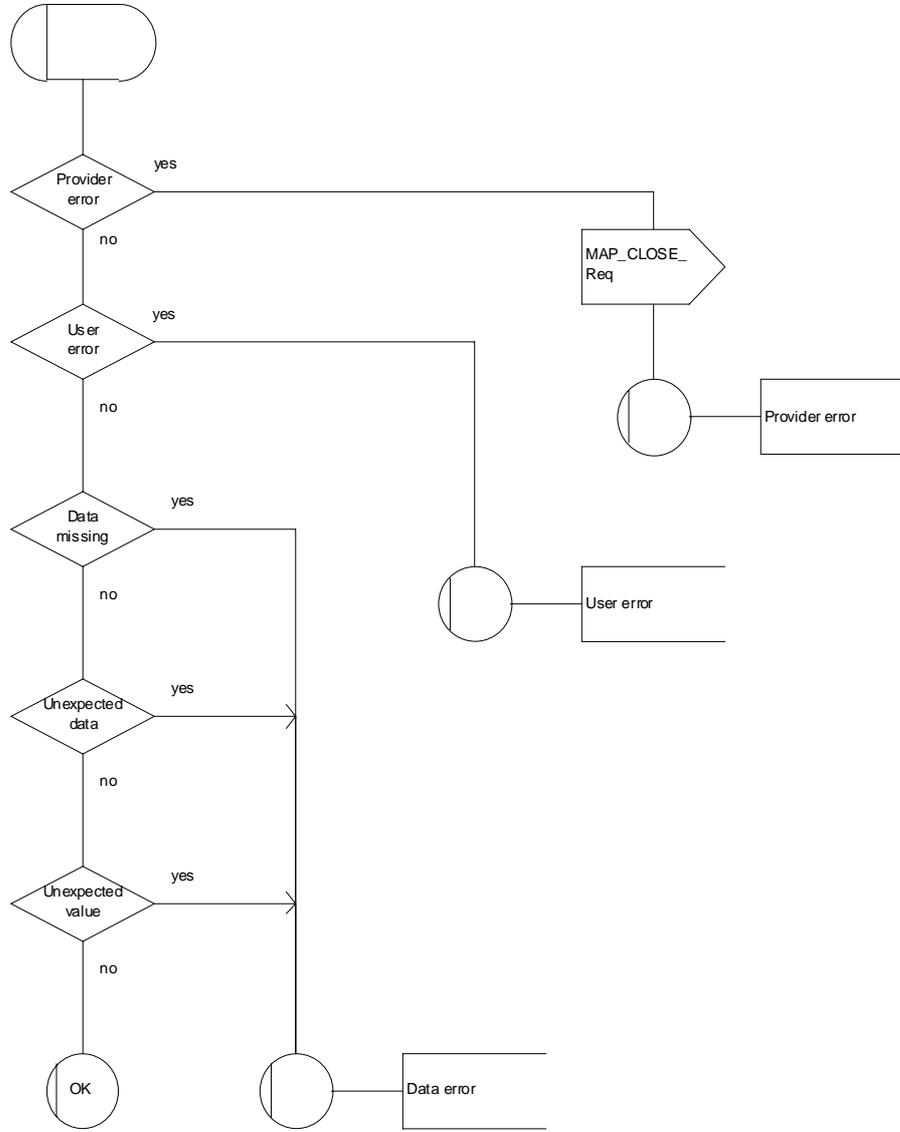


Figure 25.2/2: Macro Check_Confirmation

25.3 The page and search macros

25.3.1 Macro PAGE_MSC

This macro (see figure 25.3/1) is called if a mobile terminating call set-up, an unstructured SS notification, a network-initiated unstructured SS request or a mobile terminating short message is to be delivered to the MS and the current location area identity of the MS is known in the VLR.

When the MSC receives a MAP_PAGE indication, parameter checks are performed first (macro Check_Indication, see subclause 25.2). If parameter errors are detected, the MSC returns a MAP_PAGE response containing the appropriate error cause and the macro terminates with unsuccessful outcome.

Thereafter, several checks on the indication content are performed. The macro terminates by returning the MAP_PAGE response with error:

Unknown Location Area if the LAI is not known in the MSC;

System Failure if the call has been released by the calling subscriber or the SMS or SS transaction for this subscriber has been released by the originating entity in the meantime.

Next, the MSC checks if an MM-connection over the radio link already exists for the given IMSI. If so,

- in the case of mobile terminating call set-up the MSC determines whether the busy condition can be established (see GSM 02.01 for a definition of busy states). If the MSC determines that the MS is busy, it returns a MAP_PAGE response with error Busy Subscriber, qualified by either More Calls Allowed or No More Calls Allowed. The macro then terminates with unsuccessful outcome.
- if the service requested is short message service or an unstructured SS notification or network-initiated unstructured SS request, or if the service is mobile terminating call set-up, but the existing connection is for signalling purposes only (i.e. a service different from call set-up), the access connection status is set according to the characteristics of the existing connection (i.e. RR-connection established, ciphering mode on/off, MM-connection existing and authenticated or not), and the macro terminates with successful outcome.

If no MM-connection for the given IMSI exists, paging is initiated at the radio interface within all cells of the location area indicated by the VLR. If the VLR provided the TMSI, the MSC uses it to identify the MS at the radio interface; otherwise the MSC uses the IMSI. The IMSI will also be used to determine the page group (see GSM 04.08). There are several possible outcomes of paging:

- the MS responds to paging, causing the access connection status to be set accordingly (i.e. no RR-connection, in which case other values are not significant), and the macro terminates with successful outcome;
- the MS responds with a channel request containing an establishment cause which is not "answer to paging". The MSC sends a MAP_PAGE response primitive with user error Busy Subscriber before the macro terminates with unsuccessful outcome. This will give priority to the mobile originating request. Alternatively, as an implementation option, the MSC may treat this as a response to paging, which will give priority to the mobile terminating request.
- there is no response from the MS. The MSC sends a MAP_PAGE response primitive with user error Absent Subscriber before the macro terminates with unsuccessful outcome;
- the call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released before a response is received from the MS (indicated in the SDL by the input signal I-REL). The MAP transaction with the VLR will be released in this case by a MAP_U_ABORT request, and the unsuccessful macro termination will indicate transaction termination.
- the MAP transaction with the VLR may be released by receiving a MAP_U_ABORT or MAP_P_ABORT indication. The call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released (indicated in the SDL by the output signal I-REL), and the unsuccessful macro termination will indicate transaction termination.

25.3.2 Macro Search_For_MS_MSC

This macro (see figure 25.3/2) is called if a mobile terminating call set-up, an unstructured SS notification, a network-initiated unstructured SS request or a mobile terminating short message is to be delivered to the MS and the current location area identity of the MS is not known in VLR.

When the MSC receives a MAP_SEARCH_FOR_MS Indication, parameter checks are performed first (macro Check_indication, see subclause 25.2). If parameter errors are detected, the MSC returns a MAP_SEARCH_FOR_MS response containing the appropriate error cause and the macro terminates with unsuccessful outcome.

Thereafter, the MSC checks whether the call or the SMS or SS transaction still exists in the MSC. If the call or the SMS or SS transaction has been released, the MSC returns a MAP_SEARCH_FOR_MS response with error System Failure and the macro terminates with unsuccessful outcome.

Next, the MSC checks if an MM-connection over the radio link already exists for the given IMSI. If so,

- in the case of mobile terminating call set-up the MSC determines whether the busy condition can be established (see GSM 02.01 for a definition of busy states). If the MSC determines that the MS is busy, it returns a MAP_SEARCH_FOR_MS response with error Busy Subscriber, qualified by either More Calls Allowed or No More Calls Allowed. The macro then terminates with unsuccessful outcome.
- if the service requested is short message service or an unstructured SS notification or network-initiated unstructured SS request, or if the service is mobile terminating call set-up, but the existing connection is for signalling purposes only (i.e. a service different from call set-up), a MAP_SEARCH_FOR_MS response containing the IMSI and current location area identification of the called MS is returned to the VLR. The access connection status is set according to the characteristics of the existing connection (i.e. RR-connection established, ciphering mode on/off, MM-connection existing and authenticated or not), and the macro terminates with successful outcome.

If no MM-connection for the given IMSI exists, paging is initiated at the radio interface within all cells of all location areas of the VLR, using the IMSI to identify the subscriber and the page group (see GSM 04.08). There are several possible outcomes of paging:

- the MS responds to paging, causing a MAP_SEARCH_FOR_MS response containing the IMSI and current location area identification of the called MS to be returned to the VLR. The access connection status will be set accordingly (i.e. no RR-connection, in which case other values are not significant), and the macro terminates with successful outcome.
- the MS responds with a channel request containing an establishment cause which is not "answer to paging". The MSC sends a MAP_SEARCH_FOR_MS response primitive with user error "Busy Subscriber" before the macro terminates with unsuccessful outcome. This will give priority to the mobile originating request. Alternatively, as an implementation option, the MSC may treat this as a response to paging, which will give priority to the mobile terminating request.
- there is no response from the MS. The MSC sends a MAP_SEARCH_FOR_MS response primitive with user error "Absent Subscriber" before the macro terminates with unsuccessful outcome.
- the call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released before a response is received from the MS (indicated in the SDL by the input signal I-REL). The MAP transaction with the VLR will be released in this case by a MAP_U_ABORT request, and the unsuccessful macro termination will indicate transaction termination.
- the MAP transaction with the VLR may be released by receiving a MAP_U_ABORT or MAP_P_ABORT indication. The call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released (indicated in the SDL by the output signal I-REL), and the unsuccessful macro termination will indicate transaction termination.

Figure 25.3/2: Macro Search_For_MS_MSC

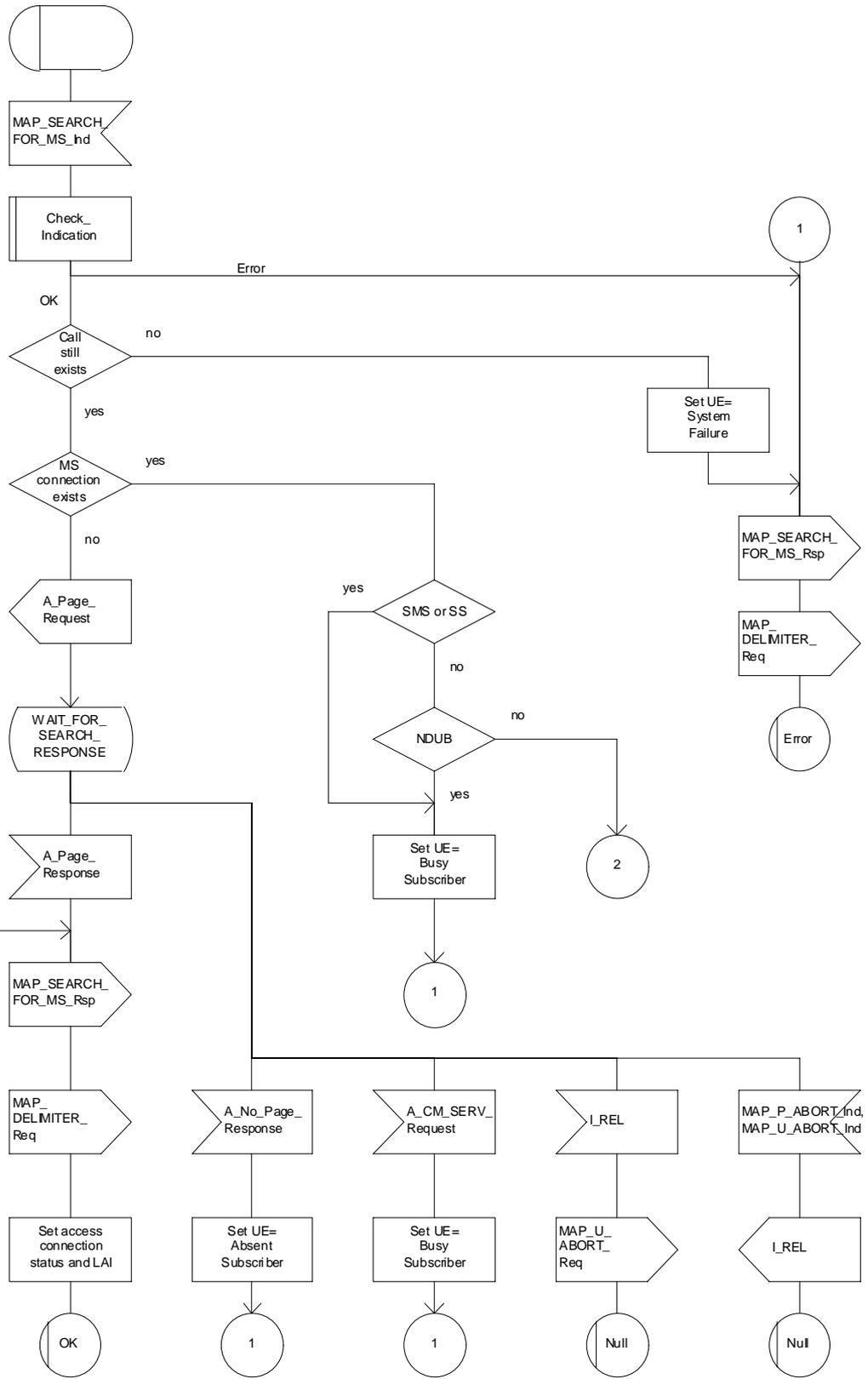


Figure 25.3/2: Macro Search_for_MS_MSC

25.4 Macros for handling an Access Request

These macros are invoked when a MS accesses the network, e.g. to set up an outgoing call or when responding to paging. The macro handles identification and authentication of the mobile subscriber as well as invocation of security related features (see GSM 02.09).

25.4.1 Macro Process_Access_Request_MSC

This macro is invoked by any procedure receiving an access request from the MS, e.g. the page response at mobile terminating call set-up or the request for outgoing call set-up.

If no dialogue with the VLR exists (e.g. within the procedure for outgoing call set-up), the MSC will open a dialogue towards the VLR by sending a MAP_OPEN request without any user specific parameters.

In any case, the parameters received from the MS are mapped to a MAP_PROCESS_ACCESS_REQUEST request primitive, containing:

- the received subscriber identification (IMSI, TMSI) or - in case of emergency call set-up - an IMEI;
- the CM service type, indicating the type of request;
- the status of the access connection, i.e. whether a connection to this MS already exists and if so, whether it is already authenticated and ciphered;
- the current location area id of the MS; and
- the CKSN received from the MS.

If opening of the dialogue was required, the MSC will wait for the dialogue confirmation (see macro Receive_Open_Confirmation, subclause 25.1), leading either to:

- immediate unsuccessful exit from the macro, in case no dialogue is possible;
- reversion to MAP version one dialogue if indicated by the VLR. The macro terminates with unsuccessful outcome, as the complete dialogue will be covered by the version one procedure, so that no further action from the calling process is required;
- continuation as given below, if the dialogue is accepted by the VLR.

The MSC waits then for the MAP_PROCESS_ACCESS_REQUEST confirmation. In between, several other indications may be received from the VLR:

- the MSC may receive a MAP_PROVIDE_IMSI indication, handled by the macro Obtain_IMSI_MSC defined in subclause 25.8. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;
- the MSC may receive a MAP_AUTHENTICATE indication, handled by the macro Authenticate_MSC defined in subclause 25.5. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;
- the MSC may receive a MAP_TRACE_SUBSCRIBER_ACTIVITY indication, handled by the macro Trace_Subscriber_Activity_MSC defined in subclause 25.9;
- the MSC may receive a MAP_SET_CIPHERING_MODE indication, which will be stored for initiating ciphering later on;
- the MSC may receive a MAP_CHECK_IMEI indication, handled by the macro Check_IMEI_MSC defined in subclause 25.6. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;
- the MSC may receive a MAP_Obtain_IMEI indication, handled by the macro Obtain_IMEI_MSC defined in subclause 25.6. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;

- the MSC may receive a MAP_U_ABORT or MAP_P_ABORT indication, or a premature MAP_CLOSE indication from the VLR. In all these cases, the macro terminates with unsuccessful outcome, after sending the appropriate reject towards the MS (see GSM 09.10);
- the MSC may receive a MAP_NOTICE indication from the VLR. In this case, the dialogue towards the VLR is terminated by a MAP_CLOSE primitive, the appropriate reject is sent towards the MS (see GSM 09.10), and the macro terminates with unsuccessful outcome;
- the MSC may receive an indication for release of the radio path, in which case the dialogue towards the VLR will be terminated by a MAP_U_ABORT primitive, containing the diagnostic information Radio Channel Release.

When the MAP_PROCESS_ACCESS_REQUEST confirmation is received, the parameters of this primitive are checked first. In case of unsuccessful outcome of the service, the MAP User Error received is mapped onto the appropriate radio interface message (see GSM 09.10), before the macro terminates with unsuccessful outcome.

In case of positive outcome of the service, ciphering is initiated on the radio path, if this had been requested by the VLR (see above). Otherwise, if the access request was not triggered by a page response from the MS, the access request is accepted explicitly by sending a CM_Service_Accept message to the MS. If the access request was triggered by a page response from the MS then no CM Service Accept message is sent.

After ciphering has been initiated, the MSC will wait for the MAP_FORWARD_NEW_TMSI indication from the VLR. While waiting, the MSC may receive:

- a MAP_U_ABORT or MAP_P_ABORT indication, or a premature MAP_CLOSE indication from the VLR. In these cases, the macro terminates with unsuccessful outcome, after sending a release request towards the MS (see GSM 09.10);
- a MAP_NOTICE indication from the VLR. In this case, the dialogue towards the VLR is terminated by a MAP_CLOSE primitive, the appropriate reject is sent towards the MS (see GSM 09.10), and the macro terminates with unsuccessful outcome;
- an indication for release of the radio path, in which case the dialogue towards the VLR will be terminated by a MAP_U_ABORT primitive, containing the diagnostic information Radio Channel Release;
- a MAP_DELIMITER request from the VLR. This will be taken as a successful outcome of the macro (i.e. the VLR did not require TMSI reallocation), and it terminates successfully;
- an A_SETUP request from the MS. This will be saved for handling by the procedure which invoked the macro Process_Access_Request_MSC after the macro has terminated.

When the MAP_FORWARD_NEW_TMSI indication is received in the MSC, the TMSI Reallocation Command is sent to the MS, and the MSC waits for an acknowledgement from the MS. In case a positive acknowledgement is received, the MSC sends an empty MAP_FORWARD_NEW_TMSI response primitive to the VLR and terminates successfully. Else, the dialogue is terminated locally (MAP_CLOSE_Req with Release method Prearranged End) without any further action.

If the MSC receives an A_SETUP request while it is waiting for the TMSI acknowledgement from the MS, the A_SETUP is saved for handling by the procedure which invoked the macro Process_Access_Request_MSC after the macro has terminated.

If the dialogue is aborted by the VLR while waiting for the TMSI acknowledgement from the MS, the MSC regards the access request to be failed and terminates with unsuccessful outcome, after sending a release request towards the MS (see GSM 09.10).

Figure 25.4/1: Macro for processing the access request in MSC

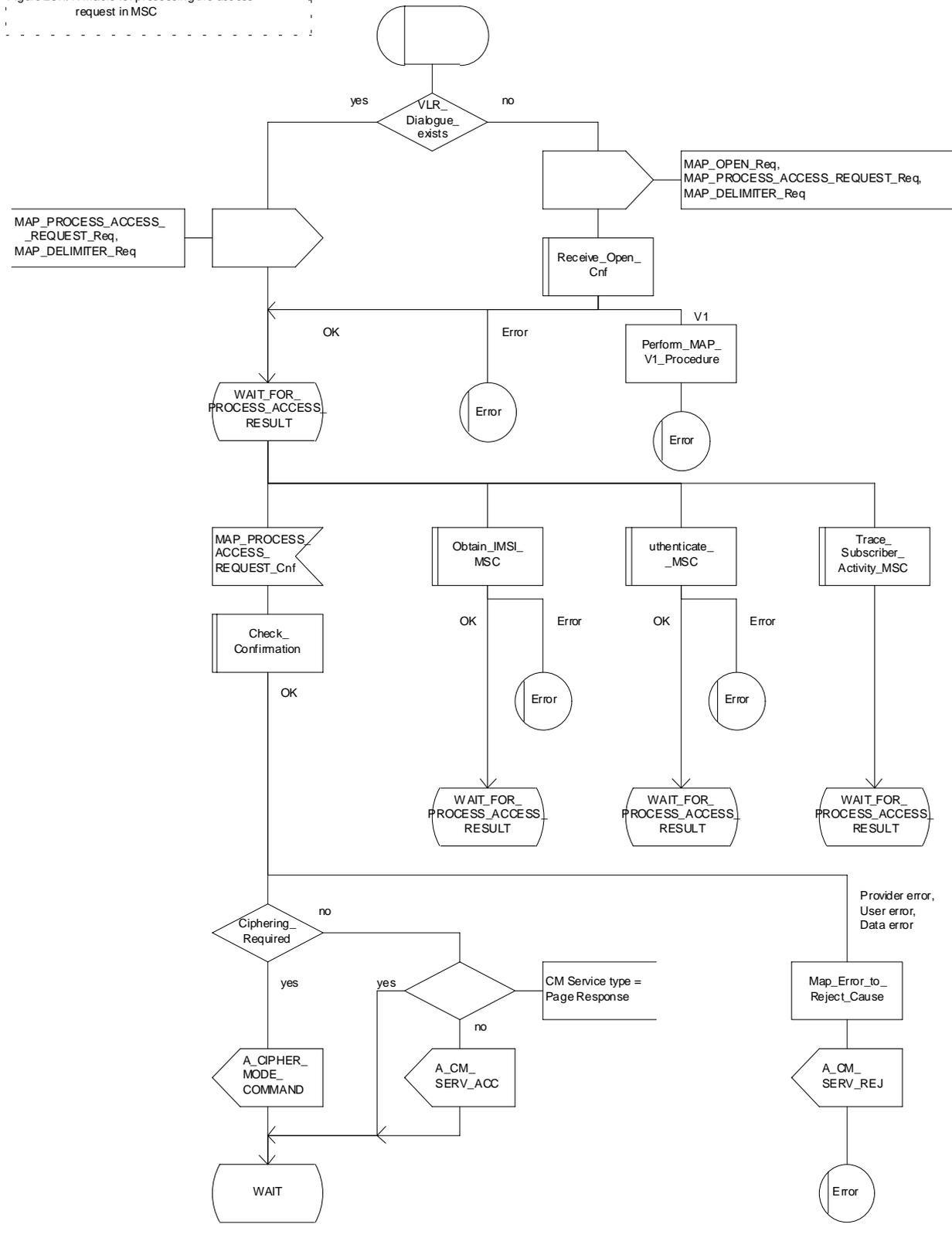


Figure 25.4/1 (sheet 1 of 3): Macro Process_Access_Request_MSC

Figure 25.4/1: Macro for processing the access request in MSC

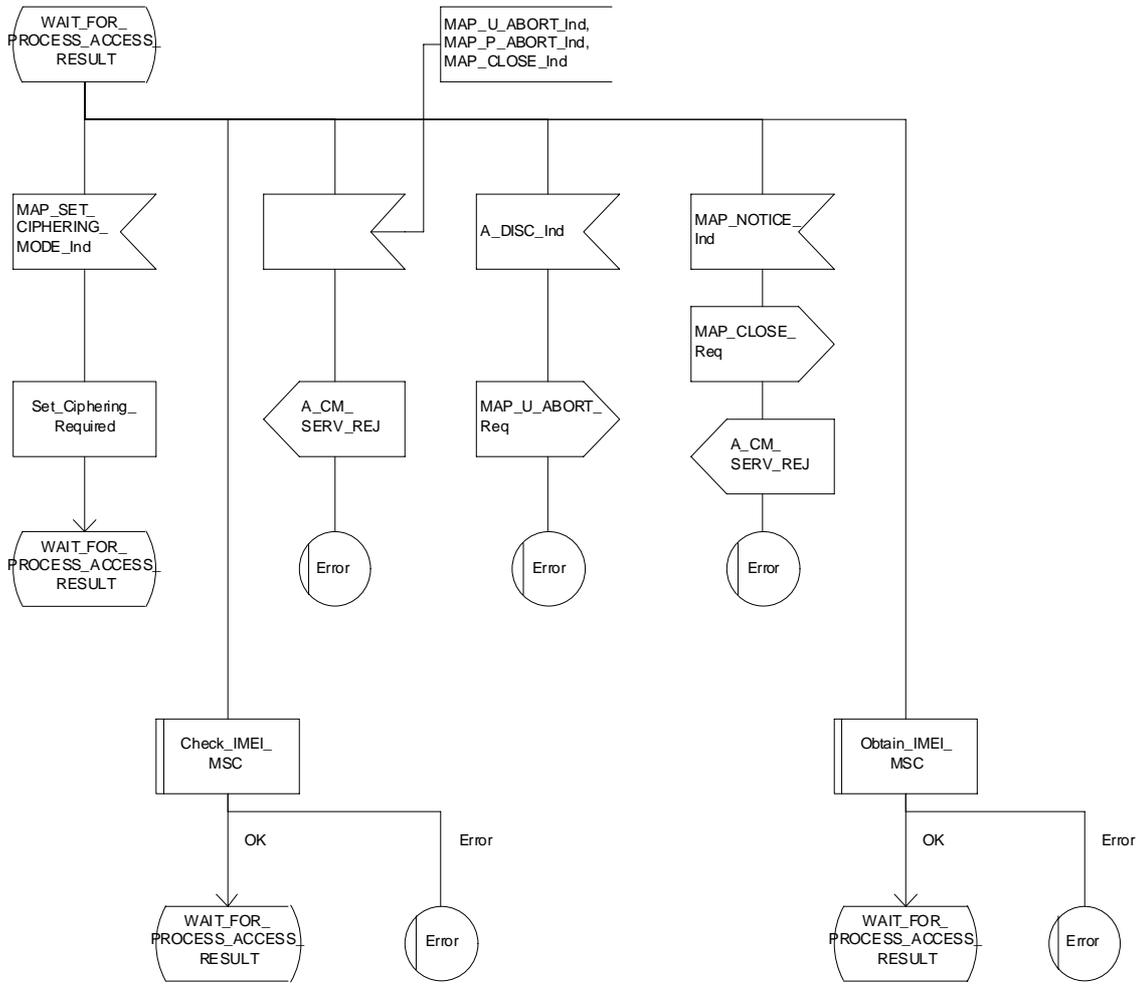


Figure 25.4/1 (sheet 2 of 3): Macro Process_Access_Request_MSC

25.4.2 Macro Process_Access_Request_VLR

When the VLR receives a MAP_PROCESS_ACCESS_REQUEST indication, the VLR will check this indication first (macro Check_Indication, see subclause 25.2). In case of negative outcome, the macro will proceed with the error handling described below.

If the indication data are correct, it is checked first whether the subscriber identification (IMSI or TMSI) is known if included:

- if the identification is not known, the IMSI may be requested from the MS, described in the macro Identification_Procedure (see below) with outcome:
 - OK, if a IMSI known in the VLR has been received;
 - Error, if the VLR did not recognize the subscriber's identity. The macro will proceed with the error handling described below;
 - Aborted, if the transaction to the MSC is released. The macro will terminate immediately with unsuccessful.

In case the identity received is an IMEI, the error System Failure is set and the macro proceeds with the error handling described below.

NOTE: Emergency Call with IMEI may be accepted within the error handling phase.

For a known subscriber the authentication check is performed next (see macro Authenticate_VLR, subclause 25.5), if required. If a negative result is received, the VLR proceeds on receipt of user error:

- illegal subscriber depending on the identity used for authentication;

In case IMSI is already used or no new authentication attempt with IMSI shall not be performed (operator option), the error Illegal Subscriber is set and the macro proceeds with the error handling described below.

If a new authentication attempt with IMSI shall be performed, the IMSI is requested from the MS (macro Obtain_IMSI_VLR, see subclause 25.8):

- the authentication will be performed again if a IMSI known in the VLR is received;
- the error Unidentified Subscriber is set and the macro proceeds with the error handling described below, if the IMSI received is unknown in VLR;
- if the IMSI request procedure fails for any other reason, the error System Failure is set and the macro proceeds with the error handling described below;
- if the dialogue has been aborted during the IMSI request, the macro terminates immediately with unsuccessful outcome;
- unknown subscriber by setting the error Unidentified Subscriber and proceeding with the error handling described below.

NOTE: This can occur only in case of data inconsistency between HLR and VLR;

- procedure error by setting the error System Failure and proceeding with the error handling described below;
- null (i.e. the dialogue towards the MSC is terminated) by terminating immediately with unsuccessful outcome.

The MS access is accepted if no authentication is required or after successful authentication. Then, the indicator "Confirmed by Radio Contact" is set to "Confirmed". If the indicator "Location Information Confirmed in HLR" is set to "Not Confirmed", HLR updating will be started as an independent process (Update_Location_VLR, see subclause 19.1.1.6).

If the indicator "Confirmed by HLR" is set to "Not Confirmed", the error Unidentified Subscriber is set and the macro proceeds with the error handling described below.

If roaming is not allowed in the location area indicated in the Current Location Area Id parameter, the error Roaming Not Allowed qualified by the roaming restriction reason is set and the macro proceeds with the error handling described below.

In case roaming is allowed, the IMSI is set to attached and the process for notifying the HLR that the subscriber is present is started if required (Subscriber Present VLR, see subclause 25.10).

At next, tracing is invoked if required by the operator (macro Trace_Subscriber_Activity_VLR, see subclause 25.9). Thereafter,

if ciphering is not required, IMEI checking is invoked if required by the operator (see macro Check_IMEI_VLR defined in subclause 25.6).

The error Illegal Equipment is set in case of unsuccessful outcome of the IMEI check, the subscriber is marked as detached and the macro proceeds with the error handling described below.

The macro terminates immediately with unsuccessful outcome if the MSC dialogue has been released during the IMEI check.

Else, the macro terminates successfully by returning the MAP_PROCESS_ACCESS_REQUEST response containing the IMSI to indicate acceptance of the MS access.

if ciphering is required, the MAP_SET_CIPHERING_MODE request containing:

- the cipher mode indicating the cipher algorithm required; and
- the cipher key to be used;

is sent to the MSC.

As a further operator option, IMEI checking may be performed next.

The error Illegal Equipment is set in case of unsuccessful outcome of the IMEI check, the subscriber is marked as detached and the macro proceeds with the error handling described below.

The macro terminates immediately with unsuccessful outcome if the MSC dialogue has been released during the IMEI check.

Else, the macro terminates successfully by returning the MAP_PROCESS_ACCESS_REQUEST response containing the IMSI to indicate acceptance of the MS access.

IF no TMSI reallocation is required (again an operator option), the macro terminates thereafter. Else, TMSI reallocation is performed by sending a MAP_FORWARD_NEW_TMSI request, containing the new TMSI as parameter. The old TMSI will be frozen until an acknowledgement from the MS has been received. Before the macro terminates, the VLR will wait for the MAP_FORWARD_NEW_TMSI response, containing no parameters if reallocation has been confirmed by the MS, or a Provider Error, otherwise, in which case the old TMSI is kept frozen to avoid double allocation. In this case, both the old as the new TMSI are subsequently regarded valid when used by the MS.

Error handling

In case some error is detected during handling the access request, a respective error has been set. Before returning this error cause to the MSC in a MAP_PROCESS_ACCESS_REQUEST response, it need to be checked whether this access is for emergency call set-up, as this will require extra treatment.

If the CM Service type given in the MAP_PROCESS_ACCESS_REQUEST indication is emergency call set-up, it is checked whether EC set-up in the particular error situation is permitted (operator option). If so, it is checked whether the IMEI is required, and if so the IMEI is requested from the MS (macro Obtain_IMEI_VLR, see subclause 25.6).

The macro will terminate immediately with unsuccessful outcome if the MSC transaction has been aborted during the IMEI retrieval.

In case of an error reported back from IMEI retrieval, MAP_PROCESS_ACCESS_REQUEST response containing the error cause set previously is returned to the MSC, the dialogue is closed (MAP_CLOSE request indicating normal release) and the macro terminates with unsuccessful outcome.

When a subscriber identity required by the operator (IMSI or IMEI) is available, the user error set previously is deleted, the respective identity is returned in the MAP_PROCESS_ACCESS_REQUEST response to indicate acceptance of emergency call, and the macro terminates with successful outcome.

In all other cases, the MAP_PROCESS_ACCESS_REQUEST response containing the error cause set previously is returned to the MSC, the dialogue is closed (MAP_CLOSE request indicating normal release) and the macro terminates with unsuccessful outcome.

25.4.3 Macro Identification Procedure

This macro is invoked by the macro Process_Access_Request_VLR in case the subscribers identity is not known in the VLR.

If the identity received from the MS is an IMSI, the error Unidentified Subscriber will be set and reported back to the calling macro (to be sent in the MAP_PROCESS_ACCESS_REQUEST response). The same error is used in case a TMSI was received from the MS, but the operator does not allow open identification of the MS.

If open identification of the MS is allowed, the macro Obtain_IMSI_VLR is invoked, requesting the subscribers IMSI from the MS (see subclause 25.8), with outcome

OK, in which case it is checked whether for the IMSI received there exists a subscriber record in the VLR. If so, the macro terminates successfully, else the error Unidentified Subscriber will be set and reported back to the calling macro.

Error, in which case the error System Failure will be set and reported back to the calling macro.

Aborted, i.e. the MSC transaction is released, in which the macro terminates accordingly.

Figure 25.4/2:
Macro for processing
on access request
in VLR

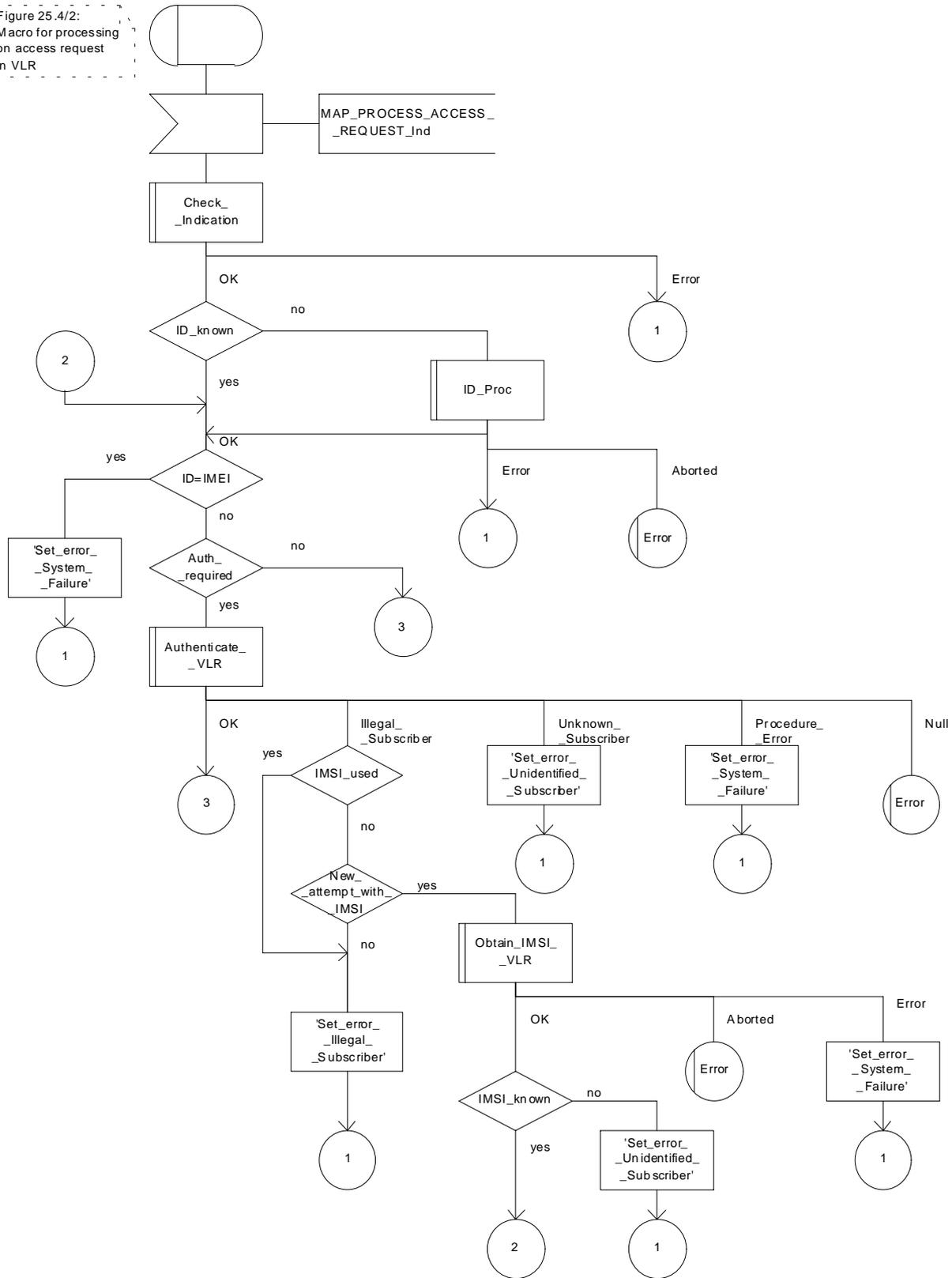


Figure 25.4/2 (sheet 1 of 3): Macro Process_Access_Request_VLR

Macrodefinition Process_Access_Request_VLR^D

25.4_2.2(3)

Figure 25.4/2:
Macro for processing
on access request
in VLR

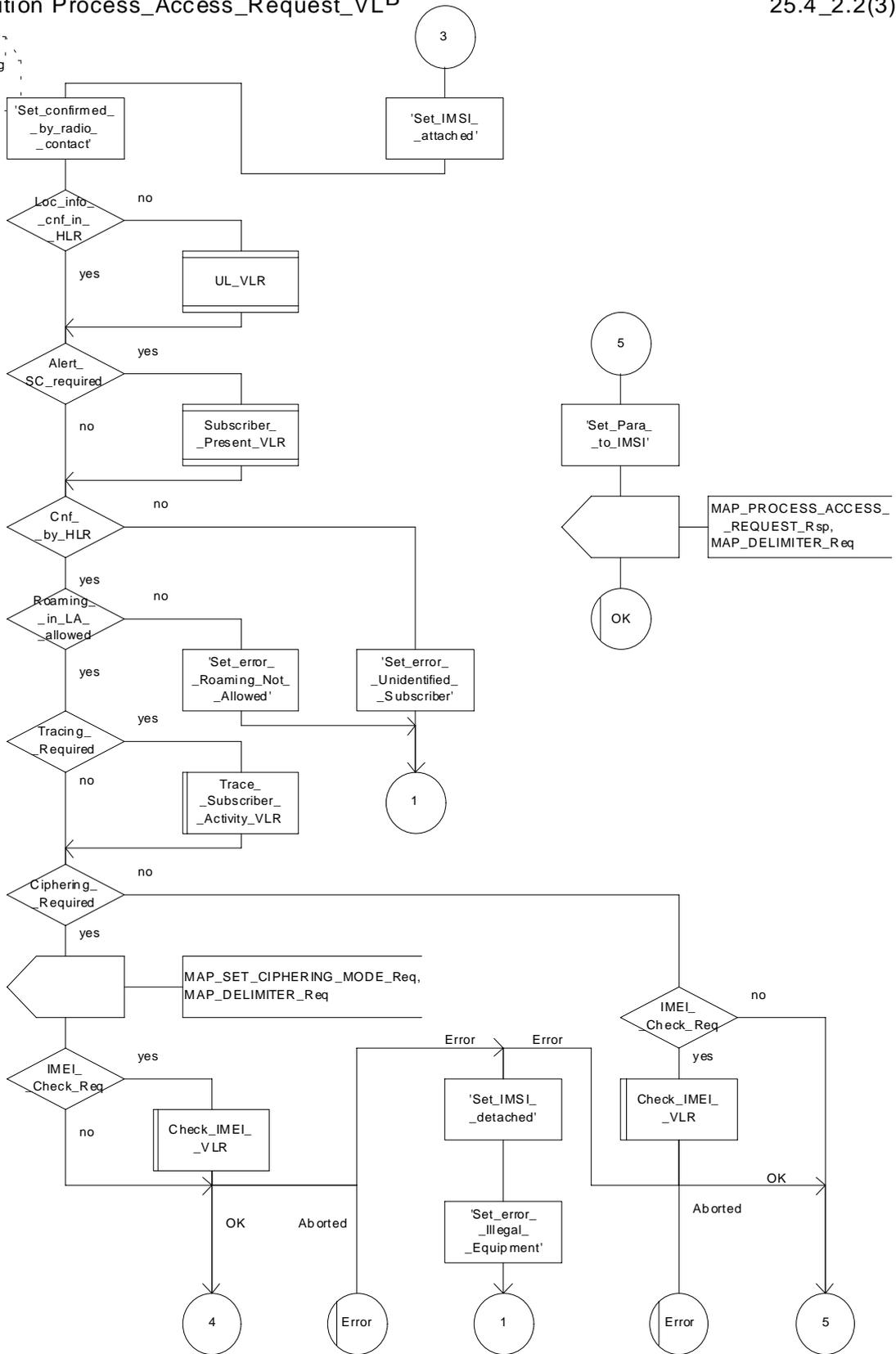


Figure 25.4/2 (sheet 2 of 3): Macro Process_Access_Request_VLR

Macrodefinition Process_Access_Request_VLR

25.4_2.3(3)

Figure 25.4/2:
Macro for processing
on access request
in VLR

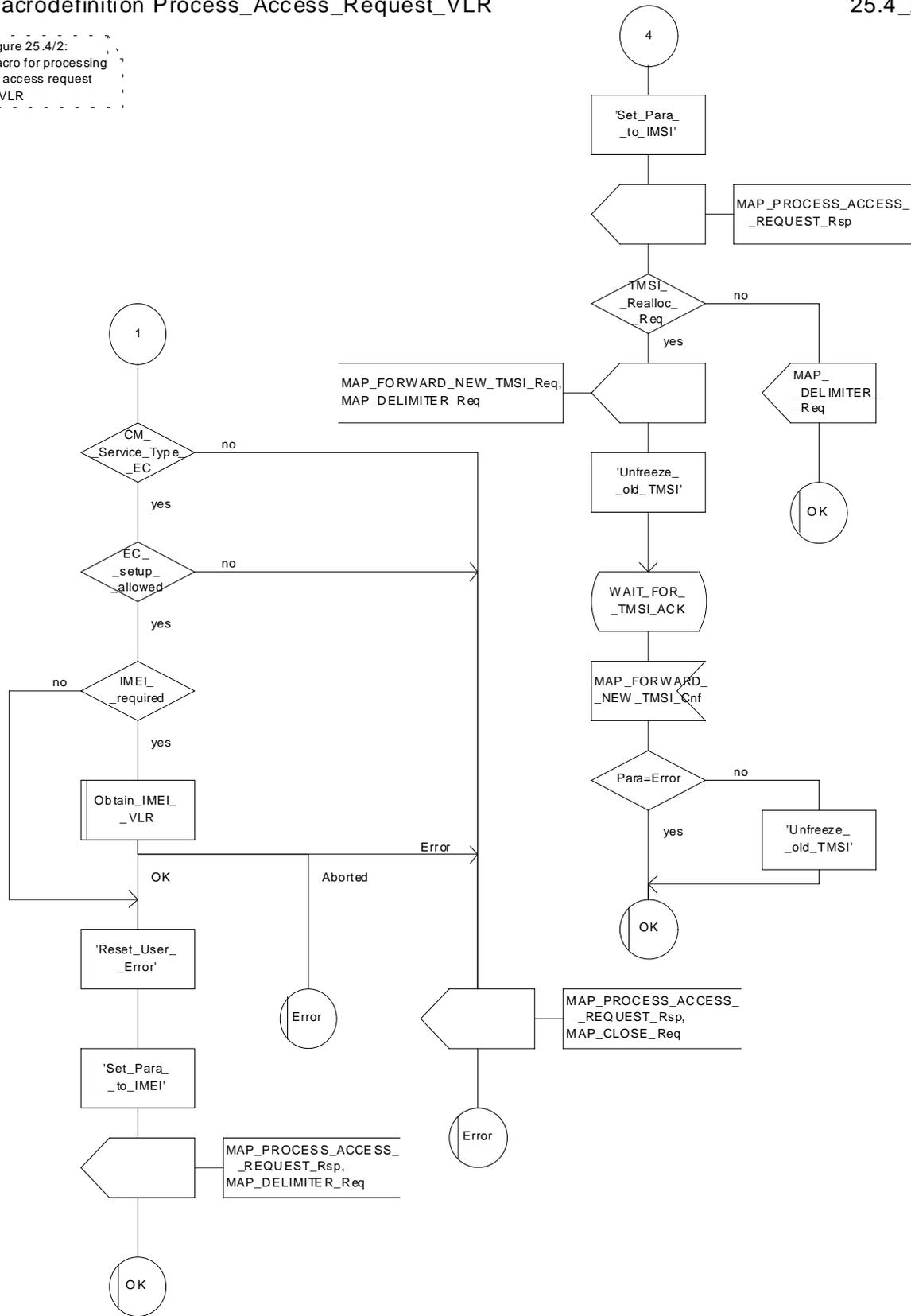


Figure 25.4/2 (sheet 3 of 3): Macro Process_Access_Request_VLR

Figure 25.4/3

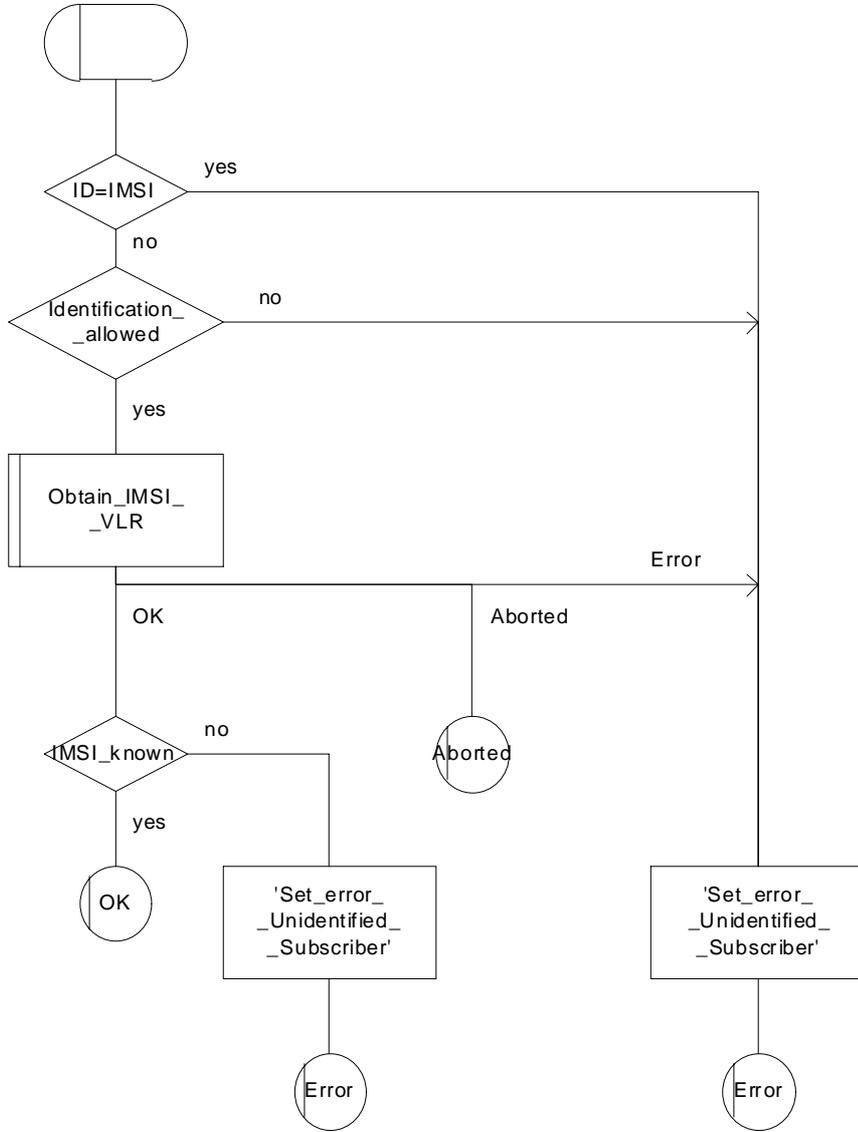


Figure 25.4/3: Macro ID_Proc_VLR

25.5 Authentication macros and processes

The following macros are used in the GSM network in order to enable authentication of a mobile subscriber.

25.5.1 Macro Authenticate_MSC

This macro is used by the MSC to relay a request for authentication transparently from the VLR to the MS, wait for a response from the MS and to relay the response from the MS back to the VLR. If, while the MSC is waiting for the authentication response, the air interface connection is released or a MAP_U_ABORT, MAP_P_ABORT or MAP_CLOSE indication is received from the VLR, then necessary connections are released and the "Error" exit is used. The macro is described in figure 25.5/1.

25.5.2 Macro Authenticate_VLR

This macro is used by the VLR to control the authentication of a subscriber. The macro proceeds as follows:

- if there are not enough authentication triplets in the VLR to perform the authentication, then the macro "Obtain_Authent_Para_VLR" described below is invoked. If this macro fails, then the corresponding error (Unknown Subscriber or Procedure Error) is returned to the calling process;
- if there are enough authentication triplets in the VLR, or the Obtain_Authent_Para_VLR macro was successful, then a MAP_AUTHENTICATE request is sent to the MSC. This request contains the RAND and CKSN parameters as indicated in the service description;
- the VLR then waits for a response from the MSC;
- if a MAP_U_ABORT, MAP_P_ABORT or MAP_CLOSE indication is received from the MSC in this wait state, the VLR checks whether authentication sets are available. If no sets are available the process Obtain_Authent_Sets_VLR is invoked to fetch authentication sets from the HLR. The "Null" exit is then used;
- if a MAP_NOTICE indication is received from the MSC in this wait state, the VLR closes the dialogue with the MSC, then checks whether authentication sets are available. If no sets are available the process Obtain_Authent_Sets_VLR is invoked to fetch authentication sets from the HLR. The "Null" exit is then used;
- if a MAP_AUTHENTICATE confirmation is received by the VLR, it checks whether the received Signed Result (SRES) is identical to the stored one (see GSM 03.20). If this is not the case, the "Illegal Subscriber" exit is used. If the SRES values are identical, then the "OK" exit is used;
- before exit, the VLR may fetch a new set of triplets from the HLR. This is done by initiating a separate Obtain_Authent_Sets_VLR process described below.

The macro is described in figure 25.5/2.

25.5.3 Process Obtain_Authentication_Sets_VLR

This process is initiated by the VLR to fetch triplets from a subscriber's HLR in a stand-alone, independent manner. The Obtain_Authent_Para_VLR macro described below is simply called; the process is described in figure 25.5/3.

25.5.4 Macro Obtain_Authent_Para_VLR

This macro is used by the VLR to request authentication triplets from the HLR. The macro proceeds as follows:

- a connection is opened, and a MAP_SEND_AUTHENTICATION_INFO request sent to the HLR;
- if the HLR indicates that a MAP version 1 dialogue is to be used, the VLR performs the equivalent MAP version 1 dialogue. which can return a positive result containing authentication sets, an empty positive result, or an error;
- if the dialogue opening fails, the "Procedure Error" exit is used. Otherwise, the VLR waits for the response from the HLR;
- if a MAP_SEND_AUTHENTICATION_INFO confirmation is received from the HLR, the VLR checks the received data.

One of the following positive responses may be received from a MAP version 1 or MAP version 2 dialogue with the HLR:

- Authentication triplets, in which case the outcome is successful;
- Empty response, in which case the VLR may re-use old triplets, if allowed by the PLMN operator.

If the VLR cannot re-use old triplets (or no such triplets are available) then the "Procedure Error" exit is used.

If the outcome was successful or re-use of old parameters in the VLR is allowed, then the "OK" exit is used.

If an "Unknown Subscriber" error is included in the MAP_SEND_AUTHENTICATION_INFO confirm or is returned by the MAP version 1 dialogue, then the "Unknown Subscriber" exit is used.

- if a MAP-U-ABORT, MAP_P_ABORT, MAP_NOTICE or unexpected MAP_CLOSE service indication is received from the MSC, then open connections are terminated, and the macro takes the "Null" exit;
- if a MAP-U-ABORT, MAP_P_ABORT or unexpected MAP_CLOSE service indication is received from the HLR, then the VLR checks whether old authentication parameters can be re-used. If old parameters cannot be re-used the macro takes the "Procedure Error" exit; otherwise it takes the "OK" exit;
- if a MAP_NOTICE service indication is received from the HLR, then the dialogue with the HLR is closed. The VLR then checks whether old authentication parameters can be re-used. If old parameters cannot be re-used the macro takes the "Procedure Error" exit; otherwise it takes the "OK" exit.

The macro is described in figure 25.5/4.

25.5.5 Process Obtain_Auth_Sets_HLR

Opening of the dialogue is described in the macro Receive_Open_Ind in subclause 25.1, with outcomes:

- reversion to version one procedure;
- procedure termination; or
- dialogue acceptance, with proceeding as below.

This process is used by the HLR to obtain authentication triplets from the AuC, upon request from the VLR or from the SGSN. The process acts as follows:

- a MAP_SEND_AUTHENTICATION_INFO indication is received by the HLR;
- the HLR checks the service indication for errors. If any, they are reported to the VLR or to the SGSN in the MAP_SEND_AUTHENTICATION_INFO response. If no errors are detected, authentication triplets are fetched from the AuC. Further details are found in GSM 03.20;
- if errors are detected they are reported to the VLR or to the SGSN in the MAP_SEND_AUTHENTICATION_INFO response. Otherwise the authentication triplets are returned.

The process is described in figure 25.5/5.

Figure 25.5/1: Authentication macro in the MSC, relaying authentication indication from the VLR to the MS, and relaying the confirmation from the MSC to the VLR

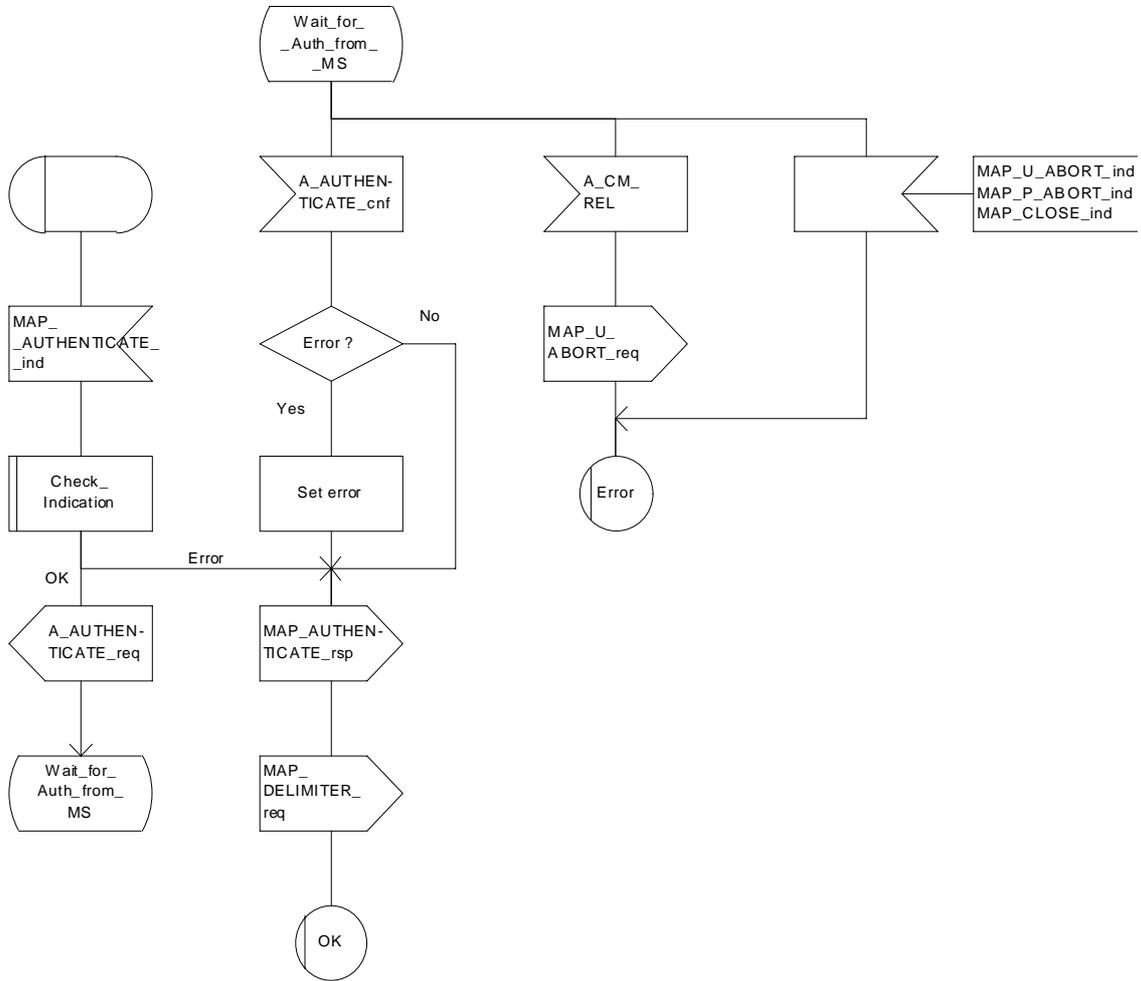


Figure 25.5/1: Macro Authenticate_MSC

Macrodefinition Authenticate_VLR

25.5_2(1)

Figure 21.5/2: Authentication macro in the VLR, controlling the authentication procedure towards the MSC/MS and obtaining authentication triplets from the HLR as applicable.

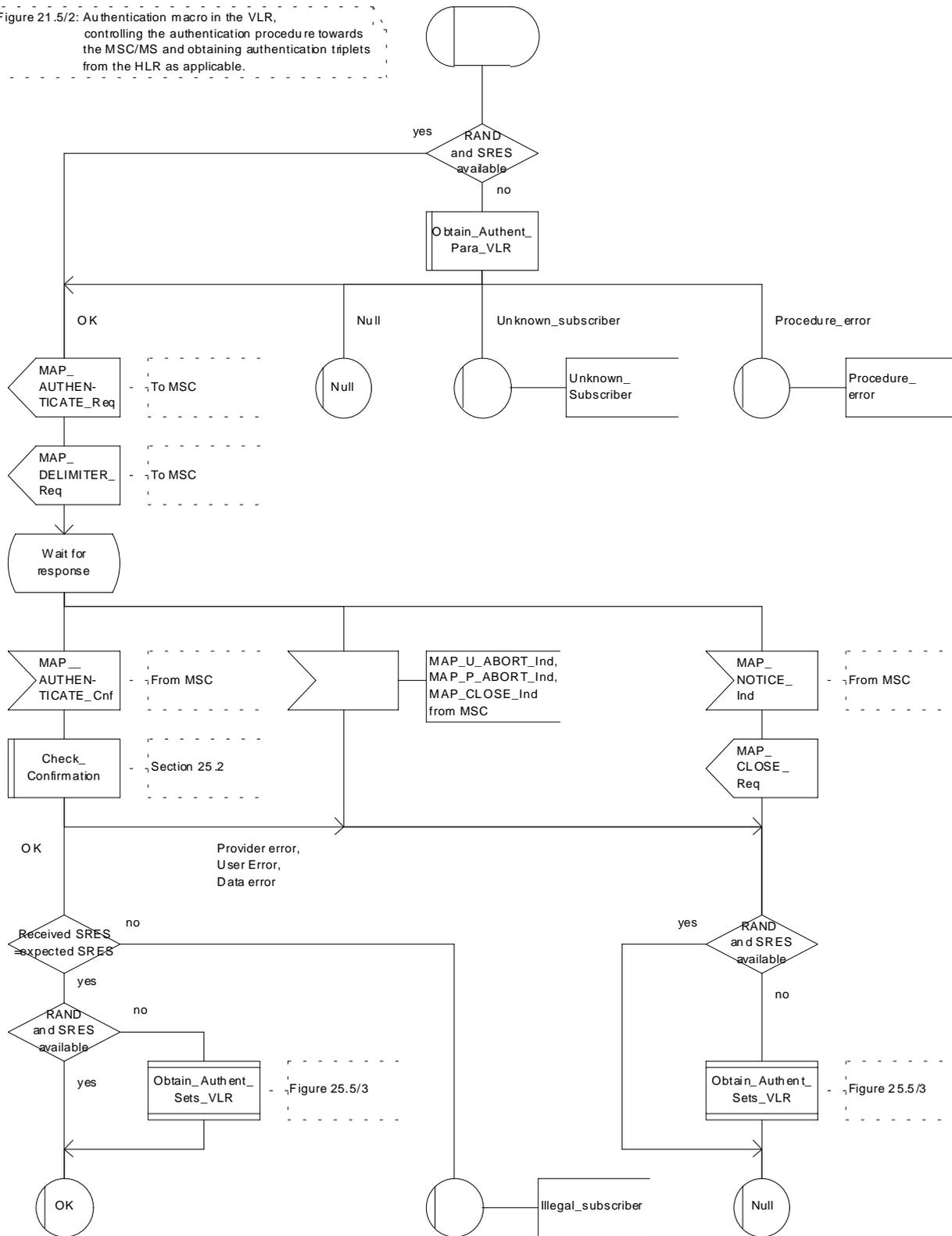


Figure 25.5/2: Macro Authenticate_VLR

Figure 25.5/3: Process to obtain authentication sets from the HLR to the VLR

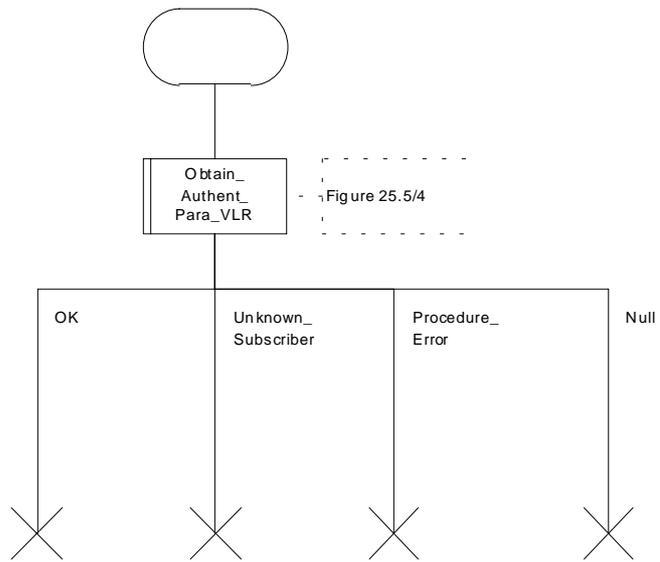


Figure 25.5/3: Process Obtain_Authentication_Sets_VLR

Macrodefinition Obtain_Authent_Para_VLR

25.5_4.1(2)

Figure 25.5/4: Macro to obtain authentication parameters from the HLR to the VLR

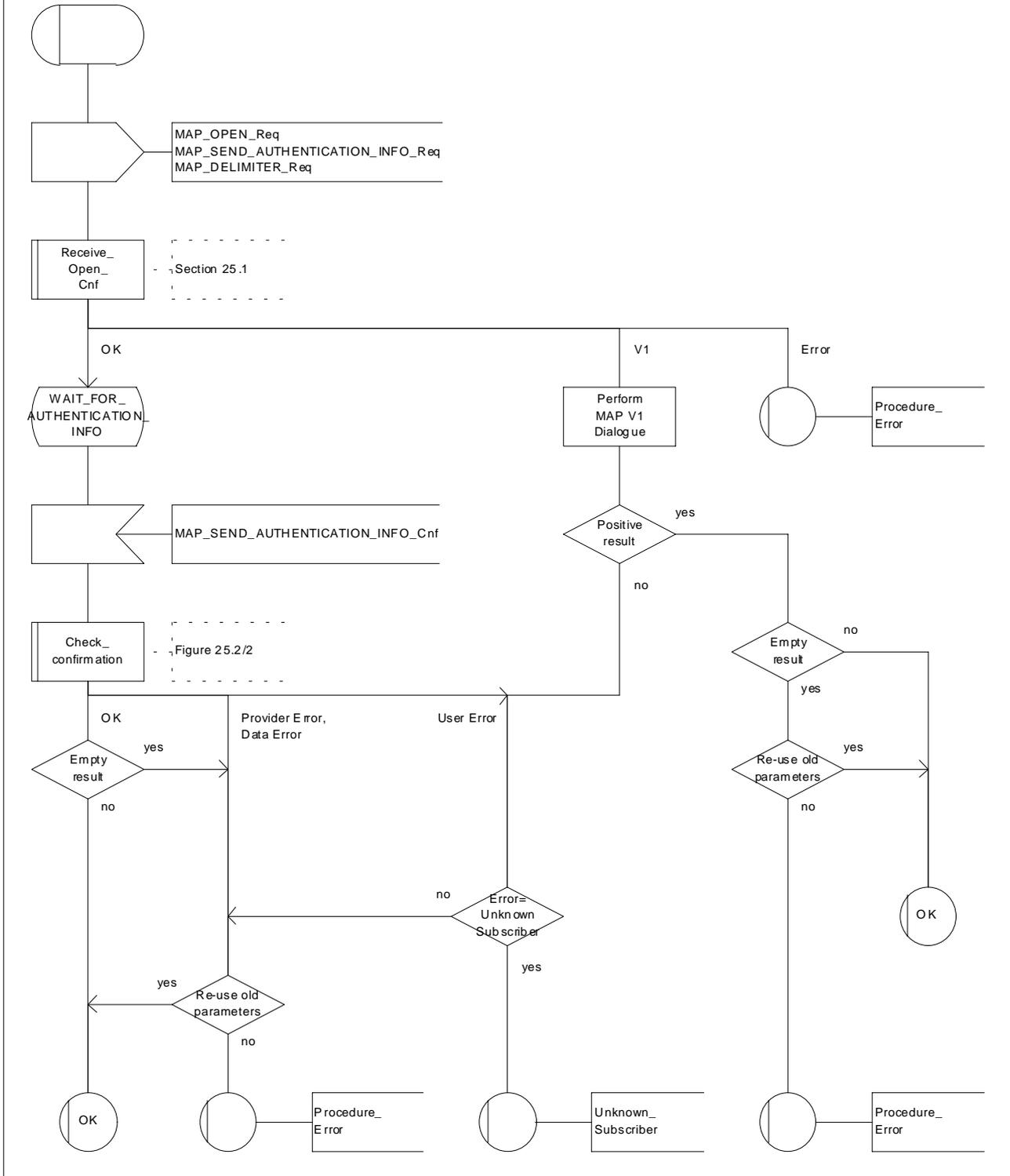


Figure 25.5/4 (sheet 1 of 2): Macro Obtain_Authent_Para_VLR

Figure 25.5/4: Macro to obtain authentication parameters from the HLR to the VLR

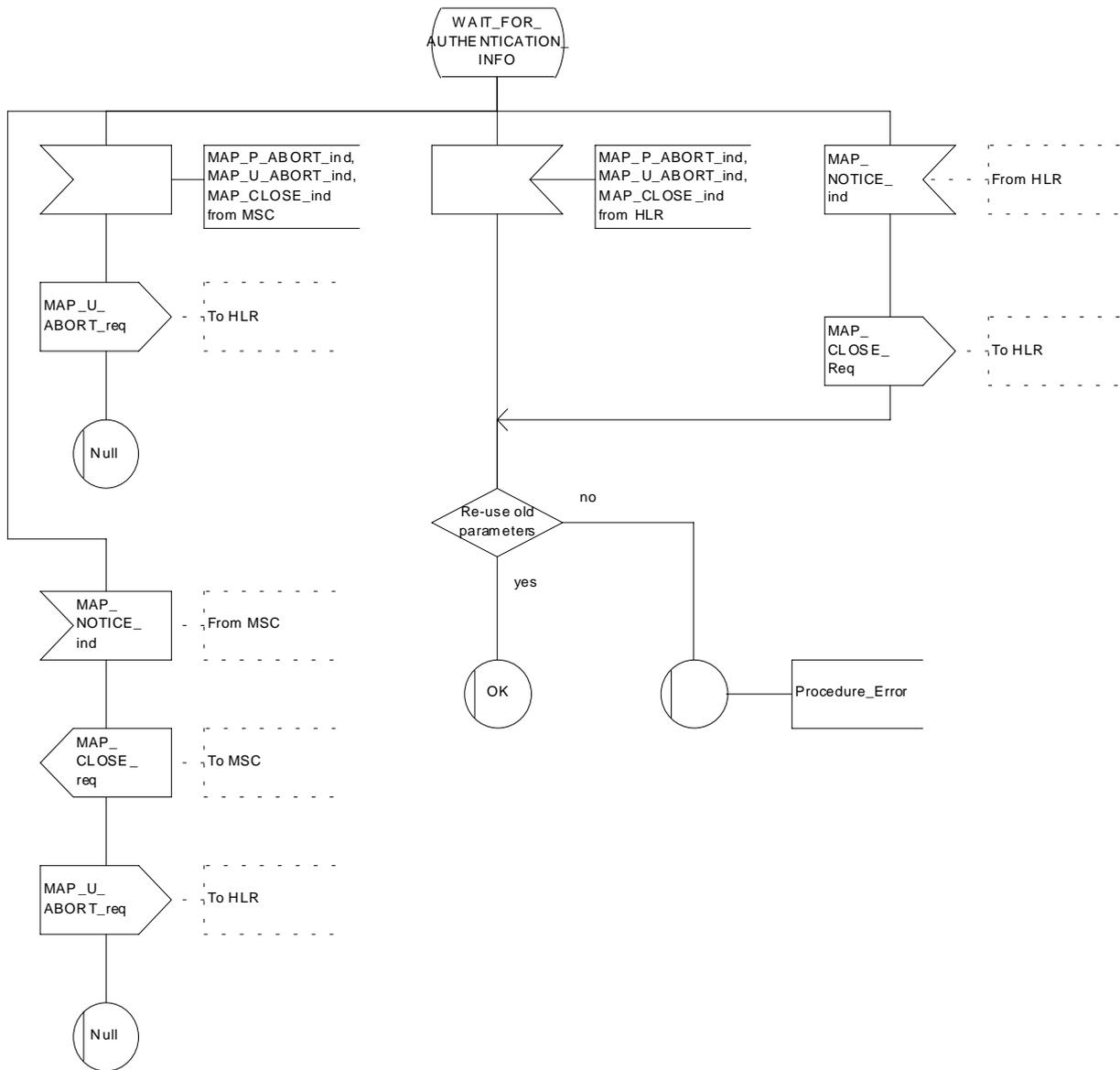


Figure 25.5/4 (sheet 2 of 2): Macro Obtain_Authent_Para_VLR

Figure 25.5/5: Process in the HLR to obtain authentication sets from the AuC and relay them to the VLR

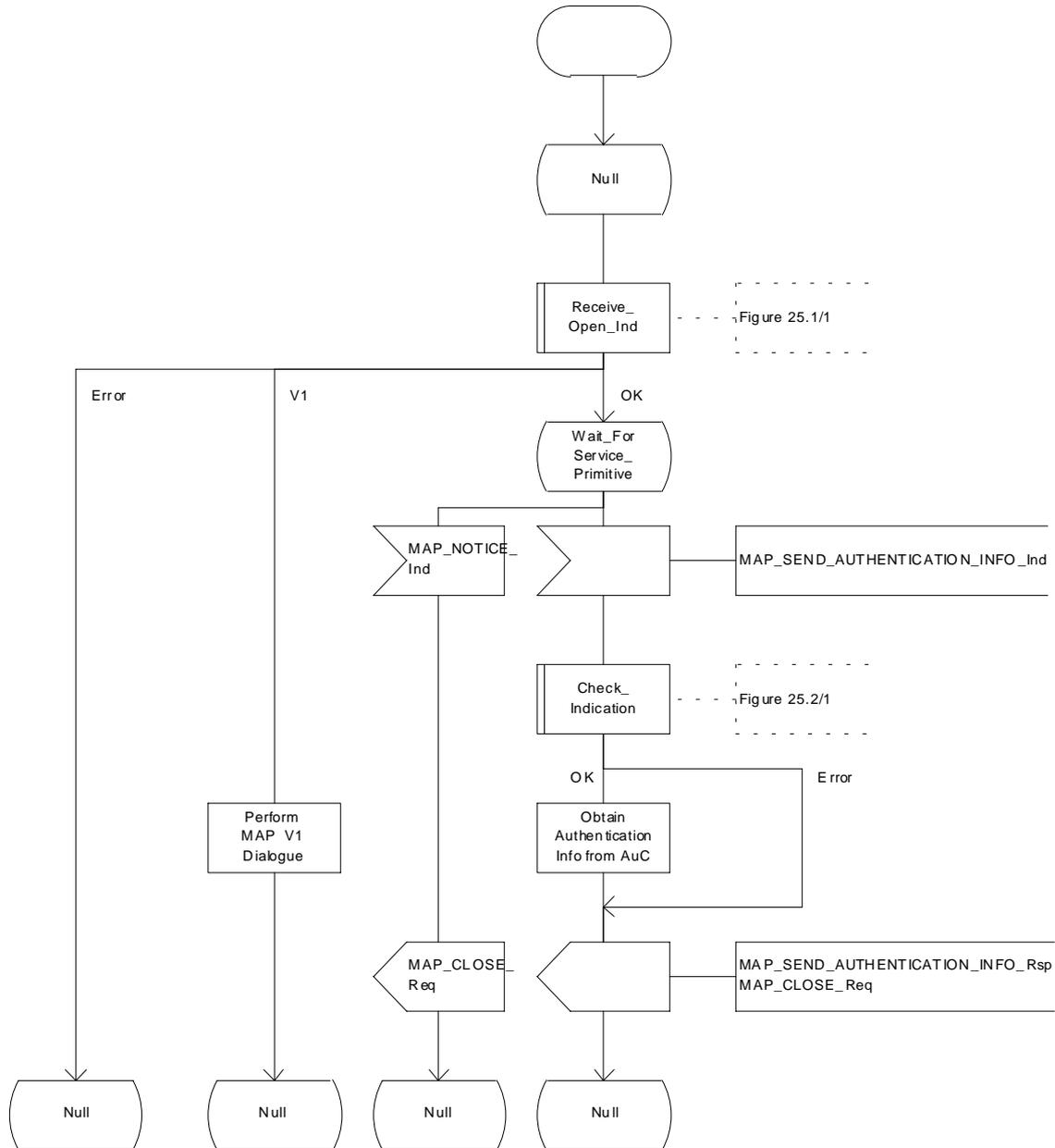


Figure 25.5/5: Process Obtain_Auth_Sets_HLR

25.5.6 Process Obtain_Authent_Para_SGSN

For authentication procedure description see GSM 03.60 and GSM 04.08.

This Process is used by the SGSN to request authentication triplets from the HLR. The Process proceeds as follows:

- a connection is opened, and a MAP_SEND_AUTHENTICATION_INFO request sent to the HLR;
- if the HLR indicates that a MAP version 1 dialogue is to be used, the SGSN performs the equivalent MAP version 1 dialogue. which can return a positive result containing authentication sets, an empty positive result, or an error;
- if the dialogue opening fails, the Authentication Parameters negative response with appropriate error is sent to the requesting process. Otherwise, the SGSN waits for the response from the HLR;
- if a MAP_SEND_AUTHENTICATION_INFO confirmation is received from the HLR, the SGSN checks the received data.

One of the following positive responses may be received from a MAP version 1 or MAP version 2 dialogue with the HLR:

- Authentication triplets, in which case the outcome is successful;
- Empty response, in which case the SGSN may re-use old triplets, if allowed by the PLMN operator.

If the SGSN cannot re-use old triplets (or no such triplets are available) then the the Authentication Parameters negative response with appropriate error is sent to the requesting process.

If the outcome was successful or re-use of old parameters in the SGSN is allowed, then the Authentication Parameters response is sent to the requesting process

If an "Unknown Subscriber" error is included in the MAP_SEND_AUTHENTICATION_INFO confirm or is returned by the MAP version 1 dialogue, then the appropriate error is sent to the requesting process in the Authentication Parameters negative response

- if a MAP-U-ABORT, MAP_P-ABORT or unexpected MAP_CLOSE service indication is received from the HLR, then the SGSN checks whether old authentication parameters can be re-used. If old parameters cannot be re-used the Authentication Parameters negative response with appropriate error is sent to the requesting process.
- if a MAP_NOTICE service indication is received from the HLR, then the dialogue with the HLR is closed. The SGSN then checks whether old authentication parameters can be re-used. If old parameters cannot be re-used the process terminates and the Authentication Parameters negative response with appropriate error is sent to the requesting process; Otherwise the Authentication Parameters response is sent to requesting process.

The process is described in figure 25.5/6.

Figure 25.5/6: Process to obtain authentication parameters from the HLR to the SGSN

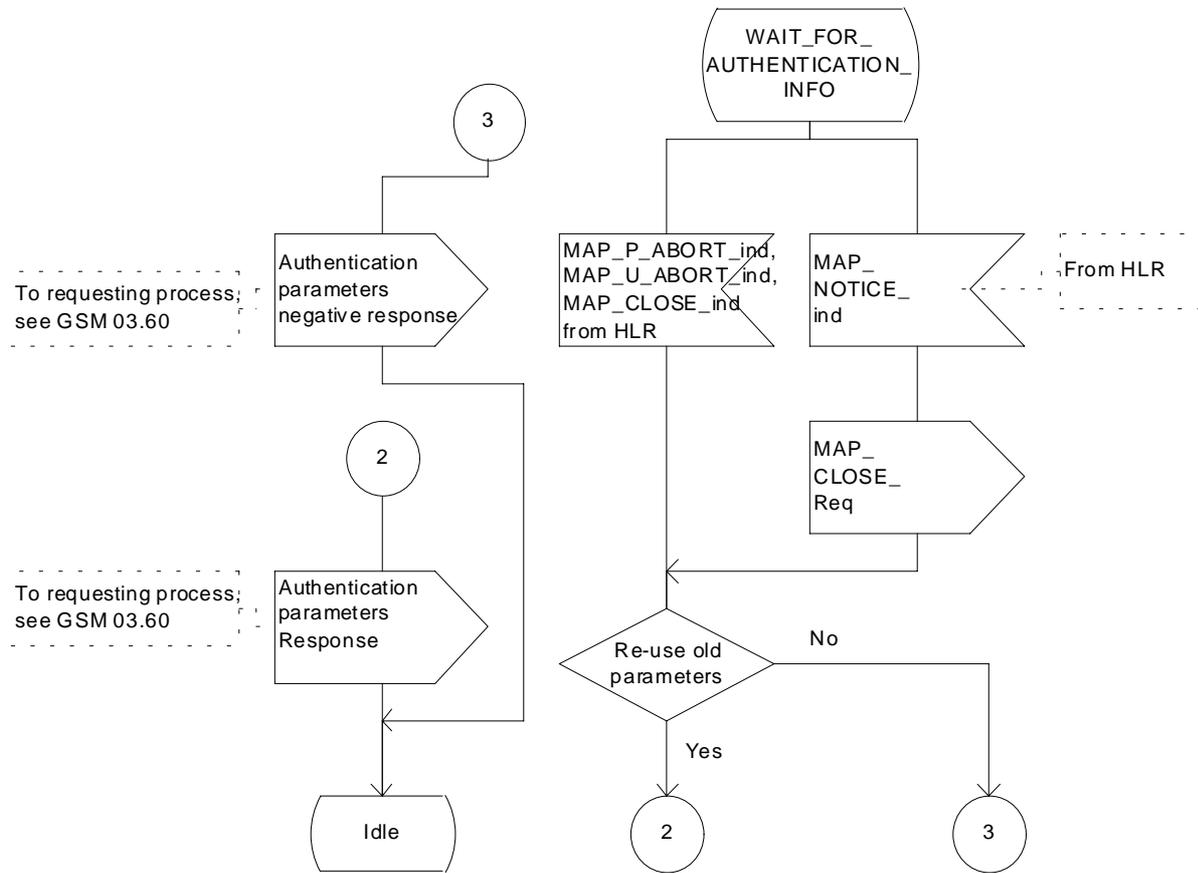


Figure 25.5/6 (sheet 2 of 2): Macro Obtain_Authen_Para_SGSN

25.6 IMEI Handling Macros

The following macros are used in the GSM network in order to enable handling and checking of the mobile equipment identity.

25.6.1 Macro Check_IMEI_MSC

This macro is used by the MSC to receive a request from the VLR, relay it to the EIR, and pass the result from the EIR back to the VLR. The macro proceeds as follows:

- a MAP_CHECK_IMEI service indication containing only the Invoke Id is received from the VLR;
- if the IMEI is not available in the MSC, it is requested from the MS using the IDENTITY REQUEST message;
- if the MS releases the radio resources, a MAP_U_ABORT request indicating "Application procedure Cancellation" is sent to the VLR, and the "Error" exit of the macro is used;
- when the IMEI is known, a connection is set up towards the EIR, and a MAP_CHECK_IMEI service request is sent including the IMEI;
- if the opening of the dialogue fails, a System Failure is reported to the VLR. Otherwise, the MSC waits for a response from the EIR;
- when the MAP_CHECK_IMEI service confirm is received, it is checked for errors. Any errors discovered in the MSC lead to the System Failure error to be reported to the VLR in the MAP_CHECK_IMEI response. Any errors reported from the EIR are sent directly to the VLR in the MAP_CHECK_IMEI service response. If no errors are detected by or reported to the MSC, the IMEI is added to the MAP_CHECK_IMEI service response returned to the VLR. The "OK" exit is used in all cases;
- if a MAP_P_ABORT, MAP_U_ABORT, MAP_CLOSE or MAP_NOTICE service indication is received from the EIR, the MSC closes the transaction with the EIR (if necessary), reports a System Failure error back to the VLR in the MAP_CHECK_IMEI response, and uses the macro's "OK" exit;
- if a MAP_P_ABORT, MAP_U_ABORT, MAP_CLOSE or MAP_NOTICE indication is received from the VLR, the MSC closes the transaction with the VLR (if necessary) and aborts the connections towards the EIR and the MS; the macro takes the "Error" exit.

If the dialogue with the EIR drops back to version 1, the result or error returned by the EIR is checked. The use of the "Check_Confirmation" macro in the SDL diagram indicates that the checks carried out on the result returned by the EIR in a MAP v1 dialogue are functionally equivalent to those carried out on the parameters of the MAP_CHECK_IMEI confirm received from the EIR in a MAP v2 dialogue.

The macro is described in figure 25.6/1.

25.6.2 Macro Check_IMEI_VLR

This macro is used by the VLR to control the check of a mobile equipment's IMEI. The macro proceeds as follows:

- a MAP_CHECK_IMEI service request is sent to the MSC, including only the Invoke Id;
- the VLR then waits for the response from the MSC;
- if a MAP_CHECK_IMEI service confirm including either:
 - the IMEI and the Equipment Status; or
 - an error;

is received, the VLR checks whether the response requires that an alarm be generated on the Operation and Maintenance interface. The criteria for such alarms are PLMN operator dependent;

- the VLR then checks whether the response from the MSC means that service is granted to the MS. The criteria for granting service depending on the equipment status or errors received in the MAP_CHECK_IMEI service response are also PLMN operator dependent;
- if a MAP_P_ABORT, MAP_U_ABORT, MAP_CLOSE or MAP_NOTICE indication is received from the MSC, then the MSC connection is closed (if necessary) and the macro takes the "Aborted" exit.

The macro is described in figure 25.6/2.

25.6.3 Process Check_IMEI_EIR

This process is used by the EIR to obtain the status of a piece of mobile equipment, upon request from the MSC or from the SGSN. The process acts as follows:

- a MAP_OPEN service indication is received (macro Receive_Open_Ind, subclause 25.1.1). If the dialogue opening fails, the process terminates;
- otherwise, a MAP_CHECK_IMEI indication is received by the EIR, containing the IMEI to be checked;
- the EIR checks the service indication for errors. If there are any, they are reported to the MSC or to the SGSN in the MAP-CHECK_IMEI response. If no errors are detected, the EIR data base function is interrogated for the status of the given equipment. Further details are found in GSM 02.16;
- the status of the equipment (white-listed, grey-listed, black-listed or unknown) is returned to the MSC or to the SGSN in the MAP_CHECK_IMEI service response;
- if a MAP_U_ABORT, MAP_P_ABORT, MAP_NOTICE or MAP_CLOSE indication is received from the MSC or from the SGSN at any time during this process, the process in the EIR terminates.

The process is described in figure 25.6/3.

25.6.4 Macro Obtain_IMEI_MSC

This macro is used by the MSC to respond to a request from the VLR to provide the IMEI. The macro proceeds as follows:

- a MAP_OBTAIN_IMEI service indication containing only the Invoke Id is received from the VLR;
- if the IMEI is not available in the MSC, it is requested from the MS using the IDENTITY REQUEST message;
- when the IMEI is known, it is returned to the VLR in the MAP_OBTAIN_IMEI service response. The macro terminates at the "OK" exit;
- if the IMEI cannot be obtained by the MSC, the System Failure error is reported back to the VLR in the MAP_OBTAIN_IMEI service response. The macro terminates at the "OK" exit;
- if a MAP_P_ABORT, MAP_U_ABORT or MAP_CLOSE indication is received from the VLR, the macro terminates at the "Error" exit.

The macro is described in figure 25.6/4.

25.6.5 Macro Obtain_IMEI_VLR

This macro is used by the VLR to obtain the IMEI from the MSC, e.g. to enable handling of emergency calls in case of authentication failure (in which case the IMEI may be used by some operators as an alternative to the IMSI). It proceeds as follows:

- the MAP_OBTAIN_IMEI service request is sent to the MSC, including only the Invoke Id;
- the VLR then waits for the response from the MSC;
- if the IMEI is received in the MAP_OBTAIN_IMEI service response, the macro terminates at the "OK" exit;

- if the System Failure error is reported in the MAP_OBTAIN_IMEI service response, the "Error" exit is used;
- if the MSC terminates the dialogue using a MAP_P_ABORT, MAP_U_ABORT, MAP_CLOSE or MAP_NOTICE service indication, the necessary connections are released, and the "Aborted" exit is used for termination of the macro.

The macro is shown in figure 25.6/5.

Figure 25.6/1: Check IMEI macro in the MSC, relaying the IMEI check indication from the VLR to the MSC and relaying the confirmation from the EIR to the VLR

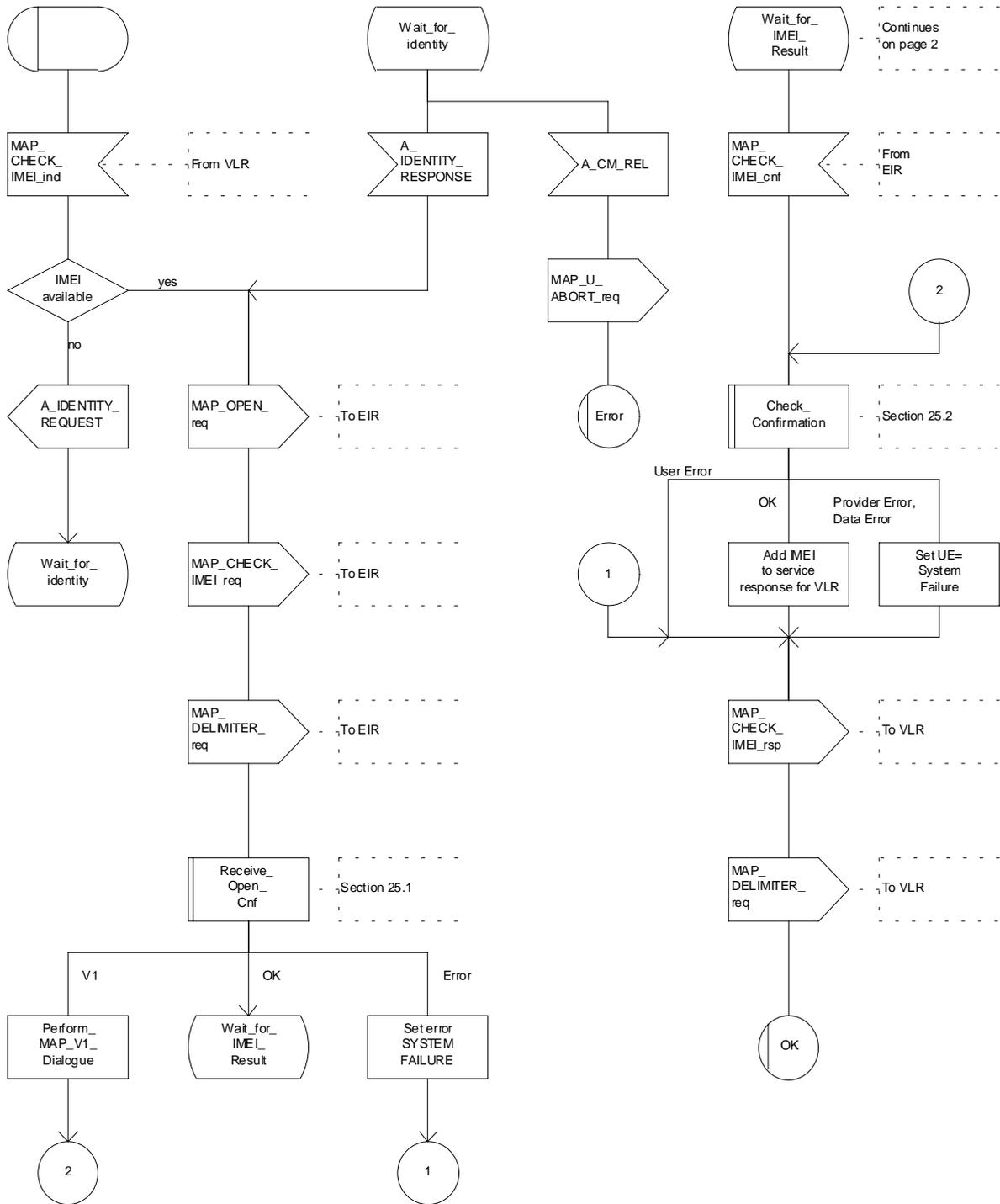


Figure 25.6/1 (sheet 1 of 2): Macro Check_IMEI_MSC

Figure 25.6/1: Check IMEI macro in the MSC, relaying the IMEI check indication from the VLR to the MSC and relaying the confirmation from the EIR to the VLR

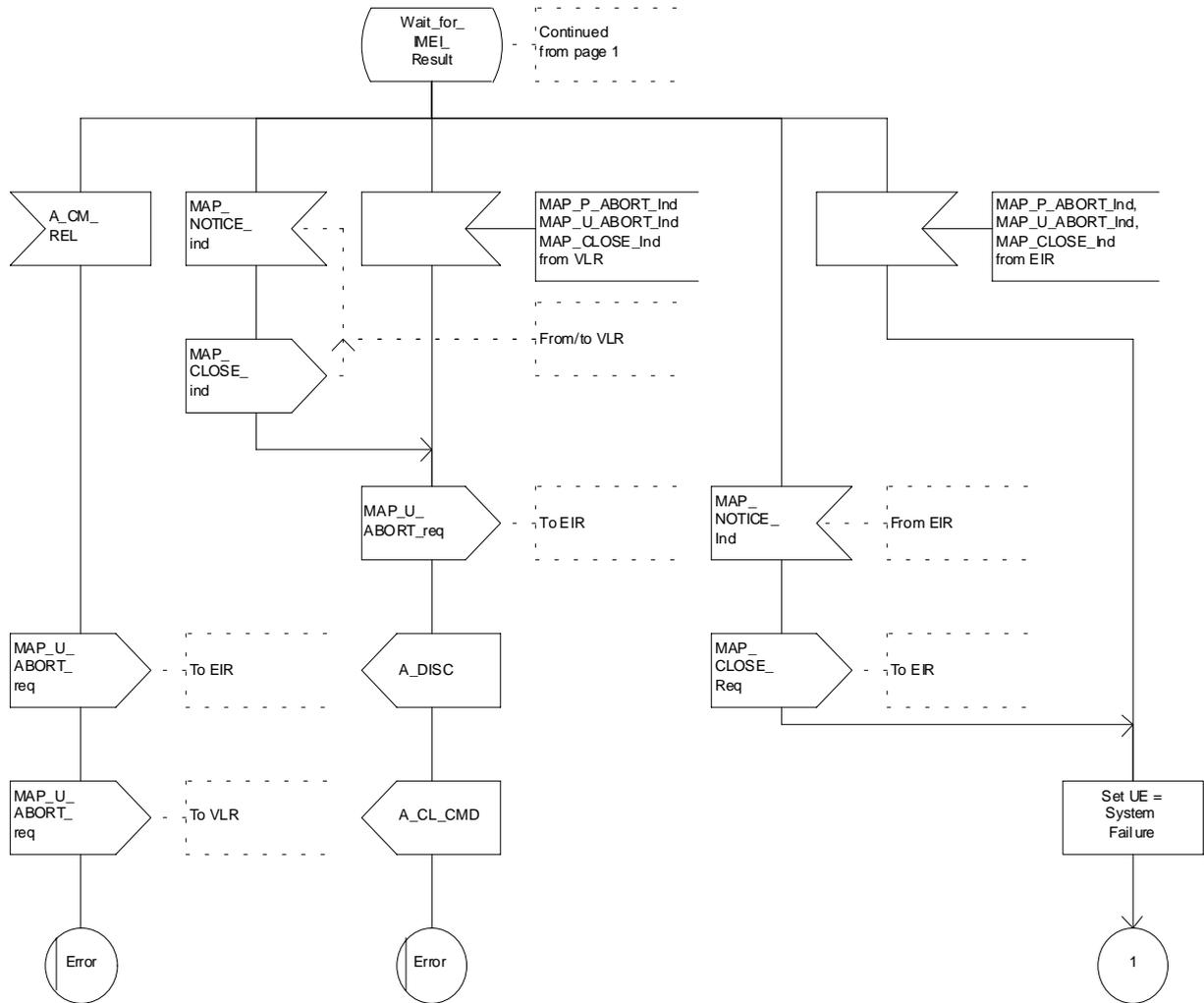


Figure 25.6/1 (sheet 2 of 2): Macro Check_IMEI_MSC

Figure 25.6/2: Check IMEI macro in the VLR, containing the request towards the MSC/EIR

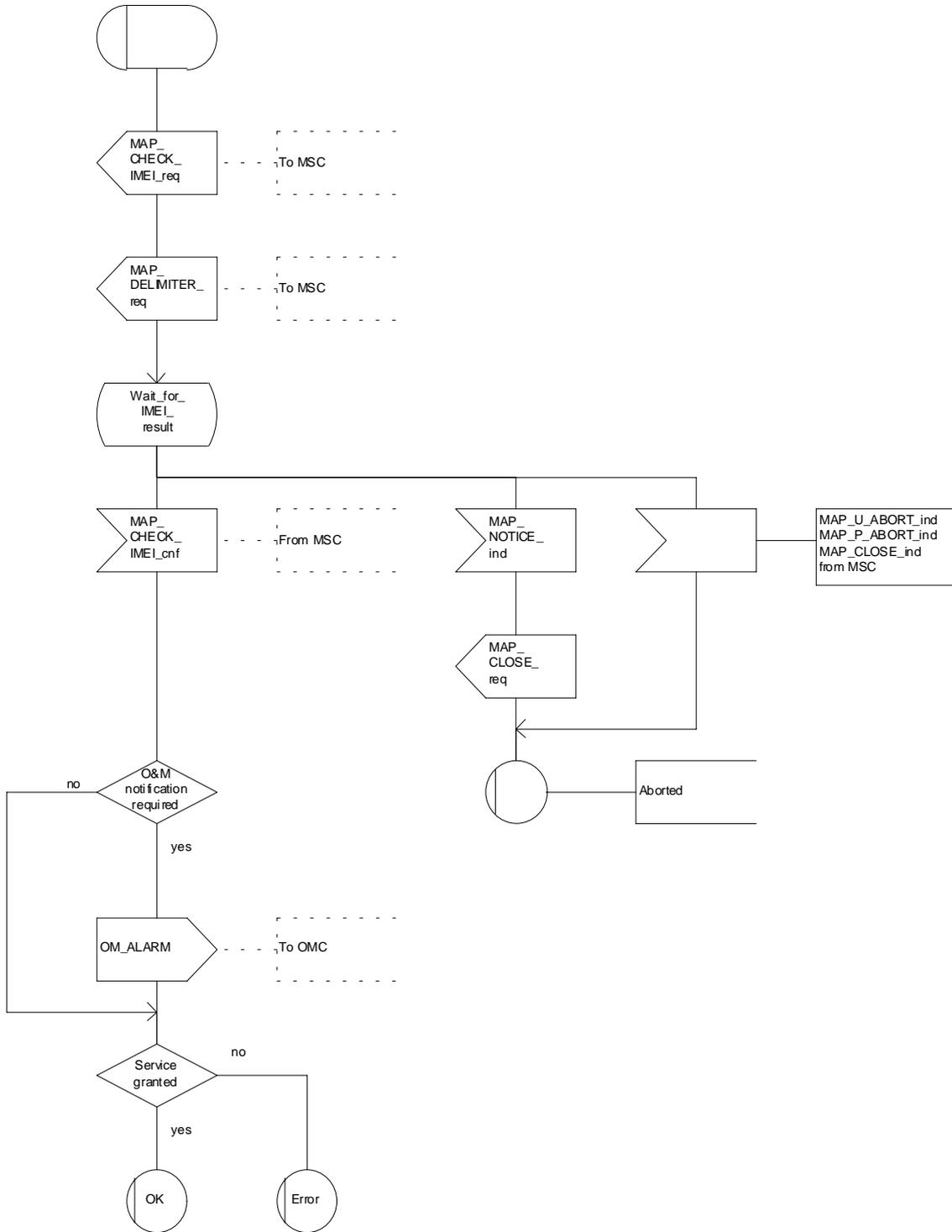


Figure 25.6/2: Macro Check_IMEI_VLR

Process Check_IMEI_EIR

25.6_3(1)

Figure 25.6/3: The process in the EIR to check an IMEI

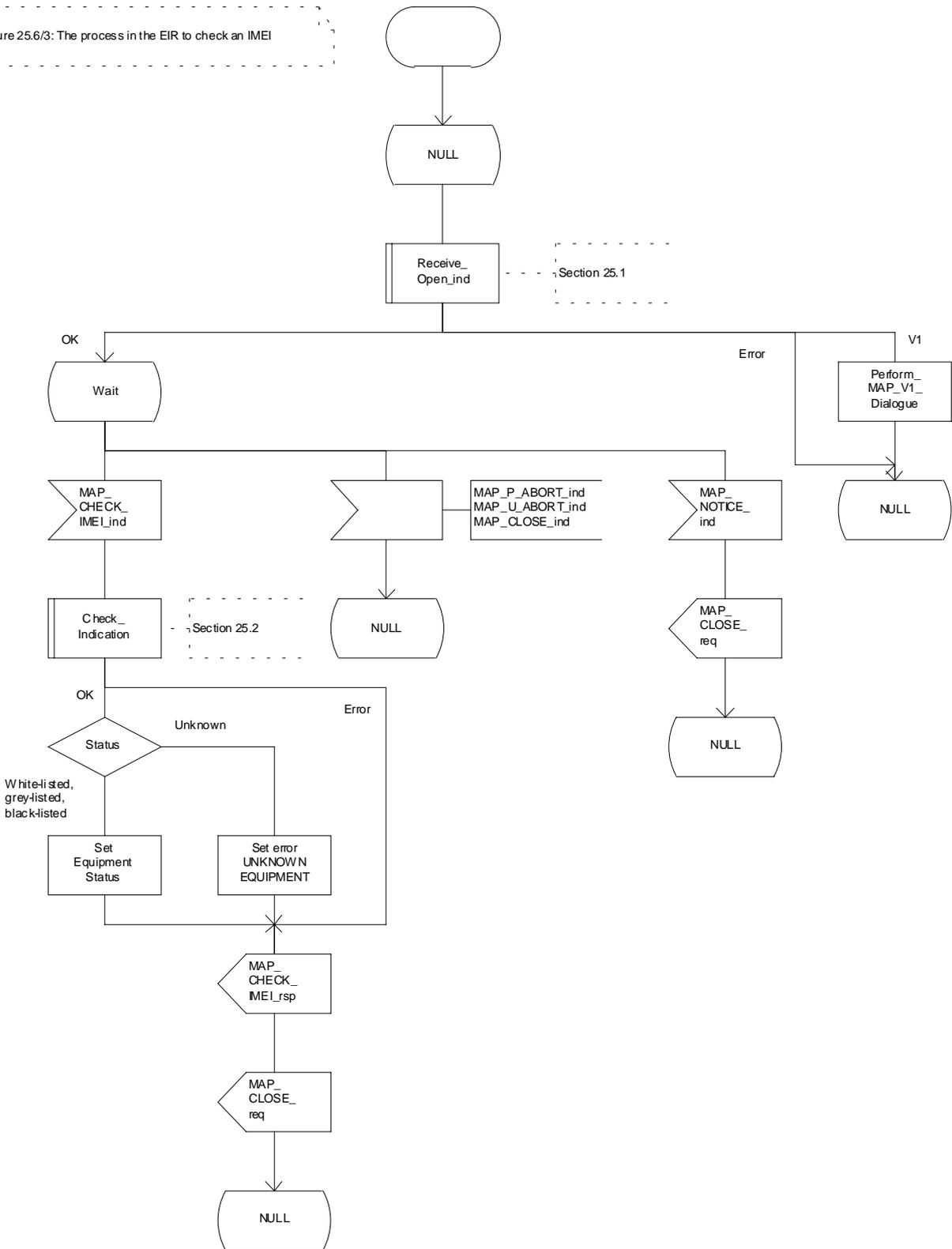


Figure 25.6/3: Process Check_IMEI_EIR

Figure 25.6/4: Obtain IMEI macro in the MSC, receiving the Obtain_IMEI indication from the VLR to the MSC and returning the confirmation to the VLR

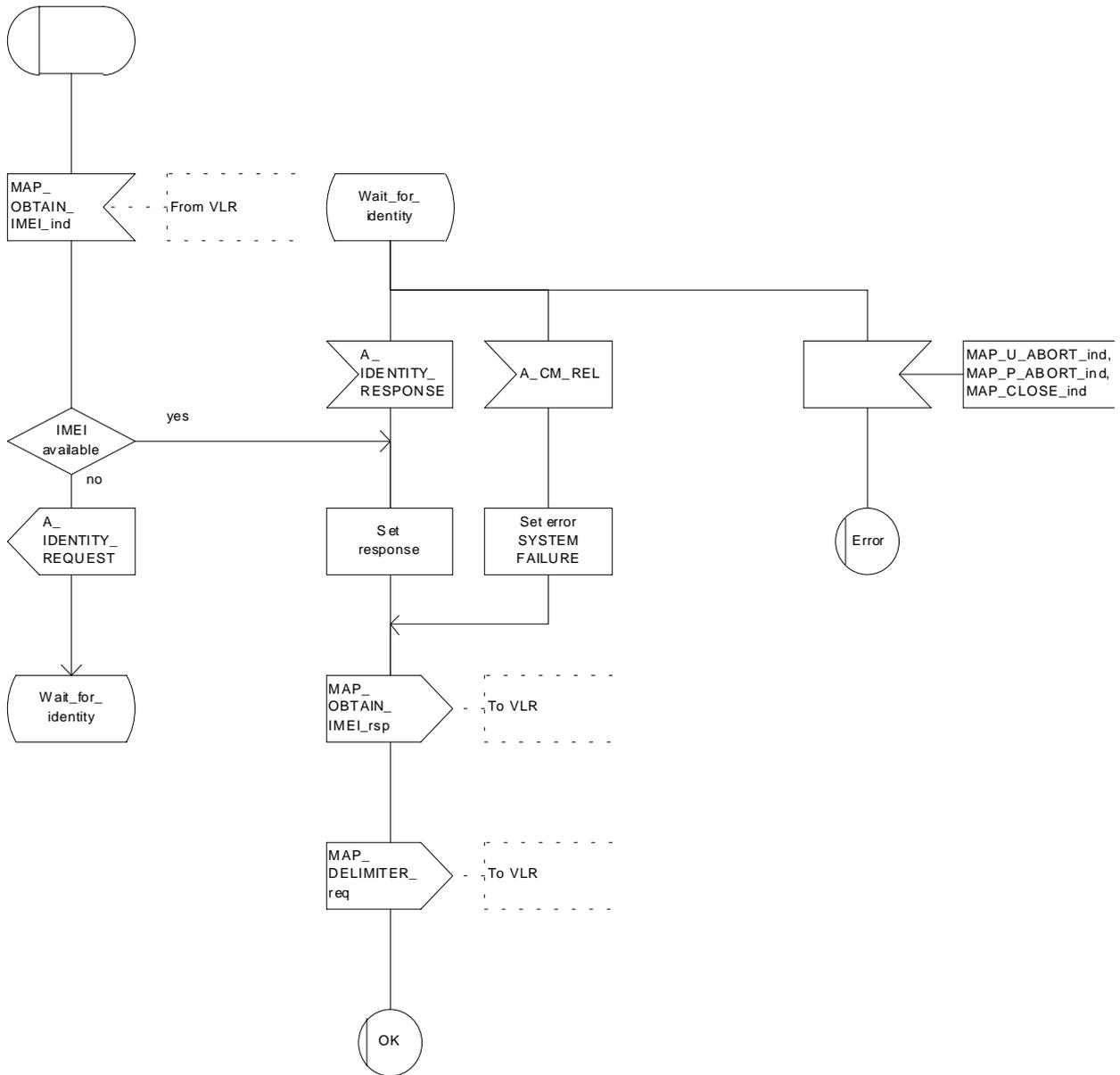


Figure 25.6/4: Macro Obtain_IMEI_MSC

Figure 25.6/5: Obtain IMEI macro in the VLR, controlling the request towards the MSC

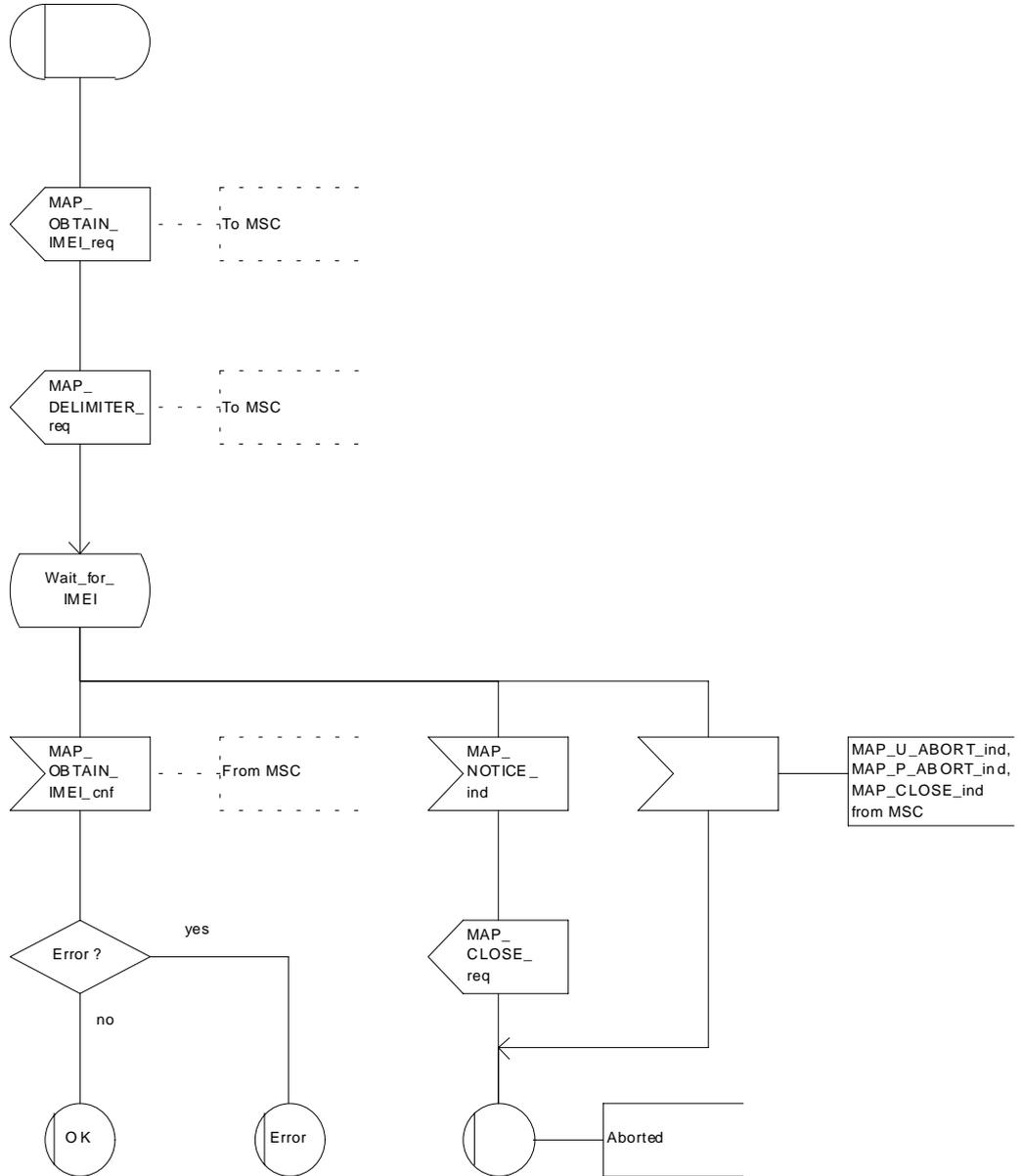


Figure 25.6/5: Macro Obtain_IMEI_VLR

25.6.6 Process Check_IMEI_SGSN

This process is used by the SGSN to control the check of a mobile equipment's IMEI. The process proceeds as follows:

- if the MS does not complete successfully the procedure, the "Error" exit of the macro is used;
- when the IMEI is known, a connection is set up towards the EIR, and a MAP_CHECK_IMEI service request is sent including the IMEI;
- if the opening of the dialogue fails, a System Failure is set. Otherwise, the SGSN waits for a response from the EIR;
- if a MAP_CHECK_IMEI service confirm including either:
 - the IMEI and the Equipment Status; or
 - an error;is received, the SGSN checks whether the response requires that an alarm be generated on the Operation and Maintenance interface. The criteria for such alarms are PLMN operator dependent;
- the SGSN then checks whether the response from the EIR means that service is granted to the MS. The criteria for granting service depending on the equipment status or errors received in the MAP_CHECK_IMEI service response are also PLMN operator dependent;

If the dialogue with the EIR drops back to version 1, the result or error returned by the EIR is checked. The use of the "Check_Confirmation" macro in the SDL diagram indicates that the checks carried out on the result returned by the EIR in a MAP v1 dialogue are functionally equivalent to those carried out on the parameters of the MAP_CHECK_IMEI confirm received from the EIR in a MAP v2 dialogue.

The process is described in figure 25.6/6.

Figure 25.6/6: Check IMEI process in the SGSN

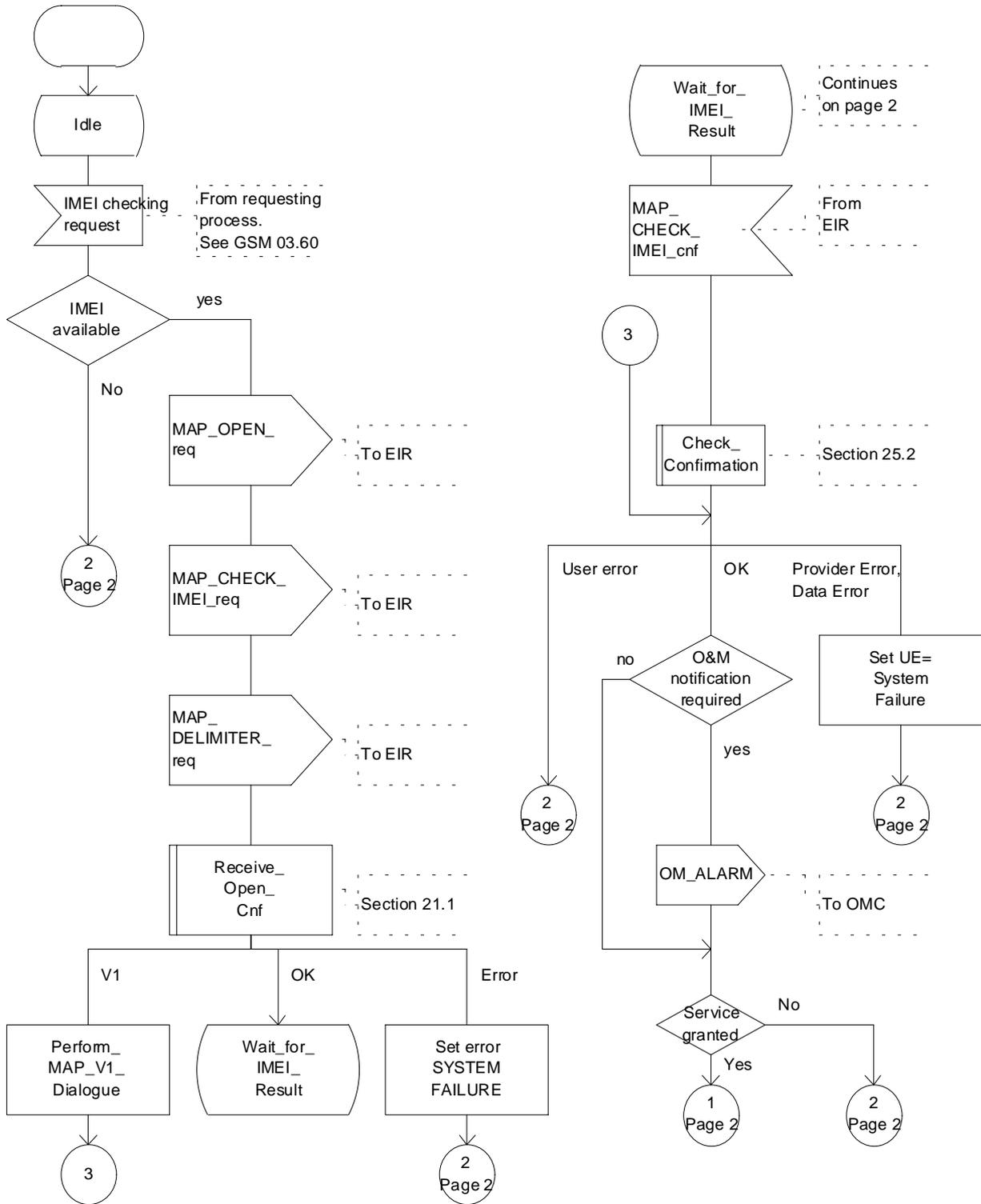


Figure 25.6/6 (sheet 1 of 2): Process Check_IMEI_SGSN

Figure 25.6/6: Check IMEI process in the SGSN

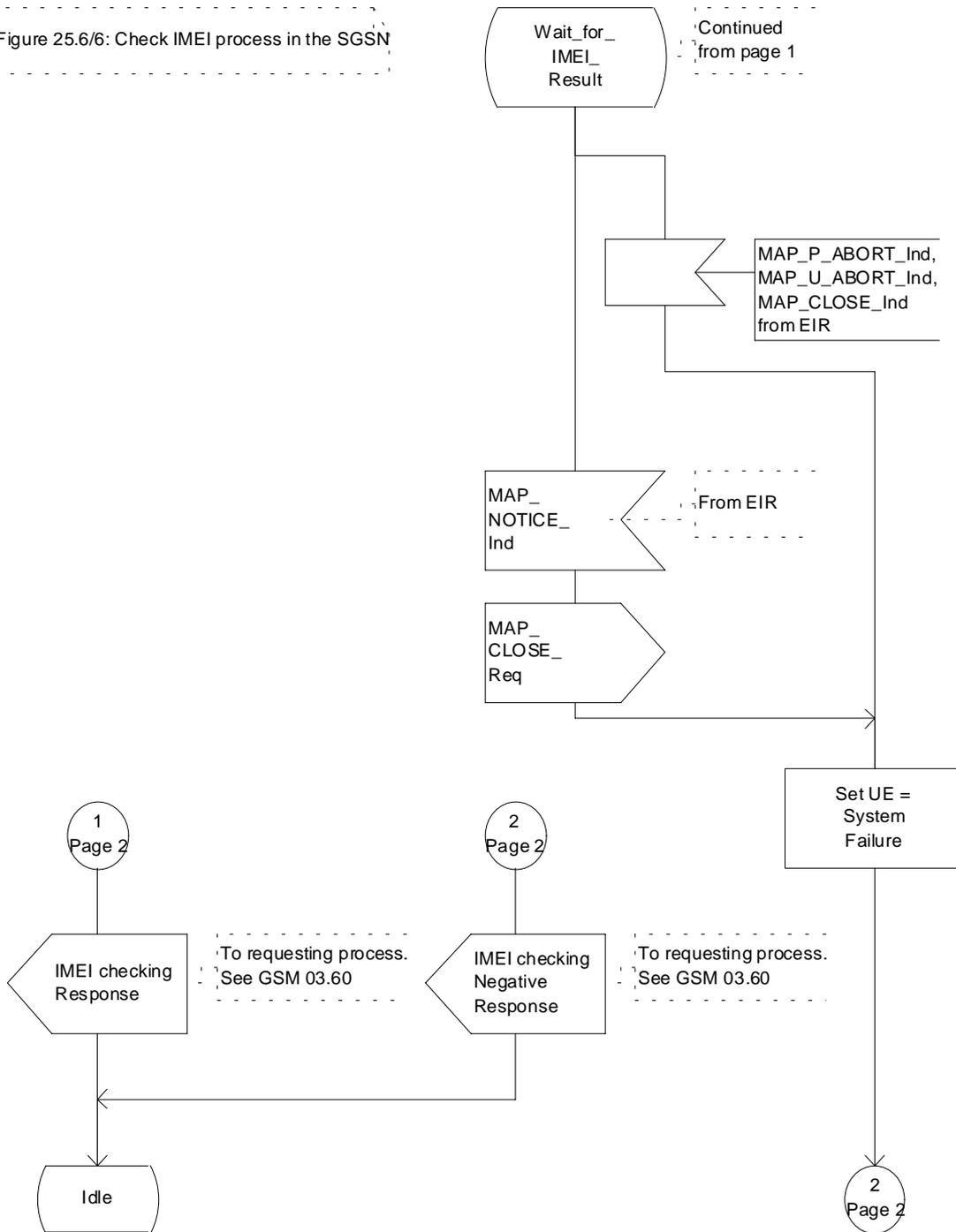


Figure 25.6/6 (sheet 2 of 2): Process Check_IMEI_SGSN

25.7 Insert Subscriber Data Macros

25.7.1 Macro Insert_Sub_Data_VLR

This macro describes the reception of the InsertSubscriberData service indication. This macro is used by any procedure that triggers the reception of subscriber data (e.g. Update Location or Restore Data).

If the VLR does not support any basic or supplementary service or the network feature Operator Determined Barring, or there is a problem with Regional Subscription Data then it reports it to the HLR.

If the entire MSC area is restricted due to regional subscription this is reported to the HLR.

The SDL diagram is shown in figure 25.7/1.

Figure 25.7/1: Macro to receive and store subscriber data in the VLR

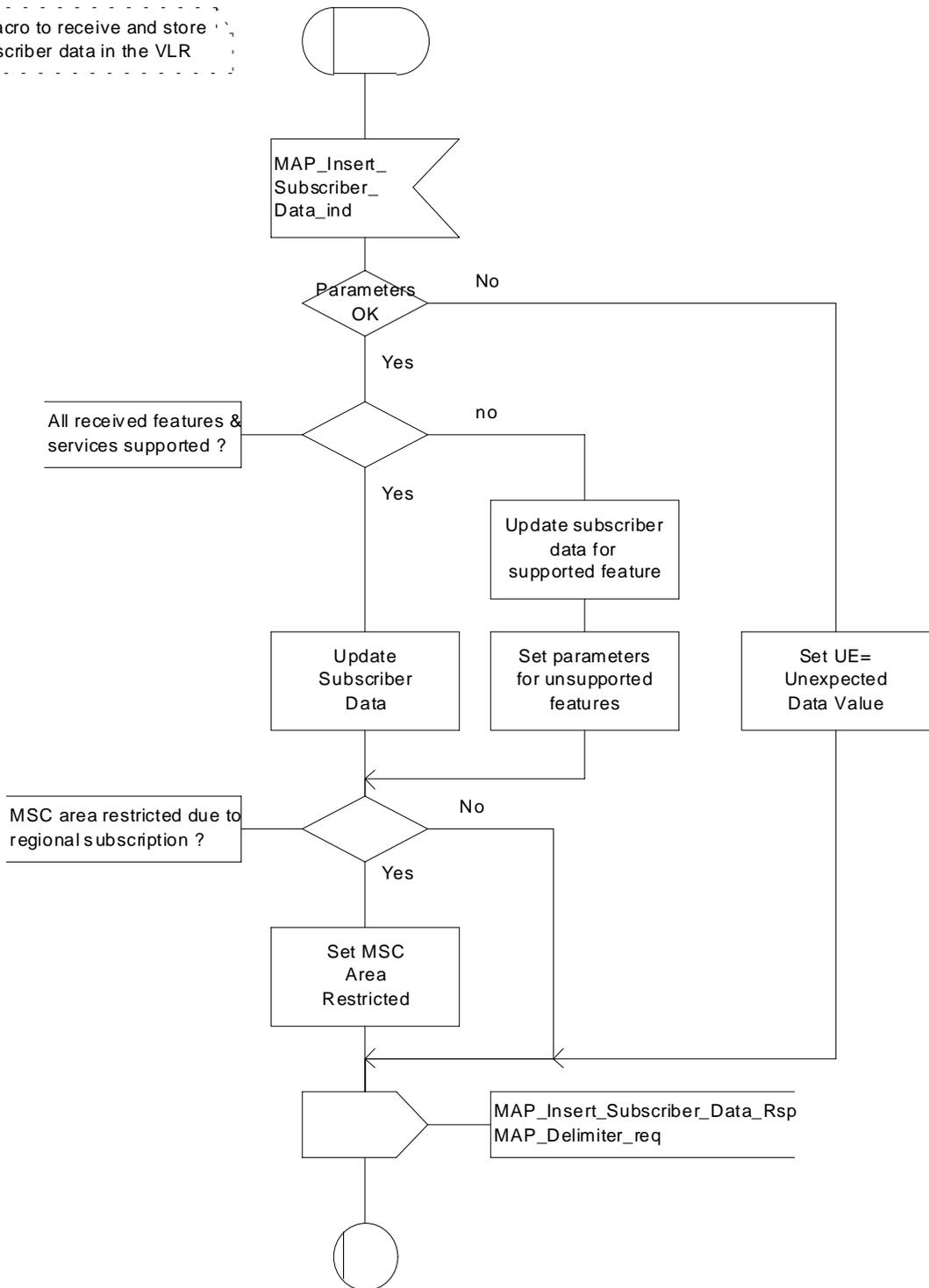


Figure 25.7/1: Macro Insert_Subs_Data_VLR

25.7.2 Process Insert_Subscriber_Data_Stand_Alone_HLR

This process is used by HLR to transfer subscriber data to VLR or to SGSN in a stand alone mode, i.e. in its own dialogue. This is done whenever a change of subscriber data is performed either by the operator or by the subscriber and this change has to be reported to VLR or to SGSN.

The process, after opening the dialogue with VLR or with SGSN, sends as many requests of the InsertSubscriberData service as necessary to transfer the subscriber data. The call to the process "Send_Insert_Subscriber_Data" (see subclause 25.7.4) is meant to describe two possible behaviours of the HLR when more than one service request has to be sent:

- either the HLR handles the requests and the confirmations in parallel; or
- the HLR sends every request after receiving the confirmation to the previous one.

The macros "Wait_for_Insert_Subscriber_Data_Cnf" and "Wait_for_Insert_GPRS_Subscriber_Data_Cnf" (see subclauses 25.7.3 and 25.7.6) are also called in order to handle every single confirmation.

If the result of a primitive received from the VLR or from the SGSN is unsuccessful, the HLR may initiate re-attempts; the number of repeat attempts and the time in between are HLR operator options, depending on the error returned by the VLR or by the SGSN.

If certain services required for a subscriber are not supported by the VLR or by the SGSN (e.g. Advice of Charge Charging Level), this may result in one of the following outcomes:

- the HLR stores and sends "Roaming Restriction Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restriction Due To Unsupported Feature" is stored in the HLR, the "MSC Area Restricted Flag" shall be set to "restricted". This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR.
- the HLR stores and sends other induced subscriber data (e.g. a specific barring program) in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. This will cause rejection of mobile originated service requests, except emergency calls.
- the HLR stores and sends "Roaming Restricted In SGSN Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restricted In SGSN Due To Unsupported Feature" is stored in the HLR, the "SGSN Area Restricted Flag" shall be set to "restricted". This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP-Context activation.

When the VLR receives regional subscription data (Zone Code List) it may respond with "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "MSC Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR.

When the SGSN receives regional subscription data (Zone Code List) it may respond with "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "SGSN Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP-Context activation.

If subscriber data for CAMEL Phase 2 or 3 services are sent to a VLR which does not support CAMEL Phase 2 or 3, the service behaviour may be unpredictable or incorrect. The HLR therefore needs to ensure that at the conclusion of a stand alone Insert Subscriber data procedure that the data in the VLR do not require a capability that the VLR does not have. Possible mechanisms to ensure this are described in 3G TS 23.078.

The HLR should send a Forwarded-to number which is not in E.164 international format to the VLR only when the HLR has ascertained that the VLR supports CAMEL Phase 2 or 3. Thus, the ISD message containing the Forwarded-to number which is not in E.164 international format shall be sent to the VLR only if the HLR previously received confirmation from the VLR at Location Update that CAMEL Phase 2 or 3 is supported.

A Forwarded-to number in non-international E.164 format shall only be sent from an HLR to a VLR if the VLR supports CAMEL Phase 2, or a subsequent version of CAMEL.

If the HLR does not store "Roaming Restriction Due To Unsupported Feature" as a consequence of the stand alone Insert Subscriber Data procedure and the HLR does not receive "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response and "Roaming Restriction Due To Unsupported Feature" has not been stored in the HLR in the course of a previous subscriber data retrieval procedure, the "MSC Area Restricted Flag" in the HLR shall be set to "not restricted".

If the HLR does not store "Roaming Restricted In SGSN Due To Unsupported Feature" as a consequence of the stand alone Insert Subscriber Data procedure and the HLR does not receive "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response and "Roaming Restricted In SGSN Due To Unsupported Feature" has not been stored in the HLR in the course of a previous subscriber data retrieval procedure, the "SGSN Area Restricted Flag" in the HLR shall be set to "not restricted".

The SDL diagram of process between HLR and VLR is shown in figure 25.7/2;

The SDL diagram of process between HLR and SGSN is shown in figure 25.7/5.

Process Insert_Subs_Data_Stand_Alone_HLR

25.7_2.1(2)

Figure 25.7/2: Independent process to open a new dialogue and transfer subscriber data from HLR to VLR

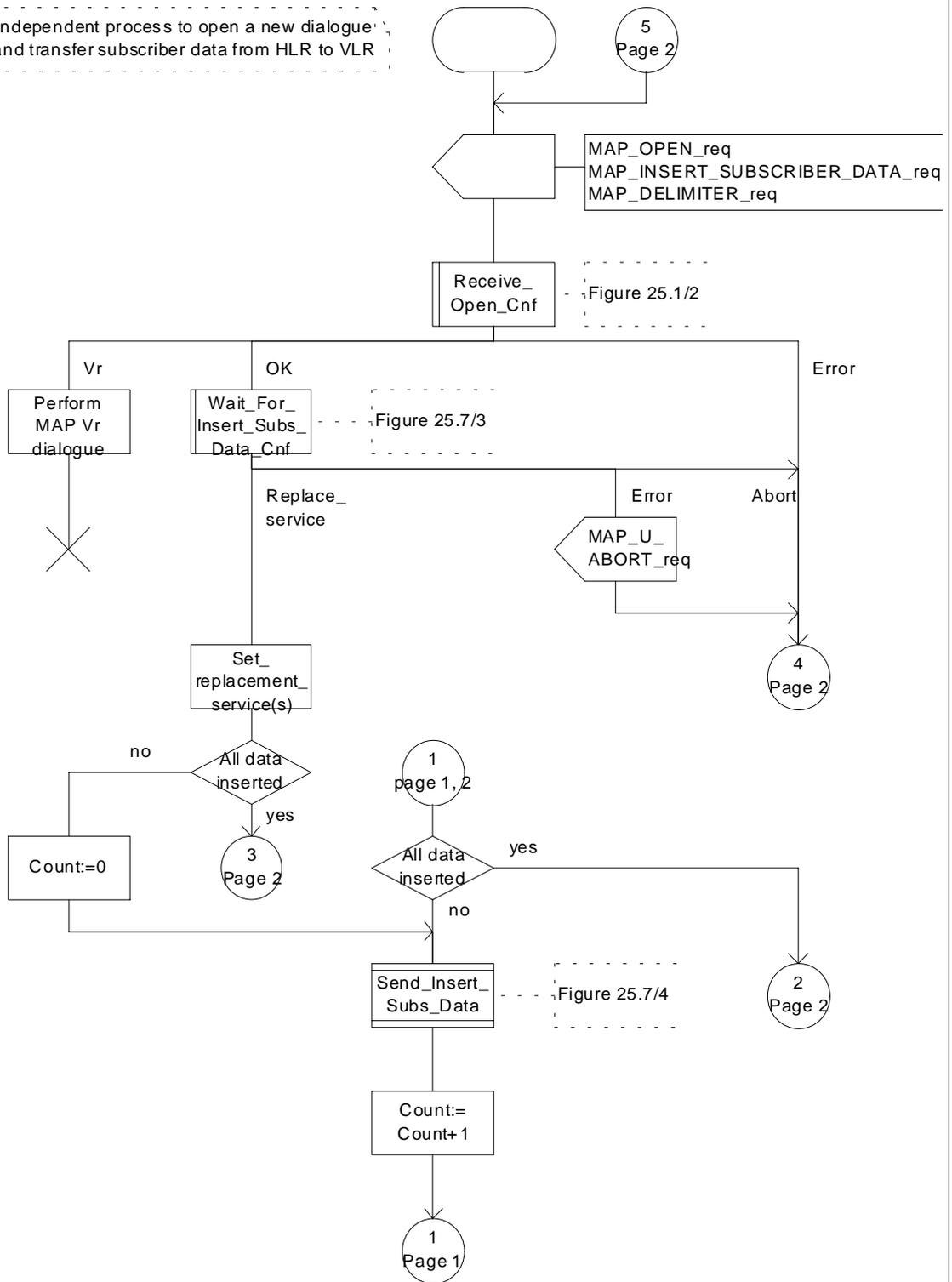


Figure 25.7/2 (sheet 1 of 2): Process Insert_Subs_Data_Stand_Alone_HLR

Figure 25.7/2: Independent process to open a new dialogue and transfer subscriber data from HLR to VLR

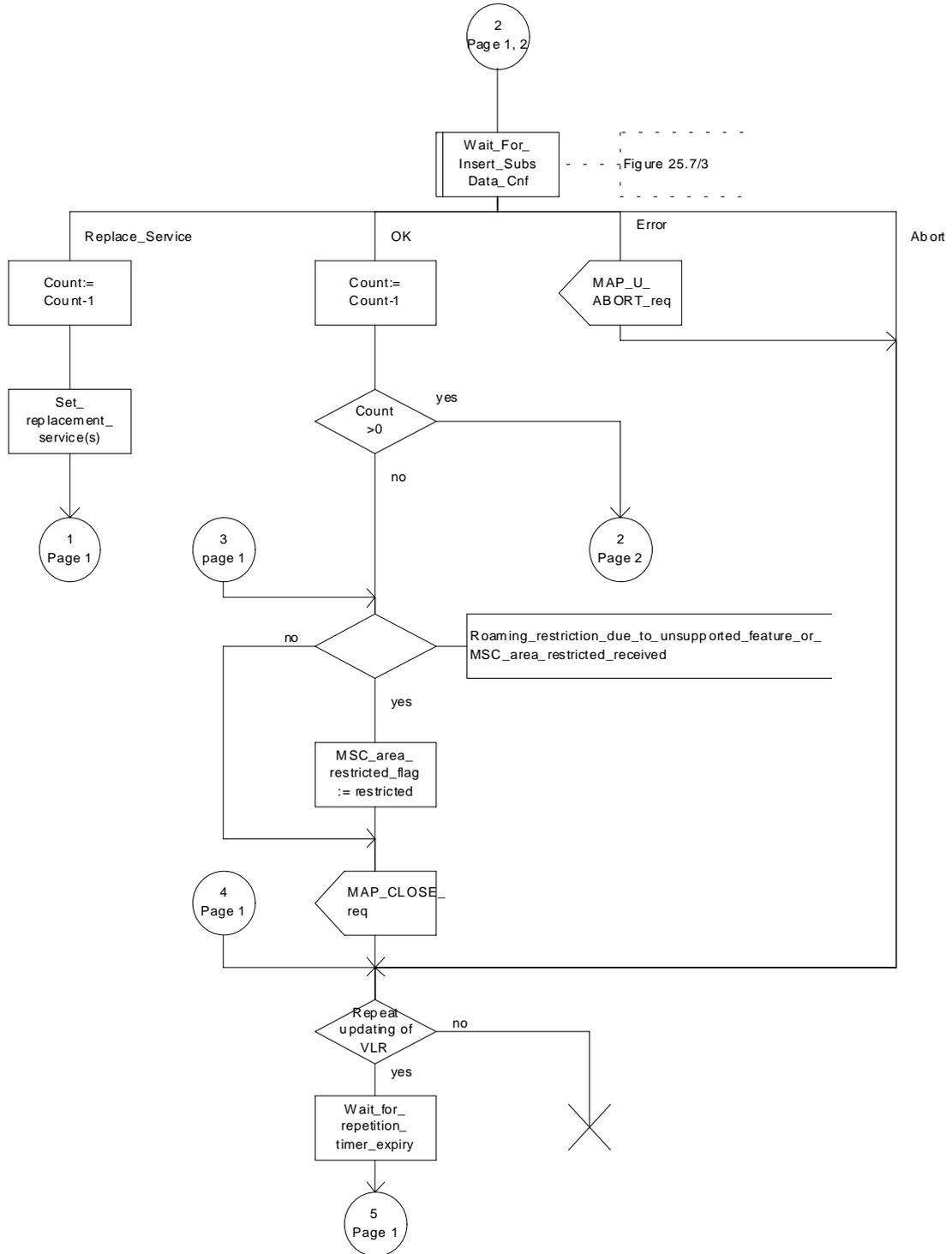


Figure 25.7/2 (sheet 2 of 2): Process Insert_Subs_Data_Stand_Alone_HLR

Process Insert_GPRS_Subscriber_Data_Stand_Alone_HLR

25.7_5.1(2)

Figure 25.7/5: Independent process to open a new dialogue and transfer GPRS subscriber data from HLR to SGSN

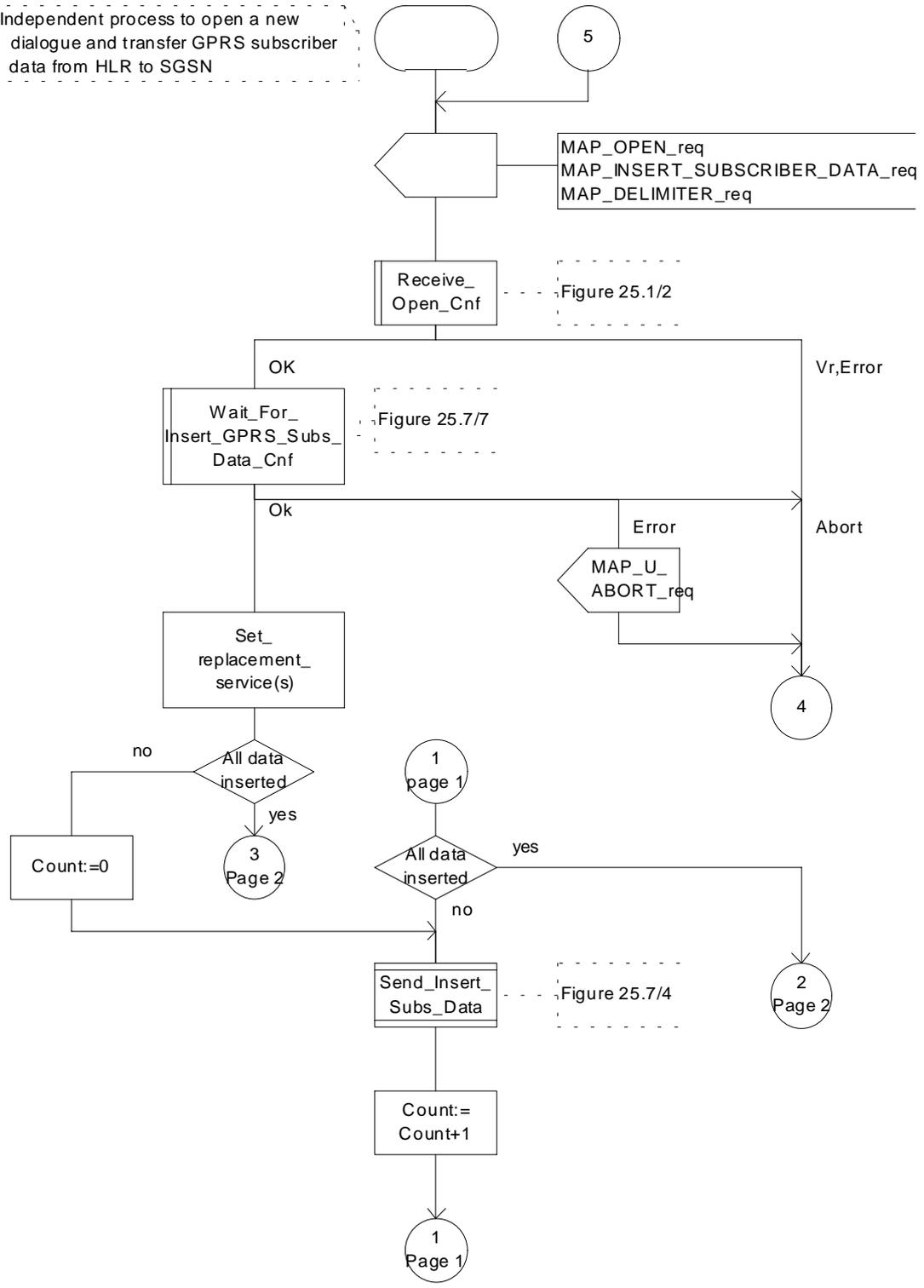


Figure 25.7/5 (sheet 1 of 2): Process Insert_GPRS_Subscriber_Data_Stand_Alone_HLR

Figure 25.7/5: Independent process to open a new dialogue and transfer GPRS subscriber data from HLR to SGSN

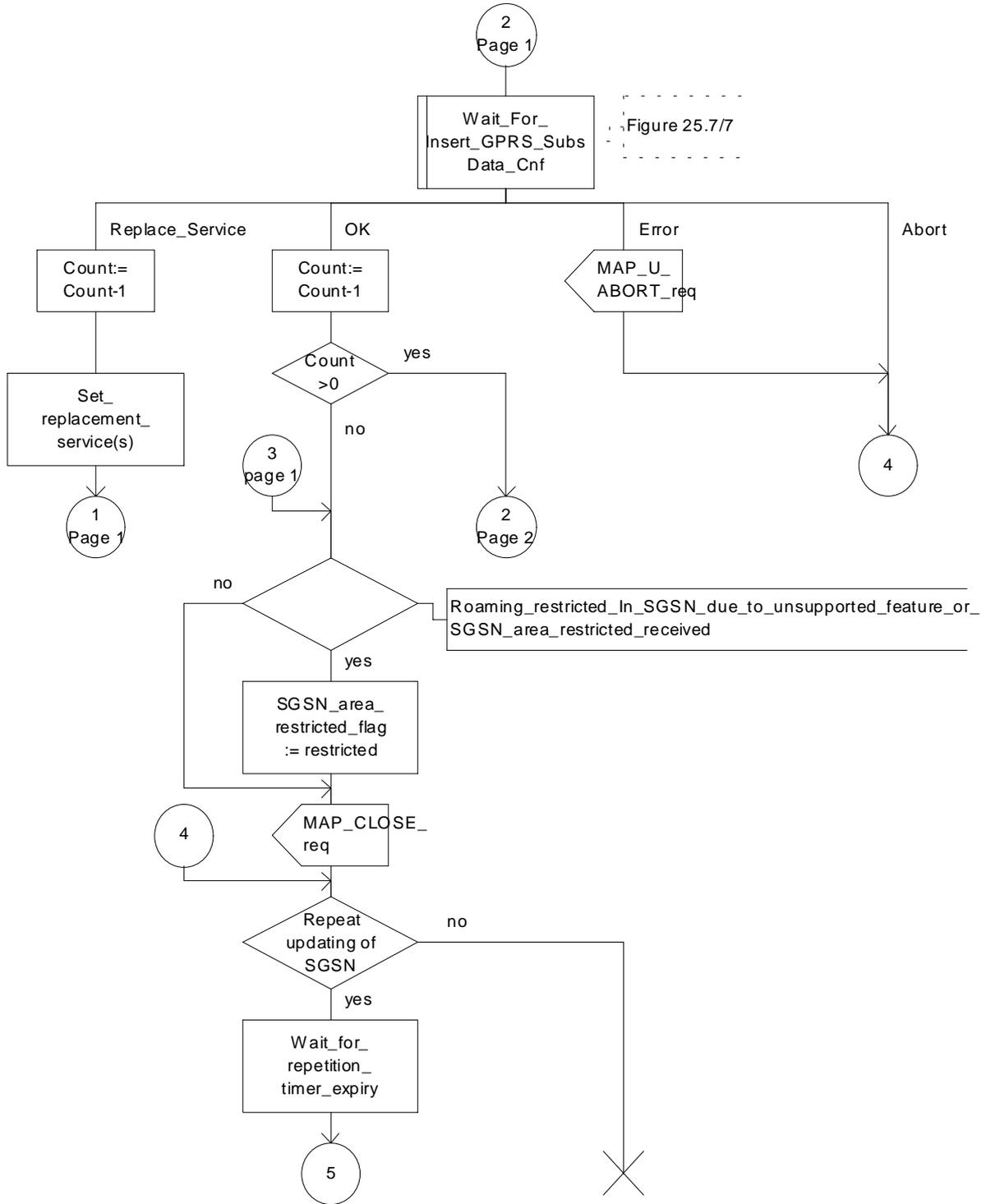


Figure 25.7/5 (sheet 2 of 2): Process Insert_GPRS_Subscriber_Data_Stand_Alone_HLR

25.7.3 Macro Wait_for_Insert_Subscriber_Data_Cnf

This macro is used by any process or macro that describes the handling of the reception of the Insert_Subscriber_Data service in HLR that is coming from VLR (e.g. Update Location or Restore Data).

If the VLR reports the non-support of some basic or supplementary service or the network feature Operator Determined Barring then three actions are possible:

- to ignore the information received;
- to replace the not supported service;
- or to perform any other internal action.

The SDL diagram is shown in figure 25.7/3.

Macrodefinition Wait_For_Insert_Subscriber_Data_Cnf

25.7_3(1)

Figure 25.7/3: Macro to receive confirmation or error indication for MAP_INSERT_SUBSCRIBER_DATA

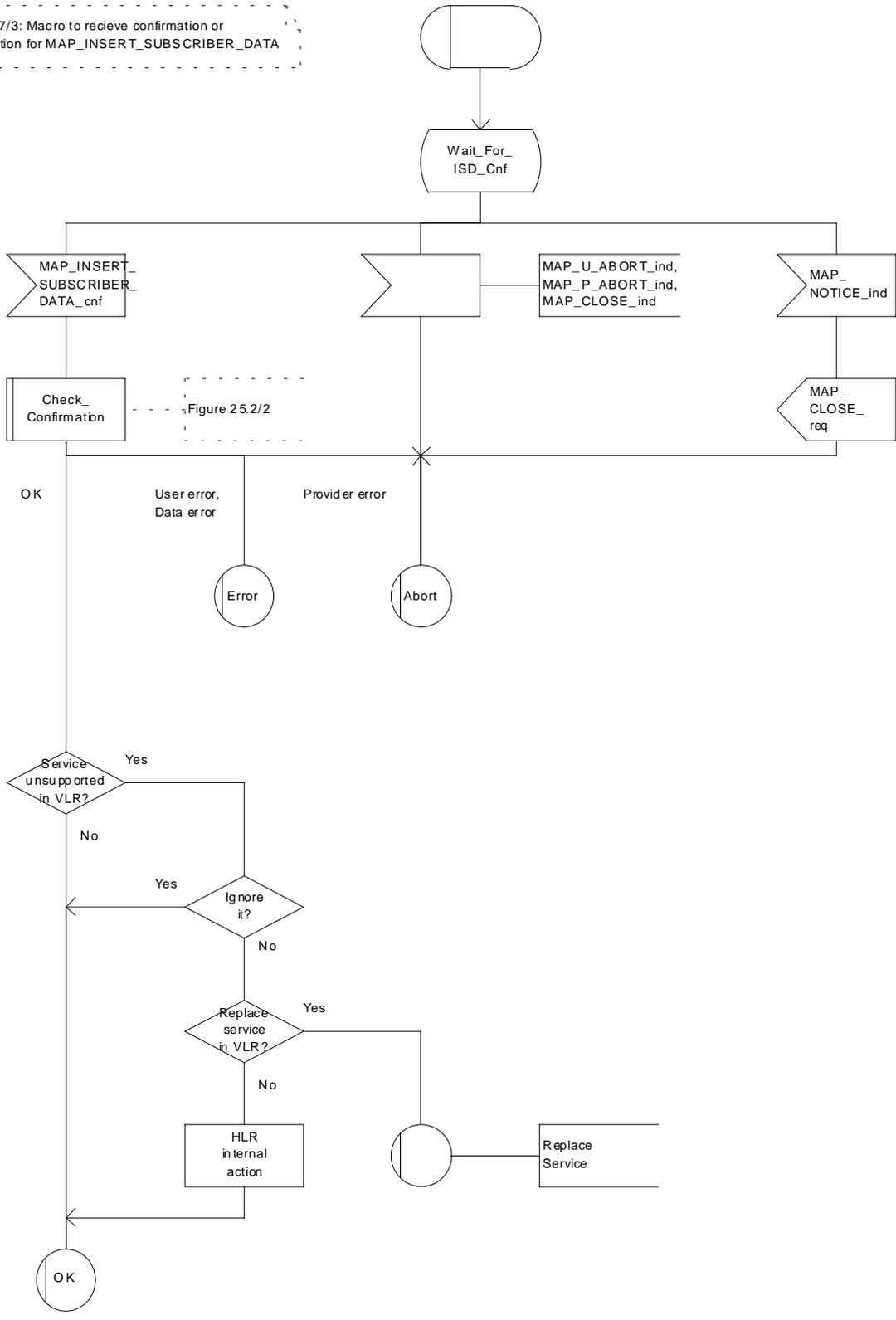


Figure 25.7/3: Macro Wait_for_Insert_Subscriber_Data_Cnf

25.7.4 Process Send_Insert_Subscriber_Data

This process is used by any process or macro where the Insert_Subscriber_Data request is sent to VLR or to SGSN.

The SDL diagram is shown in figure 25.7/4.

Process Send_Insert_SubData

25.7_4(1)

Figure 25.7/4: Independent process to send a component of subscriber data from HLR to VLR

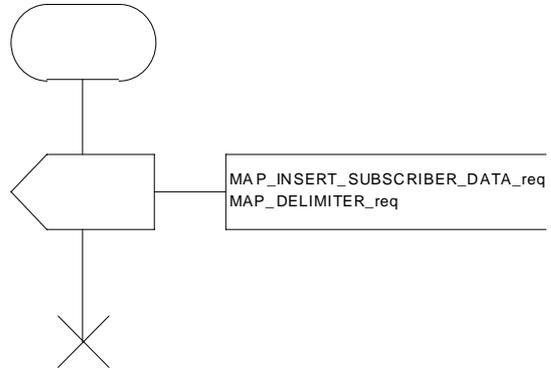


Figure 25.7/4: Process Send_Insert_SubData

25.7.5 Macro Insert_SubscriberData_SGSN

This macro describes the reception of the InsertSubscriberData service indication. This macro is used by any procedure that triggers the reception of subscriber data (e.g. Update GPRS Location).

If the SGSN does not support any basic or the network feature Operator Determined Barring, or there is a problem with Regional Subscription Data then it reports it to the HLR.

If the entire SGSN area is restricted due to regional subscription this is reported to the HLR.

The SDL diagram is shown in figure 25.7/6.

Figure 25.7/6: Macro to receive and store subscriber data in the SGSN

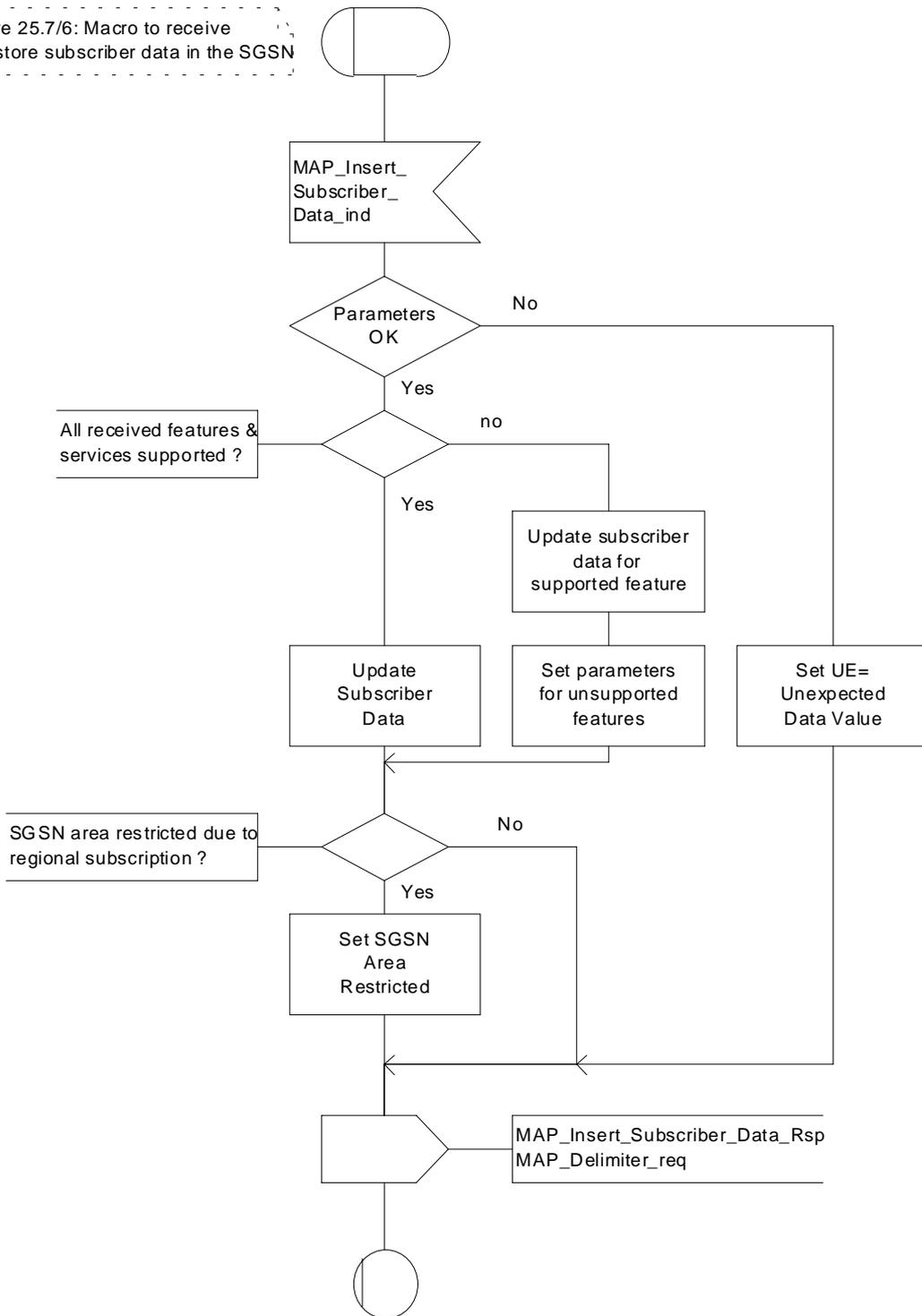


Figure 25.7/6: Macro Insert_Subscriber_Data_SGSN

25.7.6 Macro Wait_for_Insert_GPRS_Subscriber_Data_Cnf

This macro is used by any process or macro that describes the handling of the reception of the Insert_Subscriber_Data service in HLR that is coming from SGSN (e.g. Update GPRS Location).

If the SGSN reports the non-support of some basic or the network feature Operator Determined Barring then three actions are possible:

- to ignore the information received;
- to replace the not supported service;
- or to perform any other internal action.

The SDL diagram is shown in figure 25.7/7.

Macrodefinition Wait_For_Insert_GPRS_Subscriber_Data_Cnf

25.7_7(1)

Figure 25.7/7: Macro to receive confirmation or error indication for MAP_INSERT_SUBSCRIBER_DATA from SGSN

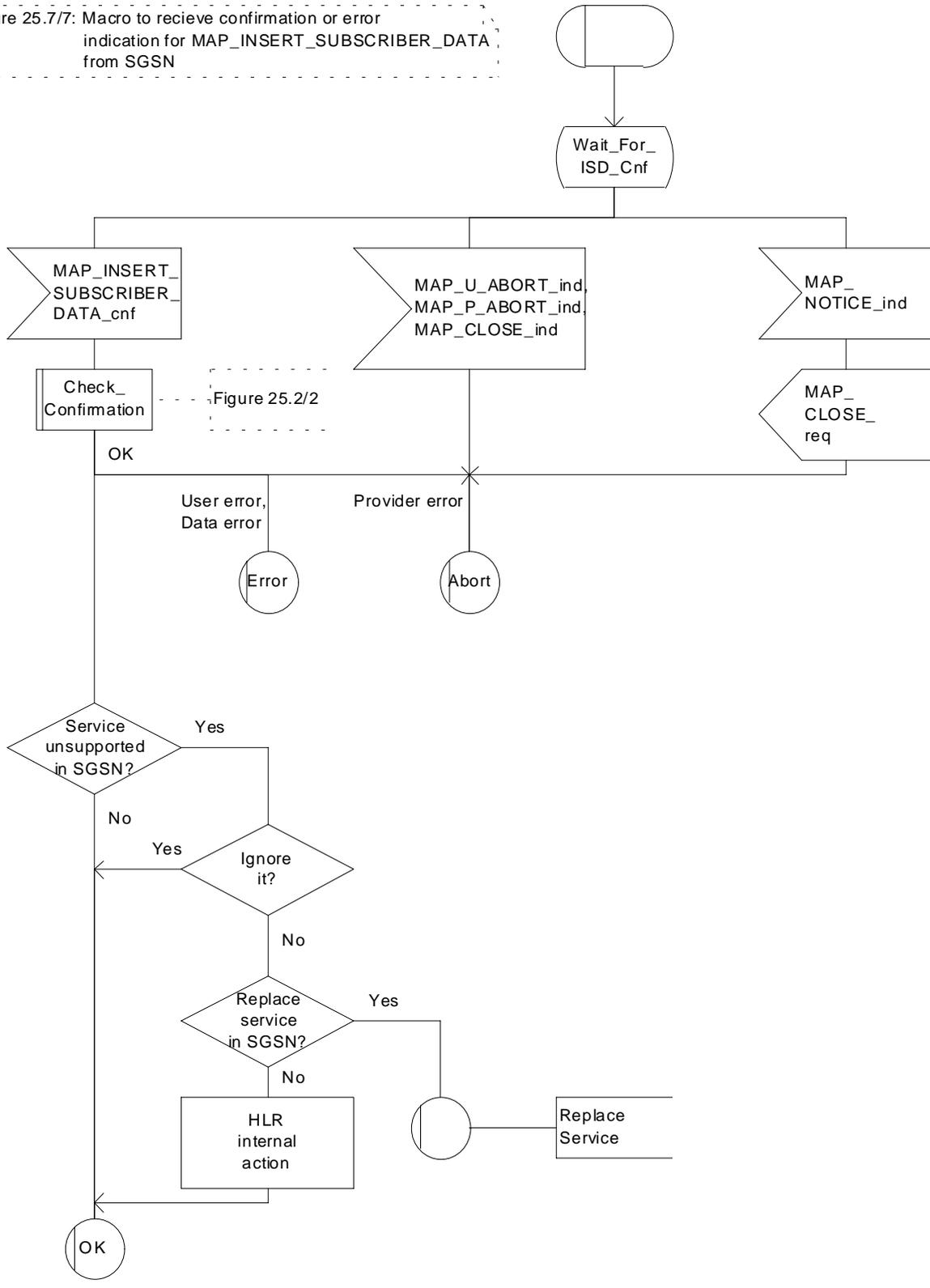


Figure 25.7/7: Macro Wait_for_Insert_GPRS_Subscriber_Data_Cnf

25.8 Request IMSI Macros

25.8.1 Macro Obtain_IMSI_MSC

This macro describes the handling of the request received from the VLR to provide the IMSI of a subscriber (e.g. at Location Updating).

The SDL diagram is shown in figure 25.8/1.

Macrodefinition Obtain_IMSI_MSC

25.8_1(1)

Figure 25.8/1: Macro to relay an IMSI request from the VLR to the MS and return the response to the VLR

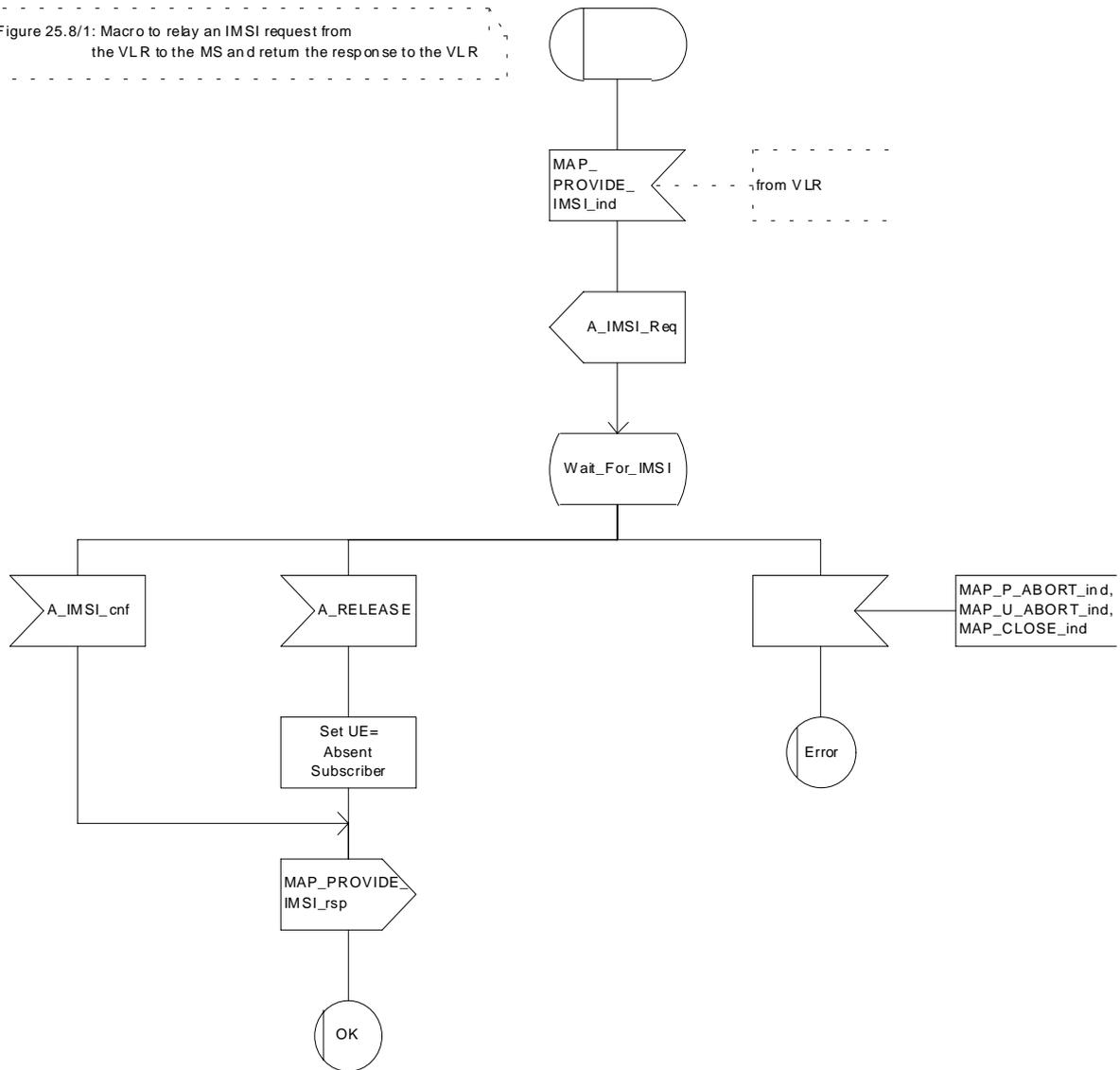


Figure 25.8/1: Macro Obtain_IMSI_MSC

25.8.2 Macro Obtain_IMSI_VLR

This macro describes the way VLR requests the MSC the IMSI of a subscriber (e.g. at Location Updating).

The SDL diagram is shown in figure 25.8/2.

Macrodefinition Obtain_IMSI_VLR

25.8_2(1)

Figure 25.8/2: Macro to obtain the IMSI from the MS via the MSC

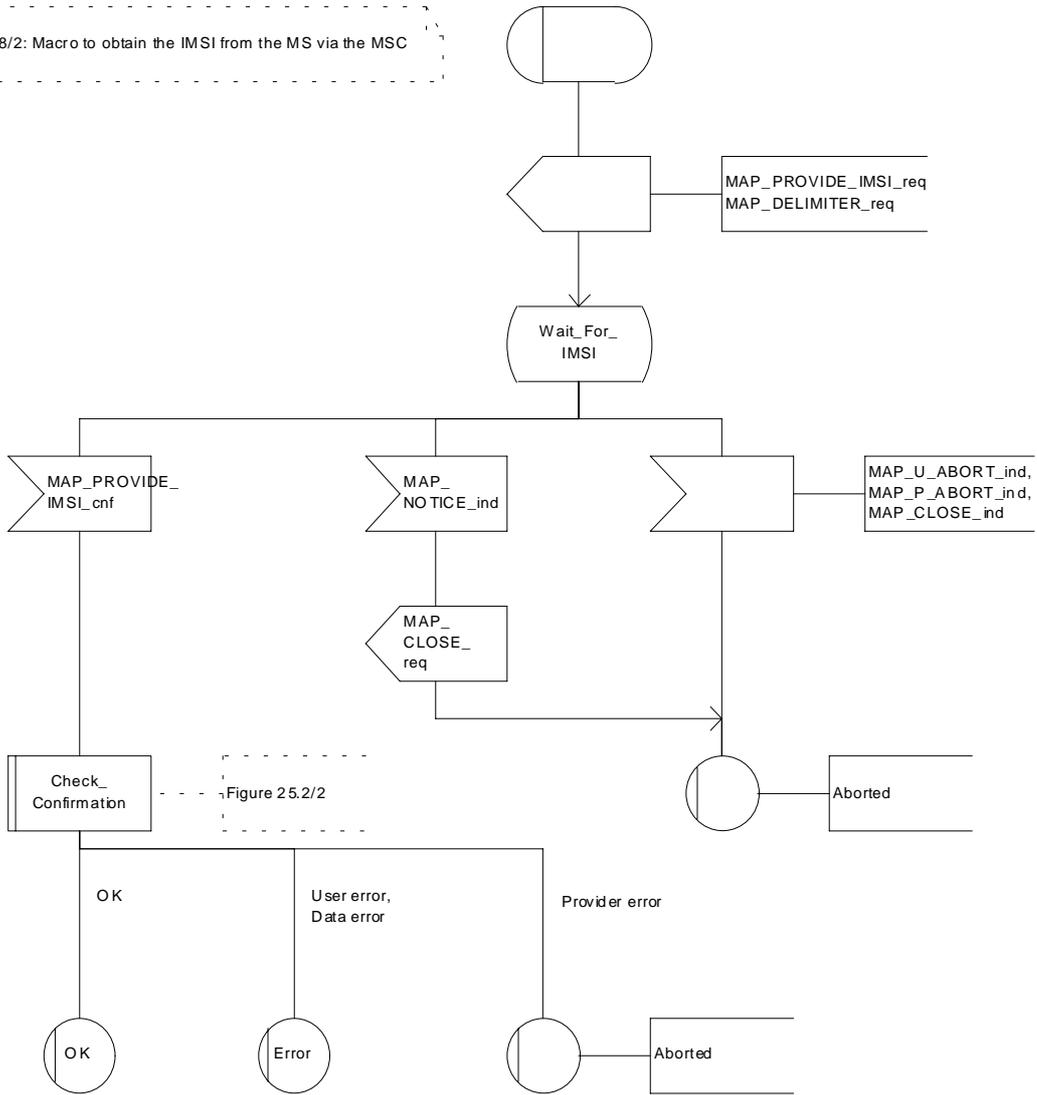


Figure 25.8/2: Macro Obtain_IMSI_VLR

25.9 Tracing macros

25.9.1 Macro Trace_Subscriber_Activity_MSC

The Trace_Subscriber_Activity_MSC is invoked in the MSC, when the MSC receives the MAP_TRACE_SUBSCRIBER_ACTIVITY indication from the VLR. The data of the primitive is checked and the tracing in the MSC is started if the content includes no errors. No response is returned to the VLR.

The Trace_Subscriber_Activity_MSC macro is described in the figure 25.9/1.

Figure 25.9/1: The Subscriber tracing macro in the MSC

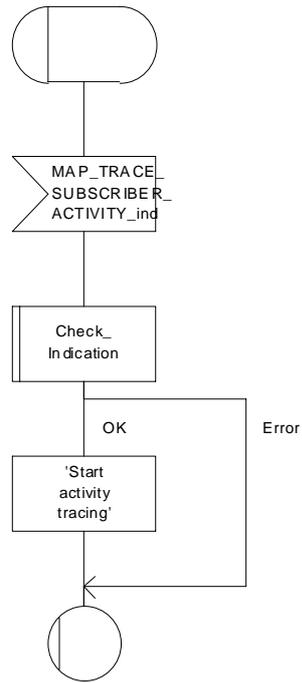


Figure 25.9/1: Macro Trace_Subscriber_Activity_MSC

25.9.2 Macro Trace_Subscriber_Activity_VLR

The macro Trace_Subscriber_Activity_VLR is invoked, if the subscriber activity is detected by the VLR and the tracing is active. The VLR sends MAP_TRACE_SUBSCRIBER_ACTIVITY request to the MSC. No answer is awaited from the MSC.

The Trace_Subscriber_Activity_VLR macro is shown in the figure 25.9/2.

Figure 25.9/2: The subscriber tracing macro in the VLR

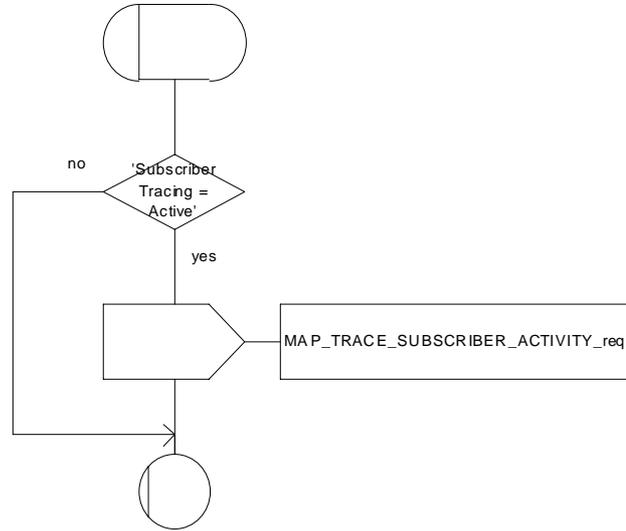


Figure 25.9/2: Macro Trace_Subscriber_Activity_VLR

25.9.3 Macro Activate_Tracing_VLR

The Activate_Tracing_VLR macro is invoked, when the MAP_ACTIVATE_TRACE_MODE indication is received from the HLR. The primitive is processed in the VLR as follows:

- if the data contains errors, a data missing or unexpected data value indication is returned to the HLR;
- if the tracing is not supported, a facility not supported indication is returned to the HLR;
- if the tracing buffer does not have any space left for the data, a tracing buffer full indication is returned to the HLR;
- if no errors is detected, the tracing is set active and a positive acknowledge is returned to the HLR.

The Activate_Tracing_VLR macro is described in the figure 25.9/3.

Figure 25.9/3: The activate trace mode macro in the VLR

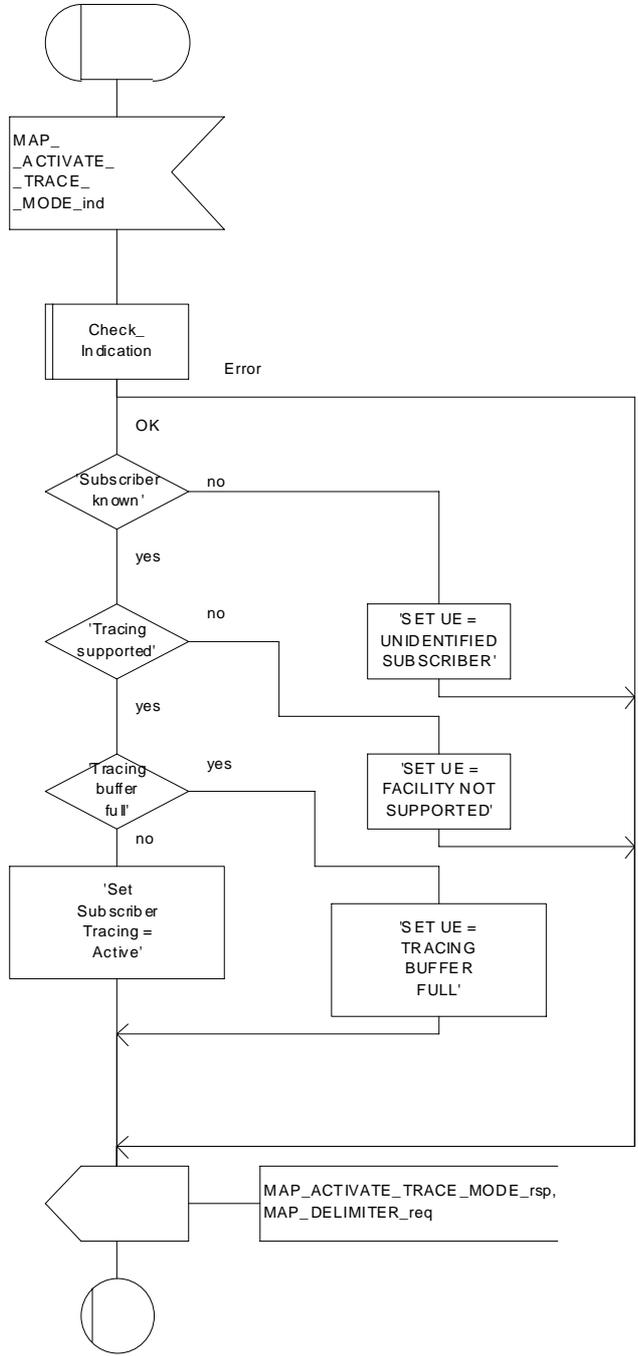


Figure 25.9/3: Macro Activate_Tracing_VLR

25.9.4 Macro Control_Tracing_HLR

The Control_Tracing_HLR macro may be invoked in the HLR, if subscriber related activity is detected. If the tracing is active in the HLR and not active in the VLR or in the SGSN, the MAP_ACTIVATE_TRACE_MODE request is sent to the VLR or to the SGSN.

The MAP_ACTIVATE_TRACE_MODE confirmation from the VLR or from the SGSN is processed as follows:

- if the primitive contains a successful acknowledge, the tracing in VLR or in the SGSN is set active;
- if the primitive contains errors, the tracing in VLR or in SGSN is set deactive.

The Control_Tracing_HLR macro between HLR and VLR is shown in the figure 25.9/4

The Control_Tracing_HLR_with_SGSN macro between HLR and SGSN is shown in the figure 25.9/5

Figure 25.9/4: The subscriber tracing activation macro in the HLR

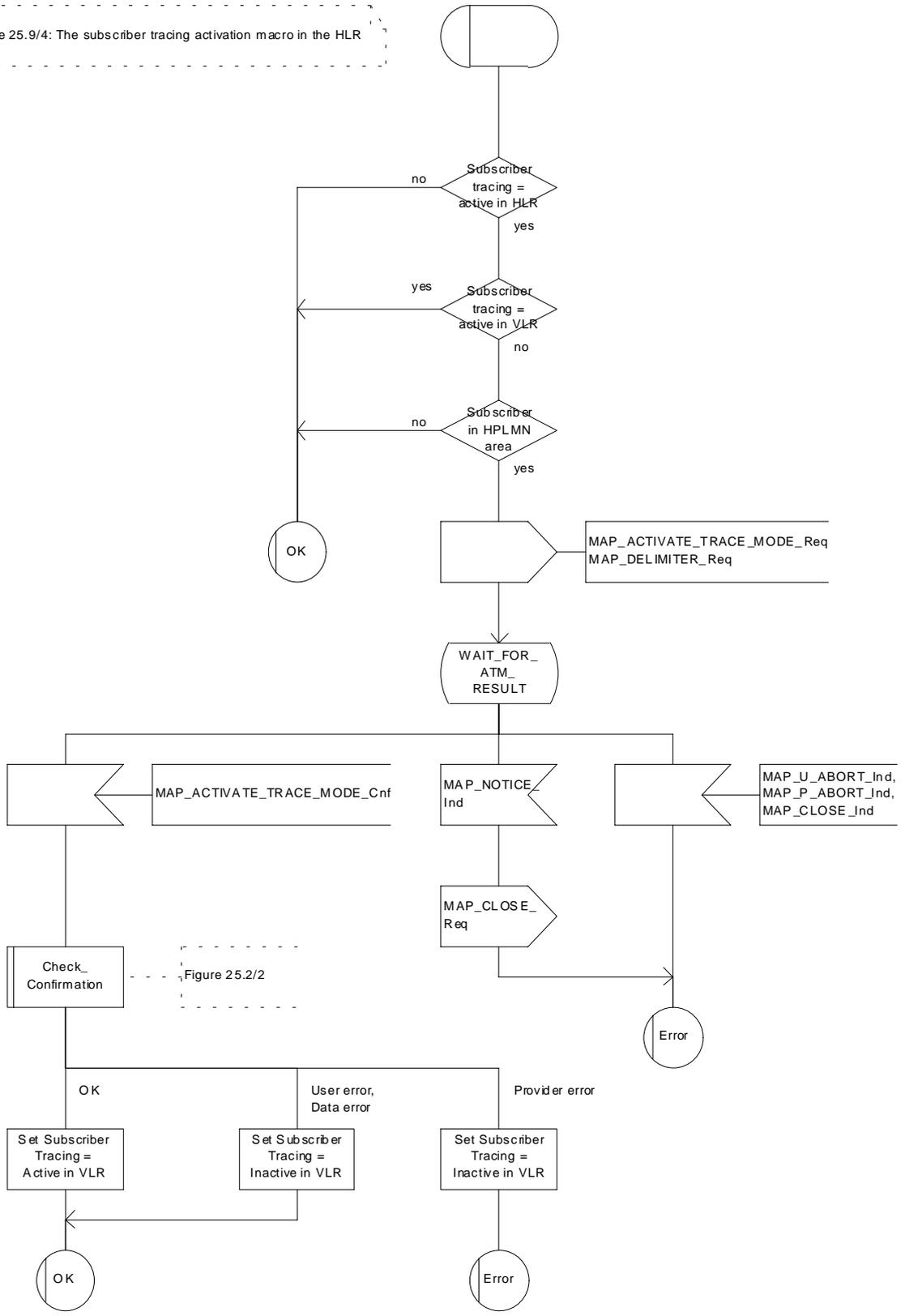


Figure 25.9/4: Macro Control_Tracing_HLR

Figure 25.9/5: The subscriber tracing activation macro in the HLR

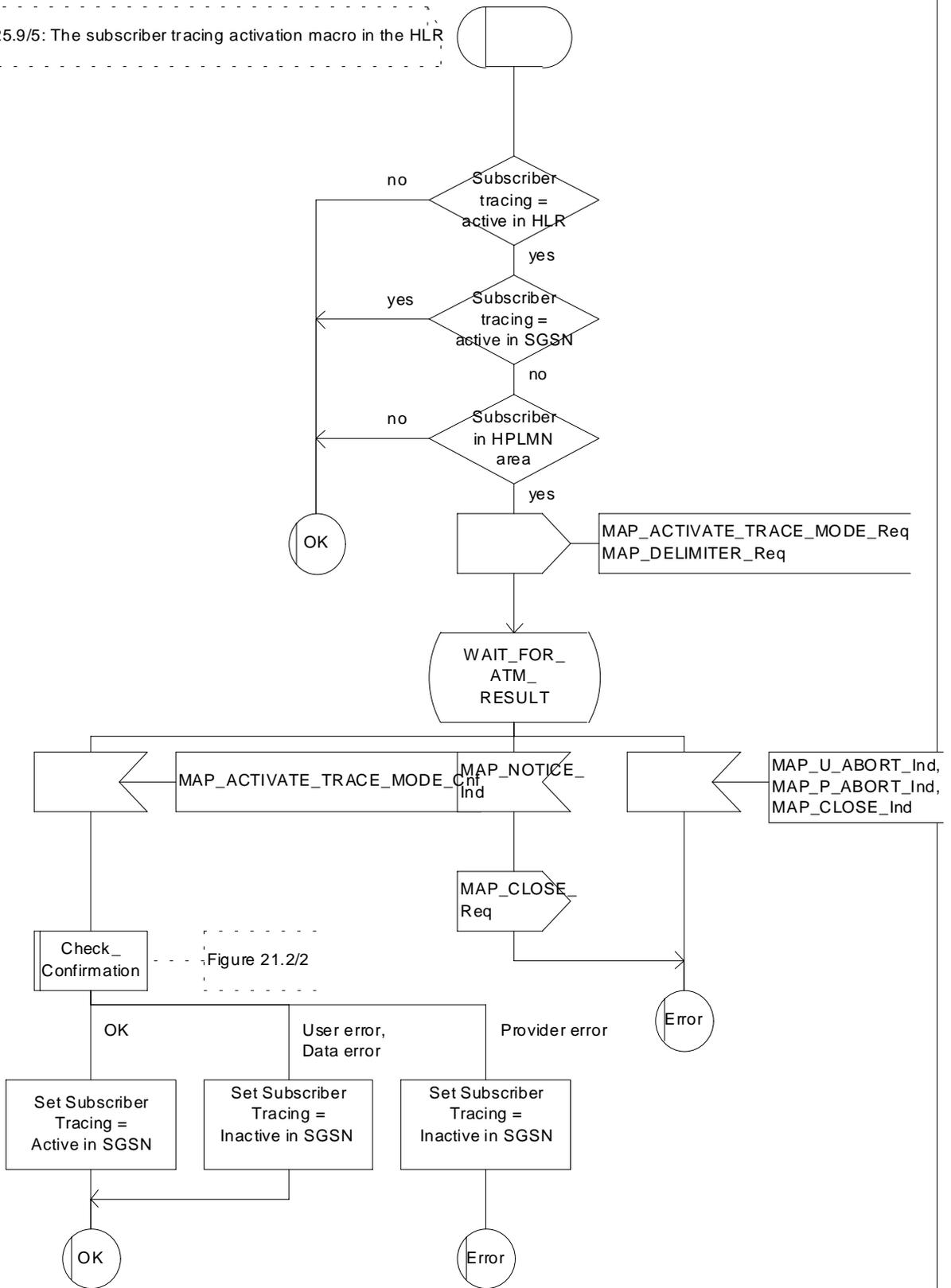


Figure 25.9/5: Macro Control_Tracing_HLR_with_SGSN

25.9.5 Macro Trace_Subscriber_Activity_SGSN

The macro Trace_Subscriber_Activity_SGSN is invoked, if the subscriber activity is detected by the SGSN and the tracing is active.

The Trace_Subscriber_Activity_SGSN macro is shown in the figure 25.9/6.

Figure 25.9/6: The subscriber tracing macro in the SGSN

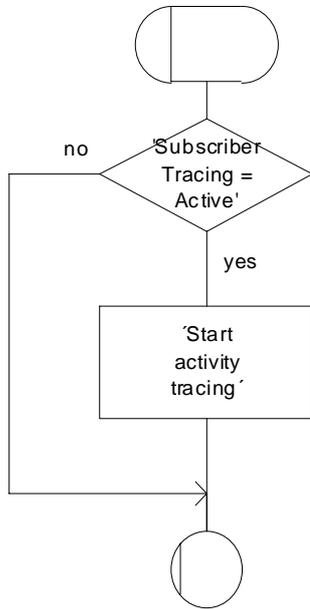


Figure 25.9/6: Macro Trace_Subscriber_Activity_SGSN

25.9.6 Macro Activate_Tracing_SGSN

The Activate_Tracing_SGSN macro is invoked, when the MAP_ACTIVATE_TRACE_MODE indication is received from the HLR. The primitive is processed in the SGSN as follows:

- if the data contains errors, a data missing or unexpected data value indication is returned to the HLR;
- if the tracing is not supported, a facility not supported indication is returned to the HLR;
- if the tracing buffer does not have any space left for the data, a tracing buffer full indication is returned to the HLR;
- if no errors is detected, the tracing is set active and a positive acknowledge is returned to the HLR.

The Activate_Tracing_SGSN macro is described in the figure 25.9/7.

Figure 25.9/7: The activate trace mode macro in the SGSN:

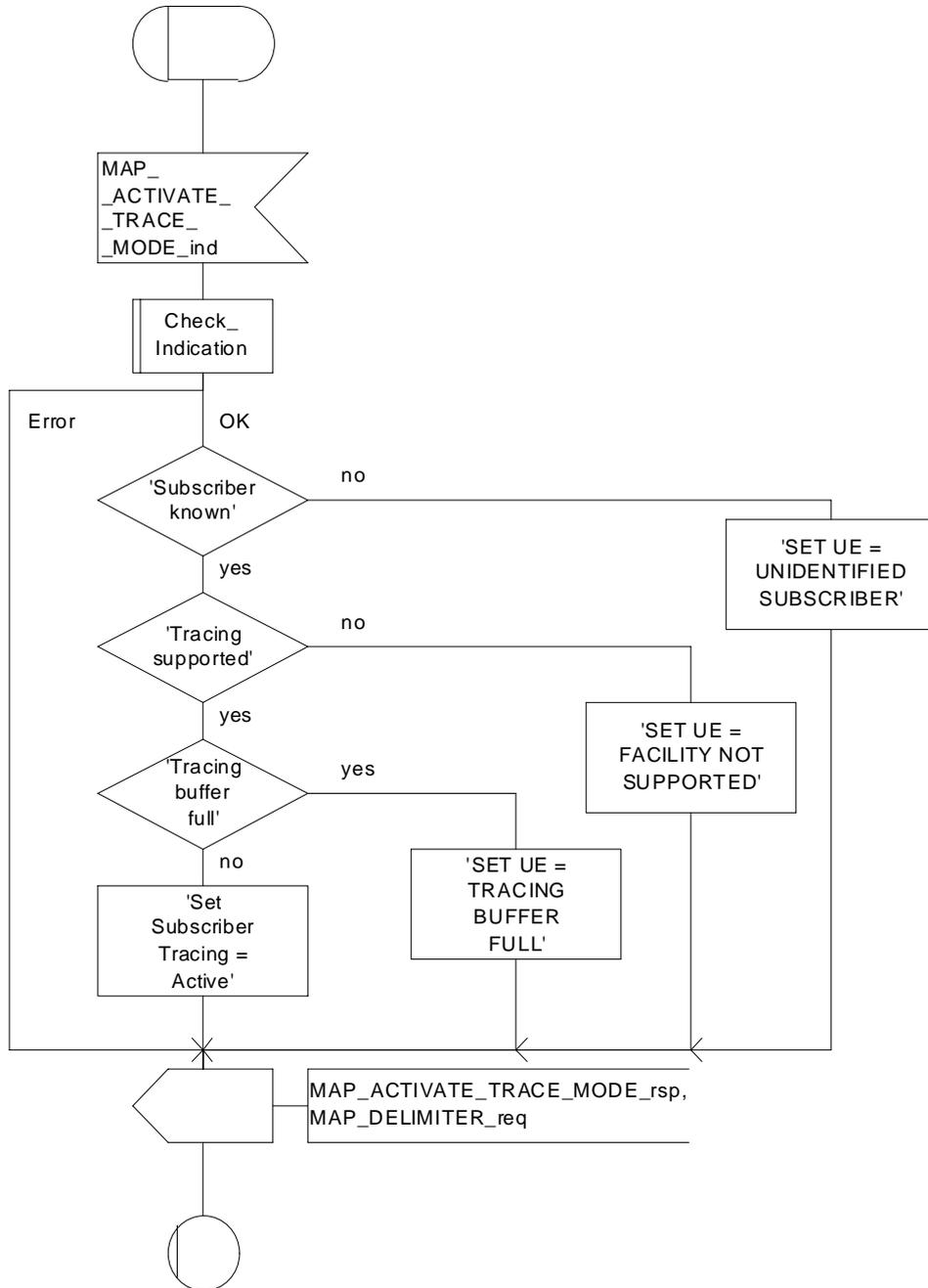


Figure 25.9/7: Macro Activate_Tracing_SGSN

25.10 Short Message Alert procedures

25.10.1 Subscriber_Present_VLR process

The Subscriber_Present_VLR process is invoked by the VLR, when the mobile subscriber becomes active and the MNRF flag is set. The general description of the short message alert procedures is in the subclause 23.4.

The VLR sends the MAP_READY_FOR_SM request to the HLR and waits for the HLR to answer. When receiving the answer, the VLR will act as follows:

- the MNRF flag is cleared if the procedure is successful;
- the MNRF flag is not cleared if the procedure is not successful.

The Subscriber_Present_VLR process is shown in the figure 25.10/1.

Figure 25.10/1: The short message alert process in the VLR for mobile present situation

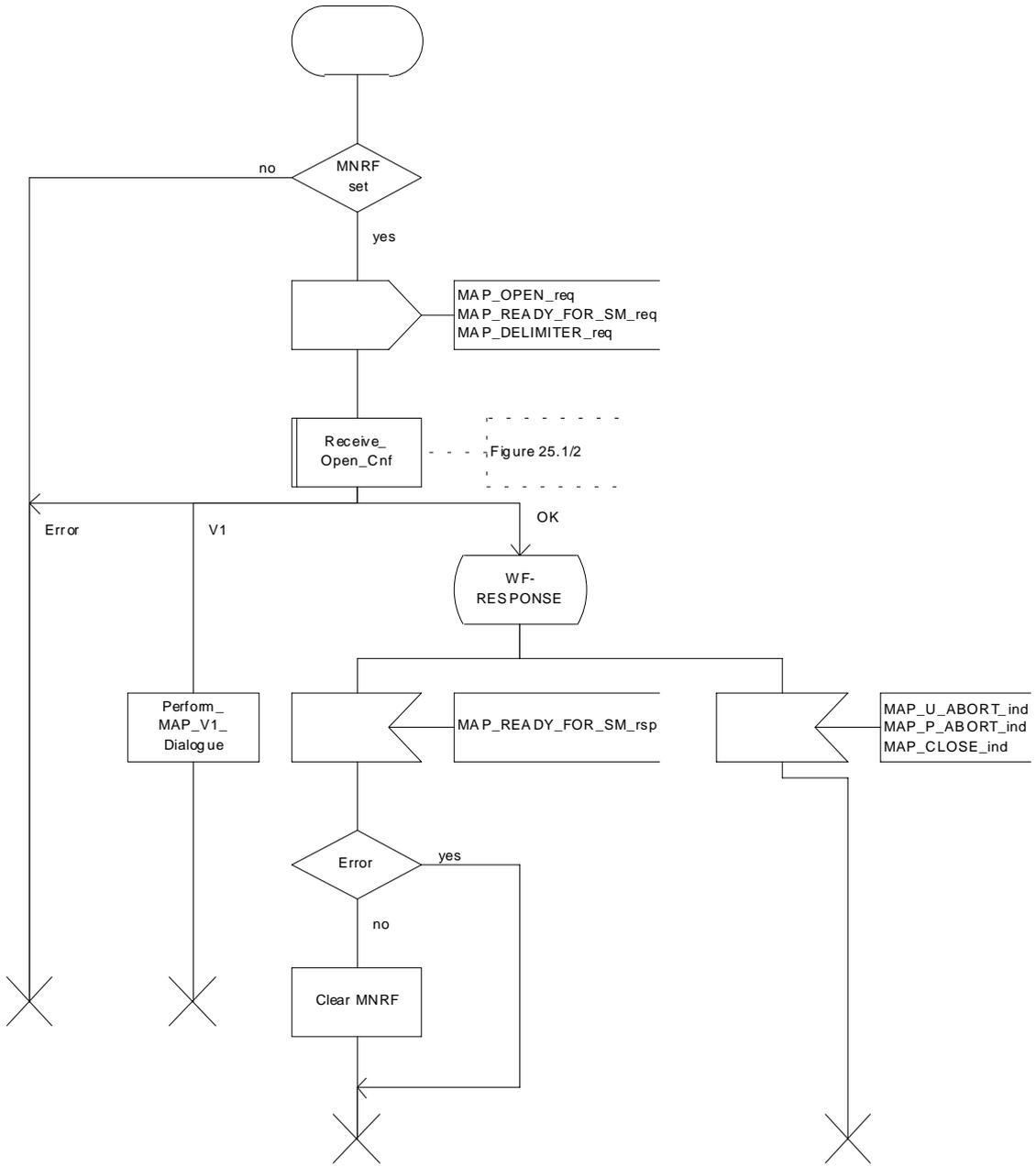


Figure 25.10/1: Process Subscriber_Present_VLR

25.10.2 Macro Alert_Service_Centre_HLR

The Alert_Service_Centre_HLR macro is initiated when the HLR notices that the Service Centre(s) shall be alerted. The macro starts process Alert_Service_Centre_HLR for every SC address in the MWD list.

In the process Alert_Service_Centre_HLR the HLR sends MAP_ALERT_SERVICE_CENTRE request to the appropriate IWMSC. The MWD entry is deleted when the positive acknowledge is received from the IWMSC. The unsuccessful alert may be repeated. The MWD entry should be purged in the unsuccessful case, at least when a suitable time period has expired.

The Alert_Service_Centre_HLR macro is shown in the figure 25.10/2 and the Alert_Service_Centre_HLR process is shown in the figure 25.10/3.

Figure 25.10/2: The short message alert macro in the HLR

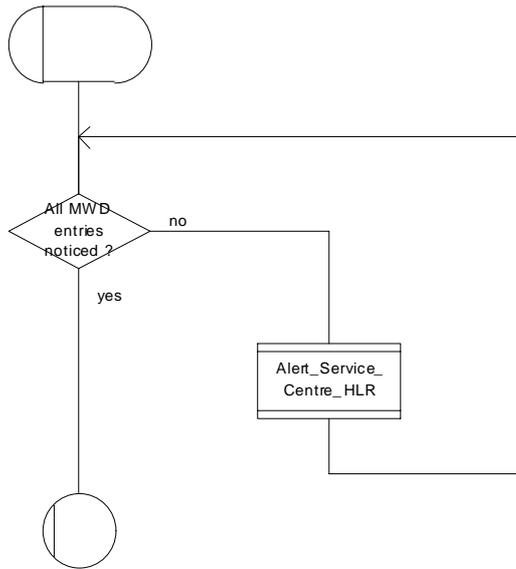


Figure 25.10/2: Macro Alert_Service_Centre_HLR

25.10.3 The Mobile Subscriber is present

When receiving Page response, Attach request or Routing area update request messages (TS GSM 04.08), while the MS not reachable for GPRS (MNRG) flag is set, the SGSN will send the MAP_READY_FOR_SM request towards the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for GPRS.

When receiving the answer, the SGSN will act as follows:

- MNRG is cleared if the procedure is successful
- MNRG is not cleared if the procedure is not successful

The Subscriber_Present_SGSN process is shown in the figure 25.10/4.

Figure 25.10/4: The short message alert process in the SGSN for mobile present situation

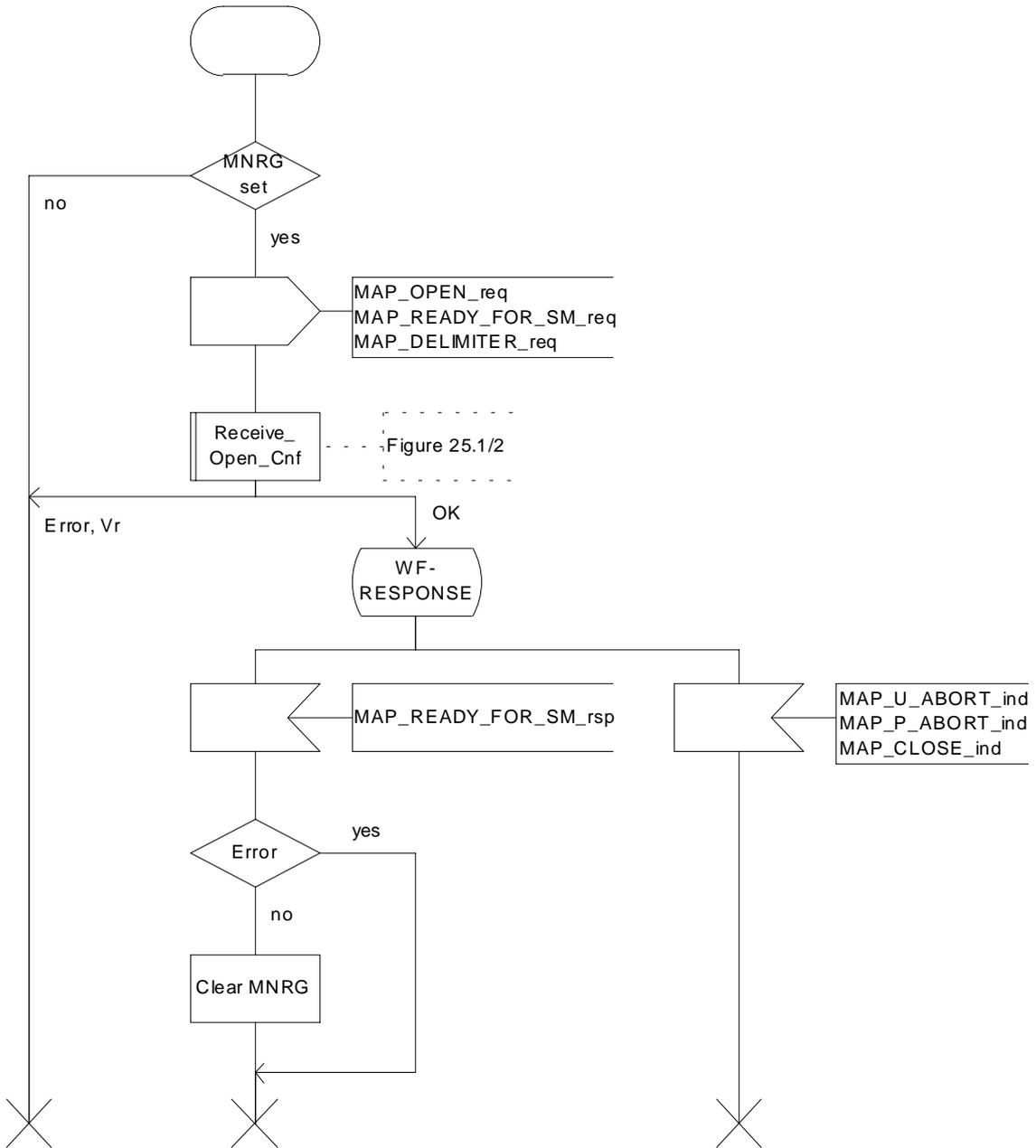


Figure 25.10/4: Process Subscriber_Present_SGSN

History

Document history		
V3.0.0	May 1999	Version 3.0.0 created
V3.1.0	September 1999	TSG#4 approval
V3.2.0	November 1999	
V3.3.0	December 1999	Introduction of CAMEL Phase 3. The following Tdocs have been included: N2-99F66, N299D63, N2-99G51, N2-99H80, N2-99H81, N2-99H82, N2-99H68, N2-99H00, N2-99F68, N2-99K34, N2-99K42 (modified), N2-99K50 (modified), N2-99F60, N2-99J21, N2-99J83, N2-99J79